PROJECT PRE-FEASIBILITY REPORT

FOR

Proposed Greenfield Project for the Manufacturing of Speciality Chemicals, Pesticide Technical & Pesticide Intermediates

At

Plot No. T-108, T-109, Notified Industrial Area, GIDC Saykha,
Tal: Vagra, District – Bharuch 392140
Gujarat.

Land/Plot Area: 57248.29 m^2 (5.724829 Ha)

Production Capacity:

Speciality Chemicals, Pesticide Technical & Pesticide Intermediates**:**
3200 MT/Month

[Schedule 5 (b) & 5 (f) Category "A" as per EIA notification 2006 and its amendment thereof]

APPLICANT

M/s Heranba Industries limited (Unit:VI)
Plot No. T-108, T-109,
Notified Industrial Area,
GIDC Saykha, Tal: Vagra,
District - Bharuch 392140, Gujarat.
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CONSULTANT

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1.0 EXECUTIVE SUMMARY

1.0.1 Name & Location

Name of the Project: Proposed Project for Manufacturing of Speciality Chemicals, Pesticide technical and Pesticide intermediates

Name of Industry: M/s Heranba Industries limited (Unit: VI)

Location: Plot No. T-108, T-109, Notified Industrial Area, GIDC Saykha, Tal: Vagra, District - Bharuch 392140, Gujarat.

1.0.2 Project

- **M/s Heranba Industries limited (Unit: VI)** is located in GIDC Notified Industrial Area, Saykha falling under large Scale category.
- The company has proposed to manufacture new products i.e. Speciality Chemicals, Pesticide technical and pesticide intermediates with capacity of 3200 MT/Month.
- The cost of proposed project is Rs. 250 Crore.

1.0.3 Applicability of EIA notification – 2006

- Category as per the amended EIA notification-2006: Project falls under Schedule 5(b) & 5(f) Category "A". Hence, Environmental clearance is required.

1.0.4 Project Proponent

- The company in India comprises of 4 Directors
- Large scale unit

1.1 List of products

S. No.	Name of the Product	CAS Number	Capacity, TPM	End use of product
Insecticides Compounds				
Group-1 Synthetic Pyrethroids Insecticides -1				
1	Cypermethrin (T) & Beta, Zeta, Theta etc Isomers(T)	52315-07-8	100	Used to control a broad spectrum of chewing, sucking and flying insects
2	Alphacypermethrin Technical	67375-30-8		Used to control a wide range of chewing and sucking insects
3	Deltamethrin Technical	52918-63-5		Use on areas such as golf courses, ornamental gardens, lawns, outdoor perimeter treatments, indoors as spot and crack and crevice treatments, and pet collars
4	Lambda Cyhalothric Technical	91465-08-6		Used to control a wide range of pests
5	Permethrin Technical	52645-53-1		Can Use to kill a broad range of pests,

				such as fleas, ticks, cockroaches, flies, and mosquitoes.
Group-2 Synthetic Pyrethroids Insecticides-2				
6	Cypermethrin (T) & Beta, Zeta, Theta etc Isomers(T)	118712-89-3	500	Used to control a broad spectrum, ofchewing, sucking and flying insects
7	Allethrin Technical	584-79-2		Use for control of flies and mosquitoes, and in combination with other pesticides to control flying or crawling insects
8	D-Allethrin Technical	231937-89-6		Household insecticide that kills flies, mosquitoes, garden insects, etc
9	Bifenthrin Technical	82657-4-3		Used against malaria and filarial vector mosquitoes
10	Prallethrin Technical	23031-36-9		Used for the control of mosquitoes in the household.
11	Cyphenothrin (T) & its [1R-Trans-isomer]	39515-40-7		Is a synthetic pyrotheroids insecticide and is effective against cockroaches
12	Etofenprox Technical	80844-07-1		Use as mosquitocide
13	Fenpropathrin Technical	39515-41-8		Widely used Pyrethroids insecticide in agriculture and household
14	Cyfluthrin & Beta Isomers (T)	68359-37-5		used in agriculture to control insects that feed on cotton, turf, ornamentals, hops, cereal, corn, fruit, and potatoes
15	Dimefluthrin (T)	271241-14-6		Used as mosquito control agent
16	Cycloprothrin (T)	63935-38-6		Used for controlling insect pests on rice plants and vegetables
17	Flumethrin (T)	69770-45-2		Flumethrin has been widely used as an acaricide for the control of Varroa mites
18	Acrinathrin (T)	101007-06-1		Use for the Plant

				protection
19	Flucythrinate (T)	70124-77-5		Use for the Plant protection
20	Tefluthrin	79538-32-2		Used primarily in the control of soil insect pests on corn plants
21	Metofluthrin	240494-70-6		Used as an insect repellent.
Group-3 Neo Nicotiods Insecticides (G-1)				
22	Thiamethoxam Technical	153719-23-4	150	Protects plant against listed chewing and sucking insects through contact and ingestion
23	Imidacloprid Technical	138261-41-3		used for pest control in agriculture
24	Acetamiprid Technical	135410-20-7		Used to control insects such as aphids, which have been known to attack and damage leafy plants
25	Fipronil Technical	120068-37-3		Fipronil is used to control ants, beetles, cockroaches and Other Insects
26	Buprofezin Technical	69327-76-0		Used for control of insect pests such as mealybugs, leafhoppers and whitefly on vegetable crops
27	Thiacloprid Technical	111988-49-9		Used as insecticide to protect cotton, pome fruit, vegetables, and potatoes.
28	Ethiprole Technical	181587-01-9		Used to kill or remove insects from crops and grains during its storage
29	Dinotefuran Technical	165252-70-0		A Broad-Spectrum Insecticides for leafy vegetables (except Brassica) (Group-4) and for Professional Turf management, professional Ornamental Production & Residential Indoor, Pet Lawn & Garden Market. It controls of

				insect pests Such as Aphids, whiteflies, thrips, leafhoppers, Leafminers, sawflies. etc.
30	Nitenpyram Technical	150824-47-8		Used to treat flea infestationsin cats anddogs
31	Chlorantraniliprole	500008-45-7		Insecticide, Ryanodine Receptor Activator is used to control a wide variety of crops including Corn, Cotton, Grapes, Rise & Potatoes.
32	Cyantraniliprole	736994-63-1		Insecticides for controlling insects with mandibulate as well as piercing-sucking mouthparts. Specially use in Vegetables, Bush Berries, Turf & Oilseeds Crops.
33	Tetraniliprole	1229654-66-3		Can be Use for Pest Control
34	Indoxacarb	144171-61-9		Used to control sucking insects like bollworm, pink bollworms, spotted bollworms, cutworms
35	Flonicamide	158062-67-0		Used as an insecticide on aphids, whiteflies, and thrips
36	Flubendiamide	272451-65-7		Insecticides for controlling insects in Corn, Tobacco, Pome & Stone Fruit. Tree Nut Crops, Grapes & Vegetable Crops (Including Cucurbit Vegetables, Fruiting.)
37	Tolfenpyrad	129558-76-5		Used for the control of several orders of insects
Group-4 **Neo Nicotiods Insecticides (G-2)**				
38	Cyclaniliprole	1031756-98-5	50	Used as insecticide for fruit, greenhouse.
39	Sulfoxaflor	946578-00-3		Use to control piercing/sucking insects such as

				aphids, stink bugs, plant bugs, and thrips on a variety of row crops
40	Clothianidin Technical	210880-92-5		Used mainly to control sucking pests, such as aphids and stink bugs, and insect
41	Pymetrozine Technical	123312-89-0		Control of aphids and whiteflies in vegetables, ornamentals, cotton, field crops, deciduous and citrus fruit; control of Plant hoppers in rice, Insecticide
Group-5 Organo Phosphorus Insecticides/ Azaspiro/Aromatic Ethers, Carbamate, Benzoyl Urea, Oxadiazine, Pyrazole & Other Miscellaneous Insecticides/ Acaricides Cpds / Benzoylurea/ Other IGRs/ Natural Products Inhibitor/Quinazolin/Halogenated Pyrroles				
42	Profenofos Technical	41198-08-7	200	used on a variety of crops including cottonand vegetables such as maize, potato, soybean, and sugar beet, Insecticide
43	Chlorpyrifose Ethyl Technical	5598-13-0		Used to kill number of Pests
44	Chlorpyriphos Methyl Technical	5598-13-0		Used to control insect pests on a range of crops, also used to treat stored cereal grain and empty warehouses
45	Temephos Technical	3383-96-8		Used as a larvicide to control mosquitoes
46	Malathion Technical	121-75-5		Used on fruits and vegetables, and to control mosquitoes, flies, and animal parasites
47	Ethion Technical	563-12-2		Used to control insects on citrus trees, but also on cotton, fruit and nut trees, and some vegetables
48	Acephate Technical	30560-19-1		Currently registered for use on a variety of field, fruit, and vegetable crops
49	Dimethoate Technical	60-51-5		Used against a

				variety of sucking insect pests on citrus, grapes, cotton, corn, sorghum.
50	Phenthoate Technical	07-03-2597		Used as insecticide and acaricide for rice, vegetables, fruits, and tea.
51	Spirotetramat Technical	203313-25-1		Use for control of sucking insects in their juvenile, immature stages, including aphids, scale insects, and whitefly
52	Triflumezopyrim	1263133-33-0		Used to control both leafhopper and planthopper
53	Fenazaquin	120928-09-8		Use to control mites and insects (especially whiteflies)
54	Chlorfenapyr	122453-73-0		Used as insecticide and acaricide as a foliar spray to ornamental crops in greenhouses.
55	Diafenthiuron Technical	80060-09-9		Control of insects and mites resistant to major chemical classes such as ops or Pyrotheroids, Insecticide
56	Fenobucarb Technical	3766-81-2		Used as an agricultural insecticide, especially for control of Hemipteran pests, on rice and cotton
57	Propargite	2312-35-8		Used to control mites on ornamentals and various field, fruit, and vegetable crops
58	Diflubenzuron	35367-38-5		used to control many leaf eating larvae of insects feeding on agricultural, forest and ornamental plants
59	Thiocyclam Oxalate	31895-22-4		used to control the sucking and chewing pets on a variety of crops
60	Fenpyroximate	134098-61-6		used for the control of leafhoppers,

				mealybugs, mites, psylla, psyllids, and whiteflies
61	Etoxazole	153233-91-1		Used to control mites and aphids on fruits, vegetables, and ornamentals
62	Hexythiazox	78587-05-0		used to control eggs and larvae of many phytophagous mites
63	Pyriproxyfen	95737-68-1		Use as insect growth regulator that affects mostly young insects and eggs
64	Thiodicarb	59669-26-0		Insecticide against major Lepidopterous, and suppresses Coleopterous and some Hemipterous insect pests.
65	Spirodiclofen	148477-71-8		used in agriculture to control mites and San Jose scale
66	Pyrithiobac	123343-16-8		Use for control of broad-leaved weeds in cotton and other crops
67	Novaluron	116714-46-6		Use to disrupting the normal growth and development of immature insects
68	Fenoxycarb (T)	72490-01-8		used as an effective control agent against fire ants (as bait), fleas, mosquitos, cockroaches, scale insects, and sucking insects
69	Pyridaben	96489-71-3		Used as insecticide and acaricide to protect field crops, fruit trees, and vegetables
70	Spiromesifen	283594-90-1		For use on cotton, field corn, ornamentals, pome fruit, strawberries, and vegetables
71	Tebufenpyrad	119168-77-3		Use to control of spider and rust mites' species on a large number of crops
72	Lufenuron	103055-07-8		used to control flea infestations by

				preventing hatching of eggs
73	Methoxyfenozide	16150-58-4		Exhibits high insecticidal efficacy against a wide range of important caterpillar pests
74	Spinetoram	187166-40-1		used to control pest insects in stored grain and on domestic cats.
75	Thiocyclam	31895-21-3		used to control sucking and chewing pests on a variety of crops
Fungicides Compounds				
Group-6 SBI-Triazole Fungicides /Conazole Fungicides/Triazolopyrimidines Fungicide				
76	Hexaconazole Technical	79983-71-4	200	Can be used on fruit trees, Fungicide
77	Tebuconazole Technical	105734-96-3		Used agriculturally to Treat plant pathogenic fungicide.
78	Difenoconazole Technical	119446-68-3		Controls a broad spectrum of foliar, seed and soil-borne diseases caused by Ascomycetes, Basidiomycetes and Deuteromycetes in cereals, soya, rice, grapes, pome fruit, stone fruit, potatoes, sugar beet and several vegetables and Ornamental crops.
79	Propiconazole Technical	60207-90-1		Used agriculturally as a systemic fungicide on turf grasses
80	Metconazole Technical	125116-23-6		Use as Plant Growth Regulators
81	Cyproconazole Technical	94361-06-5		Use on greenhouse- and field-grown roses and as a wood preservative.
82	Epoxiconazole Technical	135319-73-2		Control of Black Sigatoka (Mycosphaerella fijiensis) and Yellow Sigatoka (Mycosphaerella musicola) in bananas and Coffee Rus

83	Fenbuconazole Technical	114369-43-6		A fungicide used to control a range of diseases including powdery mildew, black rot and scab
84	Ipconazole Technical	125225-28-7		Used for seed treatment, highly effective against seed-borne and soil-borne diseases.
85	Tetraconazole Technical	112281-77-3		Inhibits the metabolic pathway of fungal ergosterol production
86	Prothioconazole Technical	178928-70-6		Use for the control of diseases caused by ascomycetes, basidiomycetes, and deuteromycetes
87	Fluquinconazole Technical	136426-54-5		Used to control various endophytic diseases mainly on cereals
88	Triticonazole Technical	131983-72-7		Use as a seed treatment in wheat
89	Azaconazole Technical	60207-31-0		Used mainly in ornamental crops to control canker and other diseases
90	Bromuconazole Technical	116255-48-2		Used on a range of crops including cereals, fruit and vegetables
91	Etaconazole Technical	60207-93-4		Used to control powdery mildew on fruit and other crops
92	Penconazole Technical	66246-88-6		Mainly applied on apples, grapes, and vegetables to control powdery mildew
93	Tricyclazole Technical	41814-78-2		Use as fungicide for the preservation of fruits, that can cause several health issues
94	Bupirimate	41483-43-6		Used as a fungicide to kill powdery mildew
95	Imazalil Technical	35554-44-0		Fungicide used to control a wide range of fungal diseases on fruit, vegetables, and ornamentals
96	Triadimenol Technical	55219-65-3		Fungicide used as seed treatment for barley, corn, cotton,

				oats, rye, sorghum, and wheat
97	Triadimefol Technical	43121-43-3		Used in agriculture to control various fungal diseases in fruits. As a seed treatment
98	Metrafenone	220899-03-6		Used for the control of powdery mildew in cereals and grape vines
99	Flusilazole	85509-19-9		Used to control fungal infections on a variety of fruit and vegetable crops
100	Prochloraz	67747-09-5		Used on wheat, barley, mushrooms, cherries, turf on golf courses, and in flower production
101	Myclobutanil Technical	88671-89-0		Used as broad spectrum Triazole fungicide
102	Ametoctradin	865318-97-4		Used to control major plant pathogens from the Oomycete class of fungi, specifically downy mildews and Phytophthora species
Group-7 Strobilurins/ Methoxyacrylate/Carbanilate Fungicides/Mono Carboxylic Acid Amide/Hydroxy Aniline				
103	Pyraclostrobin Technical	175013-18-0	150	Use on the Residential and recreation al turfgrass sites and golf course turf.
104	Azoxystrobin Technical	131860-33		Used for the protection of plants and crops from harmful fungal diseases
105	Pyroxystrobin Technical	131860-33-8		Used to control a variety of diseases on rice, vegetables and teas.
106	Picoxystrobin Technical	117428-22-5		Use for control of various fungal diseases including leaf rust, stripe rust, powdery mildew, net blotch, scald and speckled leaf Blotch.
107	Flufenoxystrobin Technical	918162-02-4		Active against

				various fungal infections including downy mildew, blight, powdery mildew and rice blast
108	Metominostrobin Technical	133408-50-1		Use to control the fungal diseases in rice, wheat, soya bean, cotton, kidney beans, and corn.
109	Orysastrobin Technical	248593-16-0		Used in the treatment of blast and sheath blight in transplanted rice inhibiting the mitochondrial respiration chain
110	Kresoxim Methyl Technical	143390-89-0		To control powdery mildew on the greenhouse-grown ornamental crops
111	Triclopyricarb Technical	902760-40-1		can be used in crops disease control
112	Fenoxanil Technical	115852-48-7		Used to control rice blast caused by the fungus Pyricularia oryzae
113	Cymoxanil Technical	57966-95-7		Used as agricultural fungicide (Potato)
114	Flutolanil Technical	66332-96-5		Used for controlling Rhizoctonia solani (black scurf) and some other Basidiomycete fungi in rice, turf, potato, vegetables and peanuts
115	Tiadinil	223580-51-6		Used particularly for the control of fungal diseases in rice
116	Dodine	03-10-2439		Used primarily on fruits and nuts
117	Captan	133-06-2		Used primarily to control Scrab, Brown Rot, Downey Mildew, Early & Late Blight, and other fungal diseases in fruits and vegetables
Group-8 Strobilurins/Acid Amide				
118	Dimoxystrobin Technical	149961-52-4	50	Used for disease control in cereals and some other crops
119	Trifloxystrobin Technical	141517-21-7		Used as agricultural

				fungicide
120	Fluoxastrobin Technical	361377-29-9		Used as broad-spectrum fungicide for cereals, fruits, vegetables, and ornamentals
121	Fenhexamide	126833-17-8		Used primarily to controlgrey mold (Botrytis Cinereal), Monilinia Fructigena, Monilinia Laxa and other fungal diseases in fruits and vegetables
Group-9 Multicite / SBI-Other Dmis / Phenyl Amides / Sulfonyl Ureas/ Ethyl Mercaptan/Pyrazole Fungicides/ SDHIs / Others-Cont Fungicides				
122	Thiophanate Methyl	23564-05-8	200	Is a systemic fungicide used on a variety of tree, vine, and root crops, as well as on Canola and wheat.
123	Chlorothalonil	1897-45-6		Used as a fungicide and preservative in paints, adhesives, and wood.
124	Isoprothiolane	50512-35-1		Used to control a range of diseases including Pyricularia oryzae, Helminthosporium sigmoideum and Fusarium nivale
125	Validamycin	37248-47-8		Used to control plant sheath blight caused by Rhizoctonia solani
126	Quinoxyfen	124495-18-7		Used as agricultural fungicide
127	Fluazinam	79622-59-6		Used as agricultural fungicide
128	Famoxadone	131807-57-3		Used as agricultural fungicide
129	Benalaxyl	71626-11-4		Used as an active substance in plant protection
130	Carboxin	5234-68-4		Used as a systemic fungicide
131	Iprobenfos (Kitazin)	26087-47-8		Used to control the rice blast fungus.
132	Bixafen	581809-46-3		Used in cereals for key stem and leaf disease control including Strobilurins-

				resistant septoria
133	Isopyrazam	881685-58-1		Use on cereals
134	Fluopicolide	239110-15-7		Used for the control of a range of diseases including downy mildew and blight
135	Fluopyram	658066-35-4		Used to control banana leaf spot, anthracnose, and scab in tropical agricultural areas
136	Boscalid	188425-85-6		Used on food crops.
137	Fluxapyroxad	907204-31-3		Helps prevent many wilts and other fungal infections from taking hold
138	Carpropamid	104030-54-8		Use for control of rice blast caused by Magnaporthe grisea
139	Cyazofamid	120116-88-3		Used as agricultural fungicide
140	Mandipropamid	374726-62-2		Effective against spore germination, mycelial growth and sporulation
141	Penflufen	494793-67-8		Used as an in-furrow treatment on potato seed pieces and as seed treatment fungicide on alfalfa, cereal grains, vegetables, legume, and oil seeds
Herbicides Compounds				
Group-10 Als-Imidazolinone/Ureas/Als-Sulfonylurea-Cont/Als-Others/Amino Acids / Ureas/ Cyclohexandiones/Dinitro Anilinees /Acetamides /Amide/ Nitro Phenyl Ether Herbicides/Monothiocarbamic Ester/ Triazinone Herbicides / Cyclohexane Oxime				
142	Imazamox	114311-32-9	200	Used as broad-spectrum post-emergence herbicide for soybeans
143	Imazamethabenz	100728-84-5		Used to control grasses and other weeds in winter cereal crops
144	Imazapyr	81334-34-1		Used as non-selective, pre- and post-emergent herbicide
145	Penoxsulam	219714-96-2		Used as A Foliar Spray on Dry-Seeded

				Rice Crops
146	Metsulfuron Methyl	74223-64-6		Used as kills broadleaf weeds and some annual grasses
147	Mesosulfuron Methyl	208465-21-8		Used to control annual grasses, brush, woody plants and broadleaf weeds
148	Chlorimuron Ethyl	90982-32-4		Used as herbicide for the control of broad-leaved weeds in peanuts, soya beans, and other crops
149	Bispyribac Sodium	125401-92-5		For the control of wide range of weeds, Herbicide
150	Pyrazosulfuron Ethyl	93697-74-6		Used to control weed growth in commercial cereal, soybean, and vegetable fields
151	Florasulam	145701-23-1		Used as control or suppression of a wide spectrum of annual and perennial broadleaf weeds
152	Thiencarbazone Methyl	317815-83-1		Used as rights-of-ways and pipeline facilities
153	Bensulfuron Methyl	83055-99-6		Used as a herbicide for the control of a variety of both annual and perennial weeds in crops, particularly wheat and rice
154	Nicosulfuron	111991-09-4		Used for control of weeds such as Johnson grass, quack grass, foxtails
155	Sulfosulfuron	141776-32-1		Used to treat annual and perennial grassy weeds and broadleaf weeds
156	Trifloxysulfuron	199119-58-9		used as an early post-emergent spray for the treatment of broadleaved weeds and nutgrass in cotton
157	Diclosulam	145701-21-9		Used to grassy and broad leaf weeds
158	Pyroxsulam	422556-08-9		Used to for the control of wild oats and certain broadleaved weeds

159	Glyphosate	1071-83-6		Is widely used herbicide that controls broadleaf weeds and grasses
160	Glufosinate Ammonium	77182-82-2		Used as broad-spectrum post-emergence herbicide for grapes, orchards, plantations, ornamentals, and non-cropland
161	Pendimethalin	40487-42-1		Used to Control Annual Grasses and Certain Broadleaf Weeds
162	Pretilachlor	51218-49-6		Used to control the most common weeds found in paddy rice crops
163	Dicamba	1918-00-9		Used as a herbicide applied to leaves or soil to control broadleaf weeds
164	Napropamide	15299-99-7		Used to control a number of annual grasses and broad-leaved weeds
165	Dimethenamid	87674-68-8		Used to destroy unwanted vegetation, especially various types of weeds, grasses, and woody plants
166	Topramezone	210631-68-8		Used to weed control on grain com, popcorn, seed corn, and sweet corn
167	Propaxycarbazone	145026-81-9		Used to destroy unwanted vegetation, especially various types of weeds, grasses (POACEAE), and woody plants
168	Fomesafen (T)	72178-02-0		Used to control or partial control of broadleaf weeds, grasses and sedges in soybeans
169	Halosafen (T)	77227-69-1		Use as antiparasitic agent
170	Clethodim (T)	99129-21-2		Used to control of grassy weeds on a variety of broadleaved crops

171	Benoxacor	93730-04-2		Used for crops such as corn, soybean, and sorghum.
172	Phenmedipham	13684-63-4		Used for weed control in beet crops
173	Desmedipham	13684-56-5		Used to control various annual weeds
174	Bromobutide	74712-19-9		Used to control weeds
175	Butachlor	23184-66-9		Used to control weeds
176	Metachlor	51218-45-2		Used to control weeds in crops of corn, soybeans, peanuts, sorghum, potatoes, peas, cotton, safflower, stone fruits, nut trees, and ornamentals
177	Prosulfocarb	52888-80-9		Used to kill broad-leafed weeds in wheat.
Group-11 Cyclohexandiones/Nitro Phenyl Ether Herbicides/Monothiocarbamic Ester/ Triazinone Herbicides / Cyclohexane Oxime				
178	Quinclorac	84087-01-4	50	Used as various types of turf grasses to kill a variety of hard-to-control weeds
179	Benfuresate	68505-69-1		Used for post-emergence control of grass and broad-leaved weeds
180	Metamitron	41394-05-2		Widely used in Italy for weed control in sugar beets.
181	Metribuzin	21087-64-9		Used to Selectively Control Certain Broadleaf Weeds and Grassy Weed Species
182	Atrazine	1912-24-9		Used as an herbicide to control weeds in corn, asparagus, tomato, potato, and ornamental plantings
183	Imazethapyr	81335-77-5		For control of wide variety of broad leaf weed species
Group-12 Aryloxyphenoxypropionates/ Aryloxyphenoxypropionic/ Aniline /Pyridine/Ppo- Diphenyl Ethers / Phenyl Ether /Phenoxy Carboxylic Acid / Pyridine / Nitro Phenyl Ether-15 /Aromatic				

Ketone				
184	Clodinofop Propargyl	105512-06-9	200	Widely used as an herbicide for the control of annual grass weeds in cereal crops
185	Quizalofop (T) & Quizalofop Ethyl (T)	76578-12-6 & 76578-14-8		Used to control annual and perennial grass weeds in potatoes, soybeans, sugar beets, peanuts vegetables, cotton and flax, Herbicides
186	Cyhalofop & Cyhalofop Butyl (T)	122008-78-0 & 122008-85-9		Used for post emergence grass weed control in rice
187	Chlorazifop (T) & Chlorazifop Propargyl (T)	60074-25-1 & 72880-52-5		Used as the propargyl variant
188	Fenoxaprop (T) & Fenoxaprop P Ethyl (T)	95617-09-7 & 71283-80-2		An herbicide which is selective against Perennial and annual grass weeds in many crops.
189	Fluazifop (T) & Fluazifop P Butyl	69335-91-7 & 79241-46-6		Used as A Post-Emergence Herbicide for The Control Grass Weeds in Various Broad-Leaved Crops
190	Haloxyfop (T) & Haloxyfop Methyl	69806-34-4 & 72619-32-0		Use for the control of a wide range of grasses and broadleaf weeds as per Directions for Use
191	Quizalofop-P-Tefuryl	119738-06-6		Use for the control of annual grass and broad-leaved weeds in a variety of crops
192	Haloxyfop Ethoxy Ethyl (Etotyl)	87237-48-7		Use to control annual and perennial grasses in sugar beet, oilseed, potatoes, leaf vegetables, onions, sunflowers, strawberries, and other crops.
193	Oxadiargyl	39807-15-3		Very effective for control of grasses, sedges, and some broad leaf weeds in Rice.
194	Propanil	709-98-8		Used as an

				Herbicide to control numerous grasses and Broad-Leaved weeds in Rice, Potatoes and Wheat.
195	Isoproturon	34123-59-6		Herbicide for Control of Annual Grasses and Broad-Leaved Weeds
196	Metamifop (T)	256412-89-2		Used for preventing and treating almost broadleaf weeds, grassy weeds and nutgrass flats edge
197	Picolinafen (T)	137641-05-5		Used as an herbicide for the control of broad-leaved weeds in cereal crops
198	Sulfentrazone	122836-35-5		Herbicide to control broadleaf and grass weed species in soybeans, sugarcane, tobacco, and several species of turfgrass.
199	Flufenacet	142459-58-3		Use for control of many annual grasses and certain broadleaf weeds in field corn, white corn, corn grown for silage, field corn grown for seed, sweet corn, and soybeans.
200	Cloransulam-Methyl	220899-03-6		Herbicide to control broadleaf weeds in soy beans
201	Diflufenican	83164-33-4		Used for The Control of Broadleaf Weeds And A Few Annual Grasses in Winter Cereals
202	Aclonifen	74070-46-5		Herbicide to control broadleaf and grass weed species in Carrot.
203	2,4-D Amine Salt	217-915-8 & 2008-39-1		Used to Regulate the Growth of Citrus Plants
204	Acifluorfen (T)	50594-66-6		Used for control of broadleaf weeds in soybeans, peanuts, rice, ornamentals
205	Chlomethoxyfen (T)	32861-85-1		Use in Agrochemicals

206	Fluoroglycofen (T)	77501-90-7		Herbicide used in vineyards to eradicate weeds
207	Lactofen (T)	77501-63-4		Used as A Post emergence Herbicide for The Control of Broadleaf Weeds in Soybean (Glycine Max) Fields
208	Oxyfluorfen (T)	42874-03-3		Used for broad spectrum pre- and post-emergent control of annual broadleaf and grassy weeds in a variety of tree fruit, nut, vine, and field crops
209	Fluoroxypyr-Meptyl	81406-37-3		Used to destroy unwanted vegetation, especially various types of weeds, grasses (POACEAE), and woody plants
210	Picloram	1918-02--1		Used in the control of broad-leaf weeds
211	Triclopyr – Butotyl	64700-56-7		Used to control a wide variety of woody plants as a foliar spray
Group-13 Aryloxyphenoxypropionates/ Aryloxyphenoxypropionic/ Aniline /Pyridine/Ppo- Diphenyl Ethers / Phenyl Ether /Phenoxy Carboxylic Acid / Pyridine / Nitro Phenyl Ether 15/Aromatic Ketone				
212	Sulcotrione	99105-77-8	100	Herbicide Commonly used in com production as well as on Maize cultivar wax.
213	Tefuryltrione	473278-76-1		Used in paddy of killing weeds
214	Mecoprop	93-65-2		Used to Control Broad-Leaved Weeds
215	2,4-D Acid	94-75-7		Used to Kill Any Dicot Plant Tissue
216	2,4-D Ethyl Ester	533-23-3		Widely used in northern India against broad-leaf weeds in cereal crops, lawns and parks
217	2,4-D Sodium Salt	2702-72-9		Used to selective systemic herbicide for the control of

				broad-leaved weeds
218	Cloquintocet Mexyl (T)	99607-70-2		Used to prevent damage to target crops due to phytotoxic effects
219	Propaquizafop	111479-05-1		Used as Systemic Herbicide for Annual and Perennial Grasses
220	Carfentrazone	128639-02-1		Used in agricultural settings to control broadleaf and sedge weeds in various grains and crops.
Group- 14 Plant Growth Regulators & Rodenticides/HPPD Inhibitors/ OTHERS/ Triazines / PGR/Pyrazoles				
221	Chlormequate Chloride	999-81-5	200	Used as Plant Growth Retardant to Produce Plants with Sturdier, Thicker Stalks, Facilitating the Harvesting of Ornamental Flowers and Cereal Crops.
222	Ethephone	16672-87-0		Used to Promote Fruit Ripening, Abscission, Flower Induction, And Other Responses
223	Forchlorfenuron	68157-60-8		Plant Growth Regulator
224	Mepiquate Chloride	24307-26-4		Used in Agriculture to Reduce Vegetative Growth Including Sprout Suppression in Garlic, Leeks and Onions
225	Bromadiolon	28772-56-7		Used widely for control of commensal and field rodents in many countries
226	Paclobutrazol	76738-62-0		Plant Growth Regulator
227	Tembotrione	335104-84-2		Used as a Post-Emergence Herbicide to Control wide range of Broad Leaved and Grassy Weeds in Corn and other Crops.
228	Mesotrione	104206-82-8		Used as a Selective Herbicide specially in

				Maize, also used to control broadleaf weeds.
229	Pinoxaden	243973-20-8		Herbicide to control Grass weeds in Cereal crops.
230	Clomazone	81777-89-1		Herbicide to control broadleaf and annual grass in cotton, peas, pumpkins, soybeans, sweet potatoes, tobacco, winter Squash and fallow wheat fields.
231	Bentazone	25057-89-0		Used for Selective Control of Broadleaf Weeds
232	Ametryn	834-12-8		Used to destroy unwanted vegetation, especially various types of weeds, grasses (POACEAE), and woody plants
233	Halosulfuron	100784-20-1		Used continuously in sugarcane fields
234	Iodosulfuron Methyl	185119-76-0		Used to control weeds in cereals and other crops
Group- 15 **Advance Specific Pesticide Intermediates (G-1)**				
235	Meta Phenoxy Benzaldehyde (MPBAD)	39515-51-0	500	Intermediate for Fenpropathrin, Cycloprothrin, Acrinathrin, Flucythrinate
236	Meta Phenoxy Benzyl Alcohol (MPBAL)	13826-35-2		Used as Intermediate
237	Cypermethric Acid Chloride & it's all Isomers	7726-95-6		Used in the manufacture of Parathyroid class of Pesticides like Cypermethrin, Alphamethrin, Permethrin and Deltamethrin.
238	CCMP (2- Chloro 5- Chloromethyl Pyridine)	70258-18-3		Used as Intermediate
239	CCMT (2- Chloro 5- Chloromethyl Thiazol)	105827-91-6		Used as Intermediate
240	NII (2- Nitro Imino Imidazolidine)	5465-96-3		Used as Intermediate
241	MNIO (2- Methyl 5- Nitro 1,3,5 Oxidiazine)	696-23-1		Used as Intermediate

242	Transfluthrin Acid Chloride	52314-67-7		Used as Intermediate
243	Para Choro Phenyl Iso Valeric Acid Chloride	51631-50-6		Used as Intermediate
244	Propargyl Chloride	624-65-7		Used as an intermediate in organic synthesis
245	1,2,4-Triazol	288-88-0		Intermediate for Fluquinconazole, Triticonazole, Myclobutanil
246	3- Methyl 1,2,4 Triazole	06-01-7170		Used as Intermediate
247	4- Bromo 2- Chlorophenol	3964-56-5		Used as Intermediate
248	5- Chloro 2,3- Difluoro Pyridine (CDFP)	89402-43-7		Used as Intermediate
249	4-4' Bi Pyridine	553-26-4		Formed as a pyrolysis product in tobacco smoke and also from the degradation of the herbicide Paraquat
250	2, 6 Diethyl - N-(Propoxy) Aniline	87-62-7		Used as Intermediate
251	PMIDA/ (Phosphono Methyl Imino) Diacetic Acid	5994-61-6		Used as Intermediate
252	2-Chloro-4-(4-Chlorophenoxy) Phenacyl Bromide	112110-16-4		Used as Intermediate
253	2,4 Dichloro Velerophenone	61023-66-3		Used as Intermediate
254	1-(4-Chloro Benzyl) Methyl-3,3-Methyl-2-Oxo Cyclopentane Carboxylate	80969-68-2		Used as Intermediate
255	Tebu- Ketal / 2-[2-(4-Chlorophenyl) Ethyl]-2-(1,1-DiMethyl Ethyl) Oxirane	80443-63-6		Used as Intermediate
256	Methyl-2- [2-(6-Chloro Pyrimidine-4-yl) Oxyphenyl-3-Methoxyprop-2-Enoate	131860-97-4		Used as Intermediate
257	1,1-Di Chloro Pinacolin	22591-21-5		Used as Intermediate
258	Thiocarbo Hydrazine	2231-57-4		Used to make pesticides and other agricultural chemicals
259	2- Hydroxy 4- Methyl Benzotioate (HMBT)	20174-68-9		Used as Intermediate
260	4-Nitro -O-xylene/3-Nitro O-Xylene	99-51-4		Used as Intermediate
Group- 16 Advance Specific Pesticide Intermediates (G-2)				
261	Lambda Cyhalothric Acid Chloride	72748-35-7	50	Used to control a wide range of pests
262	4-HPPA- 4- (Hydroxy phenoxy) Propionic Acid	67648-61-7		Pesticide Intermediate
263	PEG Ester	1603-79-8		Used as Intermediate
264	Triazinone - 4- Amino 3-Mecapto- 6-t-Butyl -1,2,4-	33509-43-2		Used as Intermediate

	triazine-5-one (AMBT)			
265	DETCL	01-04-2524		Used in the preparation of various organo phosphorus insecticide
Specialty Chemicals				
Group- 17 Amino Diphenyl Ether / Phenoxy Compounds/ Specialty Phenols/ Specialty Chloro Phenol/ Amino Benzoic Esters / Aliphatic Esters/ Amino Compounds / Hydrogenation Compounds				
266	2-Amino Di Phenyl Ether (Ortho Amino Di Phenyl Ether	2688-84-8	300	--
267	4-Amino 4'- Methyl Di Phenyl Ether	41295-20-9		--
268	2- Amino 2', 4, 4'- Tri Chloro Di Phenyl Ether (Benzinamide, 5-Chloro-2-2 (2,4-Dichloro Phenoxy)	56966-52-0		--
269	2- Amino -4'- Chloro -4 - Trifluoromethyl Di Phenyl Ether	349-20-2		--
270	2-Chloro-4-(4-Chlorophenoxy) Acetophenone/4-Acetyl-3,4'-Dichloro Diphenyl Ether	119851-28-4		--
271	2-Acetyl-2',4,4'-Trichloro Diphenyl Ether	211125-94-9		--
272	5 Chloro-6-(2,3 Dichloro Phenoxy)-2-Methyl Thio -1H Benzimidazole/Triclabendazole	68786-66-3		Pharma Intermediate, veterinary drug intermediate
273	2, 4-Dichloro Phenol	576-24-9		Pharma Intermediate
274	2, 5-Dichloro Phenol	583-78-8		Chemical Intermediate
275	3-Mehtyl Phenol (m-Cresol)	108-39-4		Pharma Intermediate
276	3-Nitro Phenol	554-84-7		Chemical Intermediate; Chemical Indicator for Slightly Basic Soln; Chem Intermediate for Other Org Cmpd
277	4-Bromo 2, 5 Dichloro Phenol	1940-42-7		--
278	4-Fluoro Phenol	371-41-5		Pharma Intermediate
279	O-Cyano Phenol	611-20-1		Intermediate for Pesticide and synthetic Organic Chemicals
280	Ortho Nitro Phenol	88-75-5		Drug & Dyes intermediate
281	Para Fluoro Anisole	459-60-9		Drug intermediate
282	2- Chloro 4-Fluoro Phenol	1996-41-4		--
283	3-Amino 4-Methyl Benzoic Acid Isopropyl Ester (AMBI)	21447-47-2		--
284	3-Amino 4-Methyl Benzoic Acid (2' - Chloro Ethyl Ester) (AMBC)	2458-12-0		--

285	3-Amino Benzotrifluoride	98-16-8		Pharma Intermediate, veterinary drug intermediate
286	2, 5-Dichloro Aniline	95-82-9		Dyes Intermediate
287	Ortho Phenylene Diamine/ Meta Phenylene Diamine/ Para Phenylene Diamine	95-54-5/108-45-2/106-50-3		Intermediate, Used as a chemical intermediate, analytical reagent, and photographic developer
288	Benzaldehyde	100-52-7		Used as a flavouring agent in food and perfume additive
Group-18 Research & Development Based Products				
289	Research & Development Based Products		100	
	TOTAL		**3200**	

Note: At a time we shall manufacture maximum 3 numbers of products of each group with specified quantity only.

Manufacturing process with chemical reaction and mass balance is attached as **Annexure – 3.**

1.2 RESOURCE REQUIREMENT

S. No.	Components	Proposed	Resources availability
1.	Power, kVA	4000	Dakshin Gujarat Vij Co. Ltd.
2.	Fresh Water, kLD	1033	GIDC water supply dept.
3.	Imported coal/briquettes for Steam boiler (20 TPH), MT/Day	65.5	Local dealer
4.	Imported coal/briquettes for Thermic fluid heater (15 lakhs kcal/hr), MT/day	22	Local dealer
5.	HSD for D. G. Set: I (1000 kVA), kg/hr.	200	Local dealer
6.	HSD for D. G. Set: II (1000 kVA), kg/hr.	200	Local dealer
7.	Cooling Tower, TR	1500	In house
8.	Chilling plant, TR	250	In-house
9.	Brine chiling plant, TR	200	In-house
10.	Nitrogen plant, m^3/hr.	50	In-house
11.	Air compresser	2 x 250 cfm	In-house

1.3 RAW MATERIAL CONSUMPTION PROPOSED SCENARIO:

Product No.	Sr. No.	Raw Materials	CAS No	MT/MT of Product	MT/Month
Insecticides Compounds					
Group-1	**Synthetic Pyrethroids Insecticides**				500
1.		**Cypermethrin Technical**			
	1.	Meta Phenoxy Benzaldehyde	39515-51-0	0.5	250
	2.	Cypermethric Acid Chloride	52314-67-7	0.585	292.5
	3.	Solvent n- Hexane	110-54-3	3	1500

	4.	Sodium Cyanide	143-33-9	0.135	67.5
	5.	Catalyst	56-37-1	0.01	5
	6.	4 % Soda Ash Solution	497-19-8	0.5	250
	7.	2% Acetic Acid solution	64-19-7	0.5	250
	8.	10 % Sodium Hypochlorite solution	7681-52-9	0.85	425
2.		**Alpha - Cypermethrin Technical**			
	1.	Meta Phenoxy Benzaldehyde	39515-51-0	0.714	357
	2.	Cis Cypermethric Acid Chloride (Cis CMAC)	52314-67-7	0.835	417.5
	3.	Sodium Cyanide	143-33-9	0.195	97.5
	4.	Solvent – n-Hexane	110-54-3	4.3	2150
	5.	Catalyst	56-37-1	0.099	49.5
	6.	Soda Ash Solution (5 %)	497-19-8	0.75	375
	7.	Acetic Acid Solution (5 %)	64-19-7	0.5	250
	8.	Sodium Hypochlorite Soln (8-10 %)	7681-52-9	0.885	442.5
	9.	Iso Propyl Alcohol (IPA)	67-63-0	2.59	1295
3		**Deltamethrin Technical**			
	1.	15% CAT-V Solution	-	7.726	3863
	2.	Caustic Soda Flakes	1310-73-2	2.028	1014
	3.	Cypermethric Acid	59042-49-8	2.841	1420.5
	4.	Methylene Dichloride (MDC)	75-09-2	18.503	9251.5
	5.	30% Hydrochloric Acid	7647-01-0	8.679	4339.5
	6.	Thionyl Chloride	7719-09-07	1.345	672.5
	7.	Benzene	71-43-2	3.481	1740.5
	8.	Iron (II) Chloride	7758-94-3	0.032	16
	9.	Bromine	7726-95-6	5.065	2532.5
	10.	Sodium Thio Sulphate	7772-98-7	0.065	32.5
	11.	Bromo Benzene	108-86-1	0.357	178.5
	12.	Aluminium Chloride	7446-70-0	1.03	515
	13.	Hydrobromic gas	10035-10-6	2.564	1282
	14.	98% Sulphuric Acid	7664-93-9	0.695	347.5
	15.	Methanol	67-56-1	0.487	243.5
	16.	SBC		0.002	1
	17.	Ester		0.935	467.5
	18.	DMF	68-12-2	0.008	4
	19.	MPBD	39515-51-0	0.525	262.5
	20.	Toluene	108-88-3	4.61	2305
	21.	Soda Ash	497-19-8	0.021	10.5
	22.	Sodium Cyanide	143-33-9	0.17	85
	23.	10% Sodium Hypochlorite	7681-52-9	0.9	450
	24.	Acetic Acid	64-19-7	0.005	2.5
	25.	Iso Propyl Alcohol (IPA)	67-63-0	9.036	4518
	26.	Tri Ethyl Amine	121-44-8	0.375	187.5
	27.	DM Tech		0.005	2.5
	28.	Carbon	7440-44-0	0.004	2
	29.	Hyflow	-	0.004	2
4		**Lambda Cyhalothrin Technical**			
	1	Lambda Cyhalothric Acid	72748-35-7	0.58	290
	2	N,N-Dimethyl Formamide	68-12-2	0.005	2.5
	3	Thionyl Chloride	7719-09-07	0.29	145
	4	n-Hexane	110-54-3	2	1000
	5	Sodium Cyanide	143-33-9	0.115	57.5
	6	3-Phenoxy Benzaldehyde	39515-51-0	0.45	225
	7	Isopropyl Alcohol	67-63-0	2	1000
	8	Di Isopropyl Amine	108-18-9	0.05	25
5		**Permethrin Technical**			
	1	Meta Phenoxy Benzaldehyde	39515-51-0	0.55	275

	2	Cypermethric Acid Chloride (CMAC)	52314-67-7	0.642	321
	3	n-Hexane (F)	110-54-3	0.2	100
	4	n-Hexane (R)	110-54-3	2.8	1400
	5	5 % Soda Ash Solution	497-19-8	1	500
	6	48% Caustic Soda Lye	1310-73-2	0.05	25
6		**Transfluthrin**			
	1	2,3,5,6-Tetra Fluoro Benzyl Alcohol	4048-38-2	0.5	250
	2	R-Trans Cypermethric Acid Chloride	52314-67-7	0.631	315.5
	3	Catalyst	56-37-1	0.012	6
	4	Solvent Hexane	110-54-3	2	1000
	5	5 % Soda Ash Solution	497-19-8	0.25	125
7		**Allethrin**			
	1	Allethrelone	29605-88-7	0.825	412.5
	2	Cyclohexane	110-82-7	1.422	711
	3	Pyridine	110-86-1	0.54	270
	4	Chrysanthemic Acid Chloride	14297-81-5	0.975	487.5
	5	30% Hydrochloric Acid	7647-01-0	0.186	93
	6	Sodium Hydroxide	1310-73-2	0.015	7.5
8		**D-Alethrin**			
	1	Allethrelone	29605-88-7	0.825	412.5
	2	Cyclohexane	110-82-7	1.422	711
	3	Pyridine	110-86-1	0.54	270
	4	Chrysanthemic Acid Chloride	14297-81-5	0.975	487.5
	5	30% Hydrochloric Acid	7647-01-0	0.186	93
	6	Sodium Hydroxide	1310-73-2	0.015	7.5
9		**Bifenthrin Technical**			
	1	Lambda Acid	72748-35-7	0.585	292.5
	2	3-Phenyl -2-Methyl Benzyl Chloride	552-45-4	0.558	279
	3	Catalyst	56-37-1	0.025	12.5
	4	Solvent- Hexane	110-54-3	0.6	300
10		**Prallethrin**			
	1	Chrysanthemic Acid Chloride	14297-81-5	0.656	328
	2	Cyclo Pentene 1-Hydroxy	10493-98-8	0.535	267.5
	3	Sodium Cyanide	143-33-9	0.162	81
	4	n-Hexane	110-54-3	2.52	1260
	5	TEBA	56-37-1	0.015	7.5
	6	Hypo Chloride	7681-52-9	0.6	300
	7	Soda Ash	497-19-8	0.015	7.5
	8	Acetic Acid	64-19-7	0.003	1.5
11		**Cyphenothrin**			
	1	Meta Phenoxy Benzaldehyde	39515-51-0	0.555	277.5
	2	Chrysanthemic Acid Chloride	4638-92-0	0.535	267.5
	3	Sodium Cyanide	143-33-9	0.15	75
	4	Solvent –n- Hexane	110-54-3	3.00	1500
	5	Catalyst	-	0.01	5
	6	5% Soda Ash Solution	497-19-8	0.5	250
	7	8-10 % Sodium Hypochorite Solution	7681-52-9	0.94	470
12		**Etofenprox**			
	1	Sodamide	7782-92-5	0.22	110
	2	MPBR - Meta Phenoxy Benzyl Bromide	51632-16-7	0.91	455
	3	Toluene	108-88-3	4	2000
	4	Tretol - 2,2 Dimethyl 2- (4- Ethoxy Phenyl) Ethanol/2-(4- Ethoxy phenyl) 2- Methyl 1- Propanol	83493-63-4	0.675	337.5

	5	Methanol	67-56-1	0.18	90
13		**Fenpropathrin**			
	1	TMCP Acid (2,2,3,3Tetra Methyl Cyclopropane Carboxylic Acid Chloride	24303-61-5	0.417	208.5
	2	ThionylChloride	7719-0-7	0.35	175
	3	Catalyst-DMF	68-12-2	0.005	2.5
	4	MPBAD	39515-51-0	0.58	290
	5	Sodium Cyanide	143-33-9	0.158	79
	6	Solvent Hexane	110-54-3	2	1000
	7	20% Caustic Lye	1310-73-2	1.47	735
	8	Sodium Hypochloride	7681-52-9	0.627	313.5
	9	5%Soda Ash	497-19-8	0.2	100
14		**Cyfluthrin/Beta- Cyfluthrin**			
	1	3-Phenoxy-4-Fluoro Benzaldehyde	68359-579	0.523	261.5
	2	CMAC-Cypermethric Acid Chloride	52314-67-7	0.578	289
	3	Sodium Cyanide	110-54-3	0.136	68
	4	Solvent –n- Hexane	110-54-3	3.00	1500
	5	Catalyst	56-37-1	0.01	5
	6	5 % Soda Ash Solution	497-19-8	0.5	250
	7	5 % Acetic Acid Solution	67-56-1	0.5	250
	8	8-10 % Sodium Hypochorite Solution	7681-52-9	0.8	400
15		**Dimefluthrin**			
	1	2, 3, 5, 6 Tetra Fluoro 3 – Methoxy Methyl Benzyl Alcohol	79538-03-7	0.611	305.5
	2	Chrysanthemic Acid Chloride	4638-92-0	0.52	260
	3	Solvent- Hexane	110-54-3	2	1000
	4	Catalyst	-	0.012	6
	5	Soda Ash Solution (5 %)	497-19-8	0.25	125
16		**Cycloprothrin**			
	1	MPBAD	39515-51-0	0.43	215
	2	Cycloprothic Acid	78-67-1	0.64	320
	3	Catalyst for Chlorination	-	0.01	5
	4	Thionyl Chloride	07-09-7719	0.3	150
	5	Dilute Caustic Solution	1310-73-2	1.05	525
	6	Sodium Cyanide	143-33-9	0.12	60
	7	n-Hexane	110-54-3	4	2000
	8	Catalyst	-	0.01	5
	9	Soda Ash Solution (5 %)	497-19-8	0.5	250
	10	Acetic Acid Solution (2 %)	64-19-7	0.5	250
	11	Sodium Hypochlorite Solution (10 %)	7681-52-9	0.9	450
17		**Flumethrin**			
	1	Flumethric Acid	69770-45-2	0.6	300
	2	Thionyl Chloride	07-09-7719	0.27	135
	3	Catalyst for Chlorination	-	0.02	10
	4	Solvent n-Hexane	110-54-3	3	1500
	5	Dilute Caustic Solution	1310-73-2	1	500
	6	4 Fluoro 3 Phenoxy Benzaldehyde	68359-57-9	0.442	221
	7	Sodium Cyanide	143-33-9	0.115	57.5
	8	Soda Ash Solution (5 %)	497-19-8	0.5	250
	9	Acetic Acid Solution (2 %)	64-19-7	0.5	250
	10	Sodium Hypochlorite (8 %)	7681-52-9	0.8	400
18		**Acrinathrin**			
	1	Acrinathric Acid	101007-06-1	0.64	320
	2	MPBAD	39515-51-0	0.38	190
	3	Catalyst for Chlorination	-	0.01	5

	4	Thionyl Chloride	07-09-7719	0.25	125
	5	Dilute Caustic Solution	1310-73-2	1.01	505
	6	Sodium Cyanide	143-33-9	0.11	55
	7	Solvent n-Hexane	110-54-3	4	2000
	8	Soda Ash Solution (5 %)	497-19-8	0.45	225
	9	Acetic Acid Solution (2 %)	64-19-7	0.45	225
	10	Sodium Hypochlorite Solution (10 %)	7681-52-9	0.8	400
19		**Flucythrinate**			
	1	MPBAD	39515-51-0	0.455	227.5
	2	Sodium Cyanide	143-33-9	0.13	65
	3	n-Hexane Solvent	110-54-3	4	2000
	4	Catalyst	-	0.015	7.5
	5	S-Acid Chloride	39637-99-5	0.62	310
	6	S-Acid Chloride	497-19-8	0.5	250
	7	20% HAC Solution (20 %)	64-19-7	0.5	250
	8	Sodium Hypochlorite Solution (10 %)	7681-52-9	0.8	400
20		**Tefluthrin**			
	1	2,3,5,6, Tetra Fluoro 4- Methyl Benzyl Alcohol	79538-03-7	0.49	245
	2	Solvent n-Hexane	110-54-3	2.95	1475
	3	Lambda Cyhalothric Acid Chloride	72748-35-7	0.69	345
	4	10% Soda Ash	497-19-8	0.98	490
21	1	**Metofluthrin**			
	2	2,2-Dimethyl-3-(E)-Prop-1-Enyl) Cyclopropane Carboxylic Acid	NA	0.47	235
	3	Thionyl Chloride	07-09-7719	0.36	180
	4	Caustic Solution	1310-73-2	0.12	60
	5	(2,3,5,6-Tetrafluoro-4-(Methoxymethyl)Phenyl) Methanol	83282-91-1	0.675	337.5
Group-2	**Neo Nicotinoids Insecticides(G-1)**				150
22		**Thiomethoxam**			
	1	2-Chloro 5-Chloromethyl Thiazole	70258-18-3	0.883	132.45
	2	3-Methyl 4-Nitroimino 1,3,5 Oxidiazine (MNIO)	70124-77-5	0.962	144.3
	3	DMF	68-12-2	4.00	600
	4	Methanol	67-56-1	2.00	300
	5	Caustic Soda Flakes	1310-73-2	0.24	36
	6	Hydrochloric Acid (30%)	7647-01-0	0.028	4.2
23		Imidacloprid			
	1	2- Chloro -5- Chloromethyl Pyridine	70258-18-3	0.83	124.5
	2	N- Nitro N- Methyl Imidazolidine	5465-96-3	0.75	112.5
	3	Sodium Carbonate	497-19-8	0.65	97.5
	4	Catalyst -1	-	0.01	1.5
	5	Solvent - DMF	68-12-2	2.2	330
	6	Caustic Lye 47 %	1310-73-2	0.05	7.5
	7	Solvent - Methanol	67-56-1	1.2	180
24		**Acetamiprid**			
	1	N-Cyanomethyl – Acetamidate (NCMA)	5652-84-6	0.505	75.75
	2	CMAMP	120739-62-0	0.73	109.5
	3	Solvent – Methanol	67-56-1	2.5	375
25		**Fipronil**			
	1	(+)-5-Amino-1(2,6)-Dichloro-1,1,1-Trifluoro-P-Tolyl)-4-Trifluoromethyl-Sulfopyrazole-3-Carbonitrile	5652-84-6	0.984	147.6
	2	50% Hydrogen Peroxide Solution	97004-04-1	0.175	26.25

	3	Catalyst	67-56-1	0.005	0.75
26		**Buprofezin**			
	1	N-Chloro Methyl Chloro Carbonyl Aniline (CCA)	52123-54-3	0.7	105
	2	Chloroform for CCA	52123-54-3	1.34	201
	3	t-Butyl Iso Thiocyanate Amino Iso Propionate	590-42-1	0.6	90
	4	Chloroform	52123-54-3	2.42	363
	5	Catalyst	-	0.015	2.25
	6	20 % Caustic Solution	1310-73-2	1.65	247.5
	7	Methanol	67-56-1	3	450
27		**Thiocloprid**			
	1	2-Chloro, 5-Chloro Methyl Pyridine	70258-18-3	0.9	135
	2	ThiazolidimylideneCynamide	26364-65-8	0.75	112.5
	3	DMF	68-12-2	2.2	330
	4	Catalyst	1643-19-2	0.01	1.5
	5	Sodium Carbonate	497-19-8	0.706	105.9
	6	Methanol	67-56-1	0.4	60
	7	Caustic Soda Lye	1310-73-2	0.05	7.5
28	1	Ethiprole			
	2	Diethyl Sulphide	352-93-2	0.34	51
	3	Chlorine Gas	7782-50-5	0.2	30
	4	1-(2,6-Dichloro-4-(Trifluoromethyl) Phenyl)-3-Cyano-5-Amino Thiazole	120068-79-3	0.88	132
	5	Hydrogen Peroxide	7722-84-1	0.095	14.25
	6	Methanol	67-56-1	2	300
	7	DMF	68-12-2	1.8	270
	8	EDC	107-06-2	2.4	360
	9	Formic Acid	64-18-6	0.112	16.8
	10	Methane Sulfonic Acid	75-09-2	0.112	16.8
29		**Dinotefuran**			
	1	M, N, O (2,3-Dimethylal-Nitrosourea	13256-32-1	0.7	105
	2	3-(Aminomethyl) Tetrahydrofuran	165253-31-6	0.534	80.1
	3	Sodium Hydroxide	1310-73-2	0.02	3
30		**Nitenpyram**			
	1	1,1,2-Trichloroethane	79-00-5	0.755	113.25
	2	Sodium Hydroxide (48%)	1310-73-2	0.472	70.8
	3	Nitric Acid (85%)	7697-37-2	0.419	62.85
	4	Hydrochloric Acid (36%)	7647-01-0	0.573	85.95
	5	2-Chloro-5-Chloromethyl Pyridine	14812-59-0	0.917	137.55
	6	Ethyl Amine (70%)	75-04-7	0.364	54.6
	7	Methyl Amine (40%)	74-89-5	0.44	66
	8	Solvent - Methylene Dichloride (MDC)	79-09-2	1.822	273.3
	9	Solvent - Methanol	67-56-1	2.1	315
31		**Chlorantraniliprole**			
	1	2-Amino-5-Chloro-N,3-Dimethyl Benzamide	890707-28-5	0.44	66
	2	3-Bromo-1-(3-Chloropyridin-2-yl)-1H-Pyrazole-5-Carbonyl Chloride	943982-60-3	0.706	105.9
	3	Triethyl Amine	121-44-8	0.225	33.75
	4	Solvent - Toluene	108-88-3	3.15	472.5
32		**Cyantraniliprole**			
	1	2-Amino-5-Cyano-N,3-Dimethyl Benzamide	890707-28-5	0.43	64.5
	2	3-Bromo-1-(3-Chloropyridin-2-yl)-1H-Pyrazole-5-Carbonyl Chloride	943982-60-3	0.725	108.75

	3	Triethyl amine	121-44-8	0.23	34.5
	4	Solvent - Xylene	1330-20-7	3.32	498
33		**Tetraniliprole**			
	1	2-Amino-5-Cyano-N,3-Dimethyl Benzamide	890707-28-5	0.38	57
	2	3-Bromo-1-(3-Chloropyridin-2-yl)-1H-Pyrazole-5-Carbonyl Chloride	943982-60-3	0.641	96.15
	3	Triethyl amine	121-44-8	0.204	30.6
	4	Solvent - Xylene	1330-20-7	2.938	440.7
	5	Solvent - Toluene	108-88-3	2.2	330
	6	Catalyst	-	0.015	2.25
	7	[5-(Trifluoromethyl)-2H-Tetrazole-2-yl] Methyl	1702-15-4	0.29	43.5
	8	Caustic Soda Lye	1310-73-2	0.17	25.5
34		**Indoxacarb**			
	1	Methyl-7-Chloro-2,5-Dihydroindeno[1,2-e]Oxadiazine-4a(3H-Carboxylate)	144171-61-9	0.6	90
	2	n-Methyl (Chlorocarbonyl)[4-Trifluoromethoxy Phenyl]Carbamate	173903-15-6	0.3	45
	3	Catalyst	-	0.2	30
	4	Toluene	108-88-3	0.55	82.5
	5	Caustic Lye	1310-73-2	0.08	12
35		**Flonicamid**			
	1	4-Trifluoromethyl Nicotinic Acid	158063-66-2	0.895	134.25
	2	Thionyl Chloride	07-09-7719	0.443	66.45
	3	Amino Acetonitrile Sulphate	5466-22-8	0.984	147.6
	4	Caustic	1310-73-2	0.298	44.7
	5	Solvent - Dimethyl Formamide (DMF)	68-12-2	0.615	92.25
	6	Solvent - Toluene	108-88-3	4.6	690
	7	Solvent - Ethylene Dichloride (EDC)	107-06-2	9.9	1485
	8	Solvent - Methanol	67-561	2	300
	9	Triethyl Amine	121-44-8	0.381	57.15
36		**Flubendiamide**			
	1	Dichloromethane	75-09-2	3	450
	2	IMMTPMPFPPP	272451-61-3	1	150
	3	mCPBA	937-14-4	0.55	82.5
37		Tolfenpyrad			0
	1	Solvent - Toluene	108-88-3	1	150
	2	4-(4-Methylphenoxy)-Benzyl amine	262862-66-8	0.553	82.95
	3	4-Chloro-3-Ethyl-1-Methyl Pyrazole-5-yl Carboxylic Acid Chloride	127892-62-0	0.54	81
Group-3	**Neo Nicotinoids Insecticides (G-2)**				50
38		**Cyclaniliprole**			
	1	Solvent A	-	3.915	195.75
	2	(PPOA)	943982-60-3	1.171	58.55
	3	Organic Base (Triethylamine)	121-44-8	0.414	20.7
	4	2-Nitrobenzenesulfenyl Chloride (NBSC)	7669-54-7	0.693	34.65
	5	Acetic Anhydride (Ac2O)	108-24-7	1.551	77.55
	6	Aqueous Hydrogen Bromide	10035-10-6	0.572	28.6
	7	Sodium Hydroxide	1310-73-2	1.067	53.35
	8	Solvent B	-	5.5	275
	9	Solvent C	-	4	200

	10	Oxidant - Sodium Peroxydisulfate	7775-27-1	1.055	52.75
	11	Solvent D	-	6.375	318.75
	12	Solvent E	-	5	250
	13	Bromine	7726-95-6	0.453	22.65
	14	Inorganic Acid	-	0.089	4.45
39		**Sulfoxaflor**			
	1	Sulfilimine (S, S-Bis(1-Methylethyl)-N-[(4-Methylphenyl) Sulfonyl]-)	18922-54-8	1.07	53.5
	2	Sodium Permanganate	10101-50-5	0.581	29.05
	3	Solvent - Ethylene Dichloride (EDC)	107-06-2	5.35	267.5
	4	Sodium Bisulphite	7631-90-5	0.778	38.9
40		**Clothianidin**			
	1	1,5-Dimethyl-2-Nitro iminohexahydro -1,3,5-Triazine(1,5-DMNIHH-1,3,5-Triazine)	136516-16-0	0.74	37
	2	Dimethyl Formamide	68-12-2	2	100
	3	Sodium Hydroxide	1310-73-2	0.17	8.5
	4	2-Chloro-5-Chloromethyl Thiazole	105827-91-6	0.715	35.75
	5	Ethanol	64-17-5	3	150
	6	Hydrochloric Acid	7647-01-0	0.6	30
41		**Pymetrozine**			
	1	3- Cyano Pyridine	100-54-9	0.532	26.6
	2	Catalyst- Pd/C	12635-27-7	0.015	0.75
	3	Ammonium Hydroxide	1336-21-6	0.17	8.5
	4	N-(6-Methyl-3-oxo-2, 5-Dihydro-3H [1, 2, 4] triazin-4-yl)-Acetamide	1333-74-0	0.87	43.5
	5	Concentrated Hydrochloric Acid	7647-01-0	0.709	35.45
	6	Caustic Soda Lye	1310-73-2	0.472	35.45
	7	Solvent-Methanol	67-56-1	2	23.6
Group-4	**Organo Phosphorus Insecticides/ Azaspiro/Aromatic Ethers, Carbamate, Benzoyl Urea, Oxidiazine, Pyrazole & Other Miscellaneous Insecticides/ Acaricides Compounds/ Benzoylurea/ Other IGRs/ Natural Products Inhibitor/ Quinazolin /Halogenated Pyrroles**				200
42		**Profenophos**			
	1	Ortho-Chloro Phenol	95-57-8	0.398	79.6
	2	Liquid Bromine	7726-95-6	0.485	97
	3	DETCl	01-04-2524	0.566	113.2
	4	Trimethyl Aluminium (TMA)	75-24-1	0.709	141.8
	5	Propyl Bromide	106-94-5	0.363	72.6
	6	Sodium Hydroxide	1310-73-2	0.215	43
43		**Chlorpyriphos Ethyl**			
	1	Na -TCP	37439-34-2	0.76	152
	2	DETC	01-04-2524	0.59	118
	3	EDC	107-06-2	2.8	560
	4	Catalyst	1643-19-2	0.01	2
	5	Caustic Soda Lye 48%	1310-73-2	0.1	20
44		**Chlorpyriphos Methyl**			
	1	Na-TCP	37439-34-2	0.763	152.6
	2	DMTC	2524-03-0	0.553	110.6
	3	EDC	107-06-2	4	800
	4	Catalyst	1643-19-2	0.01	2
	5	Caustic Soda Lye 48%	1310-73-2	0.1	20
45		**Temephos**			
	1	4,4' Thio Di Phenol	2664-63-3	0.515	103
	2	Solvent Toluene	108-88-3	1.5	300
	3	Catalyst	1643-19-2	0.01	2
	4	Catalyst Lye 47%	1310-73-2	0.6	120

	5	DMTC	2524-03-0	0.653	130.6
	6	Caustic Soda Lye	1310-73-2	0.1	20
46		**Malathion**			
	1	Phosphorus Pentasulfide	1314-80-3	0.48	96
	2	Methanol	67-56-1	0.313	62.6
	3	Triethylamine	121-44-8	0.001	0.2
	4	30% Hydrochloric Acid	7647-01-0	0.488	97.6
	5	Diethyl Maleate	141-05-9	0.84	168
	6	Dilute Caustic Lye Soln 5%	1310-73-2	1.058	211.6
	7	Sodium Nitrite	7632-00-0	0.00021	0.042
	8	Ethanol	64-17-5	0.0002	0.04
	9	Sulphuric Acid	7664-93-9	0.004	0.8
	10	C.S Lye 40 %	1310-73-2	0.1615	32.3
	11	Caustic Lye 48 %	1310-73-2	0.35	70
47		**Ethion**			
	1	Diethyl Thiophosphoric Acid	01-04-2524	0.998	199.6
	2	35% NaOH Solution	1310-73-2	0.66	132
	3	Solvent Toluene	108-88-3	2	400
	4	Catalyst-1	-	0.012	2.4
	5	Methylene Dibromide	74095-3	0.486	97.2
48	1	**Acephate**			
	2	O, O-Dimethyl Phosphoramidothioate	17321-47-0	0.998	199.6
	3	Acetic Anhydride	108-24-7	0.722	144.4
	4	Ammonia (10%)	7664-41-7	1.203	240.6
	5	Ethyl Acetate	141-78-6	0.925	185
	6	Ethylene Dichloride (EDC)	107-06-2	2	400
49		**Dimethoate**			
	1	O, O-Dimethyl S-[Methylaceto] Dithiophosphate	756-80-9	0.84	168
	2	Solvent EDC	107-06-2	2.2	440
	3	40% Mono Methyl Amine	74-89-5	0.355	71
	4	Catalyst	1643-19-2	0.01	2
50		**Phenthoate**			
	1	Phenyl Bromo Ethyl Acetate	2216-90-2	0.791	158.2
	2	Solvent EDC	107-06-2	2.4	480
	3	Catalyst (PTC)- TBAB	1643-19-2	0.012	2.4
	4	O, O-Dimethyl Thio Phosphoric Acid	756-80-9	0.46	92
51		**Spirotetramat**			
	1	Dichloroethane	107-06-2	3	600
	2	2,5-Dimethyl, Benzene Acetic Acid	13612-34-5	0.475	95
	3	Thionyl Chloride	07-09-7719	0.35	70
	4	Caustic Solution	1310-73-2	1.025	205
	5	Methanol	67-56-1	0.1	20
	6	30% Hydrochloric Acid Soln	7647-01-0	0.475	95
	7	(1s,4s)-1-Amino-4- Methoxy Cyclohexane Carboxylic Acid	387825-54-9	0.5	100
	8	Potassium Carbonate	584-08-7	0.4	80
	9	Ethoxy Formyl Chloride	541-41-3	0.31	62
52		**Triflumezopyrim**			
	1	2-[3-Trifluoromethyl) Phenyl Propanedioic Acid	1997-28-0	0.8	160
	2	Thionyl Chloride	07-09-7719	0.39	78
	3	5-(Bromomethyl) Pyrimidine (5-BMP)	93224-07-8	0.55	110
	4	Sodium Bicarbonate	144-55-8	0.275	55
	5	2-Amino Pyridine	504-29-0	0.3	60

	6	Toluene	108-88-3	5	1000
	7	Catalyst	-	0.005	1
	8	Caustic Solution	1310-73-2	0.6	120
53		**Fenazaquin**			
	1	4-Hydro Quinazoline	491-36-1	0.175	35
	2	Tert-Butyl phenyl Ethanol	5406-86-0	0.229	45.8
	3	Thionyl Chloride	07-09-7719	1.504	300.8
	4	Caustic Solution	1310-73-2	0.492	98.4
54		**Chlorfenapyr**			
	1	2-(4-Chlorophenyl) -5 -Trifluoromethyl) -1H -Pyrazole-3-Carbonirile	-	0.82	164
	2	(Chloromethoxy)Ethane	3188-13-4	0.26	52
	3	Bromine	7726-95-6	0.5	100
	4	Dichloroethane	107-06-2	3	600
55		**Diafenthiuron**			
	1	2,6-Diisopropyl Aniline	24544-04-5	0.54	108
	2	Phenol	108-95-2	0.26	52
	3	Solvent DMF	68-12-2	2.2	440
	4	Solvent - Xylene	1330-20-7	2	400
	5	Sodium Thiocyanate	540-72-7	0.23	46
	6	30% Hydrochloric Acid	7647-01-0	0.35	70
	7	Bromine Liquid	7726-95-6	0.44	88
	8	Sodium Hydroxide (30%)	1310-73-2	0.465	93
	9	Solvent - Methanol	67-56-1	1.85	370
	10	Potassium Hydroxide (85%)	1310-58-3	0.345	69
	11	Tert-Butyl Amine	75-64-9	0.2	40
56		**Fenobucarb**			
	1	2-Sec. Butyl Phenol	89-72-5	0.677	135.4
	2	n-Hexane	110-54-3	2.2	440
	3	Catalyst	-	0.012	2.4
	4	Phosgene	75-44-5	0.5	100
	5	Methyl Amine	74-89-5	0.15	30
57		**Propargite**			
	1	2-(4-Tert Butyl Phenoxy Cyclohexanol	1942-71-8	0.706	141.2
	2	Thionyl Chloride	7719-0-7	0.54	108
	3	Toluene	108-88-3	1	200
	4	Propargyl Alcohol	107-19-7	0.16	32
	5	Triethyl Amine	121-44-8	0.183	36.6
58		**Diflubenzuron**			
	1	2, 6 difluorobenzamide	18063-03-1	0.51	102
	2	4 - Chloro Phenyl Isocyanate	104-12-1	0.56	112
	3	Mono Chlorobenzene	108-90-7	1.8	360
59		Thiocyclam Oxalate			
	1	Bisultap	7772-98-7	1.333	266.6
	2	Sodium Sulphide	1313-82-2	0.29	58
	3	Oxalic Acid	144-627	0.337	67.4
	4	Toluene	108-88-3	5	1000
60		**Fenpyroximate**			
	1	Tert-Butyl-4- (Bromomethyl) Benzoate (TBB)	10852-76-2	0.755	151
	2	1,3-Dimethyl-4-Phenoxypyrazole Oxime (DMPPO)	110035-28-4	0.647	129.4
	3	KOH- Potassium Hydroxide	1310-58-3	0.172	34.4
	4	DMF	68-12-2	4	800
	5	MDC	75-09-2	4.5	900
61		**Etoxazole**			

	1	N-(2-Chloro-1-Methoxyethyl)-2,6-Difluorobenzamide	127892-62-0	0.832	166.4
	2	3-Tert-Butylphenol	585-34-2	0.652	130.4
	3	Solvent-Xylene	1330-20-7	3	600
	4	Sodium Hydroxide	1310-73-2	0.18	36
62		**Hexythiazox**			
	1	1-Methyl-2-Mercapto-2- (Para Chlorophenyl) Ethyl Amine	-	1	200
	2	Phosgene	75-44-5	0.41	82
	3	Solvent n-Hexane	110-54-3	3	600
	4	Catalyst-1	-	0.024	4.8
	5	Cyclohexyl Isocyanate	3173-53-3	0.52	104
63		**Pyriproxyfen**			
	1	4-Phenoxy Phenol	831-82-3	0.595	119
	2	1-Chloro -2- Propanol	127-00-4	0.305	61
	3	Sodium Hydroxide	1310-73-2	0.255	51
	4	2-Chloro Pyridine	39891-09-3	0.362	72.4
	5	Solvent -Toluene	108-88-3	1.7	340
	6	Solvent - Methanol	67-56-1	1.8	360
64		Thiodicarb			
	1	Methomyl	16752-77-5	0.972	194.4
	2	Sulphur Dichloride	10545-99-0	0.315	63
	3	Solvent Toluene	108-88-3	3.2	640
65		Spirodiclofen			
	1	1- [2 [(2,4-Dichloro-Phenyl)-2-Acetoxy]-1-Cyclohexane Carboxylic Acid Methyl Ester	361366-16-7	0.89	178
	2	Magnesium Ethoxide	2414-98-4	0.3	60
	3	2,2 - Dimethylbutanoyl Chloride	5856-77-9	0.345	69
	4	Ethanol	64-17-5	2	400
	5	5% Hydrochloric Acid	7647-01-0	0.2	40
	6	Ethyl Acetate	141-78-6	0.3	60
	7	Sodium Sulphate	7757-82-6	0.2	40
66		**Pyrithiobac**			
	1	2,6-Dichlorobenzonitrile	1194-65-6	0.727	145.4
	2	Sodium Sulphide	1313-82-2	0.327	65.4
	3	Hydrochloric Acid (25%)	7647-01-0	1.152	230.4
	4	N-Methyl Pyrrolidine	872-50-4	4.1	820
	5	Sodium Hydroxide	1310-73-2	0.145	29
	6	Dichloromethane	75-09-2	3.636	727.2
	7	2-Methanesulfonyl-4,6- Dimethoxy-Pyrimidine	113583-35-0	0.715	143
	8	Sodium Carbonate	497-19-8	0.347	69.4
67		**Novaluron**			
	1	2,6-Difluoro Benzoyl Isocyanate	60731-73-9	0.32	64
	2	3-Chloro-4-(1,1,2-Trifluoro-2-[Trifluoro Methoxy] Ethoxy) Aniline	116714-47-7	0.792	158.4
	3	Monochloro Benzene	108-90-7	0.546	109.2
	4	Solvent -Toluene	108-88-3	0.9	180
68		Fenoxycarb (T)			
	1	4- Phenoxy Phenol	831-82-3	0.63	126
	2	Ethyl -2- Chloro Ethyl Carbamate	-	0.505	101
	3	Sodium Hydroxide	1310-73-2	0.135	27
	4	Solvent -Toluene	108-88-3	1.4	280
69		**Pyridaben**			
	1	Mucochloric Acid	87-56-9	0.51	102
	2	Para-Tertio Butyl Benzyl Mercaptan	49543-63-7	0.548	109.6
	3	Para-Tertio Butyl Hydrazine	32064-67-8	0.254	50.8

	4	Solvent n-Hexane	110-54-3	2	400
	5	Catalyst - PTC	1643-19-2	0.018	3.6
70		Spiromesifen			
	1	Dimethyl Formamide (DMF)	68-12-2	1.947	389.4
	2	Sodium Hydroxide	1310-73-2	0.124	24.8
	3	Ester	-	0.941	188.2
	4	Solvent - Toluene	108-88-3	1.48	296
	5	Benzyl Tri Ethyl Ammonium Chloride (TBAC/ BTEAC))	56-37-1	0.438	87.6
	6	3% Sodium Bicarbonate	144-55-8	1.48	296
71		**Tebufenpyrad**			
	1	Methyl Ethyl ketone	78-93-3	0.3	60
	2	Diethyl Oxalate	95-92-1	0.62	124
	3	Hydrazine Hydrate (80%)	10217-52-4	0.26	52
	4	Dimethyl Sulphate	77-78-1	0.263	52.6
	5	Sodium Hydroxide (25%)	1310-73-2	1.65	330
	6	Sulfuryl Chloride	7791-25-5	0.563	112.6
	7	Thionyl Chloride	7719-0-7	0.396	79.2
	8	4-TertiaryButyl Benzyl Amine	39895-55-1	0.545	109
	9	Solvent -Toluene	108-88-3	2.126	425.2
	10	Sodium Ethoxide (98%)	141-52-6	0.298	59.6
	11	Dichloromethane	75-09-2	0.844	168.8
	12	Methanol	67-56-1	1.5	300
72		**Lufenuron**			
	1	1,1,2,3,3,3-Hexafluoro Propoxy-2,5-Dichloro Benzene	NA	0.65	130
	2	Nitric Acid	7697-37-2	0.13	26
	3	Sulphuric Acid	7664-93-9	0.2	40
	4	Hydrogen Gas	1333-74-0	0.04	8
	5	Catalyst Pd/C	03-05-7440	0.018	3.6
	6	2,6-Difluorobenzoyl Isocyanate	60731-73-9	0.38	76
	7	Solvent - Toluene	108-88-3	2.2	440
73		Methoxyfenozide			
	1	3,5 Dimethyl Benzo Hydrazide	27389-49-7	0.472	94.4
	2	Solvent - Toluene	108-88-3	2	400
	3	Catalyst - PTSA (Para Toluene Sulfonic Acid)	104-15-4	0.016	3.2
	4	Tert-Butyl Alcohol	75-65-0	0.45	90
	5	3-Methoxy 2-Methyl Benzoyl Chloride	24487-91-0	0.516	103.2
	6	Catalyst - TBAB (Tetra-n-Butyl ammonium Bromide)	1643-19-2	0.016	3.2
	7	48% Caustic Soda Lye	1310-73-2	0.25	50
74		**Spinetoram**			
	1	Natural Product			
75		**Thiocyclam Oxalate**			
	1	Bisultap	7772-98-7	1.333	266.6
	2	Sodium Sulphide	1313-82-2	0.29	58
	3	Oxalic Acid	144-627	0.337	67.4
	4	Toluene	108-88-3	5	1000
Fungicides Compounds					
Group-5	**SBI-Triazole Fungicides /Conazole Fungicides/ Triazolopyrimidines Fungicide**				200
76		**Hexaconazole**			
	1	Meta-Dichlorobenzene (MDCB)	541-73-1	0.522	104.4
	2	Pentanoyl Chloride	638-29-9	0.422	84.4
	3	Aluminium Trichloride	7446-70-0	0.65	130
	4	EDC	107-06-2	2	400

	5	Methyl Triophenyl Phosphorane	3487-44-3	0.956	191.2
	6	Tetrahydro Furan - THF	109-99-9	1.5	300
	7	Bromine	7726-95-6	0.545	109
	8	Hydrogen Peroxide	7722-84-1	0.12	24
	9	1,2,4 Triazole	288-88-0	0.225	45
	10	Potassium Hydroxide	1310-58-3	0.19	38
	11	Dimethyl Formamide	68-12-2	1.5	300
77		**Tebuconazole**			
	1	1-(4-Chlorophenyl)4-4 Dimethyl -3-Pentanoate	66346-01-8	0.768	153.6
	2	Dimethyl Sulphate	77-78-1	0.239	47.8
	3	Dimethyl Sulphide	75-18-3	0.212	42.4
	4	Potassium Hydroxide	1310-58-3	0.16	32
	5	1,2,4 Triazole	288-88-0	0.236	47.2
	6	N-Methyl-2-Pyrrolidone (NMP)	872-50-4	1	200
	7	Caustic Flakes	1310-73-2	0.04	8
	8	Dichloromethane	75-09-2	4	800
	9	Cyclohexane	110-82-7	1	200
78		**Difenoconazole**			
	1	Meta-Dichlorobenzene (MDCB)	541-73-1	0.402	80.4
	2	Acetyl Chloride	75-36-5	0.225	45
	3	Aluminium Trichloride	7446-70-0	0.52	104
	4	EDC	107-06-2	3	600
	5	4- Chloro Phenol	106-48-9	0.345	69
	6	Dimethyl Formamide	68-12-2	2.1	420
	7	Potassium Hydroxide	1310-58-3	0.3	60
	8	Catalyst	-	0.012	2.4
	9	Bromine	7726-95-6	0.41	82
	10	Propylene Glycol	57-55-6	0.205	41
	11	Toluene	108-88-3	1.2	240
	12	1,2,4 Triazole	288-88-0	0.182	36.4
79		**Propiconazole**			
	1	Meta-Dichlorobenzene (MDCB)	541-73-1	0.46	92
	2	Acetyl Chloride	75-36-5	0.245	49
	3	Aluminium Trichloride	7446-70-0	0.56	112
	4	Ethylene Dichloride	107-06-2	4	800
	5	Bromine Liquid	7726-95-6	0.555	111
	6	1,2 Pentane Diol	5343-92-0	0.33	66
	7	Catalyst	-	0.015	3
	8	Solvent - Toluene	108-88-3	1.2	240
	9	1,2,4 Triazole	288-88-0	0.215	43
	10	Potassium Hydroxide	1310-58-3	0.17	34
	11	DMF	68-12-2	1.5	300
80		**Metconazole**			
	1	Methyl-3,3-Dimethyl-2-Oxo-Cyclopentane Carboxylate	695-95-4	0.365	73
	2	4-Chloro Benzyl Chloride	104-83-6	0.54	108
	3	Catalyst	-	0.025	5
	4	1,2,4 Triazole	288-88-0	0.22	44
	5	Solvent Toluene	108-88-3	2.2	440
81		**Cyproconazole**			
	1	1-(4-Chlorophenyl)-2-Cyclopropyl-Propanone	28049-61-8	0.76	152
	2	Dimethyl Sulphide	75-18-3	0.225	45
	3	Potassium Hydroxide	1310-58-3	0.2	40
	4	1,2,4 Triazole	288-88-0	0.25	50
	5	Toluene	108-88-3	2.25	
	6	Potassium Carbonate	584-08-7	0.02	4

82		**Epoxiconazole**			
	1	Fluoro Benzene	462-06-6	0.32	64
	2	Chloro Acetyl Chloride	79-04-9	0.375	75
	3	Aluminium Chloride	7446-70-0	0.4	80
	4	Solvent - EDC	107-06-2	1.3	260
	5	Potassium Hydroxide	1310-58-3	0.555	111
	6	1,2,4 - Triazole	288-88-0	0.228	45.6
	7	Solvent – Dimethyl Formamide	68-12-2	1.8	360
	8	2- Chloro Benzyl Chloride	611-19-8	0.53	106
	9	Di Methyl Sulphide	75-18-3	0.202	40.4
83		**Febuconazole**			
	1	Benzyl Cynamide	18162-48-5-6	0.38	76
	2	1-Chloro-2-(4-Chlorophenyl) Ethane	2642-80-0	0.57	114
	3	Methylene Bromide	74-83-9	0.55	110
	4	Sodium Hydroxide	1310-7302	0.2	40
	5	1,2,4 - Triazole	288-88-0	0.13	26
	6	Solvent-Xylene	1330-20-7	2.5	500
	7	Catalyst	-	0.012	2.4
84		**Ipconazole**			
	1	3-Methyl Ethyl-2-Oxo Cyclopentane Carboxylate	611-10-9	0.54	108
	2	Solvent Xylene	1330-20-7	2.5	500
	3	4-Chloro Benzyl Chloride	104-83-6	0.51	102
	4	Catalyst-1	-	0.02	4
	5	Catalyst-2	-	0.015	3
	6	1,2,4 - Triazole	288-88-0	0.21	42
85		**Tetraconazole**			
	1	Methyl Alpha-2,4, Dichloro Phenyl Beta Hydroxy Propanoate	5764-85-2	0.74	148
	2	Methane Sulphonyl Chloride	124-63-0	0.325	65
	3	Solvent Toluene	108-88-3	3	600
	4	Catalyst	-	0.02	4
	5	Tetrafluoro Ethane	124-40–3	0.275	55
86		**Prothioconazole**			
	1	Ortho-Dichlorobenzene	95-50-1	0.46	92
	2	Chloro Cyclo Propane	1120-57-6	0.24	48
	3	2-Hydroxy Propanyl Chloride	685141-32-6	0.32	64
	4	Xylene	1330-20-7	2.5	500
	5	Catalyst	-	0.015	3
	6	2,4 Dihydro 1,2,4 Triazole 5 Thione	35771-65-4	0.325	65
87		**Fluquinconazole**			
	1	2-Chloro-6-Fluoro-4(3H)-Quinazolinone	769158-12-5	0.578	115.6
	2	2,4-Dichloro Bromo Benzene	1193-72-2	0.555	111
	3	Solvent Toluene	108-88-3	2	400
	4	Catalyst	-	0.01	2
	5	1,2,4-Triazole	288-88-0	0.175	35
88		**Triticonazole**			
	1	2,2-Dimethyl Cyclopentane	1121-05-7	0.38	76
	2	4-Chloro Benzaldehyde	104-88-1	0.48	96
	3	Catalyst-1	-	0.02	4
	4	Catalyst-2	-	0.015	3
	5	Solvent DMF	68-12-2	3	600
	6	1,2,4-Triazole	288-88-0	0.22	44
89		**Azaconazole**			
	1	1,3 – Dichloro Benzene	541-73-1	0.515	103
	3	Aluminium Chloride	7446-70-0	0.565	113

	4	Ethylene Dichloride	107-06-2	1.4	280
	5	Potassium Hydroxide	1310-58-3	0.195	39
	6	Dimethyl Formamide	68-12-2	1.2	240
	7	Bromine	7726-95-6	0.56	112
	8	Ethylene Glycol	107-21-1	0.217	43.4
	9	1,2,4 - Triazole	288-88-0	0.24	48
	10	Toluene	108-88-3	1.25	250
90		**Bromuconazole**			
	1	1,3 – Dichloro Benzene	541-73-1	0.413	82.6
	2	Acetyl Chloride	75-36-5	0.318	63.6
	3	Aluminium Chloride	7446-70-0	0.516	103.2
	4	Ethylene Dichloride	107-06-2	2	400
	5	Potassium Hydroxide	1310-58-3	0.157	31.4
	6	Magnesium Metal	7439-95-4	0.067	13.4
	7	Dimethyl Formamide	68-12-2	1.2	240
	8	Bromine	7726-95-6	0.898	179.6
	9	Allyl Bromide	106-95-6	0.339	67.8
	10	Tetrahydrofuran	109-99-9	2.1	420
	11	1,2,4 - Triazole	288-88-0	0.194	38.8
	12	Catalyst	-	0.018	3.6
	13	Potassium Carbonate	584-08-7	0.388	77.6
	14	Toluene	108-88-3	1	200
91		**Etaconazole**			
	1	1,3 Di Chloro Benzene	541-73-1	0.476	95.2
	2	Acetyl Chloride	75-36-5	0.254	50.8
	3	Aluminium Chloride	7446-70-0	0.595	119
	4	Solvent - EDC	107-06-2	1.8	360
	5	Bromine	7726-95-6	0.516	103.2
	6	Catalyst	-	0.012	2.4
	7	1,2 - Butanediol	584-03-2	0.29	58
	8	Solvent - Toluene	108-88-3	1.3	260
	9	Potassium Hydroxide	1310-58-3	0.178	35.6
	10	1,2,4 - Triazole	288-88-0	0.222	44.4
	11	Solvent–Dimethyl Formamide	68-12-2	1	200
92		**Penconazole**			
	1	2-(2,4 – Dichlorophenyl) Pentyl Alcohol	126-07-8	0.905	181
	2	Methane Sulfonyl Chloride	124-63-0	0.445	89
	3	Sodium Hydroxide	1310-73-2	0.155	31
	4	Solvent- Toluene	108-88-3	1.2	240
	5	1,2,4 - Triazole	288-88-0	0.264	52.8
	6	Sodium Methoxide	124-41-4	0.208	41.6
	7	Solvent – Dimethyl Formamide	68-12-2	1.2	240
93		**Tricyclazole**			
	1	2- Hydroxy -4- Methyl Benzothiazole (HMBT)	90-05-1	1	200
	2	Formic Acid	64-18-6	2	400
	3	Solvent-1 Ortho Xylene	1330-20-7	5	1000
94	1	Bupirimate			
	1	Ethirimol	23947-60-6	0.694	138.8
	2	Solvent - Toluene	108-88-3	2.2	440
	3	Catalyst	-	0.012	2.4
	4	Dimethyl Sulfomyl Chloride	13360-57-1	0.476	95.2
95		**Imazalil** (T)			
	1	2,4 Dichloro Phenacyl Bromide	2631-72-3	0.95	190
	2	Imidazole	288-32-4	0.24	48
	3	Allyl Chloride	107-05-1	0.263	52.6
	4	Solvent- Toluene	108-88-3	3	600

96		**Triadimenol (T)**			
	1	Triadimefon	43121-43-3	1.02	204
	2	Solvent- Toluene	108-88-3	2	400
	3	Catalyst	-	0.02	4
97		Triadimefol (T)			
	1	Pinacolone	75-97-8	0.365	73
	2	P-Chloro Phenol Sodium salt	1193-00-6	0.55	110
	3	Bromine	7726-95-6	1.111	222.2
	4	1,2,4 - Triazole	288-88-0	0.245	49
	5	Solvent – Toluene	108-88-3	2	400
98		**Metrafenone**			
	1	3-Bromo-6-Methoxy-2-Methyl Benzoic Acid	220901-25-7	0.61	122
	2	3,4,5-Trimethoxy Toluene	6443-69-2	0.45	90
	3	Thionyl Chloride	07-09-7719	0.35	70
	4	Solvent - Toluene	108-88-3	5	1000
	5	Dilute Caustic Solution	1310-73-2	1.42	284
99		**Flusilazole**			
	1	Dichloro (Chloromethyl) Methyl Silane	1558-33-4	0.564	112.8
	2	Solvent - Toluene	108-88-3	2	400
	3	Catalyst	-	0.015	3
	4	Para-Fluorophenyllithium	1493-23-8	0.35	70
	5	48% Caustic Solution	1310-73-2	0.345	69
	6	1,2,4 Triazole	288-88-0	0.23	46
100		**Prochloraz**			
	1	2,4,6-Trichloro Phenol	88-06-2	0.75	150
	2	Sodium Hydroxide	1310-73-2	0.18	36
	3	Solvent - Ethylene Dichloride (EDC)	107-06-2	2.82	564
	4	n-Propylamine	107-10-8	1.31	262
	5	CDI		0.525	105
	6	Solvent - Toluene	108-88-3	2.5	500
101		**Myclobutanil (T)**			
	1	4-Chlorophenyl Acetonitrile	140-53-4	0.6	120
	2	n-Butyl Bromide	109-65-9	0.525	105
	3	TBAB	1643-19-2	0.15	30
	4	Sodium Hydroxide	1310-73-2	0.675	135
	5	Dibromomethane	74-95-3	0.675	135
	6	DMF	68-12-2	1.5	300
	7	Toluene	108-88-3	2	400
	8	1,2,4-Triazole	288-88-0	0.26	52
102		**Ametoctradin**			
	1	Ethyl propionate	105-37-3	0.46	92
	2	Decanenitrile	1975-78-6	0.69	138
	3	Sodium methoxide	124-41-4	0.25	50
	4	Toluene	108-88-3	3	600
	5	30% Hydrochloric Acid	7647-01-0	0.55	110
	6	1,2,4-Triazole-5-Amine	61-82-5	0.34	68
	7	Catalyst	-	0.005	1
Group-6	**Strobilurins/ Methoxyacrylate/Carbanilate Fungicides/Mono Carboxylic Acid Amide/Hydroxy Aniline G-1**				150
103		**Pyraclostrobin**			
	1	1,4 Dichloro Benzene	106-46-7	0.42	63.3
	2	3 – Chloro Pyrazole	14339-33-4	0.28	41.25
	3	Solvent – Xylene	1330-20-7	4.00	600
	4	Catalyst	-	0.01	1.5
	5	2 - Chloro Benzyl Alcohol	17849-38-6	0.35	52.5

	6	N - Methoxy Carbamate	1117-97-1	0.27	40.5
104		**Azoxystrobin**			
	1	2-Caumaranone	84-64-0	0.35	52.5
	2	Methyl Formate	107-31-3	0.14	21.3
	3	Di Methyl Carbonate	616-38-6	0.22	32.4
	4	Sodium Hydride	7646-69-7	0.06	8.7
	5	Solvent – Toluene	108-88-3	1.40	210
	6	Sodium Methoxide	124-41-4	0.13	19.2
	7	Solvent – EDC	107-06-2	1.20	180
	8	4,6 - Di Chloro Pyrimidine	1193-21-1	0.35	52.8
	9	Ortho Cyano Phenol	611-20-1	0.28	42.45
	10	Potassium Hydroxide	1310-58-3	0.13	19.95
	11	Solvent – DMF	68-12-2	1.20	180
105		**Pyroxystrobin Technical**			
	1	1,4-Dichloro Benzene	106-46-7	0.40	59.4
	2	Solvent n-Hexane	110-54-3	2.40	360
	3	Catalyst-1		0.01	1.8
	4	2-Methyl-3-Hydroxy-5H-Pyrazole	33641-15-5	0.25	37.5
	5	Caustic Lye 48%	1310-73-2	0.22	33.3
	6	Cpd-A	14593-25-0	0.60	90
106		**Picoxystrobin**			
	1	3 – Iso Chromanone	4385-35-7	0.45	66.75
	2	Methyl Formate	107-31-3	0.18	27
	3	Di Methyl Carbonate	616-38-6	0.27	40.5
	4	Sodium Hydride	7646-69-7	0.29	43.05
	5	Solvent - Toluene	108-88-3	1.30	195
	6	Hydrogen Chloride Gas	7647-01-0	0.11	16.5
	7	Solvent – EDC	107-06-2	1.40	210
	8	2- Chloro -6-Trifluoro Methyl Pyridine	35852-58-5	0.48	72.45
	9	Potassium Hydroxide	1310-58-3	0.17	25.2
	10	Solvent - Xylene	1330-20-7	1.00	150
107		**Flufenoxystrobin**			
	1	3-Iso Chromanone	4385-35-7	0.39	58.5
	2	Methyl Formate	107-31-3	0.16	23.7
	3	Dimethyl Carbonate	616-38-6	0.23	34.5
	4	Sodium Hydride	7646-69-7	0.25	37.8
	5	Solvent Toluene	108-88-3	1.20	180
	6	Hydrogen Chloride Gas	7647-01-0	0.11	15.75
	7	Solvent EDC	107-06-2	1.40	210
	8	2-Chloro-4-Trifluoro Methyl Phenol	35852-58-5	0.51	77.1
	9	Potassium Hydroxide	1310-58-3	0.16	24
	10	Solvent Xylene	1330-20-7	1.00	150
108		**Metominostrobin**			
	1	Dimethyl Oxide	67-68-5	0.58	87.6
	2	Dimethyl Oxalate	553-90-2	0.41	60.75
	3	Catalyst	-	0.02	2.7
	4	Solvent - Toluene	108-88-3	1.10	165
	5	Methyl Amine	74-89-5	0.11	15.9
	6	Methoxy Amine	67-62-9	0.16	24.3
	7	Solvent - Xylene	1330-20-7	1.60	240
109		**Orysastrobin (T)**			
	1	(2E, 3Z)-4-Iminopentane-2, 3-Dione Bis (O-Methyloxime)	831-82-3	0.48	72
	2	2-(Methoxyimino)-N-Methylacetamide	147118-35-2	0.33	48.75
	3	Solvent - Xylene	1330-20-7	3.00	450
	4	Sodium Hydroxide	1310-73-2	0.12	18

	5	(2-Chlorophenyl) Methanol	17849-38-6	0.38	57.3
	6	2-[2-(Hydroxymethyl)Phenyl]-2-(Methoxyimino)-N-MethylAcetamide	17849-38-6	0.60	89.25
110		**Kresoxim Methyl**			
	1	Ortho Cresol	95-48-7	0.36	54
	2	Phthalide	87-41-2	0.45	67.05
	3	Potassium Hydroxide	1310-58-3	0.19	28.05
	4	Solvent - Xylene	1330-20-7	1.80	270
	5	Thionyl Chloride	07-09-7719	0.40	59.7
	6	Sodium Hydroxide	1310-73-2	0.16	24.45
	7	Sodium Cyanide	143-33-9	0.17	25.8
	8	Hydrochloric Acid (30 %)	7647-01-0	0.13	19.65
	9	Solvent – Methanol	67-56-1	1.00	150
	10	Methoxy Amine	67-62-9	0.16	23.4
111		**Triclopyricarb**			
	1	N-(2-Methylphenyl) N-Hydroxy Carbamate	151830-35-2	0.50	75.3
	2	Di Methyl Sulphate	77-78-1	0.18	26.55
	3	Sodium Hydroxide	1310-73-2	0.11	16.8
	4	N- Bromo Succinimide	128008-5	0.49	73.2
	5	Solvent - EDC	107-06-2	1.40	210
	6	3,5,6 Trichloro Pyridinol	6515-38-4	0.55	81.75
	7	Potassium Hydroxide	1310-58-3	0.16	23.25
	8	Solvent - Toluene	108-88-3	1.20	180
112		**Fenoxanil (T)**			
	1	2, 4 Dichloro Phenol	598-55-0	0.55	82.5
	2	Propionic Chloride	79-03-8	0.43	63.75
	3	Cyano 1,2 Dimethyl Propanamide	7505-93-2	0.36	54
	4	Solvent - Toluene	108-88-3	2.00	300
	5	Catalyst	-	0.01	1.5
	6	Sodium Hydroxide	1310-73-2	0.14	20.25
113		**Cymoxanil**			
	1	1-Cyano Acetyl-3-Ethyl Urea	41078-06-2	0.83	125.1
	2	Sodium Nitrite	7632-00-0	0.35	52.95
	3	DMSO4- Di Methyl Sulphate	77-78-1	0.63	93.9
114		**Flutolanil**			
	1	2-(Trifluoro Methyl) Benzyl Chloride	21742-00-7	0.71	106.5
	2	3-(1-Methayl Ethoxy) Benzene Amine	174197-34-3	0.51	75.75
	3	Triethyl Ethyl Amine	121-44-8	0.36	54
	4	Solvent- Toluene	108-88-3	1.50	225
	5	10% Caustic Solution	1310-73-2	1.43	213.75
115		**Tiadinil**			
	1	4-Methyl-1,2,3-Thiadiazole-5-Carboxylic Acid	18212-21-0	0.68	101.25
	2	3-Chloro-4-Methylbenzenamine	95-74-9	0.62	93
	3	Toluene	108-88-3	2.50	375
	4	Thionyl chloride	07-09-7719	0.55	82.5
	5	Catalyst	-	0.01	0.75
	6	5% C.S. lye Solution	1310-73-2	0.55	82.5
116		**Dodine**			
	1	Dodecyl Amine	124-22-1	0.68	102
	2	Cyanamide	420-04-2	0.16	23.25
	3	Acetic Acid	64-19-7	0.22	33
	4	Mother Liquor	-	0.40	60
117		**Captan**			

	1	CS2 – Carbon Disulphide	75-15-0	0.39	58.5
	2	Chlorine Gas	7782-50-5	2.30	345
	3	Spent Sulphuric acid	7664-93-9	5.30	795
	4	Tetrahydrophthalic	85-43-8	0.60	90.15
	5	Ammonia	1336-21-6	0.07	10.5
	6	Caustic Lye	1310-73-2	0.42	62.85
Group-7	**Strobilurins/ Methoxyacrylate/Carbanilate Fungicides/Mono Carboxylic Acid Amide/Hydroxy Aniline(G-2)**				50
118		**Dimoxystrobin**			
	1	2,5 - Xylenol	95-87-4	0.38	19
	2	Phthalate	84-64-0	0.42	20.75
	3	Potassium Hydroxide	1310-58-3	0.17	8.7
	4	Solvent - Xylene	1330-20-7	1.80	90
	5	Thionyl Chloride	07-09-7719	0.37	18.5
	6	Sodium Hydroxide	1310-73-2	0.13	6.4
	7	Sodium Cyanide	143-33-9	0.15	7.5
	8	30 % Hydrochloric Acid	7647-01-0	0.76	37.75
	9	Solvent - Ethanol	64-17-5	1.20	60
	10	Methoxy Amine	67-62-9	0.15	7.3
	11	Solvent - Toluene	108-88-3	1.10	55
	12	Methyl Amine	74-89-5	0.10	4.8
119		Trifloxystrobin			
	1	2- Methyl Aniline	87-60-5	0.29	14.4
	2	Sodium Nitrite	7632-00-0	0.19	9.25
	3	Sulphuric Acid	7664-93-9	0.27	13.6
	4	Glyoxylic Acid methyl Ester Oxime	30673-27-9	0.27	13.5
	5	Sodium Hydroxide	1310-73-2	0.31	15.3
	6	Di Methyl Sulphate	77-78-1	0.16	8
	7	Chlorine Gas	7782-50-5	0.19	9.5
	8	Solvent - EDC	107-06-2	1.20	60
	9	Sodium [1- {(3- Trifluoro Methyl) Phenyl} Ethylidene Amino] Oxidanide	106-48-9	0.52	25.9
	10	Solvent - DMF	68-12-2	1.40	70
120		Fluoxastrobin			
	1	2-Hydroxy Phenacyl Bromide	2491-36-3	0.45	22.5
	2	Methoxy Amine	67-62-9	0.10	5
	3	Solvent - Toluene	108-88-3	1.45	72.5
	4	Potassium Tertiary Butoxide	865-47-4	0.23	11.6
	5	Tertiary Butyl Nitrate	540-80-7	0.22	10.75
	6	Solvent – Butyl Alcohol	71-36-3	1.60	80
	7	Ethylene Oxide	75-21-8	0.09	4.6
	8	Potassium Hydroxide	1310-58-3	0.35	17.5
	9	4,6-Dichloro-5-Fluoro Pyrimidine	2927-71-1	0.35	17.25
	10	Solvent – Dimethyl Formamide	68-12-2	1.20	60
	11	Ortho Chloro Phenol	95-57-8	0.27	13.25
121		Fenhexamid			
	1	Aniline	62-53-3	2.17	108.35
	2	15% Hydrochloric Acid Solution	7647-01-0	0.40	19.8
	3	38.7% Sodium Nitrite	7632-00-0	0.79	39.7
	4	Sodium Hydroxide (100%)	1310-73-2	0.81	40.5
	5	2, 3-Dichloro Phenol	576-24-9	0.66	33
	6	30% Hydrochloric Acid Solution	7647-01-0	1.97	98.55
	7	Ethyl Acetate	141-78-6	10.90	545
	8	Methanol	67-56-1	11.20	560
	9	NI	-	0.20	10.1
	10	Hydrogen Gas	683-08-9	0.02	0.8
	11	THF	109-99-9	5.98	298.85

	12	TEA	121-44-8	0.57	28.25
	13	1MCH Chloro Chloride	-	0.89	44.6
Group-8	**Multisite / SBI-Other Dmis / Phenyl Amides / Sulfonyl Ureas/ Ethyl Mercaptan/Pyrazole Fungicides/ SDHIs / Others-Cont Fungicides**				200
122		**Thiophanate Methyl**			
	1	Methyl Chloro Formate	79-22-1	0.60	120
	2	Sodium Thio Cyanate	540-72-7	0.53	105.2
	3	Solvent - EDC	107-06-2	2.00	400
	4	OPDA	95-54-5	0.35	70
123		**Chlorothalonil**			
	1	TetrachloroIsophthalate	1861-32-1	1.06	211
	2	Solvent - Toluene	108-88-3	2.00	400
	3	Ammonia Soln.	1336-21-6	0.13	25
	4	Catalyst	-	0.02	4
124		**Isoprothiolane**			
	1	Di Isopropyl Malonate	13195-64-7	0.72	143
	2	Carbon Disulphide	75-15-0	0.29	58
	3	Caustic Soda Solution (47%)	1310-73-2	0.71	142
	4	Ethylene Dichloride	372-09-8	1.44	288
	5	Solvent – n-Heptane	107-06-2	2.50	500
125		**Validamycin**			
	1	TrehaloseDihydrate	6138-23-4	0.44	87
	2	Validoxylamine-A	38665-10-0	0.80	160.8
	3	Hexane	10-54-3	2.00	400
126		**Quinoxyfen**			
	1	Para-Chloro Phenol	106-48-9	0.45	90
	2	Sodium Hydroxide	1310-73-2	0.15	30
	3	Solent Toluene	108-88-3	3.00	600
	4	4,5,7 Trichloro Quinoline	238324-01-7	0.80	160
	5	Catalyst		0.01	2
127		**Fluazinam**			
	1	2-Amino-3-Chloro-5-(Trifluoromethyl) Pyridine	79456-26-1	0.43	86
	2	2,4-Dichloro-3,5-Dinitro Benzotrifluoride	29091-09-6	0.70	140
	3	MIBK-Solvent	108-10-1	2.50	500
	4	Potassium Hydroxide	1310-58-3	0.13	26
	5	Catalyst	-	0.02	3
128		**Famoxadone**			
	1	4-Phenoxychloro Benzene	4830-93-7	0.86	172
	2	5-Methyl-1,3-Oxazolidine-2,4-Dione	27770-23-6	0.48	96.8
	3	Solvent-Toluene	108-88-3	2.00	400
	4	Catalyst	-	0.02	3
	5	Aniline	62-53-3	0.54	107
129		**Benalaxyl**			
	1	4-Phenoxychloro Benzene	7005-72-3	0.44	87
	2	Methanol	67-56-1	0.51	102
	3	2,6 Dimethyl Aniline	87-62-7	0.41	81
	4	Phenyl Acetyl Chloride	103-80-0	0.49	98
	5	Solvent Toluene	108-88-3	2.50	500
130		**Carboxin**			
	1	Acetoacetanilide	102-01-2	1.51	301.2
	2	Sulfuryl Chloride (SO2Cl2)	7791-25-5	1.18	236.6
	3	Toluene	108-88-3	8.50	1700
	4	2-Mercaptoethanol	60-24-2	0.61	122
	5	TEA - Triethyl Amine	121-44-8	0.79	158
	6	PTSA	104-15-4	0.35	70
	7	Acetone	67-64-1	4.00	800

131		**Iprobenfos (Kitazin)**			
	1	Diisopropyl Phosphorochloride	2574-25-6	0.72	143.6
	2	Benzyl Mercaptan	100-53-8	0.44	88.8
	3	Dichloroethane (DCE)	107-06-2	3.60	720
	4	Charcoal	7440-44-0	0.11	21.4
132		**Bixafen**			
	1	3-(Difluoromethyl)-1-methylpyrazole-4-Carboxylic Acid	151734-02-0	0.50	100.2
	2	Thionyl Chloride	7719-0-7	0.36	71
	3	DMF	68-12-2	0.01	1
	4	Toluene	108-88-3	1.50	300
	5	3',4'-dichloro-5-fluorobiphenyl-2-Amine	877179-04-9	0.74	148.4
	6	Potassium Carbonate	584-08-7	0.40	80
	7	Dilute Caustic Solution	1310-73-2	1.61	322
133		**Isopyrazam**			
	1	3-(Difluoromethyl-1-Methyl Pyrazole -4-Carboxylic Acid Chloride	141573-96-8	0.58	116.8
	2	1,2,3,4-Tetra Hydro-8-Amino-1,4-Methano phthalene-5-yl	68376-13-8	0.21	42
	3	Solvent Toluene	108-88-3	2.00	400
	4	Catalyst	-	0.01	2
	5	Triethyl Amine	121-44-8	0.30	60.6
	6	Caustic Lye 48%	1310-73-2	0.28	55
134		**Fluopicolide**			
	1	Toluene (Recycle+Fresh)	108-88-3	7.48	1496
	2	Benzophenone (Recycle+Fresh)	119-61-9	1.56	312.6
	3	PTSS	104-15-4	0.05	9
	4	DIPEA(Recycle Fresh)	7087-68-5	0.70	139.4
	5	Potassium Carbonate	584-08-7	1.56	311.6
	6	TEBRO-Catalyst	-	0.05	9.6
	7	DCTFP	1737-93-5	0.81	162.6
	8	BXA	1985605-59-1	0.05	9
	9	Hydrochloric Acid (30%)	7647-01-0	0.96	191.8
	10	Caustic Lye (48% Solution)	1310-73-2	0.65	130
	11	DCBC	2014-83-7	0.14	27.6
135		**Fluopyram**			
	1	Solvent - Ethylene Dichloride (EDC)	107-06-2	1.69	338
	2	TFMB Amide (2-(Trifluoromethyl) Benzamide)	360-64-5	0.56	112.6
	3	Dimethyl Formamide (DMF)	68-12-2	0.01	1
	4	Thionyl Chloride	07-09-7719	0.37	74
	5	Chloro Trifluoromethyl Pyridine Ethan amine	658066-44-5	0.85	169.8
	6	Hydrochloric Acid	7647-01--0	0.39	77.4
	7	Sodium Hydroxide	1310-73-2	0.87	174.8
136		**Boscalid**			
	1	2-Chloronicotinoyl Chloride	49609-84-9	0.54	107.4
	2	2-Amino-4'-Chlrobiphenyl	1204-44-0	0.59	118.8
	3	Solvent - Toluene	108-88-3	1.50	300
137		**Fluxapyroxad**			
	1	3-(Difluoromethyl)-1-Methyl-1-H-Pyrazol-4-Carboxylic Acid	176969-34-9	0.55	110.8
	2	Thionyl Chloride	07-09-7719	0.39	78.6
	3	Dimethyl Formamide (DMF)	68-12-2	0.01	1

	4	3,4,5-Trifluoro-2-Aminobiphenyl	915416-45-4	0.70	140.4
	5	Potassium Carbonate	584-08-7	0.43	85
	6	Solvent -Toluene	108-88-3	1.66	332.8
	7	Dilute Caustic Lye	1310-73-2	0.85	170
138		Carpropamid			
	1	2,2-Dichloro 1-Ethyl 3-Methylcyclopropane Carboxylic Acid	NA	0.62	123.2
	2	1-(4-Chlorophenyl) Ethyl Amine	01-02-6299	0.49	98
	3	Solvent - Toluene	108-88-3	2.20	440
	4	Catalyst - TBAB (Tetra Butyl Ammonium Bromide)	1643-19-2	0.02	3.6
139		**Cyazofamid**			
	1	4-Chloro-2-Cyano-5-p-Tolylimidazole (CCDTI)	120118-14-1	0.66	131.2
	2	Dimethylsulfamoyl Chloride	124-63-0	0.44	88.2
	3	Potassium Carbonate	584-08-7	0.43	86
	4	Solvent -Acetonitrile	75-05-8	1.70	340
	5	Solvent -Toluene	108-88-3	2.00	400
140		**Mandipropamid**			
	1	4-Chloromandilic Acid	492-86-4	0.61	121.4
	2	Thionyl Chloride	07-09-7719	0.41	81.4
	3	Dimethyl Formamide (DMF)	68-12-2	0.01	1.2
	4	Solvent -Toluene	108-88-3	1.80	360
	5	3-Methoxy Phenethylamine	2039-67-0	0.54	108.8
	6	2-Propinyl Methane sulfonate	16156-58-4	0.90	179.2
	7	Dilute Caustic Lye	1310-73-2	1.50	300
141		**Penflufen**			
	1	5-Fluoro-1,3-Dimethyl-1H-Pyrazole-4-Carboxylic Acid	1027991-91-8	0.63	125
	2	2-(1,3-Dimethylbutyl) Aniline	203448-76-4	0.62	124
	3	Thionyl chloride	07-09-7719	0.48	95
	4	Toluene	108-88-3	3.00	600
	5	Dilute Caustic Lye	1310-73-2	1.50	300
	6	Catalyst	-	0.01	1.4
	Herbicides Compounds				
Group-9	**Als-Imidazolinone/Ureas/Als-Sulfonylurea-Cont/Als-Others/Amino Acids/Ureas/Cyclohexandiones/Dinitro Anilinees /Acetamides /Amide/ Nitro Phenyl Ether Herbicides/ Monothiocarbamic Ester/ Triazinone Herbicides / Cyclohexane Oxime**				200
142		**Imazamox**			
	1	5-Methyl-2,3-Pyridine Dicarboxylic Acid Anhydride	143382-03-0	1.04	208
	2	2-amino-2,3-dimethyl Butane nitrile	13893-53-3	0.63	126
	3	Methanol	67-56-1	0.20	39.2
	4	Sulfonyl Chloride	7791-25-5	0.99	198
	5	Chlorobenzene	108-90-7	4.00	800
	6	Sulphuric Acid	7664-93-9	0.20	40
	7	Sodium Hydroxide	1310-73-2	0.43	85.4
143		**IMAZAMETHABENZ**			
	1	3,5-Dimethylbenzoic Acid Ethyl Ester	21239-29-2	1.01	202.8
	2	Chlorine gas	7782-50-5	0.89	178
	3	2-Amino-2,3-Dimethyl Butyramide	40963-14-2	0.54	108
	4	Sodium Hydroxide	1310-73-2	0.41	81
	5	Chlorobenzene	108-90-7	4.52	904
144		**IMAZAPYR**			
	1	Ethyl 3-methylpyridine-2-	58997-10-7	0.99	197.6

		carboxylate			
	2	Chlorine gas	7782-50-5	0.94	187
	3	2-Amino-2,3-Dimethyl Butyramide	40963-14-2	0.69	137
	4	Sodium Hydroxide	1310-73-2	0.44	88
	5	Chlorobenzene	108-90-7	3.50	700
145		**Penoxsulam**			
	1	Trizolopyrimidine Amine/ 5,8 Dimethoxy -[1,2,4] Triazolo{1,5c) pyrimidine -2 Amine	219715-62-5	0.40	80.8
	2	2-(2,2-Difluoroethoxy)-6-(Trifluoromethyl)Benzene-1-Sulfonyl Chloride	86532-01-8	0.67	134.4
	3	Pyridine	110-86-1	0.16	32.8
	4	DMSO	67-68-5	2.02	404
146		**Metsulfuron Methyl**			
	1	Ortho-Carboxy Methyl Phenyl Isocyanate	52986-66-0	0.68	136
	2	2-Amino-4-Methoxy-6-Methyl-1,3,5-Triazine	1668-54-8	0.40	79
	3	Triethyl Amine	121-44-8	0.21	42
	4	Acetonitrile	75-05-8	3.25	650
147		**Mesosulfuron Methyl**			
	1	Methyl-2-(Sulfamoyl) -4-(Methanesulfonamido Methyl) Benzoate / methyl 4-(methylsulfonamidomethyl)-2-sulfamoylbenzoate	393509-80-3	0.78	156
	2	2-Isocyanato-4,6-Dimethoxypyrimidine	111284-03-8	0.44	88
	3	Triethylamine	121-44-8	0.49	97.8
	4	Toluene	108-88-3	3.56	712
	5	10% Hydrochloric Acid	7647-01-0	1.80	360
	6	Ethyl Acetate	141-78-6	1.40	280
148		**Chlorimuron Ethyl**			
	1	Isocyanate in Xylene (50%)	109-90-0	1.54	308.4
	2	Toluene	108-88-3	0.77	154
	3	2-Amino 4-Chloro 6-Methoxy Pyrimidine (ACMP)	5734-64-5	0.46	91.8
149		**Bispyribac Sodium**			
	1	2,6 Dihydroxy Benzoic Acid	303-07-1	0.60	119.8
	2	Acetone	67-64-1	25.00	5000
	3	Sodium Bi Carbonate	144-55-8	1.56	311.4
	4	Dimethyl Sulphate (DMS)	77-78-1	0.96	191.6
	5	Sodium Bi Carbonate 10% Solution	144-55-8	1.50	300
	6	Acetone for washing	67-64-1	1.20	240
	7	Potassium Carbonate	584-08-7	1.87	373.6
	8	4,6 Dimethoxy 2-Methyl Sulfonyl Pyrimidine	11358-35-0	1.47	294.6
	9	Methanol	67-56-1	3.00	600
	10	Iso Propyl Alcohol	67-63-0	11.80	2360
	11	Sodium Hydroxide Flakes	1310-73-2	0.13	26.4
	12	IPA for washing	67-63-0	1.10	220
150		**Pyrazosulfuron Ethyl**			
	1	Ethyl-1-Methyl -5-Sulphanamide Isocyanide- 1-H Pyrazole-4-Carboxylate	88398-81-6	0.80	160
	2	2- Amino -4,6-Dimethoxy Pyrimidine	36315-01-2	0.49	98

	3	Toluene	108-88-3	3.00	600
	4	Methanol	67-56-1	2.00	400
151		**Florasulam**			
	1	5-Methoxy-8-Fluoro [1,2,4] Triazolo [1,5c] Pyrimidine -2- Sulfonyl Chloride	NA	0.78	156
	2	Solvent DMSO	67-68-5	2.20	440
	3	2,6-Difluoro Aniline	5509-65-9	0.38	75.6
	4	Pyridine	110-86-1	0.24	48.8
	5	C.S. Lye 48%	1310-73-2	0.27	53.6
152		**Thiencarbazone Methyl**			
	1	Methyl 5- Methyl - 4 - Sulfomoylthiophene-3-Carboxylate	317815-81-9	0.68	136.8
	2	3-Methoxy -5-oxo-1,2,4-Triazole-1-Carbonylchloride	-	0.46	92
	3	Solvent Xylene	1330-20-7	2.60	520
	4	Triethyl Amine	121-44-8	0.29	57.2
	5	C.S. Lye 48%	1310-73-2	0.25	50
153		**Bensulfuron**			
	1	4, 6- Dimethoxy Pyrimidine -2-Amine	36315-01-2	0.42	83.6
	2	Methyl-2- {[Isocyanate Sulfamoyl] Methyl} Benzoate	112941-26-1	0.62	124
	3	Solvent - Xylene	1330-20-7	1.60	320
	4	Solvent - Methanol	67-56-1	2.00	400
154		**Nicosulfuron**			
	1	2-Ethoxy Carbonyl Amino Sulfonyl-N, N-Dimethyl-3-Pyridine Carboxamide	-	0.81	161.8
	2	Toluene	108-88-3	3.46	692
	3	2-Amino-4,6-Dimethoxy Pyrimidine	36315-01-2	0.40	80.8
	4	10% Sodium Carbonate	497-19-8	2.50	500
	5	15% Hydrochloric Acid	7647-01-0	0.58	115
155		**Sulfosulfuron**			
	1	2-Amino-4,6-Dimethoxy Pyrimidine	36315-01-2	0.40	79.2
	2	Phenyl Chloroformate	1885-14-9	0.40	80
	3	2 - Ethylsulfonylimidazo [1,2-A] Pyridine Sulfonamide	141776-47-8	0.84	167
	4	Potassium Hydroxide	1310-58-3	0.14	28.4
	5	Ethylene Dichloride (EDC)	107-06-2	13.90	2780
	6	N, N-Dimethyl aniline (DMA)	121-69-7	0.31	61.8
	7	Methanol	67-56-1	3.40	680
	8	Caustic	1310-73-2	0.09	17
	9	Hydrochloric Acid	7647-01-0	0.09	18.4
156		**Trifloxysulfuron**			
	1	2-Chloro-3-Hydroxy Pyridine	6636-78-8	0.33	66.6
	2	Benzyl Chloride	100-44-7	0.33	66.4
	3	Solvent-Methyl Ethyl Ketone (MEK)	78-93-3	2.20	440
	4	Sodium Carbonate	497-19-8	0.29	57.2
	5	Sodium Sulphide	1313-82-2	0.19	37.6
	6	30% Hydrochloric Acid Solution	7647-01-0	0.30	60
	7	Hydrogen Peroxide	7722-84-1	0.10	20.2
	8	Catalyst	-	0.01	2
	9	Liquid Ammonia	7664-41-7	0.06	11
	10	1-Chloro-2,2,2-Trifluoro Ethane	75-88-7 1330-45-6	0.28	56
	11	3,5 Dimethoxy Phenyl Amino Carbonyl Chloride	54132-75-1	0.47	93

157		**Diclosulam**			
	1	2,2 DithioBis [5-Ethoxy 7-Fluoro (1,2,4) Triazole (1,5) Pyrimidine	166524-75-0	1.15	230
	2	Solvent - Toluene	108-88-3	3.00	600
	3	Catalyst - TBAB (Tetra-n-Butyl ammonium Bromide)	1643-19-2	0.02	3.6
	4	Sulfonyl Chloride	163894-16-4	0.35	70
	5	Sodium Nitrite	7632-00-0	0.22	44
	6	2,6 Dichloro Aniline	608-31-1	0.44	88
	7	Solvent - Ethanol for Washing	64-17-5	0.55	110
158		**Pyroxsulam**			
	1	2-Amino-4,6-Dimethoxy Pyrimidine	36315-01-2	0.63	126
	2	Ethoxy Carbonyl Isothiocyanate	16182-04-0	0.81	162
	3	Solvent-1 Toluene	108-88-3	3.68	736
	4	Solvent -2 Hydroxylamine	5470-11-01	1.04	208
	5	Solvent 3-Methanol	67-56-1	5.98	1196
	6	2-Methoxy-4-(Trifluoromethyl) Pyridine-3-Sulfonyl Chloride	219715-41-0	0.88	176
	7	Hydroxylamine Hydrochloride	01-11-5470	0.27	54
	8	Diisopropylethylamine	7087-68-5	0.98	196
	9	Ethyl Acetate	141-78-6	0.86	172
	10	Acetonitrile	75-05-8	1.96	392
	11	Hydrochloric Acid (12%)	7647-01-0	1.02	204
	12	Toluene	108-88-3	1.15	230
159		**Glyphosate**			
	1	Mono Chloro Acetic Acid	79-11-8	1.33	266.4
	2	20 % Ammonia Solution	7664-41-7	0.12	24
	3	Calcium Chloride	7440-70-2	0.52	104.4
	4	Hydrochloric Acid (HCl)	7647-01-0	0.26	51.4
	5	Ortho Phosphoric Acid	7664-38-2	0.56	111.6
	6	37 % Formaldehyde Solution	462-95-3	0.21	42.2
	7	30 % Hydrochloric Acid Solution	7647-01-0	1.41	282
	8	Activated Charcoal	7440-44-0	0.05	10
	9	Oxygen Gas	7782-44-7	0.11	22.6
	10	Sulphuric Acid	7664-93-9	0.35	69
160		**Glufosinate Ammonium**			
	1	Ethanol	64-17-5	2.00	400
	2	Acrolein	107-02-8	0.31	62
	3	Diethyl Methyl Phosphonate	683-08-9	0.75	150
	4	Sodium Cyanide	143-33-9	0.27	54
	5	Ammonium Carbonate	10361-29-2	0.53	106
	6	Barium Hydroxide	22326-55-2	0.87	174
	7	30% Sulphuric Acid	7664-93-9	0.90	180
	8	Ammonium Hydroxide	1336-21-6	0.80	160
161		**Pendimethalin**			
	1	4- Nitro Ortho Xylene	64-17-5	0.58	116
	2	Diethyl Ketone	107-02-8	0.36	72
	3	Hydrogen Gas	683-08-9	0.04	8
	4	Nitric Acid	143-33-9	1.01	202
	5	Sulphuric Acid	10361-29-2	0.71	142
	6	Ethylene Dichloride	22326-55-2	2.00	400
	7	30 % Hydrochloric Acid Solution	7664-93-9	0.19	38
	8	Acetone	7664-41-7	0.05	10.4
	9	Caustic Lye	1310-73-2	0.02	4
	10	Ortho-Xylene	95-47-6	1.00	200
162		**Pretilachlor**			
	1	2,6 Diethyl Aniline (2,6-DEA)	579-66-8	0.58	115

	2	1-(2-Chloro Ethoxy) Propane	42149-74-6	0.47	94.2
	3	Chloroacetyl Chloride	79-04-9	0.44	87
	4	Sodium Hydroxide	1310-73-2	0.15	30.8
	5	Solvent -Toluene	108-88-3	2.64	528
163		**Dicamba**			
	1	2,4-Dichloro Phenol	120-83-2	0.82	164
	2	Carbon Dioxide	124-38-9	0.26	52
	3	Dimethyl Sulphate	77-78-1	0.32	64
	4	Sodium Hydroxide	1310-73-2	0.21	41
	5	Solvent -Methanol	67-56-1	1.40	280
	6	Solvent -Toluene	108-88-3	1.60	320
164		**Napropamide**			
	1	Propionic Acid	79-09-4	0.31	62
	2	Bromine	7726-95-6	0.62	124
	3	Thionyl Chloride	07-09-7719	0.49	97
	4	Dimethyl Amine	109-89-7	0.27	54
	5	Alpha Naphthol	90-15-3	0.54	107
	6	Solvent Xylene	1330-20-7	3.00	600
	7	Catalyst	-	0.02	4
	8	Caustic Soda Lye (48%)	1310-73-2	0.80	160
165		**Dimethanamide**			
	1	Thiolactic Acid	79-42-5	0.51	102.4
	2	Methacrylic Acid	79-41-4	0.42	83
	3	Solvent Toluene	108-88-3	2.20	440
	4	Catalyst	-	0.01	2.8
	5	1-Methoxy-2-Amino Propane	37143-54-7	0.35	70.4
	6	Thionyl Chloride	07-09-7719	0.48	96
	7	Caustic Soda Lye	1310-73-2	1.07	214
166		**Topramezone**			
	1	3-(4,5-Dihydro-3-Isoxazolyl)-2-Methyl-4-(MethylSulfonyl) Benzoic Acid	223646-24-0	0.96	191.4
	2	Toluene	108-88-3	1.00	200
	3	Pyridine	110-86-1	0.06	12.6
	4	Thionyl Chloride ($SOCl_2$)	07-09-7719	0.98	195.6
	5	Dioxane	123-91-1	1.50	300
	6	1-Methyl-5-Hydroxy Pyrazole	33641-15-5	0.37	74.4
	7	Triethylamine	121-44-8	0.40	80.8
	8	Potassium Carbonate	584-08-7	0.39	78.8
	9	10% Dilute Hydrochloric Acid	7647-01-0	1.00	200
	10	Ethyl Acetate	141-78-6	1.00	200
167		**Propoxy Carbazone**			
	1	Methyl (2-Sulfonylchloride) Benzoate	26638-43-7	0.63	126.8
	2	Solvent Xylene	1330-20-7	2.40	480
	3	4-Methyl (-5-oxo -3-Propoxy -1- H -1,2,4-Triazolyl)-Carbonyl amine	NA	0.54	108
	4	TEA - Triethyl Amine	121-44-8	0.29	57.2
	5	C.S. Lye 48%	1310-73-2	0.25	50
168		**Fomesafen**			
	1	3-Hydroxy -6-Nitro Benzoic Acid	619-14-7	0.49	97
	2	3,4 -Di Chloro Benzotrifluoride.	328-84-7	0.57	113.4
	3	Sodium Hydroxide	1310-73-2	0.11	21
	4	Solvent -Di methyl Sulfoxide (DMSO)	67-68-5	2.10	420
	5	Thionyl Chloride	07-09-7719	0.30	60
	6	20 % Ammonium Hydroxide Solution	1336-21-6	0.46	91.6

	7	Solvent - Toluene	108-88-3	2.40	480
	8	Methane Sulfonyl Chloride	124-63-0	0.30	60
169		**Halosafen**			
	1	3-Hydroxy-6-Nitro Benzoic Acid	601-99-0	0.49	97.4
	2	3,4 – Dichloro Benzotrifluoride	328-84-7	0.57	114
	3	Sodium Hydroxide	1310-73-2	0.11	21
	4	Solvent – Dimethyl Sulfoxide	67-68-5	2.00	400
	5	Thionyl Chloride	07-09-7719	0.30	60
	6	Ammonium Hydroxide Solution (20 %)	57340-65-5	0.46	92.6
	7	Solvent - Toluene	108-88-3	2.20	440
	8	Ethane Sulfonyl Chloride	594-44-5	0.32	64
170		**Clethodim**			
	1	5-Propyl 2-Thio Ethyl Cyclohexane 1,3 Dione	99422-01-2	0.63	125
	2	Propionyl Chloride	79-03-8	0.29	57
	3	Aluminium Chloride (Anhydrous)	7446-70-0	0.45	90
	4	1-Chloro 3-Allyl Oxyamine	82244-86-8	0.33	66
	5	Solvent - Toluene	108-88-3	2.50	500
171		**Benoxacor**			
	1	Ortho Nitro phenol	88-75-5	0.58	115.2
	2	Chloro Acetone	78-95-5	0.38	76.6
	3	Sodium Bicarbonate	144-55-8	0.35	69.6
	4	Toluene	108-88-3	1.00	200
	5	Hydrogen-Gas	1333-74-0	0.04	7
	6	Toluene	108-88-3	1.80	360
	7	Catalyst	-	0.004	0.8
	8	Dichloro Acetyl Chloride	79-36-7	0.59	118
172		**Phenmedipham**			
	1	Meta Aminophenol	591-27-5	0.39	77
	2	Methyl Chloroformate	79-22-1	0.34	68
	3	Disodium Hydrogen Phosphate	7558-79-4	0.16	32
	4	Butyl Acetate	123-86-4	3.20	640
	5	Caustic Lye	1310-73-2	0.15	29
	6	Meta Tolyl Isocyanate	622-58-2	0.47	94
	7	Tri ethylamine	121-44-8	0.01	2
173		**Desmedipham (DMP)**			
	1	Meta Aminophenol	591-27-5	0.40	79
	2	Ethyl Chloroformate	541-41-3	0.38	76
	3	Disodium Hydrogen Phosphate	7558-79-4	0.16	32
	4	Butyl Acetate	123-86-4	3.20	640
	5	Caustic Lye	1310-73-2	0.15	29
	6	Phenyl Isocyanate	103-71-9	0.42	83.2
	7	Tri ethylamine	121-44-8	0.01	2.8
174		**Bromobutide**			
	1	Phenylpropan-2-Amine	100-92-5	0.50	100
	2	2-Bromo-3,3-Dimethyl Butanoyl Chloride	29336-30-9	0.79	158
	3	Potassium Carbonate	584-08-7	0.26	51.6
	4	Solvent – Chloro Benzene	108-90-7	1.50	300
175		**Butachlor**			
	1	2,6 Diethyl Aniline (2,6-DEA)	579-66-8	0.50	100
	2	Para Formaldehyde (PFA)	30525-89-4	0.17	33.8
	3	Solvent - Benzene	541-73-1	0.27	53.2
	4	Triethylamine (TEA)	121-44-8	0.003	0.6
	5	Chloro Acetyl Chloride (CAC)	79-04-9	0.39	78.8
	6	Solvent - N-Butanol	71-36-3	1.05	210.4
	7	Ammonia Gas	1336-21-6	0.06	12.4

176		**Metachlor**			
	1	2,6 Diethyl Aniline	579-66-8	0.65	130
	2	Solvent - Toluene	108-88-3	2.00	400
	3	Catalyst - PTSA (Para Toluene sulfonic Acid)	104-15-4	0.02	4
	4	Formaldehyde	462-95-3	0.13	26
	5	Chloro Acetic Acid	79-11-8	0.47	93.6
	6	Solvent - Methanol	97-56-1	0.50	100
177		**Prosulfocarb**			
	1	50 %Ammonium Thiocyanate	1762-95-4	0.708	141.6
	2	Sulphuric Acid	7664-93-9	1.392	278.4
	3	Di-n-Propylamine	142-84-7	0.602	120.4
	4	Benzyl Chloride	100-44-7	0.547	109.4
	5	22% Sodium Hydroxide	1310-73-2	0.79	158
Group-10	**Cyclohexandiones/Nitro Phenyl Ether Herbicides/Monothiocarbamic Ester/ Triazinone Herbicides / Cyclohexane Oxime**				50
178		**Quinclorac**			
	1	3-Chloro-2-Methyl-Aniline	87-60-5	0.74	37
	2	Glycerol	56-81-5	0.46	23
	3	Conc. Sulphuric Acid - 98%	7664-93-9	1.83	91.5
	4	Sodium Carbonate	497-19-8	1.94	97
	5	Catalyst	-	0.015	0.75
	6	Ortho Dichloro Benzene	95-50-1	3.80	190
	7	Chlorine Gas	7782-50-5	1.02	51
	8	Sulphuric Acid (H2SO4)	7664-93-9	4.34	217
	9	Conc. Nitric Acid	7697-37-2	0.56	27.75
179		**Benfuresate**			
	1	NC9770 in Toluene (3,3 Dimethyl (-2H-1-Benzofuran -5-yl) 2 Hydroxy Ethane Sulfonate	-	1.49	74.4
	2	C.S lye 48%	1310-73-2	0.44	21.75
	3	Sodium borohydride	16940-66-2	0.05	2.4
	4	Toluene	108-88-3	1.35	67.6
	5	Sulphuric Acid 98%	7664-93-9	0.33	16.25
	6	Xylene (recycle & fresh)	1330-20-7	2.86	142.9
	7	Catalyst (Phthalin Anhydride + TEA	-	0.07	3.7
	8	C.S. Lye 48%	1310-73-2	0.08	4.1
180		**Metamitron**			
	1	Benzaldehyde	100-52-7	1.06	53
	2	Sodium Cyanide	143-33-9	0.54	27
	3	30 % Hydrochloric Acid	7647-01-0	1.22	61
	4	Methanolic Hydrochloric Acid	7647-01-0	2.14	107.15
	5	Sodium Hypochlorite 8-11 %	7681-52-9	6.09	304.35
	6	Solvent - Toluene	108-88-3	1.94	97
	7	Solvent - DMA	127-19-5	2.20	110
	8	Hydrazine Hydrate 80 %	7803-57-8	0.56	27.9
	9	Acetyl Hydrazine	068-57-1	0.62	31
	10	Solvent - Methanol	67-56-1	0.73	36.5
181		**Metribuzine**			
	1	4-Amino-6-Tert-Butyl-3-Mercapto-1,2,4-Triazin-5(4H)-one (ATMT)	33509-43-2	1.00	50
	2	Di Methyl Sulphate	77-78-1	0.65	32.6
	3	Sulphuric Acid	7664-93-9	1.27	63.7
	4	Soda Ash	497-19-8	1.60	80
	5	Caustic Soda Flakes	1310-73-2	0.03	1.5
182		**Atrazine**			
	1	Toluene	108-88-3	6.95	347.5
	2	Cyanuric Chloride	108-77-0	0.90	45

	3	Isopropyl Amine	75-31-0	0.44	21.75
	4	Sodium Hydroxide	1310-73-2	0.41	20.5
	5	Mono Ethyl Amine	75-04-7	0.32	16
183		**Imazethapyar**			
	1	Diethyl-5-Ethyl Pyridine Decarboxylate	105151-39-1	0.96	47.75
	2	2-Amino-2,3-Dimethyl Butane Amide	40963-14-2	0.52	26
	3	Sodium Ethoxide	141-52-6	0.63	31.5
	4	30% Hydrochloric Acid Soln.	7647-01-0	1.12	56
	5	Solvent -Toluene	108-88-3	3.20	160
	6	Ethanol	64-17-5	4.00	200
Group-11	**Aryloxyphenoxypropionates/ Aryloxyphenoxypropionic/ Aniline /Pyridine/Ppo- Diphenyl Ethers / Phenyl Ether /Phenoxy Carboxylic Acid / Pyridine / Nitro Phenyl Ether 15/Aromatic Ketone**				200
184		**ClodinafopPropargyl**			
	1	2,3-Di Fluoro -5-Chloro Pyridine	589402-43-7	0.45	89.6
	2	2- (4- Hydroxy Phenoxy) Propionic Acid	67648-61-7	0.55	109.6
	3	Sodium Hydroxide	1330-74-0	0.24	48
	4	Solvent -Di Methyl Formamide (DMF)	68-12-2	1.20	240
	5	Propargyl Chloride	624-65-7	0.18	36
	6	Solvent - Toluene	108-88-3	1.00	200
185		**Quizalofop Ethyl**			
	1	2,6 – Dichloro Quinoxaline	18674-97-1	0.58	116
	2	2- (4 – Hydroxy Phenoxy) Propionic Acid	94959-90-5	0.53	105
	3	Sodium Hydroxide	1310-73-2	0.23	46
	4	Solvent – Di Methyl Formamide	1330-74-0	1.10	220
	5	Ethyl Bromide	74-96-4	0.31	62.2
	6	Solvent – Xylene	1330-20-7	1.00	200
186		**Cyhalofop Butyl**			
	1	3,4-Fluoro Benzo nitrile	1194-02-1	0.42	83.6
	2	2-(4-Hydroxy Phenoxy) Propionic Acid	67648-61-7	0.56	112
	3	Sodium Hydroxide	1310-73-2	0.24	47.6
	4	Solvent – Dimethyl Formamide	68-12-2	1.40	280
	5	n-Butyl Bromide	109-65-9	0.40	80.2
	6	Solvent-Xylene	1330-20-7	1.10	220
187		**Chlorazifop Propargyl**			
	1	2,4,5 Trichloro Pyridine	16063-69-7	0.51	102.8
	2	2-(4-Hydroxy Phenoxy) Propionic Acid	67648-61-7	0.51	102.4
	3	Sodium Hydroxide	1310-73-2	0.22	44.8
	4	Solvent – Dimethyl Formamide	68-12-2	1.20	240
	5	Propargyl Chloride	624-65-7	0.21	41.6
	6	Solvent - Toluene	108-88-3	1.00	200
188		**Finoxaprop P Ethyl**			
	1	3,6-Dichloro Benzoxazole	3621-82-7	0.61	122
	2	2-(4-Hydrozy Phenoxy) Propionic Acid	94050-90-5	0.59	118
	3	Sodium Hydroxide	1310-73-2	0.13	26
	4	Solvent – Dimethyl Sulfoxide	67-68-5	1.40	280
	5	Thionyl Chloride	07-09-7719	0.38	76.8
	6	Solvent - Toluene	108-88-3	1.25	250
	7	Sodium Ethoxide	141-52-6	0.22	44.4
189		**Fluazifop Butyl**			

	1	2- Chloro -5- Trifluoromethyl Pyridine	81565-18-6	0.50	100
	2	2- (4 – Hydroxy Phenoxy) Propionic Acid	94050-90-5	0.50	99.2
	3	Sodium Hydroxide	1310-73-2	0.22	43
	4	Solvent – Di Methyl Formamide	67-68-5	1.10	220
	5	1-Butyl Bromide	109-65-9	0.36	72.8
	6	Solvent – Xylene	1330-20-7	1.00	200
190		**Haloxyfop Methyl**			
	1	2,3 – Dichloro-5-Trifluoromethyl Pyridine	69045-84-7	0.54	108
	2	2-(4-Hydroxy Phenoxy) Propionic Acid	94050-90-5	0.45	90.4
	3	Sodium Hydroxide	1310-73-2	0.10	20
	4	Solvent –Toluene	108-88-3	2.50	500
	5	Catalyst	-	0.02	3.6
	6	Bromo Ethoxy Ethane	592-55-2	0.37	74
191		**Quizalofop-P-Tefuryl**			
	1	Propionic Acid	79-09-4	0.19	37.6
	2	Solvent – Ethylene Dichloride	107-06-2	4.00	800
	3	Chlorine	7782-50-5	0.17	33.6
	4	Tetrahydro Furfuryl Methanol	97-99-4	0.25	49.4
	5	Hydroquinone	123-31-9	0.27	53.4
	6	2,6 Dichloro Quinoxaline	18671-97-1	0.49	97
	7	Toluene	108-88-3	2.00	400
	8	Catalyst	-	0.03	6.6
192		**Haloxyfop Ethoxy Ethyl (Etotyl)**			
	1	2,3 Dichloro 5- (Trifluoro Methyl Pyridine)	69045-84-7	0.54	108
	2	2-(4-Hydroxy Phenoxy) Propionic Acid	67648-61-7	0.45	89.6
	3	Solvent – Toluene	108-88-3	2.50	500
	4	Catalyst	1310-73-2	0.18	36
	5	Bromo Ethoxy Ethane	592-55-2	0.37	73.2
193		**Oxadiargyl**			
	1	Oxadiazon	19666-30-9	1.07	213.2
	2	35% Hydrochloric Acid	7647-01-0	0.32	64.6
	3	Propargyl Chloride	624-65-7	0.23	46
	4	Potassium Carbonate	584-08-7	0.43	85.8
	5	Toluene	108-88-3	2.00	400
	6	Methanol	67-56-1	1.00	200
194		**Propanil**			
	1	3,4 - Dichloro Aniline	95-76-1	0.75	149.4
	2	Propionic Acid	79-09-4	0.40	80.6
195		**Isoproturon**			
	1	Para-Cumidine	99-88-7	0.53	106.6
	2	MCB Solvent	108-90-7	2.80	560
	3	Phosgene Gas	75-44-5	0.51	101
	4	C.S. Lye 15% for Phosgene Scrubbing	1330-74-0	0.20	40
	5	Dimethyl Amine	124-40-3	0.22	43.6
196		**Metamifop**			
	1	3, 6 Dichloro Benzoxazole	16263-54-0	0.53	106.8
	2	2-(4-Hydroxy Phenoxy) Propionic Acid	67648-61-7	0.52	103.4
	3	Sodium Hydroxide	1310-73-2	0.23	45.2
	4	Solvent – Dimethyl Sulfoxide	67-68-5	1.80	360
	5	Thionyl Chloride	07-09-7719	0.33	66.6

	6	Solvent - Toluene	108-88-3	1.80	360
	7	2- Fluoro -N- Methyl Aniline	443-89-0	0.35	70
197		**Picolinafen**			
	1	3-Hydroxy Benzotrifluoride	98-17-9	0.46	91.2
	2	6-Chloro Pyridine-2-Carboxylic Acid	4684-94-0	0.44	88.4
	3	Sodium Hydroxide	1310-73-2	0.22	44.6
	4	Solvent – Dimethyl Formamide	68-12-2	0.90	180
	5	Thionyl Chloride	07-09-7719	0.33	66
	6	Solvent - Toluene	108-88-3	1.10	220
	7	Para Fluoro Aniline	371-40-4	0.31	61.2
	8	Solvent – Chloro Benzene	108-90-7	0.80	160
198		**Sulfentrazone**			
	1	Phenyl Hydrazine	100-63-0	0.77	153
	2	Acetaldehyde	75-07-0	0.38	75.2
	3	Sodium Cyanide	143-33-9	0.53	106
	4	Chlorine	7782-44-7	0.53	106
	5	Acetic Acid	64-19-7	0.50	100
	6	Methanol	100-52-7	4.00	800
	7	10% Sodium Hydroxide Solution	1330-74-0	1.50	300
	8	Potassium Carbonate	584-08-7	0.90	180
	9	Dimethyl Formamide	68-12-2	7.55	1510
	10	Dichlorodifluoromethane	75-71-8	0.65	130
	11	Chlorine Gas	7782-44-7	1.78	355.6
	12	Oleum	8014-95-7	4.45	890
	13	Nitric Acid	7697-37-2	0.39	77
	14	Dichloroethane - EDC	107-06-2	2.62	524
	15	Isopropyl Alcohol	107-19-7	6.42	1283
	16	Catalyst Pd/C	7440--05-3	0.06	12.6
	17	Methane Sulfonyl Chloride	124-63-0	0.69	137.8
	18	Pyridine	110-86-1	0.48	96
	19	Toluene	108-88-3	4.98	996.6
	20	Dichloromethane	75-09-2	2.13	425
199	**Flufenacet**				
	1	N-(4-Fluorophenyl)-2-Hydroxy-N-Isopropylacetamide	54041-17-7	0.58	116
	2	2-(Methyl sulfonyl)-5-(Trifluoromethyl)-1,3,4-Thiadiazole	27603-25-4	0.64	127.6
	3	25% Sodium Hydroxide (NaOH)	1310-73-2	0.71	141.6
	4	Ethylene Dichloride (EDC)	107-06-2	2.45	490
	5	Methanol	67-56-1	1.40	280
	6	5% Hydrochloric Acid (HCl)	7647-01-0	0.58	115
	7	Catalyst		0.01	1.2
200		**Cloransulam-Methyl**			
	1	Methyl-2-Amino-3-Chloro Benzoate	77820-58-7	0.44	88.2
	2	5-Ethoxy-7-Fluoro-[1,2,4]-Triazolo-[1,5-c] Pyrimidine-2-Sulfonyl Chloride	147150-77-4	0.67	133.4
	3	Toluene	108-88-3	2.00	400
201		**Diflufenican**			
	1	2-[3-(Trifluoromethyl)Phenoxy] Nicotinic Acid	36701-89-0	0.76	151.4
	2	Thionyl Chloride	07-09-7719	0.32	63.6
	3	2,4-Difluoro Aniline	367-25-9	0.35	69
	4	Toluene	108-88-3	2.00	400
	5	15% Sodium Hydroxide	1310-73-2	1.51	302.4
202		**Aclonifen**			
	1	2-Amino-3, 4-Dichloro Nitro Benzene	1004-00-8	0.76	151.2

	2	Phenol	108-95-2	0.35	70
	3	Sodium Hydroxide	1310-73-2	0.15	30
	4	Dimethyl Sulfoxide	67-68-5	1.20	240
	5	Xylene	1330-20-7	1.00	200
203		**2,4 D Amine Salt 58% W/W**			
	1	2,4-Dichloro Phenoxy Acetic Acid	94-75-7	0.6	120
	2	Dimethyl Amine	124-40-3	0.3	60
	3	Triethyl Amine	121-44-8	0.003	0.6
	4	Hyflow	68855-54-9	0.005	1.00
204		**Acifluorfen Methyl**			
	1	3-Hydroxy 2-Nitro Benzoic Acid	602-00-6	0.51	101
	2	3, 4 Dichloro Benzotrifluoride	328-84-7	0.59	118.4
	3	Sodium Hydroxide	1310-73-2	0.22	44
	4	Dimethyl Sulfoxide	67-68-5	1.10	220
	5	Methyl Bromide	74-83-9	0.22	43.6
	6	Toluene	108-88-3	1.00	200
205		**Chlomethoxyfen**			
	1	2, 4-Dichloro Phenol	120-83-2	0.53	105
	2	5-Chloro-2-Nitro Phenol	611-07-4	0.55	110
	3	Sodium Hydroxide	1310-73-2	0.26	51.6
	4	Dimethyl Sulfoxide	67-68-5	1.20	240
	5	Methyl Bromide	74-83-9	0.30	60
	6	Xylene	1330-20-7	1.00	200
206		**Fluoroglycofen**			
	1	2, 4-Dichloro Phenol	120-83-2	0.52	103.2
	2	5-Chloro-2-Nitro Phenol	611-07-4	0.54	108
	3	Sodium Hydroxide	1310-73-2	0.25	50.4
	4	Dimethyl Formamide	68-12-2	1.20	240
	5	Methyl Bromide	74-83-9	0.30	59
	6	Xylene	1330-20-7	1.00	200
207		Lactofen			
	1	3, 4-Dichloro Benzotrifluoride	328-84-7	0.50	100
	2	2-Hydroxy-6-Nitro-Benzoic Acid	601-99-0	0.42	84.2
	3	Sodium Hydroxide	1310-73-2	0.19	37
	4	Dimethyl Formamide	68-12-2	1.10	220
	5	L-2 Chloro Propionic Acid Ethyl Ester	535-13-7	0.31	62
	6	Xylene	1330-20-7	1.00	200
208		**Oxyfluorfen**			
	1	3,4-Dichloro Benzotrifluoride	328-84-7	0.61	122.8
	2	Resorcinol	108-46-3	0.32	63.4
	3	Sodium Hydroxide	1310-73-2	0.23	46.6
	4	Dimethyl Sulfoxide	67-68-5	1.10	220
	5	Ethyl Bromide	74-96-4	0.31	61.2
	6	Nitric Acid	7697-37-2	0.18	36
	7	Toluene	108-88-3	1.00	200
	8	Ethylene Dichloride	107-06-2	0.80	160
209		**Fluroxypyr - Meptyl**			
	1	Pyridine	110-86-1	0.44	88
	2	Sodium Hydroxide	1310-73-2	0.10	20
	3	Chloro Acetyl Chloride	79-04-9	0.31	61
	4	Ethylene Dichloride	107-06-2	3.00	600
	5	Sodium Hypochlorite Solution (10 %)	7681-52-9	0.10	20
	6	Caustic Soda Lye (47%)	1310-73-2	0.12	24
	7	2-Chloro Octane	628-61-5	0.34	67
	8	Catalyst		0.02	4
210		**Picloram**			

	1	a-Picoline (2-Methyl Pyridine)	109-06-8	0.42	83.4
	2	Chlorine	7782-50-5	2.23	446
	3	NH3 Gas	7664-41-7	0.08	15
	4	Caustic Soda Lye (48 %)	1310-73-2	0.05	9.4
	5	Hydrochloric Acid (30 %)	7647-01-0	0.01	1.9
	6	catalyst 1	-	0.005	1
	7	Catalyst 2	-	0.005	1
211		Triclopyr – Butotyl			
	1	Sodium TCP	7681-53-0	0.71	142
	2	Chloro Butoxy Ethyl Acetate	5330-17-6	0.49	98
	3	Sodium Hypochlorite Wash (10%)	7681-52-9	0.08	16
	4	Ethylene Dichloride	107-06-2	1.70	340
	5	Caustic Soda Lye	1310-73-2	0.10	20
	6	Catalyst	-	0.01	2
Group-12	**Aryloxyphenoxypropionates/ Aryloxyphenoxypropionic/ Aniline /Pyridine/Ppo- Diphenyl Ethers / Phenyl Ether /Phenoxy Carboxylic Acid / Pyridine / Nitro Phenyl Ether 15/Aromatic Ketone(G-2)**				100
212		**Sulcotrione**			
	1	1,3-Cyclohexanedione	504-02-9	0.49	48.5
	2	Pyridine	110-86-1	0.37	37.4
	3	2-Chloro-4-Methylsulfonyl Benzoyl Chloride	106904-10-3	1.11	110.6
	4	Dilute Hydrochloric Acid	7647-01-0	2.55	255
	5	Acetonitrile	75-05-8	5.11	510.6
	6	Triethyl amine	121-44-8	0.43	42.5
	7	Potassium Cyanide	151-50-8	0.07	6.5
	8	Ethylene Dichloride	107-06-2	2.56	255.5
	9	Dichloro Methane	75-09-2	4.25	425
213		**Tefuryltrione**			
	1	2-Chloro-3-Methyl-4- (Methyl Sulfonyl) Benzoic Acid	106904-09-0	0.80	80
	2	N-Bromo Succinimide	128-08-5	0.58	57.5
	3	Tetra Hydro Furan-2-Yl) Methanol	6126-49-4	0.31	30.5
	4	Cyclohexane 1,3-Dione	504-02-9	0.28	28
	5	Toluene	108-88-3	3.00	300
	6	Methanol	67-56-1	0.13	12.5
214		**Mecoprop**			
	1	Chlorine	7782-50-5	0.44	44
	2	O-Cresol	95-48-7	0.66	66
	3	Dichloroethane	107-06-2	4.00	400
	4	Methyl lactate	547-64-8	0.64	63.5
	5	Thionyl Chloride	09-07-7719	0.73	72.5
	6	50% C.S .lye solution	1310-73-2	1.75	175
	7	Catalyst	-	0.01	1
	8	30% Hydrochloric Acid	7647-01-0	1.25	125
215		**2,4-D Acid**			
	1	2,4 Dichloro Phenol	120-83-2	0.82	81.8
	2	Monochloro Acetic Acid	79-11-8	0.47	47.2
	3	48 % NaOH Lye	1310-73-2	0.89	89
	4	Hydrochloric Acid	7647-01-0	0.75	75
216		**2,4 D Ethyl Ester**			
	1	2,4-Dichloro Phenol	120-83-2	0.642	64.2
	2	Monochloro Acetic Acid	79-11-8	0.459	45.9
	3	Caustic lye 47%	1310-73-2	0.963	96.3
	4	Dilute Sulphuric Acid	7664-93-9	0.183	18.3
	5	Ethanol	64-17-5	0.201	20.1
	6	Catalyst	-	0.009	0.9
	7	Sodium bicarbonate	144-55-8	0.064	6.4

		OR			
	1	2,4-Dichloro Phenoxy Acetic Acid	94-75-7	0.945	94.5
	2	Ethanol	64-17-5	0.358	35.8
	3	Sulphuric Acid	7664-93-9	0.042	4.2
	4	Benzene	71-43-2	0.63	63
	5	Soda Ash	497-19-8	0.024	2.4
217		**Sodium Salt Of 2,4-Acid**			
	1	2,4 Dichloro Phenol 97 %	120-83-2	0.708	70.8
	2	Monochloro Acetic Acid	79-11-8	0.462	46.2
	3	Sodium Hydroxide 100 %	1310-73-2	0.434	43.4
	4	30% Hydrochloric Acid Solution	7647-01-0	0.326	32.6
218		**Cloquintocet Mexyl**			
	1	Mono Chloro Acetic Acid	79-11-8	0.41	40.5
	2	1-Methyl Hexanol	111-27-3	0.47	47.2
	3	Toluene	108-88-3	1.20	120
	4	Catalyst 1	-	0.01	1.3
	5	5-Chloro 8-Hydroxy Quinoline	130-16-5	0.66	66.3
	6	Methyl Isobutyl Ketone	108-10-1	3.00	300
	7	Potassium Carbonate	584-08-7	0.54	53.8
	8	Catalyst 2		0.04	3.7
	9	Sodium Bicarbonate Solution (2 %)	144-55-8	0.54	54
	10	Solvent - Methyl Isobutyl Ketone	108-10-1	3.50	350
	11	Catalyst 3	-	0.04	3.7
	12	SHS	-	0.04	3.7
	13	Solvent - Hexane	110-54-3	4.00	400
219		**Propaquizafop**			
	1	Carboxylic Acid	120-74-1	0.78	77.7
	2	Alcohol	64-17-5	0.27	26.5
	3	Thionyl Chloride	07-09-7719	0.27	26.9
	4	Pyridine	110-86-1	0.18	17.8
	5	Solvent - Dimethyl Formamide (DMF)	68-12-2	3.89	388.5
	6	Solvent - Toluene	108-88-3	3.11	310.8
220		**Carfentrazone**			
	1	2 - Fluor Aniline	358-54-9	0.73	73
	2	Sodium Nitrite	7632-00-0	0.46	46
	3	Hydrochloric Acid	7647-01-0	4.21	421
	4	Sodium Sulphite	7757-83-7	2.71	271
	5	Caustic Lye Solution	1310-73-2	2.64	264.4
	6	20% Sodium Hydroxide Solution	1310-73-2	4.78	477.5
	7	Acetaldehyde	75-07-0	0.32	32.2
	8	Sodium Cyanate	917-61-3	0.54	54.4
	9	Chlorine	7782-50-5	0.95	94.5
	10	Acetic Acid	64-19-7	0.50	50
	11	Solvent -Methanol	97-56-1	4.00	400
	12	10% Sodium Hydroxide Solution	1310-73-2	1.00	100
	13	Potassium Carbonate	584-08-7	0.92	92.4
	14	Solvent - Dimethyl Formamide (DMF)	68-12-2	7.50	750
	15	Dichloro Difluoromethane	75-71-8	0.67	66.5
	16	Chlorine Gas	7782-50-5	0.90	89.5
	17	Oleum	616-954-1	5.57	556.5
	18	Nitric Acid	7697-37-2	0.50	50.2
	19	Solvent -Dichloroethane	107-06-2	3.25	325
	20	Solvent -Isopropyl Alcohol	67-63-0	6.33	632.5
	21	Catalyst Pd/C	7440-05-03	0.06	5.9
	22	Ethyl Acrylate	140-88-5	0.43	42.5
	23	Solvent - Acetonitrile	75-05-8	5.30	530

Group-13	**Plant Growth Regulators & Rotenticides/ HPPD Inhibitors/ Others/ Triazines / PGR/Pyrazoles**				200
221		**Chlormequat Chloride**			
	1	Trimethyl Amine (27.5)	121-44-8	1.38	276
	2	Reactant EDC	107-06-2	0.63	126
	3	Solvent EDC	107-06-3	2.00	400
222		**Ethephone**			
	1	Epoxy Ethane	75-21-8	0.83	165
	2	Phosphorus Trichloride	7719-12--2	0.86	171
	3	Hydrogen Chloride Gas	7647-01-0	0.46	92
	4	Solvent EDC	107-06-2	1.11	221
223		**Forchlorofenuron**			
	1	Phenyl Iso Cyanate	103-71-9	0.12	23
	2	2-Chloro-4-Aminopyridine	14432-12-3	0.12	24.8
	3	Dichloromethane	75-09-2	0.25	50
	4	Acetone	67-64-1	0.10	20
	5	Chloroform	67-66-3	0.10	20
224		**Mepiquate Chloride**			
	1	Piperidine	110-89-4	0.60	120
	2	Formic Acid	64-18-6	0.32	64.4
	3	Para Formaldehyde	30525-89-4	0.21	42
	4	Solvent Toluene	108-88-3	3.00	600
	5	Solvent - Ethyl Acetate	141-78-6	2.00	400
	6	Caustic Soda Lye	1330-74-0	0.64	128
	7	Methyl Chloride	74-67-3	0.35	70.6
225		**Bromadiolon**			
	1	Bromadiolon Ketone	28772-56-7	1.04	208
	2	Sodium Tetra Hydro Borate	16940-66-2	0.09	18
	3	Solvent Methanol	67-56-1	3.00	600
	4	Catalyst	-	0.005	1
226		**Paclobutrazol**			
	1	Bromo Pinacolone	5469-26-1	0.72	143.2
	2	Solvent n- Hexane	110-54-3	2.50	500
	3	1,2,4 Triazole	288-88-0	0.27	54
	4	Sodium Ethoxide	141-52-6	0.04	8
	5	Para Chloro Benzyl Chloride	104-83-6	0.60	120.4
	6	Sodium Hydride	7646-69-7	0.08	16
	7	Sodium Borohydride	16940-66-2	0.03	6
	8	Solvent- IPA	67-63-0	1.00	200
227		**Tembotrione**			
	1	2-Chloro-3-(2,2,2-Trifluoroethoxymethyl)-4-Methylsulfonylbenzoic Acid	120100-77-8	0.94	188.2
	2	Solvent - Toluene	108-88-3	1.36	272.4
	3	Thionyl Chloride	07-09-7719	0.33	65.6
	4	Triethyl Amine (TEA)	121-44-8	0.63	126.6
	5	Acetone Cyanohydrine	75-86-5	0.04	8.8
	6	1,3-Cyclohexadione	504-02-9	0.37	74.2
	7	Hydrochloric Acid (HCl)	7647-01-0	0.98	195.2
	8	Sodium Hydroxide	1310-73-2	1.61	322
	9	Ethanol	64-17-5	2.31	461.6
228		**Mesotrione**			
	1	1,3-Cyclohexadione	504-02-9	0.39	77.4
	2	Ethylene Dichloride	107-06-2	9.00	1800
	3	Acetone Cyanohydrin	75-86-5	0.11	21.4
	4	Triethylamine	121-44-8	0.10	20
	5	2-Nitro-4-Methylsulfonyl Benzoyl Chloride	110964-80-2	0.91	182.8

	6	Sulphuric Acid	7664-93-9	0.84	167
	7	10% Sodium Hydroxide Solution	1310-73-2	1.00	200
229		**Pinoxaden**			
	1	Oxadiazepane Compound	405281-14-3	0.93	186.8
	2	Pivaloyl Chloride	3282-30-2	0.46	91.6
	3	4-Dimethylaminopyridine (4-DMAP)	1122-58-3	0.02	3.6
	4	Triethylamine	121-44-8	0.61	121.4
	5	Solvent - Tetrahydrofuran (THF)	109-99-9	1.00	200
	6	Solvent - Tert-Butyl Methyl Ether (MTBE)	1634-04-4	1.00	200
	7	20% Sodium Chloride solution (NaCl solution)	7647-14-5	0.25	50
230		**Clomazone**			
	1	Caustic Flakes	1310-73-2	0.97	193.6
	2	3 Chloro−2,2−Dimethylpropanoyl Chloride	4300-97-4	0.83	166
	3	Hydroxylamine Hydrochloride	01-11-5470	0.46	92
	4	Catalyst		0.01	1.6
	5	O−Chloro Benzyl chloride	100-44-7	0.71	141
	6	Hydrogen Chloride Gas (Dry)	7647-01-0	0.20	40
	7	Sodium Carbonate	497-19-8	0.02	3.8
231		**Bentazone**			
	1	Amino Benzoic Acid	150-13-0	0.74	148.2
	2	Isopropyl Amine	75-31-0	0.30	60.8
	3	Chloro Sulphonic Acid	7790-94-5	0.63	125.6
	4	Solvent - Ethylene Dichloride (EDC)	107-06-2	2.22	444.6
232		**Ametryn**			
	1	Atrazine	1912-24-9	1.51	302.2
	2	20% aq. Sodium Methyl Mercaptan	08-07-5188	2.22	444.4
	3	Methylene Dichloride (MDC)	75-09-2	1.50	300
	4	Solvent - Methanol	67-56-1	1.00	200
	5	Solvent - Tetrahydrofuran (THF)	109-99-9	1.00	200
	6	2% Sodium Chloride solution (NaCl solution)	7647-14-5	1.00	200
233		**Halosulfuron**			
	1	3-Chloro-1-Methyl-5- Sulfamoyl-1H-Pyrazole- 4-Carboxylic Acid Methyl Ester	100784-27-8	0.73	145.4
	2	4,6-Dimethoxy-2- pyrimidine Amine	3289-50-7	0.44	87
	3	N-Butyl Isocyanate	111-36-4	0.28	55.4
	4	Triethylene Diamine	280-57-9	0.02	3.4
	5	Trichloromethyl Chloroformate	503-38-8	0.83	166.8
	6	P-Xylene	106-42-3	1.33	266.6
	7	Acetonitrile	75-05-8	3.63	726.6
	8	Ethoxy Methyl Chloride	3188-13-4	0.26	51
234		**Iodosulfuron Methyl**			
	1	2-Amino-4-Methoxy-6-Methyl-1,3,5-Triazine	1668-54-8	0.35	70
	2	Benzoic Acid, 2-(Amino sulfonyl)-4-Iodo-, Methyl Ester	144550-79-8	0.75	150
	3	Dichloroethane	107-06-2	3.00	600
	4	Phenyl Chloroformate	1885-14-9	0.39	78
Group-14	**Advance Specific Pesticide Intermediates(G-1)**				500
235		**Meta Phenoxy Benzaldehyde (MPBAD)**			
	1	Benzaldehyde	100-52-7	0.75	375
	2	Solvent – Ethylene Dichloride	107-06-2	2.2	1100

		(EDC)			
	3	Mono Ethylene Glycol (MEG)	107-21-1	0.57	285
	4	Phenol	108-95-2	0.56	280
	5	Solvent - Toluene	108-88-3	2.09	1045
	6	Catalyst AlCl3	7446-70-0	1.23	615
	7	Catalyst - 2 (Cuprous Chloride)	7758-89-6	0.02	10
	8	Bromine	7726-95-6	0.55	275
	9	Sulphuric Acid (98 %)	7664-93-9	0.79	395
	10	Caustic Lye	1310-73-2	0.025	12.5
	11	Chlorine Gas	7782-50-5	0.26	130
	12	Hydrochloric Acid Solution (30 %)	7647-01-0	0.02	10
	13	Potassium Hydroxide	215-181-3	0.34	170
236		**Meta Phenoxy Benzyl Alcohol (MPBAL)**			
	1	Methanol	67-56-1	2	1000
	2	Meta Phenoxy Benzaldehyde	39515-51-0	1	500
	3	Hydrogen Gas	1333-74-0	0.03	15
	4	Catalyst	-	0.003	1.5
237		**Cypermethric Acid Chloride & it's all Isomers**			
	1	Acrylonitrile	107-13-1	0.53	265
	2	Carbon Tetra Chloride (CTC)	56-23-5	1.965	982.5
	3	Acetonitrile	75-05-8	0.25	125
	4	Catalyst - 1	7447-39-4	0.02	10
	5	Catalyst - 2- DEA. HCl	14426-21-2	0.025	12.5
	6	Ammonia Liquor (25 %)	1336-21-6	0.03	15
	7	Sulphuric Acid (98 %)	7664-93-9	2.236	1118
	8	Thionyl Chloride	7719-0-7	1.905	952.5
	9	Caustic Lye (46 – 48 %)	1310-73-2	5.86	2930
	10	Catalyst - 3	-	0.025	12.5
	11	Isobutylene	115-11-7	0.496	248
	12	Tri Ethyl Amine (TEA)	121-44-8	0.83	415
	13	Solvent – n-Hexane	10-54-3	11.83	5915
	14	Sodium Bi Carbonate	144-55-8	0.25	125
	15	Catalyst - 4 - BF3 Etherate	109-63-7	0.025	12.5
	16	Catalyst - 5 - DMF	68-12-2	0.015	7.5
	17	Catalyst - 6 - TEBA	56-37-1	0.018	9
	18	Catalyst - 7 -n TBAB	1643-19-2	0.025	12.5
	19	Caustic Soda Flakes	1310-73-2	0.285	142.5
238		**CCMP (2-Chloro-5Chloromethyl Pyridine)**			
	1	Benzyl Amine	10-46-9	0.912	456
	2	Catalyst - 1	-	0.015	7.5
	3	Propanaldehyde	123-38-6	0.494	247
	4	Solvent - Toluene	108-88-3	2	1000
	5	Acetic Anhydride	108-24-7	0.802	401
	6	Solvent - DMF	68-12-2	1.5	750
	7	Tri ethyl Amine	121-44-8	0.95	475
	8	Solvent - EDC	107-06-2	3	1500
	9	Solvent - Acetonitrile	107-13-1	2	1000
	10	Phosphorus Oxy Chloride	10025-87-3	2.125	1062.5
	11	Chlorine Gas	7782-50-5	0.33	165
	12	Catalyst - 2	-	0.01	5
	13	Caustic Lye 47%	1310-73-2	1	500
239		**CCMT (2-Chloro-5Chloromethyl Thiazole)**			
	1	Allyl Chloride	107-05-1	1.15	575
	2	30% Hydrochloric Acid Solution	7647-01-0	1.35	675
	3	Catalyst -1 (Ferric Chloride)	7705-08-0	0.015	7.5
	4	Catalyst -2 (AIBN)	78-67-1	0.015	7.5
	5	Chlorine Gas	7782-50-5	1.1	550

	6	Caustic Flakes	1310-73-2	0.35	175
	7	Potassium Thiocyanate Salt	333-20-0	0.96	480
	8	Sulfuryl Chloride	7741-25-5	0.97	485
	9	Sodium Carbonate	497-19-8	1.4	700
	10	Solvent – MDC	75-09-2	3.95	1975
	11	Caustic Soda Lye	1310-73-2	1.44	720
	12	Soda Ash	497-19-8	1	500
240		**2-Nitro Imino Imidazolidine (NII)**			
	1	Guanidine Nitrate	5465-96-3	1.175	587.5
	2	EDA	107-15-3	0.71	355
	3	Sulphuric Acid	7664-93-9	1.175	587.5
	4	Caustic Lye	1310-73-2	3.09	1545
	5	Deformer	68554-65-4	0.35	175
241		**MNIO (2- Methyl 5- Nitro 1,3,5 Oxidiazine)**			
	1	Formic Acid	64-18-6	2.88	1440
	2	N -Methyl Nitro Guanidine	4245-76-5	0.778	389
	3	Para Formaldehyde	30525-89-4	0.396	198
	4	Solvent-DMF	68-12-2	3	1500
	5	Methane Sulphonic Acid	75-75-2	0.044	22
	6	Caustic Soda Lye 48 %	1310-73-2	0.39	195
	7	Catalyst	-	0.012	6
242		**Transfluthrin Acid Chloride**			
	1	1-R Cypermethric Acid (1- R CMA)	59042-49-8	0.955	477.5
	2	Solvent – n- Hexane	110-54-3	1.6	800
	3	Thionyl Chloride	7719-0-7	0.572	286
	4	Di Methyl Formamide	68-12-2	0.006	3
	5	Caustic Lye 14-18% %	1310-73-2	2.715	1357.5
243		**Para Chloro Isovaleric Acid Chloride (PCACl)**			
	1	Para Chloro Toluene	106-43-4	0.745	372.5
	2	Chlorine	7782-50-5	0.426	213
	3	Catalyst - AIBN	78-67-1	0.004	2
	4	Sodium Cyanide	143-33-9	0.293	146.5
	5	Catalyst TEA	121-44-8	0.016	8
	6	C.S. Lye 48%	1310-73-2	0.479	239.5
	7	Isopropyl Bromide	75-26-3	0.619	309.5
	8	Catalyst TEBA	56-37-1	0.017	8.5
	9	Caustic Soda Flakes	1310-73-2	0.264	132
	10	Sulphuric Acid	7664-93-9	1.461	730.5
	11	n-Hexane-1	10-54-3	1.62	810
	12	n-Hexane-2	10-54-3	2	1000
	13	DMF Catalyst	68-12-2	0.01	5
	14	Thionyl Chloride	7719-0-7	0.568	284
	15	15% Caustic	1310-73-2	2.7	1350
244		**Propargyl Chloride**			
	1	Propargyl Alcohol	107-19-7	0.76	380
	2	Solvent Ethylene Di Chloride (EDC)	107-15-3	2	1000
	3	Catalyst - DMF	68-12-2	0.015	7.5
	4	Thionyl Chloride	7719-0-7	1.69	845
	5	Caustic (15%)	1310-73-2	7.56	3780
245		**1,2,4 Triazole**			
	1	Formic Acid 85%	64-18-6	2	1000
	2	Ammonia Gas	7664-41-7	0.9	450
	3	Hydrazine Hydrate 80%	7803-57-8	1	500
246		**3-Methyl 1,2,4-Triazole**			
	1	Hydrazine Carboxaldehyde	69349-96-8	0.733	366.5
	2	1-Imino Ethanamine HCl	557-66-4	1.15	575
	3	Sodium Methoxide	124-41-4	0.66	330

	4	Methanol	67-56-1	2.4	1200
247		**4- Bromo 2- Chloro Phenol**			
	1	Ortho Chloro Phenol	95-57-8	0.64	320
	2	Bromine	7726-95-6	0.8	400
	3	Solvent-MDC	79-09-2	2	1000
	4	2% Soda Ash Solution	497-19-8	0.5	250
248		**5- Chloro 2,3- Difluoro Pyridine (CDFP)**			
	1	2,3,5 Trichloro Pyridine	16063-70-0	1.57	785
	2	Potassium Carbonate	584-08-7	0.13	65
	3	Potassium Fluoride	7789-23-3	1.22	610
	4	Solvent - Toluene	108-88-3	0.172	86
	5	Catalyst -1 & 2	-	0.138	69
	6	Solvent- THF DP	68554-65-4	1.53	765
249		**4-4’ Bi Pyridine**			
	1	Pyridine	110-86-1	1.065	532.5
	2	Sodium	7440-23-5	0.155	77.5
	3	Ammonia Gas	7664-41-7	0.115	57.5
	4	Oxygen	7782-44-7	0.215	107.5
250		**PEDA (2, 6 Diethyl –N- (Propoxy) Aniline)**			
	1	2,6 Diethyl Aniline (2,6-DEA)	579-66-8	0.695	347.5
	2	1-(2-Chloroethoxy) Propane	42149-74-6	0.62	310
	3	Solvent - Toluene	108-88-3	2.00	1000
	4	2 % Soda Bicarbonate Soln	497-19-8	0.50	250
251		**PMIDA**			
	A	**Route 1**			
	1	DEA	579-66-8	0.521	260.5
	2	C. S. Lye 47 %	1310-73-2	0.829	414.5
	3	30 % Hydrochloric Acid Solution	7647-01-0	1.19	595
	4	Formaldehyde	462-95-3	0.147	73.5
	5	Phosphorus Acid	10294-56-1	0.216	108
	B	**Route 2**			
	1	81% MCA	79-11-8	1.682	841
	2	23 % Liq. Ammonia	7664-41-7	0.743	371.5
	3	Ca(OH)2(lime)	1305-78-8	1.079	539.5
	4	Dil Hydrochloric Acid	7647-01-0	0.121	60.5
	5	30% Hydrochloric Acid Solution	7647-01-0	2.502	1251
	6	60% OPA Solution	643-79-8	0.738	369
	7	37% Formaldehyde	50-00-0	0.459	229.5
252		**2, -Chloro-4-(4-Chlorophenoxy) Phenacyl Bromide**			
	1	Meta-Dichlorobenzene	541-73-1	0.45	225
	2	Acetyl Chloride	75-36-5	0.26	130
	3	Aluminium Chloride	7446-70-0	0.47	235
	4	Solvent - EDC	107-06-2	3	1500
	5	4 - Chloro Phenol	106-48-9	0.41	205
	6	Dimethyl Formamide	68-12-2	2.1	1050
	7	Potassium Hydroxide	1310-58-3	0.19	95
	8	Catalyst		0.012	6
	9	Bromine	7726-95-6	0.41	205
253		**2,4 Di Chloro Valerophenone**			
	1	Meta Dichloro Benzene	541-73-1	0.7	350
	2	Aluminium Chloride	7446-70-0	0.95	475
	3	Valeryl Chloride	638-29-9	0.61	305
254		**1-(4-Chloro Benzyl) Methyl-3,3-Methyl-2-Oxo Cyclopentane Carboxylate**			
	1	Methyl-3,3,-Dimethyl-2-Oxo-Cyclopentane Carboxylate	80969-68-2	0.61	305
	2	4-Chloro Benzyl Chloride	104-83-6	0.575	287.5
	3	Catalyst	-	0.02	10

	4	Solvent Toluene	108-88-3	2	1000
255		**2-[2-(4-Chlorophenyl) Ethyl]-2-(1,1-DiMethyl Ethyl) Oxirane**			
	1	1-(4-Chlorophenyl)4-4 Dimethyl -3-Pentanoate	66346-01-8	1.01	505
	2	Sodium Methoxide	124-41-4	0.25	125
	3	Dimethyl Sulphide	75-18-3	0.29	145
	4	Toluene	108-88-3	2	1000
256		**Methyl-2- [2-(6-Chloro Pyrimidine-4-yl) Oxyphenyl-3-Methoxyprop-2-Enoate**			
	1	2-Caumaranone	84-64-0	0.454	227
	2	Methyl Formate	107-31-3	0.2	100
	3	Di Methyl Carbonate	616-38-6	0.23	115
	4	Sodium Hydride	7646-69-7	0.08	40
	5	Solvent – Toluene	108-88-3	1.4	700
	6	Sodium Methoxide	124-41-4	0.18	90
	7	Solvent – EDC	107-06-2	1.2	600
	8	4,6 - Di Chloro Pyrimidine	1193-21-1	0.44	220
257		**1,1-Dichloro Pinacoline**			
	1	Pinacoline	75-97-8	0.62	310
	2	Solvent EDC	107-06-2	2.00	1000
	3	Chlorine	7782-50-5	0.88	440
	4	Catalyst	-	0.01	5
	5	15% Sodium Hydroxide Solution	1310-73-2	0.1	50
258		**Thiocarbo Hydrazine**			
	1	Carbon Disulphide	75-15-0	0.752	376
	2	Solvent - Ethyl Acetate	141-78-6	2	1000
	3	Hydrazine Mono Hydrate	7803-57-8	0.99	495
	4	Catalyst	-	0.01	5
259		**2-Hydroxy-4-Methyl Benzothioate (HMBT)**			
	1	Ortho Toluidine	95-53-4	0.953	476.5
	2	Ammonium Thiocyanate	1762-95-4	0.79	395
	3	Solvent - MCB	108-90-7	3.4	1700
	4	Sulphuric Acid	7664-93-9	0.46	230
	5	Chlorine	7782-50-5	0.662	331
	6	Hydrazine Mono Hydrate	7803-57-8	0.41	205
	7	30% Hydrochloric Acid Solution	7647-01-0	0.91	455
	8	Solvent - Xylene	1330-20-7	1.5	750
260		4-Nitro -O-xylene/3-Nitro O-Xylene			0
	1	O-Xylene	95-47-6	4.8	2400
	2	Dilute Nitric Acid	7697-37-2	1.96	980
	3	N-Hexane	110-54-3	2	1000
	4	Catalyst	-	0.24	120
Group-15	**Advance Specific Pesticide Intermediates (G-2)**				50
261		**Lambda Acid Chloride**			
	1	Tri Chloro Tri Fluoro Ethane	354-58-5	1.35	67.5
	2	Methyl Pentanoate	624-24-8	1.11	55.5
	3	Catalyst -1- Cupper Chloride	7447-39-4	0.011	0.55
	4	Catalyst -2- Ethanolamine	141-43-5	0.015	0.75
	5	30 % Hydrochloric Acid Solution	7647-01-0	3.552	177.6
	6	Tertiary Butyl Alcohol - TBA	2378--02-1	12.478	623.9
	7	Sodium- Metal	7440-23-5	0.21	10.5
	8	Solvent n- Hexane	10-54-3	7.93	396.5
	9	Di Methyl Formamide	68-12-2	0.221	11.05
	10	Sulphuric Acid 98 %	7664-93-9	0.044	2.2
	11	Caustic Lye 46 – 48 %	1310-73-2	3.233	161.65
	12	Solvent - Methanol	100-52-7	1.4	70
	13	Thionyl Chloride	7719-0-7	0.57	28.5
262		**4-HPPA- 4- (Hydroxy Phenoxy) Propionic Acid**			

	1	Hydroquinone	123-31-9	0.93	46.5
	2	Caustic Soda Lye	1310-73-2	2.37	118.5
	3	Solvent – MIBK	108-10-1	2.5	125
	4	R – Chloro Propionic Acid	598-78-7	0.862	43.1
	5	30% Hydrochloric Acid Solution	7647-01-0	1.438	71.9
263		**PEG Ester / MPG Ester**			
	1	Benzaldehyde	100-52-7	0.87	43.5
	2	Hydrogen Cyanide	143-33-9	0.44	22
	3	30% Hydrochloric Acid Solution	7647-01-0	1.00	50
	4	8-10% Sodium Hypochlorite Soln	7681-52-9	4.985	249.25
	5	Methanol / Ethanol	67-56-1 / 64-17-5	1.756	87.8
264		**Triazinone - 4- Amino 3- Mecapto- 6-t-Butyl -1,2,4- Triazine-5-one (AMBT)**			
	1	Pinacoline	75-97-8	0.61	30.5
	2	Chlorine Gas	7782-5--5	0.87	43.5
	3	Hydrazine Hydrate	7803-57-8	0.75	37.5
	4	Catalyst-1	----	0.001	0.05
	5	Catalyst -2	----	0.018	0.9
	6	Carbon Disulphide	75-15-0	0.537	26.85
	7	48% Caustic Lye	1310-73-2	1.8	90
	8	Sodium Hypochloride	7681-52-9	4.5	225
	9	Sulphuric Acid	7664-93-9	0.758	37.9
265		**Di-Ethyl Thio Phosphoryl Chloride**			
	1	Thiophosphoryl Chloride	3982-91-0	1.4	70
	2	Ethanol	64-17-5	6.57	328.5
	3	Caustic Flakes	1310-73-2	0.46	23
	4	Caustic Lye (47%)	1310-73-2	0.58	29
	5	Benzene	71-43-2	0.08	4
Specialty Chemicals					
Group-16	**Amino Diphenyl Ether / Phenoxy Compounds/ Specialty Phenols/ Specialty Chloro Phenol/ Amino Benzoic Esters / Aliphatic Esters/ Amino Compounds / Hydrogenation Compounds**				300
266		**2-Amino Diphenyl Ether**			
	1	Phenol	108-95-2	0.59	177
	2	2-Nitro Chloro Benzene	88-73-3	0.99	297
	3	Sodium Hydroxide	1310-73-2	0.26	78
	4	Solvent – 1,2 Dichloro Benzene	95-50-1	1.2	360
	5	Iron Powder	7439-89-6	0.96	288
	6	Acetic Acid	64-19-7	0.02	6
	7	Soda Ash	497-19-8	0.015	4.5
267		**4-Amino-4'-Methyl Diphenyl Ether**			
	1	4-Methyl Phenol	106-44-5	0.69	207
	2	4-Nitro Chloro Benzene	100-00-5	1.01	303
	3	Sodium Hydroxide	1310-73-2	0.26	78
	4	Solvent – 1,2 Dichloro Benzene	95-50-1	1.4	420
	5	Iron Powder	7439-89-6	1.12	336
	6	Acetic Acid	64-19-7	0.025	7.5
	7	Soda Ash	497-19-8	0.019	5.7
268		**2- Amino 2', 4, 4'- Tri Chloro Di Phenyl Ether**			
	1	2, 4 – Dichloro Phenol	120-83-2	0.65	195
	2	2, 5 – Dichloro Nitrobenzene	89-61-2	0.76	228
	3	Sodium Hydroxide	1310-73-2	0.162	48.6
	4	Solvent – 1, 2 - Dichlorobenzene	95-50-1	1.2	360
	5	Iron (Fe) Powder	7439-89-6	0.73	219
	6	Acetic Acid	64-19-7	0.02	6
	7	Soda Ash	497-19-8	0.015	4.5
269		**2- Amino -4'- Chloro -4 -Trifluoromethyl Di Phenyl Ether**			
	1	4-Chloro Phenol	106-48-9	0.53	159

	2	3-Nitro-4-Chloro Benzotrifluoride	121-17-5	0.92	276
	3	Sodium Hydroxide	1310-73-2	0.17	51
	4	Solvent – 1,2 Dichloro Benzene	95-50-1	1.2	360
	5	Iron Powder	7439-89-6	0.73	219
	6	Acetic Acid	64-19-7	0.02	6
	7	Soda Ash	497-19-8	0.015	4.5
270		**2-Chloro-4-(4-Chlorophenoxy) Acetophenone**			
		4-Acetyl-3,4'-Dichloro Diphenyl Ether			
	1	3,4'-Dichloro Diphenyl Ether	6842-62-2	1.25	375
	2	Acetyl Chloride	75-36-5	0.537	161.1
	3	Aluminium Trichloride	7446-70-0	0.96	288
	4	Solvent: Ethylene Dichloride	107-06-2	2	600
271		**2-Acetyl-2', 4, 4'-Trichloro Diphenyl Ether**			
	1	2', 4, 4'-Trichloro Diphenyl Ether	3380-34-5	1.24	372
	2	Acetyl Chloride	75-36-5	0.52	156
	3	Aluminium Trichloride	7446-70-0	0.92	276
	4	Solvent – Ethylene Dichloride	107-06-2	2	600
272		**5 Chloro-6-(2,3 Dichloro Phenoxy)-2-Methyl thio -1H Benzimidazole/ Triclabendazole**			
	1	Trichloro Phenoxy Nitro aniline	17700-09-3	1.14	342
	2	Iron	7439-89-6	0.452	135.6
	3	Acetic Acid	64-19-7	0.02	6
	4	Soda Ash	497-19-8	0.015	4.5
	5	Solvent: Chlorobenzene	108-90-7	2.1	630
	6	Carbon Disulphide	75-15-0	0.275	82.5
	7	Solvent: Methanol	67-56-1	2.4	720
	8	Sodium Hydroxide	1310-73-2	0.28	84
	9	Dimethyl Sulphate	77-78-1	0.43	129
	10	Solvent: Toluene	108-88-3	1.8	540
273		**2, 4 Dichloro Phenol**			
	1	Para Chloro Phenol	106-43-4	2.25	675
	2	Anhydrous Ferric Chloride	7705-08-0	0.12	36
	3	Chlorine Gas	7782-50-5	0.44	132
	4	Soda Ash Solution (1 %)	497-19-8	0.2	60
274		**2, 5-Dichloro Phenol**			
	1	2, 5-Dichloro Aniline	95-82-9	1.06	318
	2	Sulphuric Acid (98 %)	7664-93-9	1.2	360
	3	Nitrosyl Sulphuric Acid (40 %)	7782-78-7	2.085	625.5
	4	Solvent: Mix Xylene	1330-20-7	2.2	660
275		**3-Methyl Phenol (Meta-Cresol)**			
	1	3-Methyl Aniline	108-44-1	1.056	316.8
	2	Sulphuric Acid (98 %)	7664-93-9	1.35	405
	3	Nitrosyl Sulphuric Acid (40 %)	7782-78-7	3.195	958.5
	4	Solvent: Mix Xylene	1330-20-7	2	600
276		**3-Nitro Phenol**			
	1	3-Nitro Aniline	99-09-2	1.105	331.5
	2	Sulphuric Acid (98 %)	7664-93-9	1.4	420
	3	Nitrosyl Sulphuric Acid (40 %)	7782-78-7	2.542	762.6
	4	Solvent: Mix Xylene	1330-20-7	1.9	570
277		**4-Bromo-2, 5-Dichloro Phenol**			
	1	2, 5 – Dichloro Phenol	583-78-8	0.702	210.6
	2	Bromine	7726-95-6	0.69	207
	3	Ethylene Dichloride	107-06-2	1.2	360
278		**4-Fluoro Phenol**			
	1	4-Fluoro Aniline	371-40-4	1.075	322.5
	2	Sulphuric Acid (98 %)	7664-93-9	0.885	265.5
	3	Nitrosyl Sulphuric Acid (40 %)	7782-78-7	3.075	922.5

	4	Solvent: Mix Xylene	1330-20-7	2.2	660
279		**O-Cyano Phenol**			
	1	2-Hydroxy Benzanilide	87-17-2	1.313	393.9
	2	Thionyl Chloride	07-09-7719	1.142	342.6
	3	Solvent – Mono Chloro Benzene	108-90-7	1.4	420
	4	Sodium Hydroxide	1310-73-2	0.4	120
280		**Ortho Nitro Phenol**			
	1	Ortho Nitro Chloro Benzene	88-73-3	1.36	408
	2	Sodium Hydroxide Flakes	1310-73-2	0.726	217.8
	3	Sulphuric Acid (50%)	7664-93-9	1.778	533.4
281		**4-Fluoro Anisole / Para Fluoro Anisole**			
	1	4-Bromo Fluoro Benzene	460-00-4	1.445	433.5
	2	20% Sodium Methoxide Solution	124-41-4	2.185	655.5
	3	Catalyst	-	0.07	21
	4	Methanol	106-48-9	1.00	300
282		**2-Chloro 4-Fluoro phenol**			
	1	4-Fluorophenol	371-41-5	0.85	255
	2	Chlorine Gas	7782-50-5	0.54	162
	3	Dilute Caustic	1310-73-2	0.02	6
283		**3- Amino -4- Methyl Benzoic Acid Iso Propyl Ester**			
	1	3-Nitro-4-Methyl Benzoic Acid	96-98-0	0.97	291
	2	Iso Propyl Alcohol	67-63-0	0.322	96.6
	3	Sulphuric Acid	7664-93-9	0.34	102
	4	Iron Powder	7439-89-6	0.94	282
	5	Acetic Acid	64-19-7	0.028	8.4
	6	Sodium Carbonate	7439-89-6	0.022	6.6
	7	Solvent – Ortho Dichloro Benzene	95-50-1	1.6	480
284		**3-Amino 4-Methyl Benzoic Acid (2' - Chloro Ethyl Ester)**			
	1	3-Nitro-4-Methyl Benzoic Acid	96-98-0	0.93	279
	2	2-Chloro Ethanol	107-07-3	0.415	124.5
	3	Sulphuric Acid	7664-93-9	0.4	120
	4	Iron Powder	7439-89-6	0.9	270
	5	Acetic Acid	64-19-7	0.028	8.4
	6	Sodium Carbonate	7439-89-6	0.022	6.6
	7	Solvent – Ortho Dichloro Benzene	95-50-1	1.8	540
285		**3-Amino-Benzotrifluoride**			
	1	Benzotrifluoride	98-08-8	0.9	270
	2	Nitric Acid (98 %)	7697-37-2	0.4	120
	3	Sulphuric Acid (98 %)	7664-93-9	0.62	186
	4	Solvent – Ethylene Dichloride	107-06-2	1.6	480
	5	Iron	7439-89-6	0.88	264
	6	Acetic Acid	64-19-7	0.02	6
	7	Soda Ash	497-19-8	0.67	201
286		**2, 5-Dichloro Aniline**			
	1	2, 5-Dichloro Nitro Benzene	89-61-2	1.42	426
	2	Solvent – 1, 2-Dichloro Benzene	95-50-1	1.6	480
	3	Iron	7439-89-6	0.93	279
	4	Acetic Acid	64-19-7	0.02	6
	5	Soda Ash	497-19-8	0.015	4.5
287		**Ortho Phenylene Diamine/ Meta Phenylene Diamine/ Para Phenylene Diamine**			
	1	Orto/Meta/Para Di Nitro Benzene	528-29-0	1.7	510
	2	Solvent- Toluene	108-88-3	0.8	240
	3	Catalyst- Raney Nickel	12635-27-7	0.017	5.1
	4	Hydrogen Gas	1333-74-0	0.063	18.9
288		**Benzaldehyde**			
	1	Toluene	108-88-3	0.48	144
	2	Chlorine Gas	7782-50-5	0.82	246

	3	Soda Ash (10% Soln)	497-19-8	0.5	150
	4	Benzyl Chloride	100-44-7	0.501	150.3
	5	Caustic Lye	1310-73-2	0.074	22.2

1.4 WATER AND WASTE WATER MANAGEMENT

- For the proposed plant, total fresh water requirement will be 1033 KLD. From the proposed plant, total 585 KLD of industrial waste water will be generated, which will be treated in primary ETP & Fenton treatment process. After primary & Fenton treatment, 575 KLD of effluent will be taken to MEE & ATFD. About 125 KLD of steam will be used for MEE & ATFD. Thus, total 627 KLD of condensate will be generated, which will be treated in secondary & tertiary ETP and discharge into CETP Saykha for further treatment and disposal.
- Domestic waste water (18.0 m^3/day) will be treated in STP and STP treated will be utilized for plantation.

1.5 AIR EMISSION AND ITS CONTROL MEASURES

1.5.1 Flue Gas Emission

- For the proposed plant, 1 no. 20 TPH capacity of coal/briquettes fired steam boiler, 1 no. 15 lakhs kcal/hr. capacity of coal/briquettes fired thermic fluid heater, 1000 kVA capacity of HSD fired 2 nos. of D G set (Standby) will be installed. Adequate capacity of ESP followed by wet scrubber with 55 meters height of chimney will be provided to coal/briquettes fired steam boiler. Adequate capacity of Multi Cyclone Separator followed by bag filter and wet scrubber with 33 meters height of chimney will be provided to coal/briquettes fired thermic fluid heater. 11 meters height of chimney with acoustic enclosure will be provided to D G sets.
- A standard Coal handling system with screening, coal crushing and conveying system will be installed for the proposed plant. There will be a coal crusher plant with impact blade crusher, screen, conveyor & elevator and reject of the screen will be recycled with two roll crusher and elevator.
- A standard fly ash handling system will be installed for the proposed plant. The fly ash collected in Economizer and APH shall be designed to collect fly ash in dry form in the silo. From the silo, fly ash shall be dispatched to trucks. After burning, less than 6 mm coal in AFBC type boiler furnace will convert in to ash (fly ash particle size which is 100% less than 300 microns) and this will carry over with flue gas through super heater, economizer, air – heater (APH) and finally /will be precipitated in ESP zone. The ash collected in the hoppers of ESP will be discharged in the silo by gravity. Level in the silo will be controlled by level controllers provided on silo. Whenever the level exceeds, the pneumatic valve opens and ash shall be conveyed to ash hopper through pipes with the help of compressed dry air at a pressure of 5 kg/cm2.Unit will provide the Dense Phase pneumatic ash conveying system under the ash discharge points of economizer, APH, and all ESP fields. At the discharge point of ash silo, ash conditioner shall be put where water spay shall be done for duct free loading of trucks/lorry under the ash silo. Finally ash shall be taken by contractor for brick making/filling of low lying area

1.5.2 Process Gas Emission

- From the proposed manufacturing process, HCl, Cl_2, SO_2, H_2S, Br_2, HBr and Ammonia gas will be generated. For the scrubbing of HCl, Cl_2, HBr & Br_2 two state water followed by alkali scrubber will be provided. To scrub Ammonia gas, two stage water followed by acid scrubber will be installed. To scrub H_2S and SO_2 gas two stage alkali scrubber will be installed. 20

meters height of chimney will be provided. (Details of Air pollution control measures are attached as **Annexure – 7**).

1.6 HAZARDOUS WASTES AND ITS MANAGEMENT

S. No.	Type of hazardous waste	Schedule & Category	Quantity, TPA	Source of generation Proposed	Disposal
1.	Discarded Containers / Bags / Liners	Sch-I/33.1	200	Storage & handling of Raw Materials	Collection, Storage, Transportation, Decontamination & Disposal by selling to registered recycler.
2.	Used / Spent Oil	Sch-I/ 5.1	0.5	Equipment & Machineries	Collection, Storage, Transportation, Decontamination & Disposal by selling to registered recycler.
3.	ETP Sludge	Sch-I/35.3	3240.0	In-house ETP	Collection, Storage, Transportation and disposal at common nearest TSDF site
4.	MEE Salt	Sch-I/ 28.1	25200.0	Process	Collection, Storage, Transportation and disposal at common nearest TSDF site
5.	Recovered Solvent	Sch-I/ 28.6	1059967.8	Process	Collection, Storage, Management & Recovery within the premises and reuse in plant premises.
6.	30% Hydrochloric Acid Solution	Sch-I/ 28.1	62435.4	Process (Metofluthrin, Nitenpyram, Imazalil Pymetrozine, Prothioconazole, Tiadinil, Dimoxystrobin, Benalaxyl, Imazapyr, Desmedipham,Picloram, Mecoprop, Iodosulfuron-Methyl,Cypermethric Acid Chloride,Triazinone,Benzaldehyde, Cycloprothrin,Flumethrin, Acrinathrin,	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.

				Tefluthrin, Ethiprole,Dinotefuran, Nitenpyram, Azaconazole,Bromuconazole,Etazonazole,Penconazole,)	
7.	Sodium Bromide Salt	Sch-I/ 28.1	4344	Process (Etofenprox,Etoxazole)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
8.	20% Sodium Sulphite Soln	Sch-II-Class B(15)	156708	Process (Fenpropathrin,Flonicamid,Tebufenpyrad,Metrafenone,Tiadinil,Bixafen, Imazamox,Diflufenican, Carfentrazone, Cypermethric Acid Chloride, Lambda Acid Chloride, O-Cyano Phenol)	Collection, Storage & reuse in manufacturing Plant excess quantity will be sold to end users having Rule 9 Permission.
9.	Sodium Chloride Salt	Sch-I/ 28.1	9705	Process (Flucythrinate, Nitenpyram, Pymetrozine, Pyrithiobac Sodium, Etoxazole, Kresoxim Methyl, Trifloxystrobin, Isoprothiolane, Imazapyr,Fenoxaprop P Ethyl,Methyl-2-[2-(6-Chloro Pyrimidine-4-yl) Oxyphenyl-3-Methoxyprop-2-Enoate, DETCI, 4-Amino-4'-Methyl Diphenyl Ether)	Collection, Storage, Transportation and disposal at common nearest TSDF site.
10.	Liq. Ammonia	Sch-II-Class B(15)	23142.0	Process (Etofenprox ,1,2,4 Triazole)	Collection, Storage & reuse in manufacturing Plant excess quantity will be sold to end users having Rule 9 Permission.

11.	Distillation Residue/tarry waste/organic Residue	Sch-I/ 36.1	18055.2	Process (Etofenprox,Cyantraniliprole, Pyrithiobac Sodium, Tebuconazole, Tiadinil, Fenhexamide, Ametryn, Mandipropamid, Metribuzine, Tefuryltrione, 4-Nitro O-Xylene/3-Nitro O-Xylene,Triazinone,3-Methyl Phenol (Meta-Cresol))	Collection, Storage, Transportation and sent for co-processing in cement industries or common incineration facility.
12.	Mix Salt/Inorganic Salt	Sch-I/28.1	15710.4	Process (Thiocloprid,Glufosinate Ammonium, Picloram, Cloquintocet Mexyl, Pinoxaden, Chloro Difluoro Pyridine)	Collection, Storage, Transportation and disposal at common nearest TSDF site
13.	Sodium Bromide Solution	Sch-II-Class B(15)	35618.4	Process (CyantraniliproleEthion, Chlomethoxyfen, Paclobutrazol, P-Chloro Isoveralic Chloride, 4-Fluoro Anisole)	Collection, Storage & reuse in manufacturing Plant excess quantity will be sold to end users having Rule 9 Permission.
14.	Recovered Catalyst	Sch-I/ 28.6	1150.8	Process (Deltamethrin, Indoxacarb,Pymetrozine, Cyproconazole, Metominostrobin, Fenhexamid,Glyphosate, Sulfentrazone, Carfentrazone, m-Phenoxy Benzyl Alcohol, 4-Fluoro Anisole)	Collection, Storage, Transportation and sent for co-processing in cement industries or common incineration facility.
15.	Ammonium Chloride Soln	Sch-I/28.1	5507.4	Process (Flonicamid, Pymetrozine, Kresoxim Methyl, Dimoxystrobin,	Collection, Storage & reuse in manufacturing Plant excess quantity will be sold to end users having Rule 9

				Fomesafen, Metamitron, 3-Methyl 1,2,4 Triazole)	Permission.
16.	Ammonium Chloride Solid	Sch-I/28.1	276.0	Process (PEG / PMG Ester)	Collection, Storage & reuse in manufacturing Plant excess quantity will be sold to end users having Rule 9 Permission.
17.	Sodium Sulfate Soln	Sch-I/28.1	33145.8	Process (Flonicamid, Triclopyricarb, Trifloxystrobin, Napropamide, Metribuzine, 2–Nitro Imino Imidazolidine (NII), Triclabendazole)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
18.	N, N-Bis (Dichloromethyl) Methyl Amine	Sch-I/28.1	309.0	Process (Clothianidin)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
19.	Methyl Acetate	Sch-I/28.1	207.0	Process (Pymetrozine)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
20.	Sodium Hydrosulfide Solution (20%)	Sch-I/28.1	1867.2	Process (Malathion,Triazinone)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
21.	Ammonium Acetate	Sch-I/28.1	211.2	Process (Acephate)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
22.	30% Hydrobromic Acid Solution	Sch-II-Class B(15)	21031.2	Process (Phenthoate,Triadimefol,Napropamide,Haloxyfop,4 - Bromo 2- Chloro Phenol,4-Bromo-2,5-Dichloro Phenol)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
23.	Sodium Ethoxide	Sch-I/28.1	532.8	Process (Pyrithiobac	Collection, Storage, Transportation &

				Sodium)	Disposal by selling to authorized end user registered under Rule-9.
24.	Ethyl Alcohol	Sch-I/28.3	324.0	Process (Spiromesifen)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
25.	Sodium Methyl Sulfate	Sch-I/28.1	1334.4	Process (Tebufenpyrad)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
26.	Spent Sulphuric Acid	Sch-I/28.1	65398.2	Process (Lufenuron,Captan, Quinclorac, Carfentrazone, Cypermethric Acid Chloride,3-Methyl Phenol (Meta- Cresol))	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
27.	20 % Aluminium Chloride Soln	Sch-I/28.1	90480	Process (Hexaconazole, Clethodim, m-Phenoxy Benzaldehyde, 2-Chloro-4-(4-Chlorophenoxy) Acetophenone)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
28.	Potassium Bromide Soln. (27%)	Sch-II-Class B(15)	3774.0	Process (Hexaconazole, Triclopyricarb, 2, -Chloro-4-(4-Chlorophenoxy) Phenacyl Bromide)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
29.	Pottasium Methyl Mercaptide	Sch-I/28.1	720.0	Process (Cyproconazole)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
30.	Potassium Chloride salt	Sch-I/ 28.1	4140.0	Process (Epoxiconazole, Picoxystrobin, Fluoxastrobin, Cyazofamid, Toprammezone, Methyl-2- [2-(6-Chloro Pyrimidine-4-yl)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.

				Oxyphenyl-3-Methoxyprop-2-Enoate)	
31.	Potassium Bisulphate	Sch-I/ 28.1	571.2	Process (Epoxiconazole)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
32.	Methane Soln.	Sch-I/ 28.2	624.0	Process (Tetraconazole)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
33.	Magnesium Bromide	Sch-I/ 28.3	715.2	Process (Bromuconazole)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
34.	Potassium BI Carbonate	Sch-I/ 28.4	1368.0	Process (Bromuconazole, Cyazofamid**)**	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
35.	Methane Sulfonic Acid Sodium Salt	Sch-I/ 28.5	2517.6	Process (Penconazole, Mandipropamid)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
36.	Sodium Carbonate	Sch-I/ 28.6	3150.0	Process (Picoxystrobin, Methyl-2- [2-(6-Chloro Pyrimidine-4-yl) Oxyphenyl-3-Methoxyprop-2-Enoate)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
37.	Sodium Bi Sulphate	Sch-I/ 28.7	2425.2	Process (Kresoxim Methyl, Dimoxystrobin, Halosafen, Fenoxaprop P Ethyl)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
38.	Succinamide	Sch-I/ 28.8	504.0	Process (Triclopyricarb)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.

39.	Methyl Bisulfate	Sch-I/ 28.9	180.0	Process (Trifloxystrobin)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
40.	Acetic Acid	Sch-I/ 28.1	458.4	Process (Fluopyram)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
41.	Potassium Phenolate	Sch-I/ 28.1	648.0	Process (Sulfosulfuron)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
42.	Ammonium Sulphate	Sch-I/ 28.1	4776.0	Process (Prosulfocarb, 2-Hydroxy-4-Methyl Benzotioate (HMBT))	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
43.	Sodium Fluoride	Sch-I/28.1	314.4	Process (Cyhalofop-Butyl)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
44.	Sodium Hydroxide Solution	Sch-I/ 28.1	12721.2	Process (Sulfentrazone, Carfentrazone, 3-Methyl 1,2,4 Triazole)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
45.	Methylene Chloride	Sch-I/ 28.1	4646.4	Process (Sulcotrione)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
46.	Sodium salt of Formic Acid	Sch-I/ 28.1	1089.6	Process (Mepiquate Chloride)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
47.	Phosphoric Acid (35%)	Sch-I/28.1	15660.0	Process (CCMP)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.

48.	8 – 10 % Sodium Hypochlorite Solution	Sch-II-Class B(15)	1044.0	Process (1,1-Dichloro Pinacolin, 2-Chloro-4-Fluorophenol)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
49.	Spent Nitric Acid	Sch-I/28.1	9720.0	Process (4-Nitro O-Xylene/3-Nitro O-Xylene)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
50.	30% Sodium Bi Sulfide Solution	Sch-I/28.1	2340.0	Process (Triclabendazole)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
51.	Iron Hydroxide	Sch-I/28.1	6264.0	Process (2,5-Dichloro Aniline)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
52.	Sodium Benzoate (10% Soln)	Sch-I/28.1	1800.0	Process (Benzaldehyde)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
53.	Off specification products	Sch-I/ 36.1	250.0	Storage & handling of Products	Collection, Storage, Transportation and sent for co-processing in cement industries or nearest incineration site.
54.	Date expired products	Sch-I/ 36.1	250.0	Storage & handling of Raw Materials and Products	Collection, Storage, Transportation and sent for co-processing in cement industries or nearest incineration site.
NON HAZARDOUS WASTE					
55.	STP sludge	-	10	STP	Collection, storage and use as manure within the premises.
56.	Fly ash	-	2205	Boiler house	Collection, storage, transportation and sell to brick manufacturer.

1.7 INTRODUCTION OF THE PROJECT AND THE PROPONENT.

Name of the project Proponent: M/s. Heranba Industries limited (Unit: VI)

M/S Heranba Industries limited (Unit:VI) is a proposed unit located in Notified Industrial Area, GIDC, Saykha, Dist: Bharuch having total plot area 57248.29 m^2. The unit proposed to manufacture Pesticide technical, pesticide intermediates & speciality chemicals. The total project cost will be Rs. 250 Crore. The proposed products i.e. Pesticide technical, pesticide intermediates & speciality chemicals are especially used as agro chemicals.

The unit will be operated by technocrats having more than 35 years of experience in manufacturing and marketing of various Agro chemicals products worldwide.

The company plan to establish well equipped production plant which will be managed by dedicated, qualified & skilled persons.

The proposed project site lies on 21.795803° N Latitude & 72.807126°E Longitude. **M/s. Heranba Industries Ltd. (Unit: VI)** proposed to set up plant at plot No. T-108, T-109, GIDC Saykha, Tal: Vagra, Dist: Bharuch in Gujarat state.

Beside the rail connectivity, also well connected by road transport. There is a good network of roads in the area and contributes for the development and economic growth of the area. The National Highway No. 8 (Ahmadabad – Mumbai) is now six lanes, double tracked, more elevated and Jam free highway, which is developed by M/s. L&T Company. This highway has given a further boost to the economic growth of this area.

The company will be managed by a professional board of directors. Senior personnel will be available for providing support to the manufacturing unit in the areas of technology, R&D, manufacturing, quality control and quality assurance.

M/s. Heranba Industries Limited (Unit: VI) is a large scale unit and managed by professional Partners and proposes to manufacture Pesticide intermediates, Pesticide Technical (Insecticides, Herbicides, Fungicides) & speciality chemicals. Senior personnel are available for providing support to the manufacturing unit in the areas of technology, R&D, manufacturing, quality control and quality assurance.

1.7.1 Identification of the Project Proponent:

The unit shall be managed by technocrat, Mr. Sadashiv K Shetty having 30 years of experience in manufacturing and marketing of various Agro Chemicals worldwide. The unit has team members having 20 years of experience of Agro Chemicals industries. The details of directors and technical team are as under;

S. No.	Name	Qualification	Designation	Experience
1.	Mr. Sadashiv K. Shetty	M Sc. (Organic Chemistry)	Chairman	35 years
2.	Mr. Raghuram K. Shetty	Graduate in Economics, Diploma in Import & Export Management.	Managing Director	35 years
3.	Mrs.Sujata Sadashiv Shetty	B. com	Director	19 years
4.	Mrs.Vanita Raghuram Shetty	B Sc (Botany)	Director	19 years
5.	Dr.Venketaswara	Phd (Chemistry)	GM-QC & R&D.	28 years

	Rao			
6.	Mr.M.R.Wilson	BE Mechanical Engineering	AGM-Mechanical	25 years
7.	Mr. Prashant Bhende	BE Chemical Engineering	GM-Works	22 years
8.	Mr.Sumit R.Agrawal	M.Sc (Chemistry)	AGM-Production	27 years
9.	Mr.Vijay Warrier	B.Sc (Chem), M.Sc.(Physics)	Production Manager	25 years
10.	Mr.Ajijt Patel	M.Sc (Organic)	Manager-QC	20 years
11.	Mr.Vipul G.Makwana	B.Sc (Chem), PDIS, PDI.ENV & Tech. IOSH, NEBOSH (IGC)	Manager-EHS	20 years
12.	Mr.Ramakant S.Pathak	Diploma Electrical Engineering	Asst.Manager-Elect.	29 years

1.7.2 Brief description of nature of the Project:

M/s. Heranba Industries Limited (Unit-VI) proposes to establish a plant for the manufacture of Pesticide intermediates, Pesticide Technical (Insecticides, Herbicides, Fungicides) & speciality chemicals at proposed Plot No. T-108, T-109, GIDC Saykha, Tal: Vagra, Dist: Bharuch in Gujarat state.

The proposed project involves the production of **"Pesticide intermediates and Pesticide Technical (Insecticides, Herbicides, Fungicides & speciality chemicals)"**. These Pesticides Intermediate are especially used in manufacture of parathyroid insecticides and other pesticide technical such as insecticides are used to protect plant against sucking insect, fungicides used on various fruits and herbicides used to control wide range of weed species in crops as per requirement.

As per the EIA notification - 2006 as amended products are covered under any Schedule 5 (b) & 5(f), Category – "A" and it requires Prior Environmental Clearance.

For the proposed project, the company intends to procure the available latest technology for manufacturing the products.

This project will manufacture Pesticide intermediates and Pesticide Technical (Insecticides, Herbicides, and Fungicides & speciality chemicals). A typical plant consists of following major equipments;

S.No.	Name of equipments	MOC
1	Reactor	Mild Steel
2	Reactor	Stainless Steel
3	Reactor	Glasslined
4	Heat Exchanger	Mild Steel
5	Heat Exchanger	Stainless Steel
6	Heat Exchanger	Graphite
7	Storage Tank	Mild Steel
8	Storage Tank	Stainless Steel
9	Storage Tank	HDPE
10	Receiver	Mild Steel
11	Receiver	Stainless Steel
12	Receiver	Glass lined
13	Receiver	HDPE
14	Centrifugal Pump	Cast Iron
15	Centrifugal Pump	Stainless Steel

16	Centrifugal Pump	PP
17	Steam jet Ejector	Graphite
18	Water jet Ejector	PP
19	Cooling tower	PP FRP
20	Chilling Plant	-
21	Brine Plant	-
22	ETP Equipment	-
23	Incinerator	-
24	Spray Dryer	-
25	Transformer	-
26	Electric Pannel	-
27	Boiler	-
28	Thermic fluid Heater	-
29	D.G Set	-

The industrial sector in the past 7 to 10 years has seen a drastic boom and also the keeping in mind the globalization trend, we have identified the demand for the product and with continuous R & D found that it can be developed in-house and produce commercially for domestic market as well as an eye more on export markets.

1.7.3 Need for the project and its importance to the country and region:

The proposed project provides a potential growth opportunity for the already running business of the company. The company is already engaged in the business of manufacturing of "**Pesticide technical, intermediates & its formulation"**. The project would increase the overall export and also increase the foreign revenue.

India produces about 80,000-90,000 MT of pesticides a year. India's Agro chemicals & pesticide industries are the largest in Asia and the twelfth largest in the world. With over 400 million acres under cultivation and over 60% of the country's population dependent on agriculture, the country's economy depends on the agricultural sector to a substantial extent.

India loses nearly 30% of its potential crop to insects, weeds and rodent attacks. The Pesticides/Crop Protection/Agrochemicals industry plays a crucial role in protecting crops from damage by weeds, pests, insects and fungus, both before and after harvest. This helps to increase crop yields, which is important given the rate at which cultivable land is shrinking.

1.7.4 Demand –Supply Gap:

The production of pesticides started in India in 1952 with the establishment of a plant for the production of BHC near Calcutta, and India is now the second largest manufacturer of pesticides in Asia after China. There has been a steady growth in the production of technical grade pesticides in India, from 5,000 metric tons in 1958 to 102,240 metric tons in 1998. In 1996–97 the demand for pesticides in terms of value was estimated to be around Rs. 22 billion (USD 0.5 billion), which is about 2% of the total world market. The products have very high specific demand as they are especially used as herbicide etc. as per requirement.

1.7.5 Imports vs. Indigenous production:

Manufacturing these proposed products in the country will be very much economical as compared to Import of the same. The export of these Agrochemicals will earn revenue for the country.

1.7.6 Export Possibility:

The proposed products have high export potential. Also these products have very good potential in local market.

1.7.7 Domestic / export Markets:

The company's product is used as raw material to manufacture various herbicides as per the required applications and having very good market in domestic and also having very good international markets.

1.7.9 Employment Generation (Direct and Indirect) due to the project:

During the construction phase around 150 workers and during the operational phase around 200 workers including contractors will be required for the proposed project. Local skilled and semi-skilled workers will be engaged during construction phase. The positive impacts include enhanced direct employment for technical/administrative works and indirect employment opportunities for transporters of raw materials and finished goods.

1.7.3 Need for the project and its importance to the country and region:

The proposed project provides a potential growth opportunity for the already running business of the company. The company is already engaged in the business of manufacturing of critical & key "Pesticide technical, intermediates & its formulation". The project would increase the overall export and also increase the foreign revenue. Product is now well established and acceptable in the international markets.

Additional capacities of product range required over & above our existing capacities, as the company expect strong growth of exports to the extent of 40-50%. Local market is also showing strong growth potential.

Domestic market concentrated in Pan-India, particularly in West and Northern belt, making Saykha as ideal choice. This project will generate employment of up to 200 people.

1.7.4 Demand –Supply Gap:

The products have very high specific demand as per requirement.

1.7.5 Imports vs. Indigenous production:

The proposed products manufacturing in the country will be very much economical compare to Imports of the same and also the export of the same will earn extra revenue generation for our county.

1.7.6 Export Possibility:

The proposed products have high export potential. Also these products have very good potential in local market.

1.7.7 Domestic / Export Markets:

The company's products are used as agro chemicals as per requirement and having very good market in domestic and also having very good international markets.

1.7.9 Employment Generation (Direct and Indirect) due to the project:

There will be very good opportunity of employment generation directly and indirectly due to proposed project. Due to proposed project, there will be requirement of 200 people.

1.8 PROJECT DESCRIPTION:

1.8.1 Type of Project including interlinked and interdependent projects, if any:

The proposed project is an interdependent project of the company.

1.8.2 Location (map showing general location, Specific location, and project boundary & project site layout) with coordinates:

The map showing general location, specific location and project boundary and project site lay out is enclosed as **Annexure – 1**. Plant layout is attached as **Annexure – 2**.

1.8.3 Details of alternate sites considered and the basis of selecting the proposed site, particularly the environmental considerations gone into should be highlighted:

The proposed project activity will be accommodated in the Notified Industrial Area having proper industrial infrastructure so; there is no alternate site consideration. The proposed project activities will be carried out in land procured from GIDC authority. (Land allotment letter is attached as **Annexure – 5**)

1.8.4 Size or magnitude of operation:

As per the proposed project cost, the project is covered under large scale category of manufacturing industries.

1.8.5 Project description with process details (a schematic diagram/ flow chart showing the project layout components of the project etc. Should be given):

Detailed project description with process details is enclosed as **Annexure – 3.**

1.8.6 Raw material required along with estimated quantity, likely source, marketing area of final products/s, mode of transport of raw Material and finished product:

Detailed raw materials requirement along with estimated quantity, likely source, marketing of final products, mode of transport of raw materials and finished products & characteristics of hazardous chemicals are as below:

DETAILS ON PRODUCT TRANSPORTATION

S. No.	Product	Physical State	Type of Packing	Means of Transportation
1	Cypermethrin (T) & Beta, Zeta, Theta etc Isomers(T)	Liquid	200 Kgs MS- Laqured coated drums	By Road
2	Alphacypermethrin Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
3	Deltamethrin Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
4	Lambda Cyhalothric Technical	Liquid or Solid	200 Kgs MS- Laqured coated drums	By Road
5	Permethrin Technical	Liquid	200 Kgs MS- Laqured coated drums	By Road
6	Cypermethrin (T) & Beta, Zeta, Theta etc Isomers(T)	Liquid	200 Kgs MS- Laqured coated drums	By Road

7	Allethrin Technical	Liquid	200 Kgs MS- Laqured coated drums	By Road
8	D-Allethrin Technical	Liquid	200 Kgs MS- Laqured coated drums	By Road
9	Bifenthrin Technical	Liquid or Solid	200 Kgs MS- Laqured coated drums/ Fiber/ MSHDPE 25/50 kg drums	By Road
10	Prallethrin Technical	Liquid	200 Kgs MS- Laqured coated drums	By Road
11	Cyphenothrin (T) & its [1R-Trans-isomer]	Liquid	200 Kgs MS- Laqured coated drums	By Road
12	Etofenprox Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
13	Fenpropathrin Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
14	Cyfluthrin & Beta Isomers (T)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
15	Dimefluthrin (T)	Liquid	200 Kgs MS- Laqured coated drums	By Road
16	Cycloprothrin (T)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
17	Flumethrin (T)	Liquid	200 Kgs MS- Laqured coated drums	By Road
18	Acrinathrin (T)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
19	Flucythrinate (T)	Liquid	200 Kgs MS- Laqured coated drums	By Road
20	Tefluthrin	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
21	Metofluthrin	Liquid	200 Kgs MS- Laqured coated drums	By Road
22	Thiamethoxam Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
23	Imidacloprid Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
24	Acetamiprid Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
25	Fipronil Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
26	Buprofezin Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
27	Thiacloprid Technical	Liquid	200 Kgs MS- Laqured coated drums	By Road
28	Ethiprole Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
29	Dinotefuran Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
30	Nitenpyram Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
31	Chlorantraniliprole	Liquid or Solid	200 Kgs MS- Laqured coated drums/ Fiber/ MSHDPE 25/50 kg	By Road

			drums	
32	Cyantraniliprole	Liquid	200 Kgs MS- Laqured coated drums	By Road
33	Tetraniliprole	Solid	Fiber/ MSHDPE 25/50 kg drums	Truck
34	Indoxacarb	Solid	Fiber/ MSHDPE 25/50 kg drums	Truck
35	Flonicamide	Solid	Fiber/ MSHDPE 25/50 kg drums	Truck
36	Flubendiamide	Liquid	200 Kgs MS- Laqured coated drums	By Road
37	Tolfenpyrad	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
38	Cyclaniliprole	Liquid	200 Kgs MS- Laqured coated drums	By Road
39	Sulfoxaflor	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
40	Clothianidin Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	Truck
41	Pymetrozine Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	Truck
42	Profenofos Technical	Liquid	200 Kgs MS- Laqured coated drums	By Road
43	Chlorpyrifose Ethyl Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
44	Chlorpyriphos Methyl Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
45	Temephos Technical	Liquid or Solid	200 Kgs MS- Laqured coated drums/ Fiber/ MSHDPE 25/50 kg drums	By Road
46	Malathion Technical	Liquid	200 Kgs MS- Laqured coated drums	By Road
47	Ethion Technical	Liquid	200 litres Drum	By Road
48	Acephate Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
49	Dimethoate Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
50	Phenthoate Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
51	Spirotetramat Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
52	Triflumezopyrim	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
53	Fenazaquin	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
54	Chlorfenapyr	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
55	Diafenthiuron Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
56	Fenobucarb Technical	Solid or Liquid	Fiber/ MSHDPE 25/50 kg drums/200 Kgs MS- Laqured coated drums	By Road

57	Propargite	Liquid	200 Kgs MS- Laqured coated drums	By Road
58	Diflubenzuron	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
59	Thiocyclam Oxalate	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
60	Fenpyroximate	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
61	Etoxazole	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
62	Hexythiazox	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
63	Pyriproxyfen	Liquid	200 Kgs MS- Laqured coated drums	By Road
64	Thiodicarb	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
65	Spirodiclofen	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
66	Pyrithiobac	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
67	Novaluron	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
68	Fenoxycarb (T)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
69	Pyridaben	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
70	Spiromesifen	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
71	Tebufenpyrad	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
72	Lufenuron	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
73	Methoxyfenozide	Liquid	200 Kgs MS- Laqured coated drums	By Road
74	Spinetoram	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
75	Thiocyclam	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
76	Hexaconazole Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
77	Tebuconazole Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
78	Difenoconazole Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
79	Propiconazole Technical	Liquid	200 Kgs MS- Laqured coated drums	By Road
80	Metconazole Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
81	Cyproconazole Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
82	Epoxiconazole Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
83	Fenbuconazole Technical	Solid	Fiber/ MSHDPE 25/50	By Road

			kg drums	
84	Ipconazole Technical	Liquid	200 Kgs MS- Laqured coated drums	By Road
85	Tetraconazole Technical	Liquid	200 Kgs MS- Laqured coated drums	By Road
86	Prothioconazole Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
87	Fluquinconazole Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
88	Triticonazole Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
89	Azaconazole Technical	Liquid	200 Kgs MS- Laqured coated drums	By Road
90	Bromuconazole Technical	Liquid	200 Kgs MS- Laqured coated drums	By Road
91	Etaconazole Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
92	Penconazole Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
93	Tricyclazole Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
94	Bupirimate	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
95	Imazalil Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
96	Triadimenol Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
97	Triadimefol Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
98	Metrafenone	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
99	Flusilazole	Liquid	200 Kgs MS- Laqured coated drums	By Road
100	Prochloraz	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
101	Myclobutanil Technical	Liquid	200 Kgs MS- Laqured coated drums	By Road
102	Ametoctradin	Liquid	200 Kgs MS- Laqured coated drums	By Road
103	Pyraclostrobin Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
104	Azoxystrobin Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
105	Pyroxystrobin Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
106	Picoxystrobin Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
107	Flufenoxystrobin Technical	Liquid	200 Kgs MS- Laqured coated drums	By Road
108	Metominostrobin Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
109	Orysastrobin Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road

110	Kresoxim Methyl Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
111	Triclopyricarb Technical	Liquid	200 Kgs MS- Laqured coated drums	By Road
112	Fenoxanil Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
113	Cymoxanil Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
114	Flutolanil Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
115	Tiadinil	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
116	Dodine	Liquid	200 Kgs MS- Laqured coated drums	By Road
117	Captan	Liquid or Solid	Fiber/ MSHDPE 25/50 kg drums/200 Kgs MS- Laqured coated drums	By Road
118	Dimoxystrobin Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
119	Trifloxystrobin Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
120	Fluoxastrobin Technical	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
121	Fenhexamide	Liquid or Solid	Fiber/ MSHDPE 25/50 kg drums/200 Kgs MS- Laqured coated drums	By Road
122	Thiophanate Methyl	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
123	Chlorothalonil	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
124	Isoprothiolane	Liquid	200 Kgs MS- Laqured coated drums	By Road
125	Validamycin	Liquid	200 Kgs MS- Laqured coated drums	By Road
126	Quinoxyfen	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
127	Fluazinam	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
128	Famoxadone	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
129	Benalaxyl	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
130	Carboxin	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
131	Iprobenfos (Kitazin)	Liquid	200 Kgs MS- Laqured coated drums	By Road
132	Bixafen	Liquid	200 Kgs MS- Laqured coated drums	By Road
133	Isopyrazam	Liquid	200 Kgs MS- Laqured coated drums	By Road
134	Fluopicolide	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road

135	Fluopyram	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
136	Boscalid	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
137	Fluxapyroxad	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
138	Carpropamid	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
139	Cyazofamid	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
140	Mandipropamid	Liquid	200 Kgs MS- Laqured coated drums	By Road
141	Penflufen	Liquid	200 Kgs MS- Laqured coated drums	By Road
142	Imazamox	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
143	Imazamethabenz	Liquid	200 Kgs MS- Laqured coated drums	By Road
144	Imazapyr	Solid or Liquid	Fiber/ MSHDPE 25/50 kg drums/200 Kgs MS- Laqured coated drums	By Road
145	Penoxsulam	Liquid	200 Kgs MS- Laqured coated drums	By Road
146	Metsulfuron Methyl	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
147	Mesosulfuron Methyl	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
148	Chlorimuron Ethyl	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
149	Bispyribac Sodium	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
150	Pyrazosulfuron Ethyl	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
151	Florasulam	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
152	Thiencarbazone Methyl	Liquid	200 Kgs MS- Laqured coated drums	By Road
153	Bensulfuron Methyl	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
154	Nicosulfuron	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
155	Sulfosulfuron	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
156	Trifloxysulfuron	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
157	Diclosulam	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
158	Pyroxsulam	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
159	Glyphosate	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
160	Glufosinate Ammonium	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road

161	Pendimethalin	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
162	Pretilachlor	Liquid	200 Kgs MS- Laqured coated drums	By Road
163	Dicamba	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
164	Napropamide	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
165	Dimethenamid	Liquid	200 Kgs MS- Laqured coated drums	By Road
166	Topramezone	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
167	Propaxycarbazone	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
168	Fomesafen (T)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
169	Halosafen (T)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
170	Clethodim (T)	Liquid	200 Kgs MS- Laqured coated drums	By Road
171	Benoxacor	Liquid	200 Kgs MS- Laqured coated drums	By Road
172	Phenmedipham	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
173	Desmedipham	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
174	Bromobutide	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
175	Butachlor	Liquid	200 Kgs MS- Laqured coated drums	By Road
176	Metachlor	Liquid	200 Kgs MS- Laqured coated drums	By Road
177	Prosulfocarb	Liquid	200 Kgs MS- Laqured coated drums	By Road
178	Quinclorac	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
179	Benfuresate	Liquid	200 Kgs MS- Laqured coated drums	By Road
180	Metamitron	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
181	Metribuzin	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
182	Atrazine	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
183	Imazethapyr	Liquid	200 Kgs MS- Laqured coated drums	By Road
184	Clodinofop Propargyl	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
185	Quizalofop (T) & Quizalofop Ethyl (T)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
186	Cyhalofop & Cyhalofop Butyl (T)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
187	Chlorazifop (T) & Chlorazifop	Solid	Fiber/ MSHDPE 25/50	By Road

	Propargyl (T)		kg drums	
188	Fenoxaprop (T) & Fenoxaprop P Ethyl (T)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
189	Fluazifop (T) & Fluazifop P Butyl	Liquid	200 Kgs MS- Laqured coated drums	By Road
190	Haloxyfop (T) & Haloxyfop Methyl	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
191	Quizalofop-P-Tefuryl	Liquid	200 Kgs MS- Laqured coated drums	By Road
192	Haloxyfop Ethoxy Ethyl (Etotyl)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
193	Oxadiargyl	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
194	Propanil	Liquid or Solid	Fiber/ MSHDPE 25/50 kg drums/200 Kgs MS- Laqured coated drums	By Road
195	Isoproturon	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
196	Metamifop (T)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
197	Picolinafen (T)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
198	Sulfentrazone	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
199	Flufenacet	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
200	Cloransulam-Methyl	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
201	Diflufenican	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
202	Aclonifen	Liquid or Solid	Fiber/ MSHDPE 25/50 kg drums/200 Kgs MS- Laqured coated drums	By Road
203	2,4-D Amine Salt	Liquid	200 Kgs MS- Laqured coated drums	By Road
204	Acifluorfen (T)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
205	Chlomethoxyfen (T)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
206	Fluoroglycofen (T)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
207	Lactofen (T)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
208	Oxyfluorfen (T)	Liquid	200 Kgs MS- Laqured coated drums	By Road
209	Fluoroxypyr-Meptyl	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
210	Picloram	Liquid	200 Kgs MS- Laqured coated drums	By Road
211	Triclopyr – Butotyl	Liquid	200 Kgs MS- Laqured coated drums	By Road
212	Sulcotrione	Solid	Fiber/ MSHDPE 25/50	By Road

			kg drums	
213	Tefuryltrione	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
214	Mecoprop	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
215	2,4-D Acid	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
216	2,4-D Ethyl Ester	Liquid	200 Kgs MS- Laqured coated drums	By Road
217	2,4-D Sodium Salt	Liquid	200 Kgs MS- Laqured coated drums	By Road
218	Cloquintocet Mexyl (T)	Liquid	200 Kgs MS- Laqured coated drums	By Road
219	Propaquizafop	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
220	Carfentrazone	Liquid	200 Kgs MS- Laqured coated drums	By Road
221	Chlormequate Chloride	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
222	Ethephone	Liquid	200 Kgs MS- Laqured coated drums	By Road
223	Forchlorfenuron	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
224	Mepiquate Chloride	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
225	Bromadiolon	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
226	Paclobutrazol	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
227	Tembotrione	Liquid	200 Kgs MS- Laqured coated drums	By Road
228	Mesotrione	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
229	Pinoxaden	Liquid	200 Kgs MS- Laqured coated drums	By Road
230	Clomazone	Liquid	200 Kgs MS- Laqured coated drums	By Road
231	Bentazone	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
232	Ametryn	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
233	Halosulfuron	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
234	Iodosulfuron Methyl	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
235	Meta Phenoxy Benzaldehyde (MPBAD)	Liquid	200 Kgs MS- Laqured coated drums	By Road
236	Meta Phenoxy Benzyl Alcohol (MPBAL)	Liquid	200 Kgs MS- Laqured coated drums	By Road
237	Cypermethric Acid Chloride & it's all Isomers	Liquid	200 Kgs MS- Laqured coated drums	By Road
238	CCMP (2- Chloro 5- Chloromethyl Pyridine)	Liquid	200 Kgs MS- Laqured coated drums	By Road

239	CCMT (2- Chloro 5- Chloromethyl Thiazol)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
240	NII (2- Nitro Imino Imidazolidine)	Liquid	200 Kgs MS- Laqured coated drums	By Road
241	MNIO (2- Methyl 5- Nitro 1,3,5 Oxidiazine)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
242	Transfluthrin Acid Chloride	Liquid	200 Kgs MS- Laqured coated drums	By Road
243	Para Choro Phenyl Iso Valeric Acid Chloride	Liquid	200 Kgs MS- Laqured coated drums	By Road
244	Propargyl Chloride	Liquid	200 Kgs MS- Laqured coated drums	By Road
245	1,2,4-Triazol	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
246	3- Methyl 1,2,4 Triazole	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
247	4- Bromo 2- Chlorophenol	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
248	5- Chloro 2,3- Difluoro Pyridine (CDFP)	Liquid	200 Kgs MS- Laqured coated drums	By Road
249	4-4’ Bi Pyridine	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
250	2, 6 Diethyl - N-(Propoxy) Aniline	Liquid	200 Kgs MS- Laqured coated drums	By Road
251	PMIDA/ (Phosphono Methyl Imino) Diacetic Acid	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
252	2-Chloro-4-(4-Chlorophenoxy) Phenacyl Bromide	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
253	2,4 Dichloro Velerophenone	Liquid	200 Kgs MS- Laqured coated drums	By Road
254	1-(4-Chloro Benzyl) Methyl-3,3-Methyl-2-Oxo Cyclopentane Carboxylate	Liquid	200 Kgs MS- Laqured coated drums	By Road
255	Tebu- Ketal / 2-[2-(4-Chlorophenyl) Ethyl]-2-(1,1-DiMethyl Ethyl) Oxirane	Liquid	200 Kgs MS- Laqured coated drums	By Road
256	Methyl-2- [2-(6-Chloro Pyrimidine-4-yl) Oxyphenyl-3-Methoxyprop-2-Enoate	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
257	1,1-Di Chloro Pinacolin	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
258	Thiocarbo Hydrazine	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
259	2- Hydroxy 4- Methyl Benzotioate (HMBT)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
260	4-Nitro -O-xylene/3-Nitro O-Xylene	Liquid	200 Kgs MS- Laqured coated drums	By Road
261	Lambda Cyhalothric Acid Chloride	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
262	4-HPPA- 4- (Hydroxy phenoxy) Propionic Acid	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
263	PEG Ester	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road

264	Triazinone - 4- Amino 3-Mecapto- 6-t-Butyl -1,2,4-triazine-5-one (AMBT)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
265	DETCL	Liquid	200 Kgs MS- Laqured coated drums	By Road
266	2-Amino Di Phenyl Ether (Ortho Amino Di Phenyl Ether	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
267	4-Amino 4'- Methyl Di Phenyl Ether	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
268	2- Amino 2', 4, 4'- Tri Chloro Di Phenyl Ether (Benzinamide, 5-Chloro-2-2 (2,4-Dichloro Phenoxy)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
269	2- Amino -4'- Chloro -4 - Trifluoromethyl Di Phenyl Ether	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
270	2-Chloro-4-(4-Chlorophenoxy) Acetophenone/4-Acetyl-3,4'-Dichloro Diphenyl Ether	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
271	2-Acetyl-2',4,4'-Trichloro Diphenyl Ether	Liquid	200 Kgs MS- Laqured coated drums	By Road
272	5 Chloro-6-(2,3 Dichloro Phenoxy)-2-Methyl Thio -1H Benzimidazole/Triclabendazole	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
273	2, 4-Dichloro Phenol	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
274	2, 5-Dichloro Phenol	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
275	3-Mehtyl Phenol (m-Cresol)	Liquid	200 Kgs MS- Laqured coated drums	By Road
276	3-Nitro Phenol	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
277	4-Bromo 2, 5 Dichloro Phenol	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
278	4-Fluoro Phenol	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
279	O-Cyano Phenol	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
280	Ortho Nitro Phenol	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
281	Para Fluoro Anisole	Liquid	200 Kgs MS- Laqured coated drums	By Road
282	2- Chloro 4-Fluoro Phenol	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
283	3-Amino 4-Methyl Benzoic Acid Isopropyl Ester (AMBI)	Liquid	200 Kgs MS- Laqured coated drums	By Road
284	3-Amino 4-Methyl Benzoic Acid (2' - Chloro Ethyl Ester) (AMBC)	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
285	3-Amino Benzotrifluoride	Liquid	200 Kgs MS- Laqured coated drums	By Road
286	2, 5-Dichloro Aniline	Solid	Fiber/ MSHDPE 25/50 kg drums	By Road
287	Ortho Phenylene Diamine/ Meta Phenylene Diamine/ Para	Solid/Solid/ Solid	Fiber/ MSHDPE 25/50 kg drums	By Road

	Phenylene Diamine			
288	Benzaldehyde	Liquid	200 Kgs MS- Laqured coated drums	By Road

DETAILS OF RAW MATERIAL – TRANSPORTATION

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
1.	8-10 % Sodium Hypochorite Solution	Liquid	Tanker Load	By Road	20
2.	Acetyl Chloride	Liquid	Composite Drums	By Road	30
3.	(+)-5-Amino-1(2,6)-Dichloro-1,1,1-Trifluoro-P-Tolyl)-4-Trifluoromethyl-Sulfopyrazole-3-Carbonitrile	Solid	Composite Drums	By Road	360
4.	(1s,4s)-1-Amino-4- Methoxy Cyclohexane Carboxylic Acid	Solid	Composite Drums	By Road	360
5.	(2,3,5,6-Tetrafluoro-4-(Methoxymethyl)Phenyl) Methanol	Solid	Composite Drums	By Road	360
6.	(2-Chlorophenyl) Methanol	Solid	Composite Drums	By Road	360
7.	(2E, 3Z)-4-Iminopentane-2, 3-Dione Bis (O-Methyloxime)	Solid	Composite Drums	By Road	360
8.	(Chloromethoxy)Ethane	Liquid	Tanker Load	By Road	100
9.	(PPOA)	Liquid	Tanker Load	By Road	100
10.	[5-(Trifluoromethyl)-2H-Tetrazole-2-yl] Methyl	Liquid	Tanker Load	By Road	100
11.	1- [2 [(2,4-Dichloro-Phenyl)-2-Acetoxy]-1-Cyclohexane Carboxylic Acid Methyl Ester	Liquid	Tanker Load	By Road	360
12.	1-(2,6-Dichloro-4-(Trifluoromethyl) Phenyl)-3-Cyano-5-Amino Thiazole	Solid	Composite Drums	By Road	360
13.	1-(2-Chloroethoxy) Propane	Liquid	Tanker Load	By Road	100
14.	1-(4-Chlorophenyl) Ethyl Amine	Liquid	Tanker Load	By Road	100
15.	1-(4-Chlorophenyl)-2-Cyclopropyl-Propanone	Liquid	Tanker Load	By Road	360
16.	1-(4-Chlorophenyl)4-4 Dimethyl -3- Pentanoate	Liquid	Tanker Load	By Road	360
17.	1,1,2,3,3,3-Hexafluoro Propoxy-2,5-Dichloro Benzene	Liquid	Tanker Load	By Road	360
18.	1,1,2-Trichloroethane	Liquid	Tanker Load	By Road	100
19.	1,2 - Butanediol	Liquid	Tanker Load	By Road	100
20.	1,2 Pentane Diol	Liquid	Tanker	By Road	100

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
			Load		
21.	1,2,3,4-Tetra Hydro-8-Amino-1,4-Methano phthalene-5-yl	Liquid	Tanker Load	By Road	100
22.	1,2,4-Triazole	Solid	Composite Drums	By Road	100
23.	1,2,4-Triazole-5-Amine	Solid	Composite Drums	By Road	360
24.	1,3 – Dichloro Benzene	Liquid	Tanker Load	By Road	100
25.	1,3-Cyclohexadione	Solid	Composite Drums	By Road	100
26.	1,3-Dimethyl-4-Phenoxypyrazole Oxime (DMPPO)	Solid	Composite Drums	By Road	100
27.	1,4 Dichloro Benzene	Solid	Composite Drums	By Road	100
28.	1,5-Dimethyl-2-Nitro iminohexahydro -1,3,5-Triazine(1,5-DMNIHH-1,3,5-Triazine)	Solid or Liquid	Composite Drums/ Tanker Load	By Road	360
29.	10 % Sodium Hypochlorite solution	Liquid	Tanker Load	By Road	100
30.	10% Caustic Solution	Liquid	Tanker Load	By Road	100
31.	10% Hydrochloric Acid	Liquid	Tanker Load	By Road	100
32.	10% Soda Ash	Liquid	Tanker Load	By Road	100
33.	10% Sodium Carbonate	Liquid	Tanker Load	By Road	100
34.	10% Sodium Hydroxide Solution	Liquid	Tanker Load	By Road	100
35.	10% Sodium Hypochlorite	Liquid	Tanker Load	By Road	100
36.	15% CAT-V Solution	Liquid	Tanker Load	By Road	360
37.	15% Caustic	Liquid	Tanker Load	By Road	100
38.	15% Hydrochloric Acid	Liquid	Tanker Load	By Road	100
39.	15% Sodium Hydroxide	Liquid	Tanker Load	By Road	100
40.	15% Sodium Hydroxide Solution	Liquid	Tanker Load	By Road	100
41.	1-Butyl Bromide	Liquid	Tanker Load	By Road	100
42.	1-Chloro -2- Propanol	Liquid	Tanker Load	By Road	20
43.	1-Chloro 3-Allyl Oxyamine	Liquid	Tanker	By Road	20

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
			Load		
44.	1-Chloro-2-(4-Chlorophenyl) Ethane	Liquid	Tanker Load	By Road	25
45.	1-Chloro-2,2,2-Trifluoro Ethane	Gas	Tonner	By Road	100
46.	1-Cyano Acetyl-3-Ethyl Urea	Solid	Composite Drums	By Road	20
47.	1-Imino Ethanamine HCl	Solid	Composite Drums	By Road	20
48.	1MCH Chloro Chloride	Liquid	Tanker Load	By Road	20
49.	1-Methoxy-2-Amino Propane	Liquid	Tanker Load	By Road	20
50.	1-Methyl Hexanol	Liquid	Tanker Load	By Road	20
51.	1-Methyl-2-Mercapto-2- (Para Chlorophenyl) Ethyl Amine	Liquid	Tanker Load	By Road	100
52.	1-Methyl-5-Hydroxy Pyrazole	Solid	Composite Drums	By Road	20
53.	1-R Cypermethric Acid (1- R CMA)	Solid	Composite Drums	By Road	100
54.	2 - Chloro Benzyl Alcohol	Solid	Composite Drums	By Road	20
55.	2 - Ethylsulfonylimidazo [1,2-A] Pyridine Sulfonamide	Solid	Composite Drums	By Road	360
56.	2 - Fluor Aniline	Liquid	Tanker Load	By Road	100
57.	2 % Soda Bicarbonate Soln	Liquid	Tanker Load	By Road	100
58.	2- (4 – Hydroxy Phenoxy) Propionic Acid	Solid	Composite Drums	By Road	360
59.	2- Chloro -6-Trifluoro Methyl Pyridine	Solid	Composite Drums	By Road	20
60.	2- Chloro Benzyl Chloride	Liquid	Tanker Load	By Road	100
61.	2- Fluoro -N- Methyl Aniline	Solid	Composite Drums	By Road	20
62.	2- Hydroxy -4- Methyl Benzothiazole (HMBT)	Solid	Composite Drums	By Road	360
63.	2- Methyl Aniline	Liquid	Tanker Load	By Road	100
64.	2% Acetic Acid solution	Liquid	Tanker Load	By Road	100
65.	2% Soda Ash Solution	Liquid	Tanker Load	By Road	230
66.	2% Sodium Chloride solution (NaCl solution)	Liquid	Tanker Load	By Road	100
67.	2-(1,3-Dimethylbutyl) Aniline	Liquid	Tanker Load	By Road	30
68.	2-(2,2-Difluoroethoxy)-6-	Liquid	Tanker	By Road	30

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
	(Trifluoromethyl)Benzene-1-Sulfonyl Chloride		Load		
69.	2-(2,4 – Dichlorophenyl) Pentyl Alcohol	Liquid	Tanker Load	By Road	100
70.	2-(4-Chlorophenyl) -5 -Trifluoromethyl) -1H -Pyrazole-3-Carbonirile	Liquid	Tanker Load	By Road	360
71.	2-(4-Hydroxy Phenoxy) Propionic Acid	Solid	Composite Drums	By Road	35
72.	2-(4-Tert Butyl Phenoxy Cyclohexanol	Solid	Composite Drums	By Road	45
73.	2-(Methoxyimino)-N-Methyl Acetamide	Liquid	Tanker Load	By Road	360
74.	2-(Methyl sulfonyl)-5-(Trifluoromethyl)-1,3,4-Thiadiazole	Solid	Composite Drums	By Road	100
75.	2-(Trifluoro Methyl) Benzyl Chloride	Liquid	Tanker Load	By Road	100
76.	2, 3, 5, 6 Tetra Fluoro 3 – Methoxy Methyl Benzyl Alcohol	Solid	Composite Drums	By Road	100
77.	2, 3-Dichloro Phenol	Solid	Composite Drums	By Road	100
78.	2, 4 – Dichloro Phenol	Solid	Composite Drums	By Road	360
79.	2, 5 – Dichloro Nitrobenzene	Solid	Composite Drums	By Road	100
80.	2, 5 – Dichloro Phenol	Solid	Composite Drums	By Road	100
81.	2, 5-Dichloro Aniline	Solid	Composite Drums	By Road	100
82.	2, 5-Dichloro Nitro Benzene	Solid	Composite Drums	By Road	100
83.	2, 6 difluorobenzamide	Solid	Composite Drums	By Road	100
84.	2,2 - Dimethylbutanoyl Chloride	Solid	Composite Drums	By Road	20
85.	2,2 DithioBis [5-Ethoxy 7-Fluoro (1,2,4) Triazole (1,5) Pyrimidine	Solid	Composite Drums	By Road	100
86.	2,2-Dichloro 1-Ethyl 3-Methylcyclopropane Carboxylic Acid	Solid	Composite Drums	By Road	100
87.	2,2-Dimethyl Cyclopentane	Liquid	Tanker Load	By Road	100
88.	2,2-Dimethyl-3-(E)-Prop-1-Enyl) Cyclopropane Carboxylic Acid	Liquid	Tanker Load	By Road	100
89.	2,3 – Dichloro-5-Trifluoromethyl Pyridine	Liquid	Tanker Load	By Road	100
90.	2,3,5 Trichloro Pyridine	Solid	Composite Drums	By Road	100

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
91.	2,3,5,6, Tetra Fluoro 4- Methyl Benzyl Alcohol	Solid	Composite Drums	By Road	360
92.	2,3,5,6-Tetra Fluoro Benzyl Alcohol	Solid	Composite Drums	By Road	100
93.	2,3-Di Fluoro -5-Chloro Pyridine	Liquid	Tanker Load	By Road	100
94.	2,4 Dichloro Phenacyl Bromide	Solid	Composite Drums	By Road	100
95.	2,3,5 Trichloro Pyridine	Solid	Composite Drums	By Road	100
96.	2,4,6-Trichloro Phenol	Solid	Composite Drums	By Road	100
97.	2,4-Dichloro Bromo Benzene	Solid	Composite Drums	By Road	100
98.	2,4-Dichloro Phenoxy Acetic Acid	Solid	Composite Drums	By Road	100
99.	2,4-Dichloro Phenoxy Acetic Acid	Solid	Composite Drums	By Road	100
100.	2,4-Dichloro-3,5-Dinitro Benzotrifluoride	Solid	Composite Drums	By Road	100
101.	2,4-Difluoro Aniline	Liquid	Tanker Load	By Road	360
102.	2,5 - Xylenol	Solid	Composite Drums	By Road	100
103.	2,5-Dimethyl, Benzene Acetic Acid	Solid	Composite Drums	By Road	100
104.	2,6 – Dichloro Quinoxaline	Solid	Composite Drums	By Road	100
105.	2,6 Dichloro Aniline	Solid	Composite Drums	By Road	25
106.	2,6 Dichloro Quinoxaline	Solid	Composite Drums	By Road	100
107.	2,6 Diethyl Aniline	Liquid	Tanker Load	By Road	100
108.	2,6 Dihydroxy Benzoic Acid	Solid	Composite Drums	By Road	100
109.	2,6 Dimethyl Aniline	Liquid	Tanker Load	By Road	100
110.	2,6-Dichlorobenzonitrile	Solid	Composite Drums	By Road	360
111.	2,6-Difluoro Aniline	Liquid	Tanker Load	By Road	100
112.	2,6-Difluoro Benzoyl Isocyanate	Solid	Composite Drums	By Road	100
113.	2,6-Diisopropyl Aniline	Liquid	Tanker Load	By Road	100
114.	2-[2-(Hydroxymethyl)Phenyl]-2-(Methoxyimino)-N-MethylAcetamide	Liquid	Tanker Load	By Road	100

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
115.	2-[3-(Trifluoromethyl)Phenoxy] Nicotinic Acid	Solid	Composite Drums	By Road	100
116.	2-[3-Trifluoromethyl) Phenyl Propanedioic Acid	Liquid	Tanker Load	By Road	360
117.	2', 4, 4'-Trichloro Diphenyl Ether	Solid	Composite Drums	By Road	100
118.	20 % Ammonia Solution	Liquid	Tanker Load	By Road	45
119.	20 % Ammonium Hydroxide Solution	Liquid	Tanker Load	By Road	40
120.	20 % Caustic Solution	Liquid	Tanker Load	By Road	38
121.	20% aq. Sodium Methyl Mercaptan	Liquid	Tanker Load	By Road	85
122.	20% Caustic Lye	Liquid	Tanker Load	By Road	25
123.	20% HAC Solution (20 %)	Liquid	Tanker Load	By Road	45
124.	20% Sodium Chloride solution (NaCl solution)	Liquid	Tanker Load	By Road	30
125.	20% Sodium Hydroxide Solution	Liquid	Tanker Load	By Road	230
126.	20% Sodium Methoxide Solution	Liquid	Tanker Load	By Road	230
127.	22% Sodium Hydroxide	Liquid	Tanker Load	By Road	230
128.	23 % Liq. Ammonia	Liquid	Tanker Load	By Road	230
129.	25% Sodium Hydroxide (NaOH)	Liquid	Tanker Load	By Road	230
130.	2-Amino 4-Chloro 6-Methoxy Pyrimidine (ACMP)	Solid	Composite Drums	By Road	45
131.	2-Amino Pyridine	Solid	Composite Drums	By Road	40
132.	2-Amino-2,3-Dimethyl Butane Amide	Solid	Composite Drums	By Road	38
133.	2-amino-2,3-dimethyl Butane nitrile	Liquid	Tanker Load	By Road	85
134.	2-Amino-2,3-Dimethyl Butyramide	Solid	Composite Drums	By Road	25
135.	2-Amino-3, 4-Dichloro Nitro Benzene	Liquid	Tanker Load	By Road	230
136.	2-Amino-3-Chloro-5-(Trifluoromethyl) Pyridine	Solid	Composite Drums	By Road	49
137.	2-Amino-4,6-Dimethoxy Pyrimidine	Solid	Composite Drums	By Road	230
138.	2-Amino-4,6-Dimethoxy Pyrimidine	Solid	Composite Drums	By Road	45
139.	2-Amino-4,6-Dimethoxy	Solid	Composite	By Road	45

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
	Pyrimidine		Drums		
140.	2-Amino-4'-Chlrobiphenyl	Solid	Composite Drums	By Road	45
141.	2-Amino-4-Methoxy-6-Methyl-1,3,5-Triazine	Solid	Composite Drums	By Road	38
142.	2-Amino-5-Chloro-N,3-Dimethyl Benzamide	Solid	Composite Drums	By Road	38
143.	2-Bromo-3,3-Dimethyl Butanoyl Chloride	Liquid	Tanker Load	By Road	230
144.	2-Caumaranone	Solid	Composite Drums	By Road	230
145.	2-Chloro 5-Chloromethyl Thiazole	Solid	Composite Drums	By Road	45
146.	2-Chloro Ethanol	Liquid	Tanker Load	By Road	40
147.	2-Chloro Octane	Liquid	Tanker Load	By Road	38
148.	2-Chloro Pyridine	Liquid	Tanker Load	By Road	85
149.	2-Chloro, 5-Chloro Methyl Pyridine	Solid	Composite Drums	By Road	25
150.	2-Chloro-3-(2,2,2-Trifluoroethoxymethyl)-4-Methylsulfonylbenzoic Acid	Liquid	Tanker Load	By Road	230
151.	2-Chloro-3-Hydroxy Pyridine	Solid	Composite Drums	By Road	230
152.	2-Chloro-3-Methyl-4- (Methyl Sulfonyl) Benzoic Acid	Solid	Composite Drums	By Road	45
153.	2-Chloro-4-Aminopyridine	Solid	Composite Drums	By Road	40
154.	2-Chloro-4-Methylsulfonyl Benzoyl Chloride	Liquid	Tanker Load	By Road	230
155.	2-Chloro-4-Trifluoro Methyl Phenol	Liquid	Tanker Load	By Road	85
156.	2-Chloro-5-Chloromethyl Pyridine	Liquid	Composite Drums	By Road	25
157.	2-Chloro-5-Chloromethyl Thiazole	Solid	Composite Drums	By Road	38
158.	2-Chloro-6-Fluoro-4(3H)-Quinazolinone	Liquid	Tanker Load	By Road	230
159.	2-Chloronicotinoyl Chloride	Solid	Composite Drums	By Road	38
160.	2-Ethoxy Carbonyl Amino Sulfonyl-N, N-Dimethyl-3-Pyridine Carboxamide	Liquid	Tanker Load	By Road	230
161.	2-Hydroxy Benzanilide	Liquid	Tanker Load	By Road	38
162.	2-Hydroxy Phenacyl Bromide	Solid	Composite Drums	By Road	38

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
163.	2-Hydroxy Propanyl Chloride	Liquid	Tanker Load	By Road	38
164.	2-Hydroxy-6-Nitro-Benzoic Acid	Liquid	Tanker Load	By Road	230
165.	2-Isocyanato-4,6-Dimethoxypyrimidine	Liquid	Tanker Load	By Road	230
166.	2-Mercaptoethanol	Liquid	Tanker Load	By Road	100
167.	2-Methanesulfonyl-4,6-Dimethoxy-Pyrimidine	Liquid	Tanker Load	By Road	230
168.	2-Methoxy-4-(Trifluoromethyl) Pyridine-3-Sulfonyl Chloride	Liquid	Tanker Load	By Road	230
169.	2-Methyl-3-Hydroxy-5H-Pyrazole	Solid	Composite Drums	By Road	360
170.	2-Nitro Chloro Benzene	Solid	Composite Drums	By Road	100
171.	2-Nitro-4-Methylsulfonyl Benzoyl Chloride	Liquid	Tanker Load	By Road	230
172.	2-Nitrobenzenesulfenyl Chloride (NBSC)	Solid	Composite Drums	By Road	100
173.	2-Propinyl Methane sulfonate	Liquid	Tanker Load	By Road	230
174.	2-Sec. Butyl Phenol	Liquid	Tanker Load	By Road	100
175.	3 – Chloro Pyrazole	Liquid	Tanker Load	By Road	230
176.	3 – Iso Chromanone	Solid	Composite Drums	By Road	100
177.	3 Chloro−2,2−Dimethylpropanoyl Chloride	Liquid	Tanker Load	By Road	100
178.	3- Cyano Pyridine	Solid	Composite Drums	By Road	100
179.	3% Sodium Bicarbonate	Liquid	Tanker Load	By Road	100
180.	3-(1-Methayl Ethoxy) Benzene Amine	Liquid	Tanker Load	By Road	230
181.	3-(4,5-Dihydro-3-Isoxazolyl)-2-Methyl-4-(MethylSulfonyl) Benzoic Acid	Liquid	Tanker Load	By Road	230
182.	3-(Aminomethyl) Tetrahydrofuran	Liquid	Tanker Load	By Road	360
183.	3-(Difluoromethyl)-1-methylpyrazole-4-Carboxylic Acid	Liquid	Tanker Load	By Road	230
184.	3, 4 Dichloro Benzotrifluoride	Liquid	Tanker Load	By Road	360
185.	3, 6 Dichloro Benzoxazole	Liquid	Tanker Load	By Road	230

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
186.	3,4 - Dichloro Aniline	Solid	Composite Drums	By Road	100
187.	3,4 – Dichloro Benzotrifluoride	Liquid	Tanker Load	By Road	20
188.	3,4,5-Trifluoro-2-Aminobiphenyl	Liquid	Tanker Load	By Road	230
189.	3,4,5-Trimethoxy Toluene	Liquid	Tanker Load	By Road	35
190.	3,4-Dichloro Benzotrifluoride	Liquid	Tanker Load	By Road	40
191.	3,4'-Dichloro Diphenyl Ether	Liquid	Tanker Load	By Road	45
192.	3',4'-dichloro-5-fluorobiphenyl-2-Amine	Liquid	Tanker Load	By Road	230
193.	3,4-Fluoro Benzo nitrile	Solid	Composite Drums	By Road	45
194.	3,5 Dimethoxy Phenyl Amino Carbonyl Chloride	Liquid	Tanker Load	By Road	230
195.	3,5 Dimethyl Benzo Hydrazide	Liquid	Tanker Load	By Road	230
196.	3,5,6 Trichloro Pyridinol	Solid	Composite Drums	By Road	100
197.	3,5-Dimethylbenzoic Acid Ethyl Ester	Liquid	Tanker Load	By Road	100
198.	3,6-Dichloro Benzoxazole	Liquid	Tanker Load	By Road	100
199.	30 % Hydrochloric Acid	Liquid	Tanker Load	By Road	100
200.	37% Formaldehyde	Liquid	Tanker Load	By Road	100
201.	38.7% Sodium Nitrite	Liquid	Tanker Load	By Road	100
202.	3-Bromo-1-(3-Chloropyridin-2-yl)-1H-Pyrazole-5-Carbonyl Chloride	Liquid	Tanker Load	By Road	230
203.	3-Bromo-6-Methoxy-2-Methyl Benzoic Acid	Solid	Composite Drums	By Road	100
204.	3-Chloro-1-Methyl-5- Sulfamoyl-1H-Pyrazole- 4-Carboxylic Acid Methyl Ester	Liquid	Tanker Load	By Road	100
205.	3-Chloro-2-Methyl-Aniline	Liquid	Tanker Load	By Road	100
206.	3-Chloro-4-(1,1,2-Trifluoro-2-[Trifluoro Methoxy] Ethoxy) Aniline	Solid	Composite Drums	By Road	360
207.	3-Chloro-4-Methylbenzenamine	Solid	Composite Drums	By Road	360
208.	3-Hydroxy 2-Nitro Benzoic Acid	Solid	Composite Drums	By Road	360

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
209.	3-Hydroxy Benzotrifluoride	Liquid	Tanker Load	By Road	100
210.	3-Hydroxy-6-Nitro Benzoic Acid	Solid	Composite Drums	By Road	100
211.	3-Iso Chromanone	Solid	Composite Drums	By Road	360
212.	3-Methoxy 2-Methyl Benzoyl Chloride	Liquid	Tanker Load	By Road	230
213.	3-Methoxy -5-oxo-1,2,4-Triazole-1-Carbonylchloride	Liquid	Tanker Load	By Road	230
214.	3-Methoxy Phenethylamine	liquid	Tanker Load	By Road	100
215.	3-Methyl 4-Nitroimino 1,3,5 Oxidiazine (MNIO)	Solid	Composite Drums	By Road	360
216.	3-Methyl Aniline	liquid	Tanker Load	By Road	200
217.	3-Methyl Ethyl-2-Oxo Cyclopentane Carboxylate	Liquid	Tanker Load	By Road	230
218.	3-Nitro Aniline	Solid	Composite Drums	By Road	20
219.	3-Nitro-4-Chloro Benzotrifluoride	Liquid	Tanker Load	By Road	30
220.	3-Nitro-4-Methyl Benzoic Acid	Solid	Composite Drums	By Road	40
221.	3-Nitro-4-Methyl Benzoic Acid	Solid	Composite Drums	By Road	25
222.	3-Phenoxy Benzaldehyde	Liquid	Tanker Load	By Road	100
223.	3-Phenoxy-4-Fluoro Benzaldehyde	Liquid	Tanker Load	By Road	230
224.	3-Phenyl -2-Methyl Benzyl Chloride	Liquid	Tanker Load	By Road	230
225.	3-Tert-Butylphenol	Solid	Composite Drums	By Road	20
226.	4 - Chloro Phenol	Solid	Composite Drums	By Road	360
227.	4 - Chloro Phenyl Isocyanate	Liquid	Tanker Load	By Road	
228.	4 % Soda Ash Solution	Liquid	Tanker Load	By Road	230
229.	4- Chloro Phenol	Solid	Composite Drums	By Road	360
230.	4 Fluoro 3 Phenoxy Benzaldehyde	Liquid	Tanker Load	By Road	20
231.	4- Nitro Ortho Xylene	Solid	Composite Drums	By Road	30
232.	4- Phenoxy Phenol	Solid	Composite Drums	By Road	20
233.	4-(4-Methylphenoxy)-Benzyl	Liquid	Tanker	By Road	230

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
	amine		Load		
234.	4, 6- Dimethoxy Pyrimidine -2-Amine	Solid	Composite Drums	By Road	100
235.	4,4' Thio Di Phenol	Solid	Composite Drums	By Road	360
236.	4,5,7 Trichloro Quinoline	Liquid	Tanker Load	By Road	230
237.	4,6 - Di Chloro Pyrimidine	Solid	Composite Drums	By Road	25
238.	4,6 Dimethoxy 2-Methyl Sulfonyl Pyrimidine	Liquid	Tanker Load	By Road	360
239.	4,6-Dichloro-5-Fluoro Pyrimidine	Solid	Composite Drums	By Road	100
240.	4,6-Dimethoxy-2- pyrimidine Amine	Solid	Composite Drums	By Road	45
241.	40% Mono Methyl Amine	Liquid	Tanker Load	By Road	20
242.	48% Caustic Lye	Liquid	Tanker Load	By Road	20
243.	4-Amino-6-Tert-Butyl-3-Mercapto-1,2,4-Triazin-5(4H)-one (ATMT)	Solid	Composite Drums	By Road	360
244.	4-Bromo Fluoro Benzene	Liquid	Tanker Load	By Road	100
245.	4-Chloro Benzaldehyde	Solid	Composite Drums	By Road	100
246.	4-Chloro Benzyl Chloride	Solid	Composite Drums	By Road	100
247.	4-Chloro Phenol	Solid	Composite Drums	By Road	360
248.	4-Chloro-2-Cyano-5-p-Tolylimidazole (CCDTI)	Solid	Composite Drums	By Road	360
249.	4-Chloro-3-Ethyl-1-Methyl Pyrazole-5-yl Carboxylic Acid Chloride	Solid	Composite Drums	By Road	360
250.	4-Chloromandilic Acid	Solid	Composite Drums	By Road	100
251.	4-Chlorophenyl Acetonitrile	Solid	Composite Drums	By Road	100
252.	4-Dimethylaminopyridine (4-DMAP)	Solid	Composite Drums	By Road	360
253.	4-Fluoro Aniline	Liquid	Tanker Load	By Road	100
254.	4-Fluorophenol	Solid	Composite Drums	By Road	100
255.	4-Hydro Quinazoline	Solid	Composite Drums	By Road	100
256.	4-Methyl (-5-oxo -3-Propoxy -1-H -1,2,4-Triazolyl)-Carbonyl	Liquid	Tanker Load	By Road	230

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
	amine				
257.	4-Methyl Phenol	Solid	Composite Drums	By Road	360
258.	4-Methyl-1,2,3-Thiadiazole-5-Carboxylic Acid	Liquid	Tanker Load	By Road	360
259.	4-Nitro Chloro Benzene	Solid	Composite Drums	By Road	100
260.	4-Phenoxy Phenol	Solid	Composite Drums	By Road	100
261.	4-Phenoxychloro Benzene	Liquid	Tanker Load	By Road	360
262.	4-TertiaryButyl Benzyl Amine	Liquid	Tanker Load	By Road	
263.	4-Trifluoromethyl Nicotinic Acid	Solid	Composite Drums	By Road	360
264.	5 % Acetic Acid Solution	Liquid	Tanker Load	By Road	45
265.	5 % Soda Ash Solution	Liquid	Tanker Load	By Road	230
266.	5% Hydrochloric Acid (HCl)	Liquid	Tanker Load	By Road	45
267.	5% Soda Ash Solution	Liquid	Tanker Load	By Road	230
268.	5-(Bromomethyl) Pyrimidine (5-BMP)	Liquid	Tanker Load	By Road	230
269.	50 %Ammonium Thiocyanate	Liquid	Tanker Load	By Road	150
270.	50% Hydrogen Peroxide Solution	Liquid	Tanker Load	By Road	50
271.	5-Chloro 8-Hydroxy Quinoline	Solid	Composite Drums	By Road	360
272.	5-Chloro-2-Nitro Phenol	Solid	Composite Drums	By Road	360
273.	5-Ethoxy-7-Fluoro-[1,2,4]-Triazolo-[1,5-c] Pyrimidine-2-Sulfonyl Chloride	Solid	Composite Drums	By Road	360
274.	5-Fluoro-1,3-Dimethyl-1H-Pyrazole-4-Carboxylic Acid	Liquid	Tanker Load	By Road	100
275.	5-Methoxy-8-Fluoro [1,2,4] Triazolo [1,5c] Pyrimidine -2-Sulfonyl Chloride	Liquid	Tanker Load	By Road	100
276.	5-Methyl-1,3-Oxazolidine-2,4-Dione	Liquid	Tanker Load	By Road	100
277.	5-Propyl 2-Thio Ethyl Cyclohexane 1,3 Dione	Liquid	Tanker Load	By Road	100
278.	60% OPA Solution	Liquid	Tanker Load	By Road	100
279.	6-Chloro Pyridine-2-Carboxylic Acid	Solid	Composite Drums	By Road	360

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
280.	81% MCA	Liquid	Tanker Load	By Road	100
281.	8-10 % Sodium Hypochorite Solution	Liquid	Tanker Load	By Road	360
282.	98% Sulphuric Acid	Liquid	Tanker Load	By Road	230
283.	Acetaldehyde	Liquid	Tanker Load	By Road	100
284.	Acetic Acid	Liquid	Tanker Load	By Road	100
285.	Acetic Anhydride	Liquid	Tanker Load	By Road	100
286.	Acetoacetanilide	Solid	Composite Drums	By Road	360
287.	Acetone	Liquid	Tanker Load	By Road	360
288.	Acetonitrile	Liquid	Tanker Load	By Road	360
289.	Acetyl Chloride	Liquid	Tanker Load	By Road	100
290.	Acetyl Hydrazine	Solid	Composite Drums	By Road	100
291.	Acrinathric Acid	Solid	Composite Drums	By Road	360
292.	Acrolein	Liquid	Tanker Load	By Road	100
293.	Acrylonitrile	Liquid	Tanker Load	By Road	100
294.	Activated Charcoal	Solid	Composite Drums	By Road	100
295.	Alcohol	Liquid	Tanker Load	By Road	360
296.	Allethrelone	Liquid	Tanker Load	By Road	100
297.	Allyl Bromide	liquid	Tanker Load	By Road	360
298.	Allyl Chloride	liquid	Tanker Load	By Road	100
299.	Alpha Naphthol	Solid	Composite Drums	By Road	100
300.	Aluminium Chloride	Solid	Composite Drums	By Road	200
301.	Aluminium Trichloride	Solid	Composite Drums	By Road	200
302.	Amino Acetonitrile Sulphate	Solid	Composite Drums	By Road	100
303.	Amino Benzoic Acid	Solid	Composite Drums	By Road	100
304.	Ammonia Gas	Gas	Cylinder	By Road	100

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
305.	Ammonia Liquor (25 %)	liquid	Tanker Load	By Road	360
306.	Ammonium Thiocyanate	Solid	Composite Drums	By Road	360
307.	Anhydrous Ferric Chloride	Solid	Composite Drums	By Road	360
308.	Aniline	liquid	Tanker Load	By Road	100
309.	a-Picoline (2-Methyl Pyridine)	liquid	Tanker Load	By Road	100
310.	Aqueous Hydrogen Bromide	Gas	Tonner	By Road	360
311.	Atrazine	Solid	Composite Drums	By Road	100
312.	Barium Hydroxide	Solid	Composite Drums	By Road	100
313.	Benzaldehyde	Liquid	Tanker Load	By Road	100
314.	Benzene	Liquid	Tanker Load	By Road	360
315.	Benzene	Liquid	Tanker Load	By Road	360
316.	Benzene	Liquid	Tanker Load	By Road	360
317.	Benzoic Acid, 2-(Amino sulfonyl)-4-Iodo-, Methyl Ester	Liquid	Tanker Load	By Road	100
318.	Benzophenone (Recycle+Fresh)	Solid	Composite Drums	By Road	100
319.	Benzotrifluoride	Liquid	Tanker Load	By Road	360
320.	Benzyl Amine	Liquid	Tanker Load	By Road	360
321.	Benzyl Chloride	Liquid	Tanker Load	By Road	360
322.	Benzyl Cynamide	Liquid	Tanker Load	By Road	100
323.	Benzyl Mercaptan	Liquid	Tanker Load	By Road	360
324.	Benzyl Tri Ethyl Ammonium Chloride (TBAC/ BTEAC))	Solid	Composite Drums	By Road	100
325.	Bisultap	Liquid	Tanker Load	By Road	100
326.	Bromadiolon Ketone	Solid	Composite Drums	By Road	25
327.	Bromine	Liquid	Tanker Load	By Road	25
328.	Bromo Benzene	Liquid	Tanker Load	By Road	25
329.	Bromo Ethoxy Ethane	Liquid	Tanker Load	By Road	25

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
330.	Bromo Pinacolone	Liquid	Tanker Load	By Road	100
331.	Butyl Acetate	Liquid	Tanker Load	By Road	360
332.	Ca(OH)2(lime)	Solid	Composite Drums	By Road	100
333.	Calcium Chloride	Solid	Composite Drums	By Road	100
334.	Carbon	Solid	Composite Drums	By Road	100
335.	Carbon Dioxide	Gas	Cylinder	By Road	360
336.	Carbon Disulphide	Liquid	Tanker Load	By Road	100
337.	Carbon Tetra Chloride (CTC)	Liquid	Tanker Load	By Road	360
338.	Carboxylic Acid	Liquid	Tanker Load	By Road	100
339.	Charcoal	Solid	Composite Drums	By Road	360
340.	Chlorine	gas	Tonner	By Road	360
341.	Chloro Acetic Acid	Solid	Composite Drums	By Road	100
342.	Chloro Acetone	Liquid	Tanker Load	By Road	100
343.	Chloro Acetyl Chloride	Liquid	Tanker Load	By Road	360
344.	Chloro Butoxy Ethyl Acetate	Liquid	Tanker Load	By Road	100
345.	Chloro Cyclo Propane	Liquid	Tanker Load	By Road	100
346.	Chloro Sulphonic Acid	Liquid	Tanker Load	By Road	100
347.	Chloro Trifluoromethyl Pyridine Ethan amine	Solid	Composite Drums	By Road	360
348.	Chloroacetyl Chloride	Liquid	Tanker Load	By Road	25
349.	Chlorobenzene	Liquid	Tanker Load	By Road	30
350.	Chloroform	Liquid	Tanker Load	By Road	35
351.	Chloroform	Liquid	Tanker Load	By Road	35
352.	Chloroform for CCA	Liquid	Tanker Load	By Road	100
353.	Chrysanthemic Acid Chloride	Liquid	Tanker Load	By Road	100
354.	CMAC-Cypermethric Acid Chloride	Liquid	Tanker Load	By Road	100
355.	CMAMP	Solid	Composite	By Road	360

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
			Drums		
356.	Conc. Nitric Acid	Liquid	Tanker Load	By Road	20
357.	Conc. Sulphuric Acid - 98%	Liquid	Tanker Load	By Road	230
358.	Concentrated Hydrochloric Acid	Liquid	Tanker Load	By Road	45
359.	CS2 – Carbon Disulphide	Liquid	Tanker Load	By Road	100
360.	Cyanamide	Liquid	Tanker Load	By Road	360
361.	Cyano 1,2 Dimethyl Propanamide	Liquid	Tanker Load	By Road	100
362.	Cyanuric Chloride	Solid	Composite Drums	By Road	360
363.	Cyclo Pentene 1-Hydroxy	Solid	Composite Drums	By Road	100
364.	Cyclohexane	Liquid	Tanker Load	By Road	100
365.	Cyclohexane 1,3-Dione	Solid	Composite Drums	By Road	360
366.	Cyclohexyl Isocyanate	Liquid	Tanker Load	By Road	100
367.	Cycloprothic Acid	Solid	Composite Drums	By Road	100
368.	Cypermethric Acid	Liquid	Tanker Load	By Road	100
369.	Cypermethric Acid Chloride	Liquid	Tanker Load	By Road	360
370.	DCBC	Solid	Composite Drums	By Road	360
371.	DCTFP	Liquid	Tanker Load	By Road	360
372.	DEA	Liquid	Tanker Load	By Road	100
373.	Decanenitrile	Liquid	Tanker Load	By Road	100
374.	Deformer	Liquid	Tanker Load	By Road	100
375.	DETC	Liquid	Tanker Load	By Road	360
376.	DETCl	Liquid	Tanker Load	By Road	360
377.	Di Isopropyl Amine	Liquid	Tanker Load	By Road	100
378.	Di Isopropyl Malonate	Liquid	Tanker Load	By Road	360
379.	Di Methyl Carbonate	Liquid	Tanker Load	By Road	100

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
380.	Di Methyl Sulphate	Liquid	Tanker Load	By Road	20
381.	Dibromomethane	Liquid	Tanker Load	By Road	25
382.	Dichloro (Chloromethyl) Methyl Silane	Liquid	Tanker Load	By Road	25
383.	Dichloro Acetyl Chloride	Liquid	Tanker Load	By Road	25
384.	Dichloro Difluoromethane	Gas	Tonner	By Road	25
385.	Dichloro Methane	Liquid	Tanker Load	By Road	100
386.	Dichlorodifluoromethane	Gas	Tonner	By Road	360
387.	Dichloroethane	Liquid	Tanker Load	By Road	100
388.	Diethyl Ketone	Liquid	Tanker Load	By Road	100
389.	Diethyl Methyl Phosphonate	Liquid	Tanker Load	By Road	100
390.	Diethyl Oxalate	Liquid	Tanker Load	By Road	360
391.	Diethyl Sulphide	Liquid	Tanker Load	By Road	100
392.	Diethyl Thiophosphoric Acid	Liquid	Tanker Load	By Road	360
393.	Diethyl-5-Ethyl Pyridine Decarboxylate	Liquid	Tanker Load	By Road	100
394.	Diisopropyl Phosphorochloride	Liquid	Tanker Load	By Road	100
395.	Diisopropylethylamine	Liquid	Tanker Load	By Road	100
396.	Dil Hydrochloric Acid	Liquid	Tanker Load	By Road	45
397.	Dilute Caustic	Liquid	Tanker Load	By Road	360
398.	Dilute Caustic Solution	Liquid	Tanker Load	By Road	100
399.	Dilute Hydrochloric Acid	Liquid	Tanker Load	By Road	360
400.	Dilute Nitric Acid	Liquid	Tanker Load	By Road	20
401.	Dilute Sulphuric Acid	Liquid	Tanker Load	By Road	230
402.	Dimethyl Amine	Gas	Cylinder	By Road	20
403.	Dimethyl Amine	Gas	Cylinder	By Road	20
404.	Dimethyl Carbonate	Liquid	Tanker Load	By Road	20
405.	Dimethyl Formamide	Liquid	Tanker Load	By Road	30
406.	Dimethyl Oxalate	Solid	Composite	By Road	20

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
			Drums		
407.	Dimethyl Oxide	Liquid	Tanker Load	By Road	230
408.	Dimethyl Sulfomyl Chloride	Liquid	Tanker Load	By Road	20
409.	Dimethyl Sulfoxide	Liquid	Tanker Load	By Road	20
410.	Dimethyl Sulphate	Liquid	Tanker Load	By Road	20
411.	Dimethyl Sulphate (DMS)	Liquid	Tanker Load	By Road	30
412.	Dimethyl Sulphide	Liquid	Tanker Load	By Road	20
413.	Dimethylsulfamoyl Chloride	Liquid	Tanker Load	By Road	230
414.	Di-n-Propylamine	Liquid	Tanker Load	By Road	20
415.	Dioxane	Liquid	Tanker Load	By Road	20
416.	DIPEA(Recycle Fresh)	Liquid	Tanker Load	By Road	20
417.	Disodium Hydrogen Phosphate	Solid	Composite Drums	By Road	100
418.	Disodium Hydrogen Phosphate	Solid	Composite Drums	By Road	100
419.	DMF	Liquid	Tanker Load	By Road	20
420.	DMF Catalyst	Liquid	Tanker Load	By Road	20
421.	DMSO	Liquid	Tanker Load	By Road	20
422.	DMTC	Liquid	Tanker Load	By Road	100
423.	Dodecyl Amine	Liquid	Tanker Load	By Road	20
424.	EDA	Liquid	Tanker Load	By Road	20
425.	Epoxy Ethane	Gas	Tonner	By Road	20
426.	Ester	Liquid	Tanker Load	By Road	20
427.	Ethanol	Liquid	Tanker Load	By Road	100
428.	Ethion	liquid	Tanker Load	By Road	20
429.	Ethirimol	Solid	Composite Drums	By Road	20
430.	Ethoxy Carbonyl Isothiocyanate	Liquid	Tanker Load	By Road	100
431.	Ethoxy Formyl Chloride	Liquid	Tanker	By Road	20

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
			Load		
432.	Ethyl -2- Chloro Ethyl Carbamate	Liquid	Tanker Load	By Road	100
433.	Ethyl 3-methylpyridine-2-carboxylate	Liquid	Tanker Load	By Road	360
434.	Ethyl Acetate	Liquid	Tanker Load	By Road	28
435.	Ethyl Acrylate	Liquid	Tanker Load	By Road	28
436.	Ethyl Bromide	Liquid	Tanker Load	By Road	28
437.	Ethyl Chloroformate	Liquid	Tanker Load	By Road	20
438.	Ethyl propionate	Liquid	Tanker Load	By Road	100
439.	Ethyl-1-Methyl -5-Sulphanamide Isocyanide- 1-H Pyrazole-4-Carboxylate	Solid	Composite Drums	By Road	360
440.	Ethylene Dichloride	Liquid	Tanker Load	By Road	180
441.	Ethylene Dichloride (EDC)	Liquid	Tanker Load	By Road	180
442.	Ethylene Glycol	Liquid	Tanker Load	By Road	30
443.	Ethylene Oxide	Gas	Tonner	By Road	30
444.	Flumethric Acid	Liquid	Tanker Load	By Road	20
445.	Fluoro Benzene	Liquid	Tanker Load	By Road	20
446.	Formaldehyde	Gas	Tonner	By Road	100
447.	Formic Acid	Liquid	Tanker Load	By Road	30
448.	Glycerol	Liquid	Tanker Load	By Road	20
449.	Glyoxylic Acid methyl Ester Oxime	Liquid	Tanker Load	By Road	360
450.	Glyphosate	Solid	Composite Drums	By Road	360
451.	Guanidine Nitrate	Solid	Composite Drums	By Road	360
452.	Hexane	Liquid	Tanker Load	By Road	30
453.	Hydrazine Carboxaldehyde	Solid	Composite Drums	By Road	100
454.	Hydrazine Hydrate	Liquid	Tanker Load	By Road	25
455.	Hydrobromic gas	Gas	Cylinder	By Road	30
456.	Hydrochloric Acid	Liquid	Tanker Load	By Road	30

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
457.	Hydrochloric Acid	Liquid	Tanker Load	By Road	30
458.	Hydrochloric Acid	Liquid	Tanker Load	By Road	30
459.	Hydrochloric Acid	Liquid	Tanker Load	By Road	30
460.	Hydrochloric Acid	Liquid	Tanker Load	By Road	30
461.	Hydrogen Chloride Gas	Gas	Tonner	By Road	30
462.	Hydrogen Cyanide	Liquid	Tanker Load	By Road	20
463.	Hydrogen Gas	Gas	Cylinder	By Road	20
464.	Hydrogen Peroxide	Liquid	Tanker Load	By Road	100
465.	Hydroquinone	Solid	Composite Drums	By Road	360
466.	Hydroxylamine Hydrochloride	Solid	Composite Drums	By Road	360
467.	Hyflow				
468.	Hypo Chloride	Liquid	Tanker Load	By Road	100
469.	Imidazole	Solid	Composite Drums	By Road	360
470.	Iron Powder	Solid	Composite Drums	By Road	100
471.	Iso Propyl Alcohol	Liquid	Tanker Load	By Road	100
472.	Isopropyl Amine	Liquid	Tanker Load	By Road	360
473.	Isopropyl Bromide	Liquid	Tanker Load	By Road	100
474.	Lambda Acid	Solid	Composite Drums	By Road	360
475.	Lambda Cyhalothric Acid	Solid	Composite Drums	By Road	100
476.	Lambda Cyhalothric Acid Chloride	Solid	Composite Drums	By Road	100
477.	Liquid Ammonia	Liquid	Tanker Load	By Road	360
478.	Liquid Bromine	Liquid	Tanker Load	By Road	300
479.	M, N, O (2,3-Dimethylal-Nitrosourea	Solid	Composite Drums	By Road	360
480.	Magnesium Ethoxide	Solid	Composite Drums	By Road	100
481.	Magnesium Metal	Chips	Pallets	By Road	360
482.	MCB Solvent	Liquid	Tanker Load	By Road	100
483.	MDC	Liquid	Tanker	By Road	100

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
			Load		
484.	Meta Aminophenol	Solid	Composite Drums	By Road	360
485.	Meta Dichloro Benzene	Liquid	Tanker Load	By Road	300
486.	Meta Phenoxy Benzaldehyde	Liquid	Tanker Load	By Road	360
487.	Meta Tolyl Isocyanate	Liquid	Tanker Load	By Road	360
488.	Meta-Dichlorobenzene	Liquid	Tanker Load	By Road	100
489.	Methacrylic Acid	Liquid	Tanker Load	By Road	360
490.	Methane Sulfonic Acid	Liquid	Tanker Load	By Road	360
491.	Methane Sulfonyl Chloride	Liquid	Tanker Load	By Road	360
492.	Methanol	Liquid	Tanker Load	By Road	100
493.	Methanolic Hydrochloric Acid	Liquid	Tanker Load	By Road	100
494.	Methomyl	Solid	Composite Drums	By Road	360
495.	Methoxy Amine	Liquid	Tanker Load	By Road	100
496.	Methyl (2-Sulfonylchloride) Benzoate	Solid	Composite Drums	By Road	100
497.	Methyl 5- Methyl - 4 - Sulfomoylthiophene-3-Carboxylate	Liquid	Tanker Load	By Road	360
498.	Methyl Alpha-2,4, Dichloro Phenyl Beta Hydroxy Propanoate	Liquid	Tanker Load	By Road	100
499.	Methyl Amine	Gas	Cylinder	By Road	100
500.	Methyl Bromide	Gas	Cylinder	By Road	100
501.	Methyl Chloride	Gas	Cylinder	By Road	100
502.	Methyl Chloro Formate	liquid	Tanker Load	By Road	360
503.	Methyl Ethyl ketone	liquid	Tanker Load	By Road	100
504.	Methyl Formate	liquid	Tanker Load	By Road	100
505.	Methyl Isobutyl Ketone	Liquid	Tanker Load	By Road	100
506.	Methyl lactate	Liquid	Tanker Load	By Road	360
507.	Methyl Pentanoate	Liquid	Tanker Load	By Road	100
508.	Methyl Triophenyl Phosphorane	Solid	Composite	By Road	100

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
			Drums		
509.	Methyl-2- {[Isocyanate Sulfamoyl] Methyl} Benzoate	Solid	Composite Drums	By Road	100
510.	Methyl-2-(Sulfamoyl) -4-(Methanesulfonamido Methyl) Benzoate / methyl 4-(methylsulfonamidomethyl)-2-sulfamoylbenzoate	Solid	Composite Drums	By Road	360
511.	Methyl-2-Amino-3-Chloro Benzoate	Solid	Composite Drums	By Road	360
512.	Methyl-3,3,-Dimethyl-2-Oxo-Cyclopentane Carboxylate	Liquid	Tanker Load	By Road	100
513.	Methyl-7-Chloro-2,5-Dihydroindeno[1,2-e]Oxadiazine-4a(3H-Carboxylate)	Liquid	Tanker Load	By Road	100
514.	Methylene Bromide	Liquid	Tanker Load	By Road	35
515.	Methylene Dibromide	Liquid	Tanker Load	By Road	35
516.	MIBK-Solvent	Liquid	Tanker Load	By Road	20
517.	Mono Chloro Acetic Acid	Solid	Composite Drums	By Road	100
518.	Mono Chloro Acetic Acid	Solid	Composite Drums	By Road	100
519.	Mono Chlorobenzene	Liquid	Tanker Load	By Road	300
520.	Mono Ethyl Amine	Gas	Cylinder	By Road	100
521.	Mono Ethylene Glycol (MEG)	Liquid	Tanker Load	By Road	100
522.	Monochloro Acetic Acid	Solid	Composite Drums	By Road	100
523.	Monochloro Acetic Acid	Solid	Composite Drums	By Road	360
524.	Monochloro Benzene	Liquid	Tanker Load	By Road	100
525.	MPBAD	Liquid	Tanker Load	By Road	100
526.	MPBR - Meta Phenoxy Benzyl Bromide	Liquid	Tanker Load	By Road	100
527.	Mucochloric Acid	Solid	Composite Drums	By Road	360
528.	N - Methoxy Carbamate	Liquid	Tanker Load	By Road	25
529.	N- Bromo Succinimide	Solid	Composite Drums	By Road	100
530.	N -Methyl Nitro Guanidine	Solid	Composite Drums	By Road	100

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
531.	N- Nitro N- Methyl Imidazolidine	Solid	Composite Drums	By Road	360
532.	N-(2-Chloro-1-Methoxyethyl)-2,6-Difluorobenzamide			By Road	
533.	N-(2-Methylphenyl) N-Hydroxy Carbamate	Solid	Composite Drums	By Road	360
534.	N-(4-Fluorophenyl)-2-Hydroxy-N-Isopropylacetamide	Solid	Composite Drums	By Road	100
535.	N-(6-Methyl-3-oxo-2, 5-Dihydro-3H [1, 2, 4] triazin-4-yl)-Acetamide	Solid	Composite Drums	By Road	100
536.	N, N-Dimethyl aniline (DMA)	Liquid	Tanker Load	By Road	360
537.	N,N-Dimethyl Formamide	Liquid	Tanker Load	By Road	
538.	Na -TCP	Solid	Composite Drums	By Road	100
539.	N-Bromo Succinimide	Solid	Composite Drums	By Road	100
540.	n-Butyl Bromide	Liquid	Tanker Load	By Road	360
541.	N-Butyl Isocyanate	Liquid	Tanker Load	By Road	150
542.	N-Chloro Methyl Chloro Carbonyl Aniline (CCA)	Liquid	Tanker Load	By Road	100
543.	N-Cyanomethyl – Acetamidate (NCMA)	Solid	Composite Drums	By Road	230
544.	n-Hexane	Liquid	Tanker Load	By Road	150
545.	Nitric Acid	Liquid	Tanker Load	By Road	100
546.	Nitrosyl Sulphuric Acid (40 %)	Liquid	Tanker Load	By Road	230
547.	n-Methyl (Chlorocarbonyl)[4-Trifluoromethoxy Phenyl]Carbamate	6	Tanker Load	By Road	100
548.	N-Methyl Pyrrolidine	Liquid	Tanker Load	By Road	100
549.	N-Methyl-2-Pyrrolidone (NMP)	Liquid	Tanker Load	By Road	100
550.	n-Propylamine	Liquid	Tanker Load	By Road	100
551.	O, O-Dimethyl Phosphoramidothioate	Solid	Composite Drums	By Road	360
552.	O, O-Dimethyl S-[Methylaceto] Dithiophosphate	Liquid	Tanker Load	By Road	360
553.	O, O-Dimethyl Thio Phosphoric Acid	Liquid	Tanker Load	By Road	180
554.	O−Chloro Benzyl chloride	Liquid	Tanker	By Road	360

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
			Load		
555.	O-Cresol	Solid	Composite Drums	By Road	230
556.	Oleum	Liquid	Tanker Load	By Road	150
557.	OPDA	Solid	Composite Drums	By Road	100
558.	Ortho Chloro Phenol	Liquid	Tanker Load	By Road	230
559.	Ortho Cresol	Solid	Composite Drums	By Road	360
560.	Ortho Cyano Phenol	Solid	Composite Drums	By Road	360
561.	Ortho Dichloro Benzene	Liquid	Tanker Load	By Road	230
562.	Ortho Nitro Chloro Benzene	Liquid	Tanker Load	By Road	150
563.	Ortho Nitro phenol	Solid	Composite Drums	By Road	100
564.	Ortho Phosphoric Acid	Solid or Liquid	Composite Drums /Tanker Load	By Road	230
565.	Ortho Toluidine	Liquid	Tanker Load	By Road	360
566.	Ortho-Carboxy Methyl Phenyl Isocyanate	Liquid	Tanker Load	By Road	360
567.	Ortho-Chloro Phenol	Liquid	Tanker Load	By Road	20
568.	Ortho-Dichlorobenzene	Liquid	Tanker Load	By Road	20
569.	Ortho-Xylene	Liquid	Tanker Load	By Road	30
570.	Orto/Meta/Para Di Nitro Benzene	Solid	Composite Drums	By Road	30
571.	Oxadiazepane Compound	Solid	Composite Drums	By Road	360
572.	Oxadiazon	Solid	Composite Drums	By Road	360
573.	Oxalic Acid	Solid	Composite Drums	By Road	360
574.	Oxygen Gas	Gas	Cylinder	By Road	20
575.	O-Xylene	Liquid	Tanker Load	By Road	20
576.	Para Chloro Benzyl Chloride	Solid or Liquid	Composite Drums /Tanker Load	By Road	30
577.	Para Chloro Phenol	Solid	Composite	By Road	30

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
			Drums		
578.	Para Chloro Toluene	Liquid	Tanker Load	By Road	360
579.	Para Fluoro Aniline	Liquid	Tanker Load	By Road	360
580.	Para Formaldehyde	Solid	Composite Drums	By Road	360
581.	Para Formaldehyde	Solid	Composite Drums	By Road	20
582.	Para Formaldehyde (PFA)	Solid	Composite Drums	By Road	20
583.	Para-Cumidine	Liquid	Tanker Load	By Road	30
584.	Para-Fluorophenyllithium				30
585.	Para-Tertio Butyl Benzyl Mercaptan	Liquid	Tanker Load	By Road	360
586.	Para-Tertio Butyl Hydrazine	Solid	Composite Drums	By Road	360
587.	P-Chloro Phenol Sodium salt	Solid	Composite Drums	By Road	360
588.	Pentanoyl Chloride	Liquid	Tanker Load	By Road	20
589.	Phenol	Solid	Composite Drums	By Road	20
590.	Phenyl Acetyl Chloride	Liquid	Tanker Load	By Road	30
591.	Phenyl Bromo Ethyl Acetate	Liquid	Tanker Load	By Road	30
592.	Phenyl Chloroformate	Liquid	Tanker Load	By Road	360
593.	Phenyl Hydrazine	Liquid	Tanker Load	By Road	100
594.	Phenyl Iso Cyanate	Liquid	Tanker Load	By Road	100
595.	Phenylpropan-2-Amine	Liquid	Tanker Load	By Road	100
596.	Phosgene	Gas	Cylinder	By Road	100
597.	Phosphorus Acid	Solid	Composite Drums	By Road	100
598.	Phosphorus Oxy Chloride	Liquid	Tanker Load	By Road	100
599.	Phosphorus Pentasulfide	Liquid	Tanker Load	By Road	150
600.	Phosphorus Trichloride	Liquid	Tanker Load	By Road	360
601.	Pinacoline	Liquid	Tanker Load	By Road	100
602.	Phthalide	Solid	Composite Drums	By Road	360

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
603.	Pinacoline	Liquid	Tanker Load	By Road	100
604.	Piperidine	Liquid	Tanker Load	By Road	100
605.	Pivaloyl Chloride	Liquid	Tanker Load	By Road	100
606.	Potassium Carbonate	Solid	Composite Drums	By Road	375
607.	Potassium Cyanide	Solid	Composite Drums	By Road	20
608.	Potassium Fluoride	Solid	Composite Drums	By Road	30
609.	Potassium Hydroxide	Solid	Composite Drums	By Road	230
610.	Potassium Tertiary Butoxide	Solid	Composite Drums	By Road	20
611.	Potassium Thiocyanate Salt	Solid	Composite Drums	By Road	30
612.	Propanaldehyde	Liquid	Tanker Load	By Road	20
613.	Propargyl Alcohol	Liquid	Tanker Load	By Road	30
614.	Propargyl Chloride	Liquid	Tanker Load	By Road	20
615.	Propionic Acid	Liquid	Tanker Load	By Road	25
616.	Propionic Chloride	Liquid	Tanker Load	By Road	26
617.	Propionyl Chloride	Liquid	Tanker Load	By Road	30
618.	Propyl Bromide	Liquid	Tanker Load	By Road	20
619.	Propylene Glycol	Liquid	Tanker Load	By Road	25
620.	PTSA	Solid	Composite Drums	By Road	26
621.	PTSS	Solid	Composite Drums	By Road	30
622.	P-Xylene	Liquid	Tanker Load	By Road	20
623.	Pyridine	Liquid	Tanker Load	By Road	20
624.	Sodium [1- {(3- Trifluoro Methyl) Phenyl} Ethylidene Amino] Oxidanide			By Road	360
625.	Sodium Bi Carbonate	Solid	Composite Drums	By Road	230
626.	Sodium Bisulphite	Solid	Composite Drums	By Road	20

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
627.	Sodium borohydride	Solid	Composite Drums	By Road	30
628.	Sodium Carbonate	Solid	Composite Drums	By Road	230
629.	Sodium Cyanate	Solid	Composite Drums	By Road	100
630.	Sodium Cyanide	Solid	Composite Drums	By Road	360
631.	Sodium Cyanide	Solid	Composite Drums	By Road	360
632.	Sodium Ethoxide	Solid	Composite Drums	By Road	20
633.	Sodium Hydride	Solid	Composite Drums	By Road	30
634.	Sodium- Metal	Solid	Composite Drums	By Road	230
635.	Sodium Methoxide	Liquid	Tanker Load	By Road	20
636.	Sodium Nitrite	Solid	Composite Drums	By Road	30
637.	Sodium Permanganate	Solid	Composite Drums	By Road	230
638.	Sodium Sulphate	Solid	Composite Drums	By Road	20
639.	Solent Toluene	Liquid	Tanker Load	By Road	30
640.	Solvent – 1, 2 - Dichlorobenzene	Liquid	Tanker Load	By Road	230
641.	Solvent - Acetonitrile	Liquid	Tanker Load	By Road	20
642.	Solvent - Benzene	Liquid	Tanker Load	By Road	360
643.	Solvent – Butyl Alcohol	Liquid	Tanker Load	By Road	20
644.	Solvent – Chloro Benzene	Liquid	Tanker Load	By Road	25
645.	Solvent – Di Methyl Formamide	Liquid	Tanker Load	By Road	20
646.	Solvent – Dimethyl Sulfoxide	Liquid	Tanker Load	By Road	20
647.	Solvent - DMA	Liquid	Tanker Load	By Road	360
648.	Solvent - DMF	Liquid	Tanker Load	By Road	20
649.	Solvent - EDC	Liquid	Tanker Load	By Road	180
650.	Solvent - Ethanol	Liquid	Tanker Load	By Road	360
651.	Solvent - Ethyl Acetate	Liquid	Tanker	By Road	20

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
			Load		
652.	Solvent - Ethyl Acetate	Liquid	Tanker Load	By Road	20
653.	Solvent – Ethylene Dichloride	Liquid	Tanker Load	By Road	180
654.	Solvent - Hexane	Liquid	Tanker Load	By Road	180
655.	Solvent - MCB	Liquid	Tanker Load	By Road	25
656.	Solvent – MDC	Liquid	Tanker Load	By Road	360
657.	Solvent - Methanol	Liquid	Tanker Load	By Road	360
658.	Solvent - Methyl Isobutyl Ketone	Liquid	Tanker Load	By Road	100
659.	Solvent - Methylene Dichloride (MDC)	Liquid	Tanker Load	By Road	360
660.	Solvent – MIBK	Liquid	Tanker Load	By Road	100
661.	Solvent – Mono Chloro Benzene	Liquid	Tanker Load	By Road	25
662.	Solvent – n- Hexane	Liquid	Tanker Load	By Road	180
663.	Solvent - N-Butanol	Liquid	Tanker Load	By Road	100
664.	Solvent – n-Heptane	Liquid	Tanker Load	By Road	360
665.	Solvent - Tert-Butyl Methyl Ether (MTBE)	Liquid	Tanker Load	By Road	100
666.	Solvent - Tetrahydrofuran (THF)	Liquid	Tanker Load	By Road	375
667.	Solvent - Toluene	Liquid	Tanker Load	By Road	150
668.	Solvent - Xylene	Liquid	Tanker Load	By Road	375
669.	Solvent -2 Hydroxylamine	Solid	Composite Drums	By Road	360
670.	Solvent 3-Methanol	Liquid	Tanker Load	By Road	360
671.	Solvent -Acetonitrile	Liquid	Tanker Load	By Road	30
672.	Solvent -Di Methyl Formamide (DMF)	Liquid	Tanker Load	By Road	20
673.	Solvent -Di methyl Sulfoxide (DMSO)	Liquid	Tanker Load	By Road	20
674.	Solvent -Dichloroethane	Liquid	Tanker Load	By Road	180
675.	Solvent Ethylene Di Chloride (EDC)	Liquid	Tanker Load	By Road	180

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
676.	Solvent-1 Ortho Xylene	Liquid	Tanker Load	By Road	100
677.	Solvent-1 Toluene	Liquid	Tanker Load	By Road	150
678.	Solvent–Dimethyl Formamide	Liquid	Tanker Load	By Road	20
679.	Solvent-DMF	Liquid	Tanker Load	By Road	20
680.	Solvent-MDC	Liquid	Tanker Load	By Road	360
681.	Solvent-Methanol	Liquid	Tanker Load	By Road	360
682.	Solvent-Methyl Ethyl Ketone (MEK)	Liquid	Tanker Load	By Road	100
683.	Solvent-Toluene	Liquid	Tanker Load	By Road	150
684.	Sulfilimine (S, S-Bis(1-Methylethyl)-N-[(4-Methylphenyl) Sulfonyl]-)	Liquid	Tanker Load	By Road	100
685.	Sulfonyl Chloride	Liquid	Tanker Load	By Road	100
686.	TBAB	Solid	Composite Drums	By Road	100
687.	t-Butyl Iso Thiocyanate Amino Iso Propionate	Liquid	Tanker Load	By Road	360
688.	TEA	Liquid	Tanker Load	By Road	100
689.	Tert-Butyl Alcohol	Liquid	Tanker Load	By Road	100
690.	Tert-Butyl Amine	Liquid	Tanker Load	By Road	360
691.	Tert-Butyl phenyl Ethanol	Solid	Composite Drums	By Road	20
692.	Tert-Butyl-4- (Bromomethyl) Benzoate (TBB)	Liquid	Tanker Load	By Road	360
693.	Tertiary Butyl Alcohol - TBA	Liquid	Tanker Load	By Road	100
694.	Tertiary Butyl Nitrate	Liquid	Tanker Load	By Road	100
695.	Tetra Hydro Furan-2-Yl) Methanol	Liquid	Tanker Load	By Road	25
696.	TetrachloroIsophthalate	Solid	Composite Drums	By Road	20
697.	Tetrafluoro Ethane	gas	Cylinder	By Road	20
698.	Tetrahydro Furfuryl Methanol	Liquid	Tanker Load	By Road	30
699.	Tetrahydrofuran	Liquid	Tanker Load	By Road	20
700.	Tetrahydrophthalic	Solid	Composite	By Road	360

S. No.	Substance	Physical State	Type of packing	Means of Transportation	Distance of supplier from project site (km)
			Drums		
701.	TFMB Amide (2-(Trifluoromethyl) Benzamide)	Solid	Composite Drums	By Road	360
702.	ThiazolidimylideneCynamide	Solid	Composite Drums	By Road	20
703.	Thiolactic Acid	Liquid	Tanker Load	By Road	30
704.	Thionyl Chloride	Liquid	Tanker Load	By Road	300
705.	TMCP Acid (2,2,3,3Tetra Methyl Cyclopropane Carboxylic Acid Chloride	Solid	Composite Drums	By Road	360
706.	Trehalose Dihydrate	Solid	Composite Drums	By Road	100
707.	Tretol - 2,2 Dimethyl 2- (4-Ethoxy Phenyl) Ethanol/2-(4-Ethoxy phenyl) 2- Methyl 1-Propanol	Solid	Composite Drums	By Road	360
708.	Tri Chloro Tri Fluoro Ethane	Liquid	Tanker Load	By Road	100
709.	Tri Ethyl Amine	Liquid	Tanker Load	By Road	360
710.	Triadimefon	Solid	Composite Drums	By Road	100
711.	Trichloro Phenoxy Nitro aniline	Solid	Composite Drums	By Road	360
712.	Trichloromethyl Chloroformate	Liquid	Tanker Load	By Road	100
713.	Triethylene Diamine	Solid	Composite Drums	By Road	100
714.	Trimethyl Aluminium (TMA)	Liquid	Tanker Load	By Road	100
715.	Trizolopyrimidine Amine/ 5,8 Dimethoxy -[1,2,4] Triazolo{1,5c) pyrimidine -2 Amine	Solid	Composite Drums	By Road	360
716.	Valeryl Chloride	Liquid	Tanker Load	By Road	100
717.	Validoxylamine-A				
718.	Xylene	Liquid	Tanker Load	By Road	100

DETAILS ON STORAGE & HANDLING OF HAZARDOUS CHEMICALS

Sr. No.	Name of the Raw Material	Quantity stored, MT/Month		BP ^{0}C	MP ^{0}C	Vapour pressure	Place of its Storage	State operating pressure & temp.	Possible type of hazards	Safety measures to be provided
		Required	Actual							
1.	1,4 Di Hydroxy Anthra Quinone	10	2.0	450	191 - 193	1 mmHg @ 197 ^{0}C	Bag	Solid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
2.	2,2′-((5-Acetamido-2-ethoxyphenyl) imino) diethyl diacetate	14.35	2.0	536.3 ± 50.0	NA	NA	Bag	Solid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
3.	2 Cyno Pera Nitro Aniline	19.0	3.0	NA	205	NA	Bag	Solid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
4.	2 Ethyl pyridine	12.75	2.0	149	-63	38	Bag	Solid, ambient temperature	Flammable, irritant	Use PPE as required. Ensure adequate ventilation. Avoid breathing dust.
5.	2,2 ethanol 3 methyl Phenyl	14.15	2.0	243	NA	NA	Drum	Liquid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
6.	2,6,Dichloro 5 Pyrazole	11.25	2.0	NA	NA	NA	Bag	Solid, ambient temperature	Irritant, Toxic	Use PPE as required. Ensure adequate ventilation.
7.	3 Ethyl Amino Propanenitrile	6.75	1.0	190	NA	NA	Drum	Liquid, ambient temperature	Toxic	
8.	3 Acetamide N ethyl Amino Phenyl	23.45	5.0	NA	NA	NA	Drum	Liquid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
9.	3-Diethylamino phenol	20.19	3.0	170	70 – 73	NA	Bag	Solid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
10.	3-Propanoyl amino-N,N-bis (2-acetoxyethyl) benzenamine	13.6	2.0	NA	NA	NA	Drum	Liquid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation. Avoid breathing dust.
11.	4 Chloro 2 Amino Phenol	8.25	1.0	185.5	136 - 141	NA	Drum	Liquid, ambient temperature	Irritant	Use PPE as required. Ensure adequate ventilation.

12.	4-Methyl amino Benzadehyde	20.75	3.0	177	70 – 75	NA	Drum	Liquid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
13.	5,6,7 Tri Chloro Benzo Thiazol	9.0	2.0	411.9 ± 55.0	NA	NA	Drum	Liquid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
14.	6 Bromo 2 Cyno Pera Nitro Aniline	10.0	2.0	NA	178	NA	Bag	Solid, ambient temperature	Irritant	Use PPE as required. Ensure adequate ventilation.
15.	6 Chloro 2-4 Dinitro aniline	9.25	2.0	NA	159	NA	Bag	Solid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
16.	Acetic Acid	391.5	25.0	118	16.2	15.2 hPa (11.4 mmHg) at 20 ^oC	Storage Tank	Liquid, ambient temperature	Flammable liquid	Use PPE as required. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.
17.	Acetonitrile	125.0	10.0	82	-46	94.61 hPa at 20 ^oC	Drum	Liquid , ambient temperature	Flammable liquid, Health hazards	Use PPE as required. Ensure adequate ventilation. Avoid contact with skin. Keep container tightly closed.
18.	Activated carbon	0.462	0.10	Decom poses	3652	1 mm Hg	Bag	Solid, ambient temperature	Flammable, irritant	Use PPE as required. Ensure adequate ventilation. Avoid breathing dust & wash skin thoroughly after handling.
19.	Aluminium sulfate	4.63	0.50	NA	NA	NA	Bag	Solid, ambient temperature	Corrosive, irritant	Use PPE as required. Ensure adequate ventilation. Wash skin thoroughly after handling.
20.	Amines of acitiles Sulphonile Chloride	13.45	2.0	NA	148	NA	Bag	Solid, ambient temperature	Corrosive	Use PPE as required. Ensure adequate ventilation. Avoid dust formation & breathing dust.
21.	Ammonia	21.0	2.0	36	-72	115	Drum	Liquid, ambient temperature	Corrosive, irritant	Use PPE as required. Ensure adequate ventilation. Use respiratory protective device against the effect of fumes. Keep away from ignition source. Protect from heat.
22.	Ammonium Chloride	9.0	1.0	520	328	1 mmHg	Bag	Solid, ambient temperature	Irritant	Use PPE as required. Ensure adequate ventilation.

23.	Benzaldehyde	27.0	5.0	178	-56	1 mmHg	Drum	Liquid, ambient temperature	Irritant, Combustible liquid, Health hazards	Use PPE as required. Ensure adequate ventilation.
24.	Butyl Cyno Pyridone	13.15	3.0	342.8 ± 42.0	NA	NA	Drum	Liquid, ambient temperature	Irritant	Use PPE as required. Ensure adequate ventilation.
25.	Catalyst	0.20	0.05	-	-	-	Bag	Solid, ambient temperature	Irritant	Use PPE as required. Ensure adequate ventilation.
26.	Caustic lye	593.55	30.0	1388	323	NA	Storage Tank	Liquid, ambient temperature	Corrosive, irritant	Use PPE as required. Ensure adequate ventilation.
27.	Caustic soda	111.67	10.0	1388	323	NA	Bag	Solid, ambient temperature	Corrosive, irritant	Use PPE as required. Ensure adequate ventilation.
28.	Copper Cyanide	14.25	3.0	NA	474	NA	Bag	Solid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation. Avoid breathing dust.
29.	Copper Sulfate	0.93	0.10	NA	NA	NA	Bag	Solid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation. Avoid breathing dust.
30.	Di Bromo Pera Nitro Aniline	43.0	5.0	NA	128 - 130	NA	Bag	Solid, ambient temperature	Irritant, Toxic	Use PPE as required. Ensure adequate ventilation. Avoid breathing dust.
31.	Di Bromo pera Toluidine	28.1	3.0	283.3 ± 35.0	74 - 76	0.0±0.6 mmHg at 25 °C	Bag	Solid, ambient temperature	Irritant	Use PPE as required. Ensure adequate ventilation.
32.	Di Chloro Methane	187.5	10.0	39	-97	350 mbar @ 20°C	Drum	Liquid, ambient temperature	Irritant, Toxic	Use PPE as required. Ensure adequate ventilation.
33.	Di Chloro Para Nitro Aniline	22.5	5.0	NA	190 - 192	NA	Bag	Solid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation. Avoid breathing dust.
34.	Diethylamino benzaldehyde	41.5	5.0	174	37 - 41	NA	Bag	Solid, ambient temperature	Irritant, Toxic	Use PPE as required. Ensure adequate ventilation. Avoid breathing dust.
35.	Di Methyl Aniline	16.875	3.0	214	10 - 12	0.1	Drum	Liquid, ambient temperature	Harmful, irritant	Use PPE as required. Ensure adequate ventilation.
36.	Di Methyl	198.46	15.0	153	-61	0.3 kPa	Storage	Liquid, ambient	Flammable	Use PPE as required. Ensure

	Formamide					(@ 20°C)	Tank	temperature		adequate ventilation. Provision of Emergency eye wash fountains and safety shower near storage area
37.	Di methyl sulphate	2.63	0.50	188	-32	1.03 mbar @ 20 °C	Drum	Liquid, ambient temperature	Flammable, corrosive, acute toxicity, health hazard	Use PPE as required. Ensure adequate ventilation. Provision of Emergency eye wash fountains and safety shower near storage area
38.	Dimethyl amine	21.76	3.0	NA	NA	1.17 hPa at 55 ^{o}C	Drum	Liquid, ambient temperature	Flammable	Use PPE as required. Ensure adequate ventilation. Provision of Emergency eye wash fountains and safety shower near storage area
39.	Ethyl Cyano Acetate	7.0	1.0	208 – 210	-22	1.3 hPag @ 68 °C	Bag	Solid, ambient temperature	Irritant	Use PPE as required. Ensure adequate ventilation.
40.	Fischer Base	16.75	2.0	NA	NA	NA	Drum	Liquid, ambient temperature	Flammable, Toxic	Use PPE as required. Ensure adequate ventilation.
41.	Formaldehyde	8.0	1.0	101	0	NA	Drum	Liquid, ambient temperature	Flammable, Toxic	Use PPE as required. Ensure adequate ventilation.
42.	Formic Acid 80%	7.25	1.0	101	8	44 mbar @ 20 ^{o}C	Drum	Liquid, ambient temperature	Flammable, Toxic	Use PPE as required. Ensure adequate ventilation.
43.	HCl	631.92	30.0	83	-46.2	16 kPa @ 20 ^{o}C	Storage Tank	Liquid, ambient temperature	Corrosive, Irritant	Use PPE as required. Ensure adequate ventilation. Provision of Emergency eye wash fountains and safety shower near storage area.
44.	Iron powder	21.76	5.0	275	1535	1 mmHg	Bag	Solid, ambient temperature	Flammable	Use PPE as required. Ensure adequate ventilation.
45.	Methyl Iodide	27.5	5.0	42.5	-66	NA	Drum	Liquid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
46.	Methyl isopropyl ketone	44.25	5.0	94 - 95	NA	70 hPa @ 25 ^{o}C	Drum	Liquid, ambient temperature	Flammable, Toxic	Use PPE as required. Ensure adequate ventilation. Provision of Emergency eye wash fountains and safety shower near storage area.

47.	Mono ethanol Amine	9.45	2.0	170	NA	0.2 mmHg @ 20 °C	Drum	Liquid, ambient temperature	Corrosive	Use PPE as required. Ensure adequate ventilation.
48.	N ethyl N cyano ethyl Aniline	11.3	2.0	176	NA	NA	Drum	Liquid, ambient temperature	Irritant	Use PPE as required. Ensure adequate ventilation.
49.	N hydroxy ethyl n ethyl M chloro aniline	19.55	2.0	397.4	84 – 86	NA	Bag	Solid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
50.	N,N-Bis 2-cynoethyl benzenamine	14.2	2.0	326.78	81 - 84	NA	Drum	Liquid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
51.	N.N Diethyl Meta Toluidine	9.25	1.0	232	NA	NA	Drum	Liquid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
52.	N.N. Diethyl Meta Amino methyl Sulphonil (D-34(B))	14.0	2.0	NA	NA	NA	Drum	Liquid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
53.	Nitro Benzene	5.2	1.0	88 - 211	5 - 6	< 1 mmHg @ 20 °C	Drum	Liquid, ambient temperature	Combustible liquid	Use PPE as required. Ensure adequate ventilation.
54.	Nitrosyl sulphuric Acid	52.25	5.0	NA	-10	NA	Drum	Liquid, ambient temperature	Corrosive, irritant	Use PPE as required. Ensure adequate ventilation.
55.	N-N Di Ethyl m-Amino Acetanilide	51.5	5.0	NA	81 - 84	NA	Drum	Liquid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
56.	Oxalic acid	16.58	2.0	> 100	NA	NA	Bag	Solid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
57.	P-Anisidine	3.63	0.50	240 – 243	56 – 59	NA	Bag	Solid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
58.	Pera Amino Acetanilide	10.5	1.0	267	159 - 165	NA	Bag	Solid, ambient temperature	Irritant	Use PPE as required. Ensure adequate ventilation.
59.	Pera Cresol	7.6	1.0	202.2	35	1 mmHg at 53 °C	Bag	Solid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation. Avoid breathing dust.
60.	Pera Nitro Aniline	39.5	3.0	260	146 – 149	0,005 hPa at 25 °C	Bag	Solid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation. Avoid breathing dust.

61.	Phenyl Hydrazine	37.5	3.0	238 – 241	18 – 21	1,35 hPa at 60 °C	Drum	Liquid, ambient temperature	Toxic & irritant	Use PPE as required. Ensure adequate ventilation.
62.	Phosphoryl Chloride	51.78	5.0	105.5	1.18	37 hPa at 20 °C	Drum	Liquid, ambient temperature	Toxic, Corrosive	Use PPE as required. Ensure adequate ventilation.
63.	Phthalic anhydride	24.52	2.0	295	131	NA	Bag	Solid, ambient temperature	Toxic & irritant	Use PPE as required. Ensure adequate ventilation. Provision of Emergency eye wash fountains and safety shower near storage area.
64.	Piperidine	0.95	0.10	106	-13	40 mmHg	Drum	Liquid, ambient temperature	Flammable	Use PPE as required. Ensure adequate ventilation.
65.	Propionitrile	16.65	2.0	97	-93	NA	Drum	Liquid, ambient temperature	Flammable, Toxic	Use PPE as required. Ensure adequate ventilation.
66.	Soda ash	225.0	25.0	NA	851	NA	Bag	Solid, ambient temperature	Irritant	Use PPE as required. Ensure adequate ventilation.
67.	Sodium Acetate	75.9	8.0	NA	324	NA	Bag	Solid, ambient temperature	Irritant	Use PPE as required. Ensure adequate ventilation.
68.	Sodium Chloride	18.33	2.0	1461	801	1 mmHg	Bag	Solid, ambient temperature	Irritant	Use PPE as required. Ensure adequate ventilation.
69.	Sodium cyanide	11.25	2.0	1.50 °C at 1013 hPa	563,7	1 hPa at 817 °C	Bag	Solid, ambient temperature	Toxic	Use PPE as required. Ensure adequate ventilation.
70.	Sodium Dichromate	37.04	2.0	400	357	NA	Bag	Solid, ambient temperature	Toxic, Irritant	Use PPE as required. Ensure adequate ventilation. Avoid breathing dust.
71.	Sodium Nitrate	66.2	5.0	380	306	< 0.0001 hPa at 25 °C	Bag	Solid, ambient temperature	Toxic, irritant	Use PPE as required. Ensure adequate ventilation. Avoid breathing dust.
72.	Sodium Nitrite	48.46	5.0	320	271	NA	Bag	Solid, ambient temperature	Toxic, irritant	Use PPE as required. Ensure adequate ventilation. Avoid breathing dust.
73.	Sodium Thiosulfate	2.78	0.50	100	45	NA	Bag	Solid, ambient temperature	Irritant	Use PPE as required. Ensure adequate ventilation. Avoid breathing dust.

74.	Sulphur	191.2	20.0	445	112 - 120	NA	Bag	Solid, ambient temperature	Irritant	Use PPE as required. Ensure adequate ventilation. Avoid breathing dust.
75.	Sulphuric acid	420.17	30.0	290 - 338	10	< 0.001 mm Hg @ 20 °C	Storage Tank	Liquid, ambient temperature	Corrosive & irritant	Use PPE as required. Ensure adequate ventilation. Provision of Emergency eye wash fountains and safety shower near storage area.
76.	Tri Ethyl Amine/methano l	26.25	3.0	90	-115	69 mbar @ 20 °C	Drum	Liquid, ambient temperature	Flammable, Toxic, corrosive, irritant	Use PPE as required. Ensure adequate ventilation. Provision of Emergency eye wash fountains and safety shower near storage area.
77.	Tri methyl Iodole	25.0	3.0	229	NA	NA	Drum	Liquid, ambient temperature	Irritant	Use PPE as required. Ensure adequate ventilation.
78.	Xylol	18.0	2.0	138	-48	0.93 kPa	Drum	Liquid, ambient temperature	Flammable, toxic	Use PPE as required. Ensure adequate ventilation. Provision of Emergency eye wash fountains and safety shower near storage area.
79.	Zinc Chloride salt	4.17	0.50	732	293	1.3 mbar @ 428 deg C	Bag	Solid, ambient temperature	Toxic, irritant	Use PPE as required. Ensure adequate ventilation.

1.8.7 Resource optimization/ recycling and reuse envisaged in the project, if any, should briefly outline:

Resource optimization/recycling and reuse envisaged in the project in details are as mentioned below:

- The raw materials will be stored in closed containers and will be handled through closed system to avoid the handling losses.
- Proper earthing shall be provided were ever hazardous material handling is done.
- Plant will have flameproof motor wherever required.
- Solvents will be recovered by adequate distillation system and pure recovered solvents will be recycled to minimize the fresh solvents.
- Water vapour generated from process will be recovered by condenser and reuse in process to minimize fresh water consumption.
- Domestic effluent will be treated in STP and utilize for plantation to minimize the fresh water consumption.

Solvent management plant

From the mass balance, it can be seen that; various solvents like hexane, MDC, IPA, Pyridine, Cyclo Hexane, DMF, Methanol, Chloroform, Ethanol, EDC, Xylene, ethyl acetate, TEA etc. , will be used for the purification of products.

Crude solvents will be collected and distilled out within the premises and recovery of solvents above 95% will be done and recycled in the process. To control VOC into atmosphere following solvent management plan and mitigation measures will be implemented.

Product wise solvent consumption for purification and recovered are as under;

Product	Solvent to be used	Total Consumption,TPM	Recovery,TPM	% Recovery
Group-1 -Synthetic Pyrethroids Insecticides:				
Cypermethrin	n- Hexane	3000	2900	96.7
Alphacypermethrin Technical	n-Hexane	4300	4105	95.5
Deltamethrin Technical	Methylene Dichloride (MDC)	18503	14042	75.9
	Toluene	4610	4250	92.2
	Iso Propyl Alcohol (IPA)	9036	8600	95.2
	Tri Ethyl Amine	375	370	98.7
Lambda Cyhalothrin	n-Hexane	2000	1950	97.5
	Isopropyl Alcohol	2000	1960	98.0
Permethrin Technical	n-Hexane	3000	2800	93.3
Transfluthrin	n-Hexane	2000	1950	97.5
Allethrin	Pyridine	353	335	94.9
	Cyclohexane	1000	960	96.0
D-Allethrin & D-Trans Allethrin Tech	Pyridine	353	340	96.3
	Cyclohexane	2000	1850	92.5
Bifenthrin	Solvent- Hexane	600	560	93.3

Technical				
Prallethrin	n-Hexane	2520	2395	95.0
Cyphenothrin (Tech)	n-Hexane	3000	2870	95.7
Etofenprox	Toluene	4000	3900	97.5
Fenpropathrin	Solvent Hexane	2000	1910	95.5
Cyfluthrin & Beta-Cyfluthrin	n-Hexane	3000	2850	95.0
Dimefluthrin (Tech)	n-Hexane	2000	1940	97.0
Cycloprothrin (T)	n-Hexane	4000	3900	97.5
Flumethrin (T)	n-Hexane	3000	2930	97.7
Acrinathrin (T)	n-Hexane	4000	3910	97.8
Flucythrinate (T)	n-Hexane	4000	3900	97.5
Tefluthrin Technical	n-Hexane	2950	2870	97.3
Group -2: Neo-Nicotinoids Insecticides: -				
Thiamethoxam Technical	DMF	4000	3800	95.0
	Methanol	2000	1925	96.3
Imidacloprid Technical	DMF	2200	2140	97.3
	Methanol	1200	1150	95.8
Acetamiprid Technical	Methanol	2500	2450	98.0
Buprofezin Technical	Solvent – Chloroform	3660	3400	92.9
	Methanol	2200	2150	97.7
Thiacloprid	DMF	2200	2050	93.2
	Methanol	400	375	93.8
Ethiprole	DMF	1800	1750	97.2
	EDC	2400	2350	97.9
Nitenpyram	Methylene Dichloride (MDC)	1822	1786	98.0
	Methanol	2100	1995	95.0
Chlorantraniliprole	Toluene	3150	3050	96.8
Cyantraniliprole	Xylene	3320	3154	95.0
Tetraniliprole	Xylene	2938	2791	95.0
	Solvent - Toluene	2200	2110	95.9
Indoxacarb	Toluene	550	520	94.5
Flonicamide	DMF	615	595	96.7
	EDC	9900	9700	98.0
	Methanol	2000	1900	95.0
	Toluene	4600	4470	97.2
Flubendiamide	Dichloromethane	3000	2950	98.3
Tolfenpyrad	Toluene	1000	950	95.0
Group 3: Neo Nicotinoids Insecticides G-2				
Cyclaniliprole	Solvent A	3915	3708	94.7
	Solvent B	5500	5035	91.5
	Solvent C	4000	3800	95.0
	Solvent D	6375	5950	93.3
	Solvent E	5000	4650	93.0
Sulfoxaflor	EDC	5350	4922	92.0
Clothianidin	Dimethyl Formamide	2000	1950	97.5
	Ethanol	3000	2900	96.7

Pymetrozine Technical	Solvent-Methanol	2000	1900	95.0
Group -4: Organo Phosphorus Insecticides/Aromatic Ethers, Carbamate, Benzoyl Urea, Oxadiazine, Pyrazole & Other Miscellaneous Insecticides/ Acaricides Compounds/ Benzoylurea/ Other IGRs/ Natural Products:				
Profenophos	Trimethyl Aluminium (TMA)	709	650	91.7
Chlorpyrifose Ethyl	EDC	2800	2700	96.4
Chlorpyrifose Methyl	EDC	4000	3840	96.0
Temephos Technical	Solvent Toluene	1500	1400	93.3
Ethion	Solvent Toluene	2000	1920	96.0
Acephate	Ethyl Acetate	925	883	95.5
	Ethylene Dichloride (EDC)	2000	1950	97.5
Dimethoate	Ethylene Dichloride (EDC)	2200	2130	96.8
Phenthoate Technical	Ethylene Dichloride (EDC)	2400	2320	96.7
Spirotetramat Technical	Dichloroethane	3000	2950	98.3
Triflumezopyrim Technical	Toluene	5000	4800	96.0
Chlorfenapyr	Dichloroethane	3000	2900	96.7
Difenthiuron Technical	DMF	2200	2120	96.4
	Solvent - Xylene	2000	1950	97.5
	Solvent - Methanol	1850	1750	94.6
Febunocarb Technical	n-Hexane	2200	2130	96.8
Propargite	Toluene	1000	950	95.0
Diflubenzuron	Mono Chlorobenzene (MCB)	1800	1740	96.7
Thiocyclam Oxalate	Toluene	5000	4775	95.5
Fenpyroximate	DMF	4000	3810	95.3
	MDC	4500	4275	95.0
Etoxazole	Solvent-Xylene	3000	2910	97.0
Hexythiazox	Solvent n-Hexane	3000	2910	97.0
Pyriproxyfen	Solvent -Toluene	1700	1640	96.5
	Solvent - Methanol	1800	1740	96.7
Thiodicarb	Solvent -Toluene	3200	2950	92.2
Spirodiclofen	Ethanol	2000	1950	97.5
Pyrithiobac	N-Methyl Pyrrolidine	4100	3893	95.0
	Dichloromethane	3636	3454	95.0
Novaluron	Toluene	900	880	97.8
Fenoxycarb	Toluene	1400	1340	95.7
Pyridaben	n-Hexane	2000	1910	95.5
Spiromesifen	Toluene	1480	1465	99.0
Tebufenpyrad	Toluene	2126	2046	96.2
	Methanol	1500	1400	93.3
Lufenuron	Toluene	2200	2120	96.4

Methoxyfenozide	Toluene	2000	1930	96.5
Thiocyclam Oxalate	Toluene	5000	4775	95.5
GROUP 5: - SBI-Triazole Fungicides /Conazole Fungicides/Triazolopyrimidines Fungicide				
Hexaconazole	EDC	2000	1940	97.0
	Tetrahydro Furan	1500	1465	97.7
	Dimethyl Formamide	1500	1460	97.3
Tebuconazole	Dichloromethane	4000	3880	97.0
	Cyclohexane	1000	970	97.0
Difenoconazole	EDC	3000	2910	97.0
	Toluene	1200	1170	97.5
	Dimethyl Formamide	2100	2040	97.1
Propiconazole	EDC	4000	3880	97.0
	Dimethyl Formamide	1500	1455	97.0
	Toluene	1200	1170	97.5
Metconazole	Toluene	2200	2140	97.3
Cyproconazole	Toluene	2250	2200	97.8
Epoxiconazole	Solvent - EDC	1300	1260	96.9
	Dimethyl Formamide	1800	1765	98.1
Fenbuconazole	Solvent-Xylene	2500	2430	97.2
Ipconazole	Solvent-Xylene	2500	2430	97.2
Tetraconazole	Toluene	3000	2940	98.0
Prothioconazole	Solvent-Xylene	2500	2430	97.2
Fluquinconazole	Toluene	2000	1960	98.0
Triticonazole	Solvent DMF	3000	2930	97.7
Azaconazole	Dimethyl Formamide	1200	1155	96.3
	Toluene	1250	1210	96.8
Bromuconazole	Solvent - EDC	2000	1940	97.0
	Solvent - THF	2100	2060	98.1
	Dimethyl Formamide	1200	1160	96.7
	Toluene	1000	965	96.5
Etaconazole	Solvent - EDC	1800	1765	98.1
	Dimethyl Formamide	1000	970	97.0
	Toluene	1300	1260	96.9
Penconazole	Toluene	1200	1160	96.7
	Dimethyl Formamide	1200	1175	97.9
Tricyclazole	Solvent-1 Ortho Xylene	5000	4800	96.0
	Formic Acid	2000	1900	95.0
Bupirimate	Toluene	2200	2130	96.8
Imazalil	Toluene	3000	2900	96.7
Triadimenol	Toluene	2000	1950	97.5
Triadimefol	Toluene	2000	1940	97.0
Metrafenone	Toluene	5000	4850	97.0
Flusilazole	Toluene	2000	1930	96.5

Prochloraz	Solvent - EDC	2820	2650	94.0
	N-Propyl amine	1310	1225	93.5
	Toluene	2500	2320	92.8
Mycobutanil	Dimethyl Formamide	1500	1450	96.7
	Toluene	2000	1950	97.5
Ametoctradin	Toluene	3000	2900	96.7
Group-6:- Strobilurins/ Methoxyacrylate/Carbanilate Fungicides/Mono Carboxylic Acid Amide/Hydroxy Aniline G-1				
Pyraclostrobin	Solvent – Xylene	4000	3920	98.0
Azoxystrobin	Toluene	1400	1370	97.9
	Solvent - EDC	1200	1160	96.7
	Dimethyl Formamide	1200	1160	96.7
Pyroxystrobin	Solvent n-Hexane	2400	2320	96.7
Picoxystrobin	Toluene	1300	1260	96.9
	Solvent - EDC	1400	1360	97.1
	Solvent – Xylene	1000	970	97.0
Flufenoxystrobin	Toluene	1200	1165	97.1
	Solvent - EDC	1400	1365	97.5
	Solvent – Xylene	1000	970	97.0
Metominostrobin	Toluene	1100	1060	96.4
	Solvent – Xylene	1600	1560	97.5
Orysastrobin	Solvent – Xylene	3000	2940	98.0
Kresoxim Methyl	Solvent – Xylene	1800	1760	97.8
	Solvent - Methanol	1000	960	96.0
Triclopyricarb	Solvent - EDC	1400	1370	97.9
	Toluene	1200	1160	96.7
Fenoxanil	Toluene	2000	1960	98.0
Flutolanil	Triethyl Ethyl Amine (TEA)	360	340	94.4
Tiadinil	Toluene	2500	2400	96.0
GROUP-7: Strobilurins/ Methoxyacrylate/Carbanilate Fungicides/Mono Carboxylic Acid Amide/Hydroxy Aniline(G-2)				
Dimoxystrobin	Solvent – Xylene	1800	1760	97.8
	Ethanol	1200	1150	95.8
	Toluene	1100	1075	97.7
Trifloxystrobin	Solvent - EDC	1200	1160	96.7
	Solvent - DMF	1400	1360	97.1
Fluoxastrobin	Toluene	1450	1410	97.2
	Solvent Butyl Alcohol	1600	1550	96.9
	Solvent - DMF	1200	1165	97.1
Fenhexamide	Ethyl Acetate	10900	10550	96.8
	Methanol	11200	11000	98.2
	THF	5977	5828	97.5
	TEA	565	525	92.9
GROUP-8: Multicite / SBI-Other Dmis / Phenyl Amides / Sulfonyl Ureas/ Ethyl Mercaptan/Pyrazole Fungicides/ SDHIs / Others-Cont Fungicides				
Thiophenate Methyl	Solvent- EDC	2000	1950	97.5
Chlorothalonil	Toluene	2000	1950	97.5
Isoprothiolane	Ethylene Dichloride	1440	1345	93.4

	Solvent – n-Heptane	2500	2375	95.0
Validamycin	Hexane	2000	1960	98.0
Quinoxyfen	Toluene	3000	2900	96.7
Fluazinam	MIBK-Solvent	2500	2450	98.0
Famoxadone	Toluene	2000	1960	98.0
Benalaxyl	Methanol	510	470	92.2
Carboxin	Toluene	8500	8100	95.3
	Acetone	4000	3820	95.5
Iprobenfos	Dichloroethane (DCE)	3600	3506	97.4
Bixafen	Toluene	1500	1450	96.7
Isopyrazam	Toluene	2000	1920	96.0
	Triethyl Amine	303	296	97.7
Fluopicolide	Toluene	907	842	92.8
Fluopyram	EDC	1690	1555	92.0
Boscalid	Toluene	1500	1450	96.7
Fluxapyroxad	Toluene	1664	1598	96.0
Carpropamid	Toluene	2200	2130	96.8
Cyazofamid	Acetonitrile	1700	1630	95.9
	Toluene	2000	1950	97.5
Mandipropamid	Toluene	1800	1750	97.2
	DMF	6	5.5	91.7
Penflufen	Toluene	3000	2900	96.7
GROUP-9-Als-Imidazolinone/Ureas/Als-Sulfonylurea-Cont/Als-Others/AminoAcids/Ureas/Cyclohexandiones/DinitroAnilinees/Acetamides/Amide/NitroPhenyl Ether Herbicides/Monothiocarbamic Ester/ Triazinone Herbicides / Cyclohexane Oxime				
Imazamox	Chlorobenzene	4000	3940	98.5
Imazamethabenz	Chlorobenzene	4520	4430	98.0
Imazapyr	Chlorobenzene	3500	3430	98.0
Penoxsulam	DMSO	2020	1930	95.5
Metsulfuron Methyl	Acetonitrile	3250	3088	95.0
Mesosulfuron Methyl	Toluene	3560	3382	95.0
	Ethyl Acetate	1400	1330	95.0
Chlorimuron Ethyl	Toluene	770	740	96.1
	Xylene	772	731	94.7
Bispyribac Sodium	Acetone	2540	2435	95.9
	Methanol	3000	2880	96.0
	Iso Propyl Alcohol	12900	12384	96.0
Pyrazosulfuron Ethyl	Toluene	3000	2900	96.7
Florasulam	Solvent DMSO	2200	2130	96.8
	Pyridine	244	235	96.3
Thiencarbazone Methyl	Solvent Xylene	2600	2540	97.7
	TEA	286	275	96.2
Bensulfuron Methyl	Solvent Xylene	1600	1565	97.8
	Methanol	2000	1970	98.5
Nicosulfuron	Toluene	3460	3287	95.0
Sulfosulfuron	Methanol	3400	3230	95.0
	Ethylene Dichloride (EDC)	13900	13622	98.0
	N, N-Dimethylaniline (DMA)	309	304	98.4
Trifloxysulfuron	MEK	2200	2140	97.3

	Benzyl Chloride	332	319	96.1
Diclosulam	Toluene	3000	2910	97.0
	Ethanol	550	520	94.5
Pyroxsulam	Solvent-1Toluene	4830	4520	93.6
	Slovent-2Hydroxylamine	1040	954	91.7
	Solvent-3Methanol	5980	5630	94.1
	Ethyl Acetate	860	800	93.0
	Acetonitrile	1960	1830	93.4
Glufosinate Ammonium	Ethanol	2000	1900	95.0
Pendimethalin	Ethylene Dichloride	2000	1900	95.0
	Ortho-Xylene	1000	955	95.5
Pretilachlor	Toluene	2640	2572	97.4
Dicamba	Solvent -Methanol	1400	1345	96.1
	Toluene	1600	1540	96.3
Napropamide	Solvent Xylene	3000	2940	98.0
Dimethenamid	Toluene	2200	2130	96.8
Topramezone	Toluene	1000	950	95.0
	Dioxane	1500	1450	96.7
	Ethyl Acetate	1000	950	95.0
Propoxycarbazone	Solvent Xylene	2400	2340	97.5
	TEA	286	269	94.1
Fomesafen	DMSO	2100	2060	98.1
	Toluene	2400	2360	98.3
Halosafen	DMSO	2000	1965	98.3
	Toluene	2200	2170	98.6
Clethodim	Toluene	2500	2450	98.0
Benoxacor	Toluene	2800	2560	91.4
Phenmedipham (PMP)	Solvent - Butyl Acetate	3200	3100	96.9
Desmedipham (DMP)	Solvent - Butyl Acetate	3200	3110	97.2
Bromobutide	Solvent – Chloro Benzene	1500	1450	96.7
Butachlor	Benzene	266	245	92.1
	N-Butanol	1052	960	91.3
Metachlor	Toluene	2000	1950	97.5
	Methanol	500	475	95.0
Group-10:Cyclohexandiones/Nitro Phenyl Ether Herbicides/Monothiocarbamic Ester/ Triazinone Herbicides / Cyclohexane Oxime				
Quinclorac	Ortho Dichloro Benzene	3800	3700	97.4
Benfuresate	Xylene	2858	2810	98.3
Metamitron	Toluene	1940	1880	96.9
	Methanol	2045	1921	93.9
	Solvent - DMA	2200	2150	97.7
Atrazine	Toluene	6950	6900	99.3
Imazethapyar	Solvent -Toluene	3200	3100	96.9
	Ethanol	4200	4000	95.2
Group-11: Aryloxyphenoxypropionates/ Aryloxyphenoxypropionic/ Aniline /Pyridine/Ppo-Diphenyl Ethers / Phenyl Ether /Phenoxy Carboxylic Acid / Pyridine / Nitro Phenyl Ether 15/Aromatic Ketone				

Clodinaflop & Clodinaflop Propargyl	Solvent -Di Methyl Formamide (DMF)	1200	1165	97.1
	Toluene	1000	980	98.0
Quizalofop& Quizalofop Ethyl	Solvent -Di Methyl Formamide (DMF)	1100	1070	97.3
	Solvent – Xylene	1000	975	97.5
Cyhalofop & Cyhalofop Butyl	Solvent -Di Methyl Formamide (DMF)	1400	1375	98.2
	Solvent – Xylene	1100	1080	98.2
Chlorazifop &Chlorazifop Propargyl	Solvent -Di Methyl Formamide (DMF)	1200	1170	97.5
	Toluene	1000	975	97.5
Fenoxaprop & Fenoxaprop P Ethyl	Solvent – Di Methyl Sulfoxide	1400	1360	97.1
	Toluene	1250	1210	96.8
Fluazifop &Fluazifop P Butyl	Solvent – Di Methyl Formamide	1100	1065	96.8
	Solvent – Xylene	1000	970	97.0
Haloxyfop & Haloxyfop Methyl	Toluene	2500	2450	98.0
Quizalofop p-Tefuryl	Solvent EDC	4000	3920	98.0
	Toluene	2000	1950	97.5
Haloxyfop Ethoxy Ethyl	Toluene	2500	2450	98.0
Oxardiargyl	Toluene	2000	1925	96.3
	Methanol	1000	950	95.0
Isoproturon	MCB Solvent	2800	2710	96.8
Metamifop	Solvent -Di Methyl Sulfoxide	1800	1765	98.1
	Toluene	1800	1770	98.3
Picolinafen	DMF	900	860	95.6
	Toluene	1100	1075	97.7
	Solvent – Chloro Benzene	800	785	98.1
Sulfentrazone	Methanol	1400	1345	96.1
	DMF	7550	7150	94.7
	Dichloroethane	2620	2546	97.2
	Isopropyl Alcohol	6415	5950	92.8
	Toluene	4983	4599	92.3
	Dichloromethane	2125	1950	91.8
	Pyridine	480	441	91.9
Flufenacet	Methanol	1400	1330	95.0
	EDC	2450	2350	95.9
Cloransulam-Methyl	Toluene	2000	1800	90.0
Diflufenican	Toluene	2000	1940	97.0
Aclonifen	Solvent – Di Methyl Sulfoxide	1200	1165	97.1
	Solvent – Xylene	1000	975	97.5
Acifluorfen	Solvent – Di Methyl Sulfoxide	1100	1070	97.3
	Toluene	1000	975	97.5
Chlomethoxyfen	Solvent – Di Methyl	1200	1175	97.9

	Sulfoxide			
	Solvent – Xylene	1000	980	98.0
Fluoroglycofen	Di Methyl Formamide	1200	1175	97.9
	Solvent – Xylene	1000	970	97.0
Lactofen	Di Methyl Formamide	1100	1070	97.3
	Solvent – Xylene	1000	970	97.0
Oxyfluorfen	Solvent – Di Methyl Sulfoxide	1100	1075	97.7
	Toluene	1000	980	98.0
	EDC	800	775	96.9
Fluoroxypyr-Meptyl	EDC	3000	2920	97.3
Triclopyr Butotyl	EDC	1700	1650	97.1
GROUP 12: Aryloxyphenoxypropionates/ Aryloxyphenoxypropionic/ Aniline /Pyridine/Ppo-Diphenyl Ethers / Phenyl Ether /Phenoxy Carboxylic Acid / Pyridine / Nitro Phenyl Ether 15/Aromatic Ketone (G-2)				
Sulcotrione	EDC	2555	2400	93.9
	Dichloromethane	4250	4130	97.2
Tefuryltrione	Toluene	3000	2900	96.7
	Methanol	125	119	95.2
Mecoprop	EDC	4000	3900	97.5
2,4-D Ethyl Ester	Benzene	630	590	93.7
Cloquintocet Mexyl	Toluene	1200	1150	95.8
	Solvent - MIBK	6500	6200	95.4
	Solvent - Hexane	4000	3950	98.8
Propaquizafop	Toluene	3108	2960	95.2
	Di Methyl Formamide	3885	3690	95.0
Carfentrazone	Methanol	4000	3678	92.0
	DMF	7500	7250	96.7
	EDC	3250	3074	94.6
	Isopropyl Alcohol	6325	6150	97.2
	Acetonitrile	5300	4825	91.0
Group-13: Plant Growth Regulators & Rotenticides/HPPD Inhibitors/ Others/ Triazines / PGR/Pyrazoles				
Chlormequat Chloride	EDC	2000	1950	97.5
Ethephon	EDC	1105	1075	97.3
Forchlorfenuron	Dichloromethane	1250	1190	95.2
	Acetone	500	475	95.0
	Chloroform	500	475	95.0
Mepiquat Chloride	Toluene	3000	2900	96.7
	Ethyl Acetate	2000	1940	97.0
Bromadiolone	Methanol	3000	2860	95.3
Paclobutrazol	n- Hexane	2500	2375	95.0
	Solvent- IPA	1000	940	94.0
Tembotrione	Triethyl Amine (TEA)	633	598	94.5
	Ethanol	2308	2200	95.3
Mesotrione	EDC	9000	8925	99.2
Pinoxaden	Tetrahydrofuran (THF)	1000	925	92.5

	Tert-Butyl Methyl Ether (MTBE)	1000	925	92.5
Bentazone	EDC	2223	2046	92.0
Ametryn	Tetrahydrofuran (THF)	1000	935	93.5
	Methylene Dichloride (MDC)	1500	1380	92.0
	Methanol	1000	935	93.5
Halosulfuron	Acetonitrile	3633	3450	95.0
	P-Xylene	1333	1317	98.8
Iodosulfuron-methyl	EDC	3000	2900	96.7
GROUP- 14: Advance Specific Pesticide Intermediates				
Meta-Phenoxy Benzaldehyde	EDC	2200	2050	93.2
Meta-Phenoxy Benzyl Alcohol	Methanol	2000	1940	97.0
Cypermethric Acid Chloride	Acetonitrile	250	235	94.0
	Tri Ethyl Amine (TEA)	830	780	94.0
	n-Hexane	11830	11145	94.2
2-Chloro-5-Chloromethyl Pyridine	Toluene	2000	1925	96.3
	Solvent - DMF	1500	1450	96.7
	Solvent - EDC	3000	2870	95.7
	Acetonitrile	2000	1900	95.0
2-Chloro 5-Chloromethyl Thiazole	Solvent - MDC	3950	3825	96.8
3- Methyl 4-Nitroimino perhydro 1, 3, 5 Oxidiazine	Di Methyl Formamide	3000	2910	97.0
TransfluthrinAcid Chloride	n- Hexane	1600	1540	96.3
Para Choro Phenyl Iso Valeric Acid Chloride	n-Hexane	3620	3520	97.2
Propargyl Chloride	Solvent - EDC	2000	1955	97.8
3- Methyl 1,2,4 – Triazole	Ethanol	2400	2360	98.3
4- Bromo 2- Chloro Phenol	MDC	2000	1950	97.5
5- Chloro 2,3 Di Fluoro Pyridine	Solvent- THF DP	1530	1460	95.4
	Toluene	172	160	93.0
2, 6 Diethyl –N-(Propoxy) Aniline	Toluene	2000	1960	98.0
2, -Chloro-4-(4-Chlorophenoxy) Phenacyl Bromide	Solvent - EDC	3000	2910	97.0
	Dimethyl Formamide	2100	2040	97.1
1-(4-Chloro Benzyl) Methyl-3, 3-Dimethyl-2-Oxo Cyclopentane	Toluene	2000	1970	98.5

Carboxylate				
Tebu- Ketal	Toluene	2000	1970	98.5
Methyl -2- [2- {(6-Chloro Pyrimidine -4 –yl)} Oxy Phenyl] -3- Methoxyprop -2-Ethanoate.	Toluene	1400	1370	97.9
	Solvent - EDC	1200	1160	96.7
1,1-Dichloro Pinacholane	Solvent - EDC	2000	1960	98.0
Thicarbono Hydrazine	Ethyl Acetate	2000	1850	92.5
2-Hydroxy-4-Methyl Benzo Thiazole	Monochloro Benzene (MCB)	3400	3320	97.6
	Xylene	1500	1450	96.7
4-Nitro-O-Xylene/3-Nitro O-Xylene	N-Hexane	2000	1850	92.5
	O-Xylene	4800	4450	92.7
Group- 15: Advance Specific Pesticide Intermediates				
Lambda Cyhalothric Acid Chloride	TBA	12478	11785	94.4
	n- Hexane	7930	7550	95.2
	Methanol	1400	1300	92.9
2-(4- Hydroxy Phenoxy) Propionic Acid	Solvent – MIBK	2500	2400	96.0
PEG/PMG Ester	Methanol	1065	1005	94.4
O, O Di Ethyl Thio Phosphoryl Chloride (DETCl)	Ethanol	6570	6150	93.6
GROUP:16- Amino Diphenyl Ether / Phenoxy Compounds/ Specialty Phenols/ Specialty Chloro Phenol/ Amino Benzoic Esters / Aliphatic Esters/ Amino Compounds / Hydrogenation Compounds				
2- Amino Di Phenyl Ether	1,2-Dichloro benzene/DCT	1200	1170	97.5
4-Amino 4'- Methyl Di Phenyl Ether	1,2-Dichloro benzene/DCT	1400	1370	97.9
2- Amino 2', 4, 4’-Tri Chloro Di Phenyl Ether	1,2-Dichloro benzene/DCT	1200	1172	97.7
2- Amino -4'-Chloro -4 -Trifluoromethyl Di Phenyl Ether	1,2-Dichloro benzene/DCT	1200	1174	97.8
4-Acetyl-3,4’-Dichloro Diphenyl Ether	EDC	2000	1930	96.5
2-Acetyl-2’,4,4’-Trichloro Diphenyl Ether	Ethylene Dichloride	2000	1935	96.8
Triclabendazole	Chlorobenzene	2100	2060	98.1
	Methanol	2400	2355	98.1
	Toluene	1800	1760	97.8
2, 4 Di Chloro Phenol	Para Chloro Phenol	2250	1440	64.0
2, 5 Dichloro	Solvent: Mixed	2200	2150	97.7

Phenol	Xylene			
3 Methyl Phenol (m-cresol)	Solvent: Mixed Xylene	2000	1965	98.3
3-Nitro Phenol	Solvent: Mixed Xylene	1900	1860	97.9
4-Bromo 2,5 Dichloro Phenol	Ethylene Dichloride	1200	1170	97.5
4-fluoro phenol	Solvent: Mixed Xylene	2200	2170	98.6
O-Cyano phenol	Solvent: Monochloro Benzene	1400	1360	97.1
4-Fluoro Anisole	Methanol	1000	925	92.5
3-Amino 4-Methyl Benzoic Acid Isopropyl Ester	Solvent - ODCB	1600	1575	98.4
3-Amino 4-Methyl Benzoic Acid (2' - Chloro Ethyl Ester).	Solvent - ODCB	1800	1750	97.2
3-Amino Benzotrifluoride	Solvent: Ethylene Dichloride	1600	1575	98.4
2,5-Dichloro Aniline	Solvent: 1,2-DichloroBenzene	1600	1535	95.9
Ortho Phenylene Diamine /Meta Phenylene Diamine/Para Phenylene Diamine	Solvent- Toluene	800	750	93.8
Benzaldehyde	Solvent- Toluene	480	445	92.7

Mitigation measures for LDAR

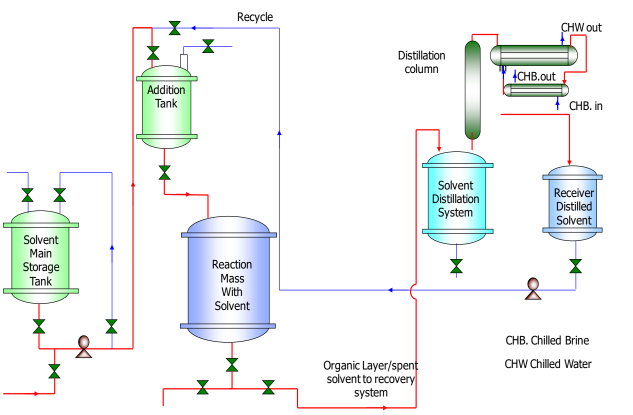
S. No.	Solvent	Source	% loss	Mitigation measures
1	All solvents	Transfer from tanker to storage tank	1%	-Unloading of solvents from Tanker to Storage Tank through appropriate Transferring system. -Closed loop sampling for sampling of Relative materials. -Condenser and scrubber system with proper cooling arrangement -Leak Free Pumps for transfer of solvents -MSW Gaskets in solvent pipelines to prevent leakage from flanges -Provide LEL meter/VOC meter
	All solvents	Transfer storage tank to day tank	1.2%	-Ensure proper cleaning of Day tank/reactor and Provide Nitrogen purging for at least 30 minutes before charging any flammable solvents inside the reactor. -Ensure isolation valves near receiver and near Reactor. -Ensure Double earthing to receiver/reactors (Tantalum plug in case of GLR) and bonding continuity on solvent transfer fix lines. -Solvent shall be charged through Deep pipe
	All solvents	Transfer day tank to reactor		

				with vacuum breaker. -Ensure quantity in receiver before charging into reactor. Check condition of tank, receiver, level indicators, valves, flange joints etc.
	All solvents	Solvent recovery plant (Solvent Distillation plant)	1.0%	-Closed solvent recovery system provided. -Double condenser with chilled brine circulation provided -Sufficient HTA and residence time provided -Mechanical seal and breather valve provided. -Storage tank shall be vented through trap receiver and condenser operated on cooling water

Solvent Management plan

- Selection of proper material of construction to get optimum heat-transfer co-efficient and minimize the loss of product as well solvent.
- Provision of either Chilled water or Brine water in secondary heat exchanger to eliminate the possibility of any solvent loss.
- The Reactors involved are provided with mechanical seal to ensure the elimination of any leakage.
- Heat exchangers for these operations are specially designed, procured from overseas countries, like China, Germany, USA etc.
- Vent of the heat exchangers is provided with the solvent trap, which have the jacket to prevent and minimize the vapor loss to atmosphere.

FLOW DIAGRAM OF PROPOSED SPENT SOLVENT MANAGEMENT SYSTEM



1.8.8 Availability of water source, Energy/Power requirement and source should be given:

Availability of water its source, Energy/power required and its source is below.

OVERALL WATER CONSUMPTION & WASTE WATER GENERATION

Total Water Consumption and Wastewater Generation

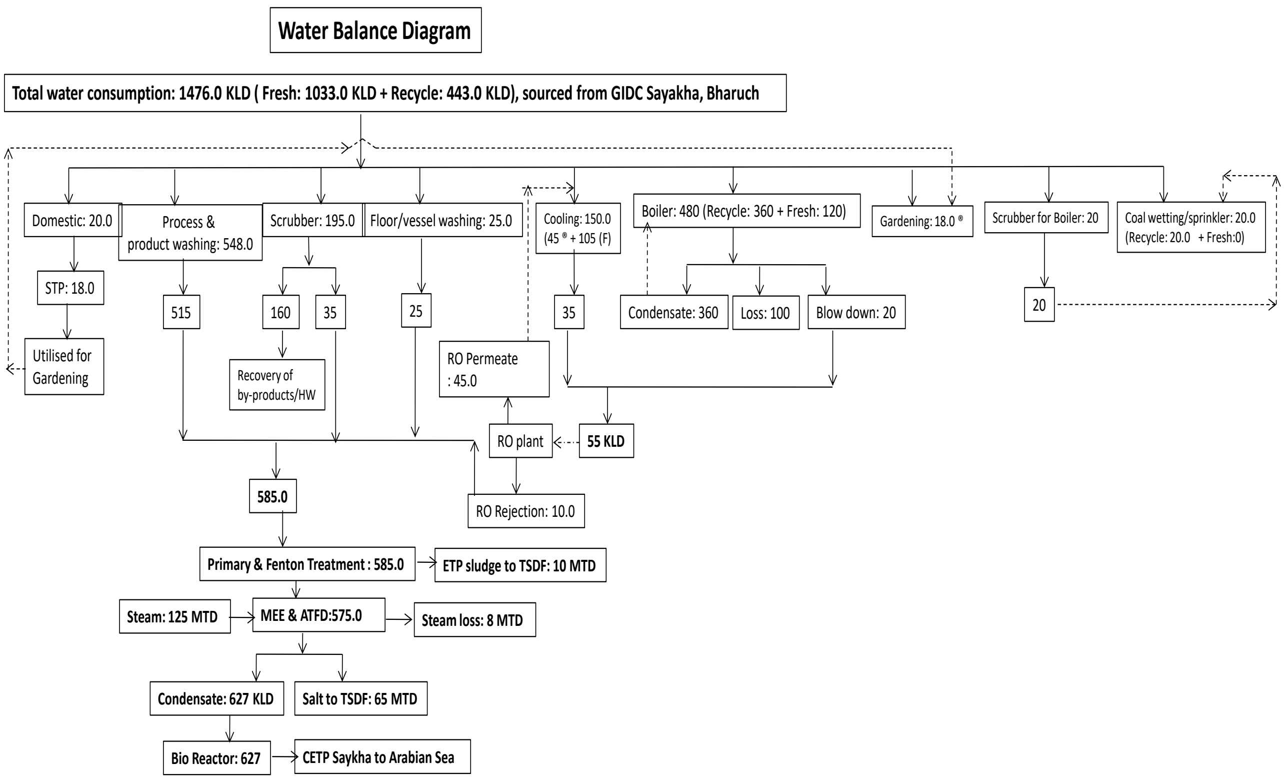
Sr. No.	Particulars	Water Consumption, KLD	Remarks
A.	**Domestic**	**20.0**	
B.	**Industrial**		
1.	Processing & washing	548.0	

2.	Boiler	480.0	360 KLD condensate recycled
3.	Cooling	150.0	45 KLD of RO treated water will be recycled
4.	Floor/container washing	25.0	
5.	Scrubber for process gas	195.0	
6.	Scrubber for boiler	20.0	
7.	Coal wetting /water sprinkler	20.0	20 KLD scrubber effluent attached to boiler will be recycled
	Total Industrial	**1438.0**	
C.	**Gardening**	18.0	18 KLD treated water from STP will be reused
	Grand Total (A+B+C)	**1476.0**	
	Recycle	**443.0**	
	Net fresh	**1033.0**	

Note:

- For the proposed plant, total fresh water requirement will be 1033 KLD. From the proposed plant, total 585 KLD of industrial waste water will be generated, which will be treated in primary ETP & Fenton treatment process. After primary & Fenton treatment, 575 KLD of effluent will be taken to MEE & ATFD. About 125 KLD of steam will be used for MEE & ATFD. Thus, total 627 KLD of condensate will be generated, which will be treated in secondary & tertiary ETP and discharge into CETP Saykha for further treatment and disposal.
- Domestic waste water (18.0 m^3/day) will be treated in STP and STP treated will be utilized for plantation.

WATER BALANCE DIAGRAM



ENERGY REQUIREMENTS AND ITS SOURCE

S. No.	Particulars	Details	Source
1.	Steam requirement	18000 kg/hr.	Will be obtained from proposed 20000 kg/hr steam boiler

POWER REQUIREMENTS AND ITS SOURCE

S.	Particulars	Proposed	Source
1.	Power – Electricity requirement	4000 kVA	Will be sourced from Dakshin Gujarat Vij Co. Ltd.

1.8.9 Quantity of waste to be generated (liquid and solid) and scheme for their Management/disposal

Quantity of waste to be generated (liquid and solid) and scheme for their Management/ disposal is given in Section 1.6**.**

1.8.10 Schematic representations of the feasibility drawing which give information of EIA purpose

A schematic representation of the feasibility drawing is enclosed as **Annexure – 6.**

1.9 SITE ANALYSIS

1.9.1 Connectivity

The project is located in notified Industrial Estate of Saykha which is very well connected to National Highway no. 8, Western Railways and the nearest airport is Vadodara which is 63 km away from the project site by road.

1.9.2 Land Form, Land use and Land ownership

The land is in the form of industrial shed owned by Gujarat Industrial Development Corporation.

1.9.3 Topography (along with map)

The catchment area of the proposed project site altitude is 35 m (a.m.s.l) consists of the near site is flat topped, highly dissected plateaus and dyke ridges running in a west to east direction. The Main River (Narmada) in the catchment area flows in incised meanders forming steep geomorphologically 'V' shaped valleys with steep sides. The entire catchment has a drainage pattern that shows the characteristics of the tributaries joining major channel and eroding at right angle. Thus, the drainage pattern can be said as trellis pattern and rectangular pattern of drainage. The piedmonts at the base of the steep plateaus and dyke ridges are covered with thin soils, which support agriculture in very few areas. The river valley, wherever flat, has good quality soil and is mostly cultivated based on the availability of water. The river valley fills with thick alluvium provides the only area for cultivation.

The command area of the proposed project is surrounded by moderately dissected plateaus and piedmont slopes. The slope of the land along the piedmont and the nature of flow of the streams. The Narmada River with tributaries in the piedmont slope area show parallel pattern, which are partly controlled by the lineaments. Along the river valley the flood plain consists of good quality soil, suitable for cultivation. The largest portion of the command area is the alluvial plain, which has been formed by the river Man. The alluvial plain is studded with number of residual hills with degraded forests. The river man in the command area also flows in straight channels, which shows that the river is structurally controlled. The topographical map is enclosed as **Annexure – 1**.

1.9.4 Existing land use pattern (agriculture, non-agriculture, forest, water bodied (including area under CRZ)), shortest distances from the periphery of the project to periphery of the forest, national park, wild life sanctuary, eco sensitive areas, water bodies (distance from the HFL of the river), CRZ. In case of notified industrial area, a copy of Gazette notification should be given

The land is located in the Saykha Industrial Estate. Possession letter is attached as **Annexure – 5.**

1.9.5 Existing Infrastructure

GIDC Saykha Industrial Estate has the entire available infrastructure like water, electricity, roads, rail, transportation, availability of raw materials and drainage system, CETP etc.

1.9.6 Soil classification

Soil Characteristics under Project Area are as below Table;

CATEGORY	AREA-SQ KM	DESCRIPTION	TAXONOMY1	TAXONOMY2	CLASS	SUB CLASS
A	88.93	Very deep, moderately well drained, calcareous, fine soils on very gently sloping alluvial plain with slight erosion and moderate salinity; associated with very deep moderately well drained, calcareous, fine soils with moderate erosion.	Fine, montmorillonitic (calcareous), hypothermic Typic Chromusterts	Fine, montmorillonitic (calcareous) hyperthermic Udic Chromusters	Soils of west coast (soils of Gujarat plain)	Soils of alluvial plains
C	108.64	Very deep, poorly drained, calcareous fine-loamy soils on very gently sloping coastal plain with moderate erosion and strong salinity; associated with very deep , imperfectly drained, calcareous, fine soils with severe erosion and strong salinity.	Fine-loamy, mixed (calcareous), hyperthermic Aeric Haplaquepts	Fine, mixed (calcareous), hyperthermic Typic Halaquepts	Soils of west coast (soils of Gujarat plain)	Soils of coastal plains
-	116.43	Sea	-	-	-	-

1.9.7 Climate data from secondary sources

Rainfall Data:

The project site location receives annual rainfall of 2010 – 1200 to 1300 mm in 35 rainy days with coefficient of variation of 65 %. There is large spatial and temporal variation in rainfall of the study area. The low rainfall areas receiving less than 500 mm rainfall are comprised of Kutch district and western parts of Banaskantha and Patan district and parts of Jamnagar, Rajkot and Surendranagar districts. These are also characterized by arid climate. The high rainfall (> 1400 mm) receiving areas (Dang, Valsad, Navsari and Surat, Dadra & nagar haveli and Daman & Diu) are characterized as sub humid climate. The rest part of the state receives rainfall between 500-1000 mm and generally fall under semi-arid climate. Considering the abnormality of weather particularly rainfall during the monsoon period. The observed and predicted rainfall was then analysed for its validity.

S. No.	Region	Rainfall Projection (in mm) June – Oct	Normal Rainfall (In mm)	Rainfall Projection (% Departure from normal)
1.	Middle Gujarat	905.3	796	13.7
2.	South Gujarat	696.3	575	21.0
3.	Project site	2071.7	1433.7	44.5
4.	Saurashtra	767.1	580.4	32.2
5.	Gujarat State	1110.1	846.5	31.1

Temperature Data:

M/s Heranba Industries Ltd. (Unit: VI) is a proposed unit and to be located in the southern part of Gujarat. The secondary data was collected from free data of Worldclim.org year of 2013. The project site temperature regime for medium to high level temperature (30-32 °C) during the seasonal months (June to Sep). The climate map for site location shows that temperature recorded over a month of (4 month). Coastal area from the inland site for 10 km distance, temperature recorded for this area low to medium level. Figure showing project site for seasonal temperature in (June to September-2013).

1.9.8 Social Infrastructure available

Social Infrastructure in Bharuch district is as under:

Education:

- There are 1464 School in the district. (922-primary, 165-secondary & 109-higher secondary schools).
- There are 19 ITIs offering several industrial training Institutes programs which includes, fitting, armature & motor rewinding, electrician, information technology and electronic system maintenance.
- 03 (Two) polytechnic College (Government-1 and Self Finance-2) is present in the district offering courses in civil, chemical, electrical, mechanical, plastic, etc. engineering.
- One Degree Engineering College in the district.
- One Pharmacy College in the district.
- There are 09 other college. Offering Business Management, Arts, Commerce, and Science.

Health:

- There are 207 Sub Health Centre, 40 primary healthcare centres and 08 Community Health Centre present in the district.
- Bharuch has several private specialized hospitals and corporate funded hospital to provide a comprehensive range of tertiary and secondary care services backed by state-of- the- art technology and trained medicos.

Tourism:

- **Kabirvad:** It is the island of Banyan trees. Kabirvad is an island on the river Narmada at a distance of about 16 km (10 mi) east of Bharuch city. The main attraction here is a gigantic banyan tree covering an area of more than 2.5 acres. According to legend, it is at this place that saint Kabirdas meditated and the tree grew from a meswak stick (used for brushing the teeth) that was thrown here by the saint. A single tree has over years proliferated into a tree with several trunks and spread in over 2.5 acres of land. Other added attractions here are the lotus shaped marble temple, Kabir museum and boat ride on Narmada River.

- **Bhrighu Rishi Temple:** The temple of Bhrighu Rishi, one of the famous and sacred temples of Gujarat, is situated on the east of the city in Dandia Bazar area on the banks of the holy river Narmada. This temple, being visited by a number of pilgrims, has great religious importance to the people of Bharuch. Bharuch which was originally called 'Bhrigukachchha' derived its name from this temple. The temple was built in honour of the great saint Maharishi Bhrighu who was able to attain sainthood by reaching the perfect balance between wisdom and activity. It was here that Bhrighu Rishi wrote first Indian Astrological work, Bhrighu Samhita. He is said to have documented five million horoscopes, in which he wrote down the fate of every being in the universe.
- **The Golden Bridge:** It was built by the British in 1881 across the Narmada River to improve access to traders and administrators to Bombay. The structure was built with rust-resistant iron, and therefore, more expensive than modern steel, lending to the name Golden Bridge. This bridge connects Bharuch and Ankleshwar.
- **Fort:** Around 1000 year old fort, built by Siddhraj Jaysinh, the then king of Gujarat. The fort is situated on a hill top which overlooks the Narmada river. Within the fort there are the Collector's office, Civil Courts, the Old Dutch factory, a church, the Victoria Clock tower and other buildings. Around 3 km (1.9 mi) from the fort there are some early Dutch tombs, overlooked by some Parsee Towers of Silence. Also there are many historical monuments built by the Dutch, Portuguese and British.

1.10 PLANNING BRIEF

1.10.1 Planning Concept (Type of industries, facilities, transportation, etc.) Town and Country Planning /Development authority Classification

There is a cluster of numerous large-scale, medium-scale and small-scale industries, engaged in manufacture of variety of products, for example pharmaceuticals, dyes and chemicals, paper mills, paints, plastics, packaging, textiles, speciality chemicals, pesticides and others in the Gujarat Industrial Development Corporation (GIDC) notified area of Saykha.

1.10.2 Land use planning (breakup along with green belt etc)

The proposed project is located within the Notified Industrial Area by Government of Gujarat and due to development of proposed project; there will not be any change in the land use pattern of the region. Proposed Green belt planning in the project area is as below.

For Green Belt Development as per the layout plan, the company proposes approx. **33.0% (18892 m^2) green belt** of the total land i.e. **57248.29 m2**. The company shall develop green belt along the periphery of the proposed site.

While selecting the plants species to be grown in the green belt zone, following points will be taken into account:

1. Climatic condition and soil characteristics of the region.
2. The air pollution emitted by the industry – gaseous and particulate matter. Plant interaction with both gaseous and particulate pollutants and to a great extent absorbs them and thus, removes them from the atmosphere.
3. Characteristics of plants including shapes of crowns considered necessary for effective absorption of pollutant gases and removal of dust particles.
4. Height of the plants should not be too high to be lethal.
5. For absorbance of gases, the duration of the foliage should be longer.

6. Vegetation controls soil erosion rates significantly. The decrease of water erosion rates with increasing vegetation cover is exponential. This review reveals that the decrease in water erosion rates with increasing root mass is also exponential. Plant species having good root system are selected, so that soil erosion can be checked.

SITE PLAN WITH AREA TABLE FOR PROPOSED PLANT

Sr. No.	Name of the Units	Area in Sq. mt	Ground coverage Percentage (%)
1	Plant-1	1650	2.88
2	Plant-2	1320	2.31
3	Plant-3	2450	4.28
4	Plant-4	1800	3.14
5	Plant-5	2100	3.67
6	Tank Farm-1	1188.8	2.08
7	Tank Farm-2	2000	3.49
8	Finish Goods Storage	1750	3.06
9	Raw Material Storage	1750	3.06
10	Cloak Room	891.87	1.56
11	Admin Cabin and R & D	910	1.59
12	Chlorine Shed	875	1.53
13	Recovery Plant	875	1.53
14	Engineering Workshop	1197.8	2.09
15	ETP	2594	4.53
16	Utility	2305	4.03
17	Hazardous Waste Storage	1217.5	2.13
18	Underground Solvent Storage	2215.5	3.87
19	Weighing Bridge Cabin	50	0.09
20	Green Belt Area	18892	33.00
21	Open Space	5000.8	8.74
22	Road Infrastructure	4215	7.36
Total		**57248.29**	**100.00**

1.10.3 Site map with Green Belt Development Planning

1.10.4 Assessment of Infrastructure demand (Physical & Social)

There is no need for any infrastructure demand in terms of physical or social needs for proposed project.

1.10.5 Amenities/ Facilities:

GIDC Notified Industrial Area of Saykha has the entire available infrastructure like CETP, water, electricity, roads, rail, transportation, availability of raw material and drainage system.

1.11 PROPOSED INFRASTRUCTURE

1.11.1 Industrial Area (Processing Area):

The proposed infrastructure to manufacture products will be built with standard engineering design considering all the relevant parameters related to environment, health and safety.

1.11.2 Residential Area (Non Processing Area):

No residential area is involved in the project.

1.11.3 Green Belt

Green belt will be provided and maintained at the tune of 33.3% of the total land area.

1.11.4 Social Infrastructure: **Not applicable**

1.11.5 Connectivity (Traffic and Transportation Road/Rail/ Metro/ Water ways etc.)

The project site is very well connected by road through National Highway no. 48, western railways.

1.11.6 Drinking Water management (Source & Supply of water)

Source of water is from GIDC water supply services.

1.11.7 Sewerage System

GIDC has provided sewerage system to dispose the sewage effluent.

1.11.8 Industrial Waste Management

- For the proposed plant, total fresh water requirement will be 1033 KLD. From the proposed plant, total 585 KLD of industrial waste water will be generated, Which will be treated in primary ETP & Fenton treatment process. After primary & Fenton treatment, 575 KLD of effluent will be taken to MEE & ATFD. About 125 KLD of steam will be used for MEE & ATFD. Thus, total 627 KLD of condensate will be generated, which will be treated in secondary & tertiary ETP and discharge into CETP Saykha for further treatment and disposal.
- Domestic waste water (18.0 m^3/day) will be treated in STP and STP treated will be utilized for plantation.

1.11.9 Solid/Hazardous Waste Management

S. No.	Type of hazardous waste	Schedule & Category	Quantity, TPA	Source of generation Proposed	Disposal
1	Discarded Containers / Bags / Liners	Sch-I/33.1	200	Storage & handling of Raw Materials	Collection, Storage, Transportation, Decontamination &

					Disposal by selling to registered recycler.
2	Used / Spent Oil	Sch-I/ 5.1	0.5	Equipment & Machineries	Collection, Storage, Transportation, Decontamination & Disposal by selling to registered recycler.
3	ETP Sludge	Sch-I/35.3	3240.0	In-house ETP	Collection, Storage, Transportation and disposal at common nearest TSDF site
4	MEE Salt	Sch-I/ 28.1	25200.0	Process	Collection, Storage, Transportation and disposal at common nearest TSDF site
5	Recovered Solvent	Sch-I/ 28.6	1059967.8	Process	Collection, Storage, Management & Recovery within the premises and reuse in plant premises.
6	30% Hydrochloric Acid Solution	Sch-I/ 28.1	62435.4	Process (Metofluthrin, Nitenpyram, Imazalil Pymetrozine, Prothioconazole, Tiadinil, Dimoxystrobin, Benalaxyl, Imazapyr, Desmedipham,Picloram, Mecoprop, Iodosulfuron-Methyl,Cypermethric Acid Chloride,Triazinone ,Benzaldehyde, Cycloprothrin,Flumethrin, Acrinathrin, Tefluthrin, Ethiprole,Dinotefuran, Nitenpyram, Azaconazole,Bromuconazole,Etazonazole,Penconazole,)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
7	Sodium Bromide Salt	Sch-I/ 28.1	4344	Process (Etofenprox,Etoxazole)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
8	20% Sodium Sulphite Soln	Sch-II-Class B(15)	156708	Process (Fenpropathrin,Flonicamid,Tebufenpyrad,Metrafenone,Tiadinil,Bixafen,Imazamox,Diflufenican, Carfentrazone, Cypermethric Acid Chloride, Lambda Acid Chloride, O-	Collection, Storage & reuse in manufacturing Plant excess quantity will be sold to end users having Rule 9 Permission.

				Cyano Phenol)	
9	Sodium Chloride Salt	Sch-I/ 28.1	9705	Process (Flucythrinate, Nitenpyram, Pymetrozine, Pyrithiobac Sodium, Etoxazole, Kresoxim Methyl, Trifloxystrobin, Isoprothiolane, Imazapyr,Fenoxaprop P Ethyl,Methyl-2- [2-(6-Chloro Pyrimidine-4-yl) Oxyphenyl-3-Methoxyprop-2-Enoate, DETCI, 4-Amino-4'- Methyl Diphenyl Ether)	Collection, Storage, Transportation and disposal at common nearest TSDF site.
10	Liq. Ammonia	Sch-II-Class B(15)	23142.0	Process (Etofenprox ,1,2,4 Triazole)	Collection, Storage & reuse in manufacturing Plant excess quantity will be sold to end users having Rule 9 Permission.
11	Distillation Residue/tarry waste/organic Residue	Sch-I/ 36.1	18055.2	Process (Etofenprox,Cyantraniliprole, Pyrithiobac Sodium, Tebuconazole, Tiadinil, Fenhexamide, Ametryn, Mandipropamid, Metribuzine, Tefuryltrione, 4-Nitro O-Xylene/3-Nitro O-Xylene,Triazinone, 3-Methyl Phenol (Meta- Cresol))	Collection, Storage, Transportation and sent for co-processing in cement industries or common incineration facility.
12	Mix Salt/Inorganic Salt	Sch-I/28.1	15710.4	Process (Thiocloprid,Glufosinate Ammonium, Picloram, Cloquintocet Mexyl, Pinoxaden, Chloro Difluoro Pyridine)	Collection, Storage, Transportation and disposal at common nearest TSDF site
13	Sodium Bromide Solution	Sch-II-Class B(15)	35618.4	Process (CyantraniliproleEthion, Chlomethoxyfen, Paclobutrazol, P-Chloro Isoveralic Chloride, 4-Fluoro Anisole)	Collection, Storage & reuse in manufacturing Plant excess quantity will be sold to end users having Rule 9 Permission.
14	Recovered Catalyst	Sch-I/ 28.6	1150.8	Process (Deltamethrin, Indoxacarb,Pymetrozine,	Collection, Storage, Transportation and sent for co-processing in cement industries or

				Cyproconazole, Metominostrobin, Fenhexamid,Glyphosate, Sulfentrazone, Carfentrazone, m-Phenoxy Benzyl Alcohol, 4-Fluoro Anisole)	common incineration facility.
15	Ammonium Chloride Soln	Sch-I/28.1	5507.4	Process (Flonicamid, Pymetrozine, Kresoxim Methyl, Dimoxystrobin, Fomesafen, Metamitron, 3-Methyl 1,2,4 Triazole)	Collection, Storage & reuse in manufacturing Plant excess quantity will be sold to end users having Rule 9 Permission.
16	Ammonium Chloride Solid	Sch-I/28.1	276.0	Process (PEG / PMG Ester)	Collection, Storage & reuse in manufacturing Plant excess quantity will be sold to end users having Rule 9 Permission.
17	Sodium Sulfate Soln	Sch-I/28.1	33145.8	Process (Flonicamid, Triclopyricarb, Trifloxystrobin, Napropamide, Metribuzine, 2–Nitro Imino Imidazolidine (NII), Triclabendazole)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
18	N, N-Bis (Dichloromethyl) Methyl Amine	Sch-I/28.1	309.0	Process (Clothianidin)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
19	Methyl Acetate	Sch-I/28.1	207.0	Process (Pymetrozine)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
20	Sodium Hydrosulfide Solution (20%)	Sch-I/28.1	1867.2	Process (Malathion,Triazinone)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
21	Ammonium Acetate	Sch-I/28.1	211.2	Process (Acephate)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
22	30% Hydrobromic Acid Solution	Sch-II-Class B(15)	21031.2	Process (Phenthoate,Triadimefol,Napropamide,Haloxyfop,4-Bromo 2- Chloro Phenol,4-Bromo-2,5-Dichloro Phenol)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.

23	Sodium Ethoxide	Sch-I/28.1	532.8	Process (Pyrithiobac Sodium)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
24	Ethyl Alcohol	Sch-I/28.3	324.0	Process (Spiromesifen)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
25	Sodium Methyl Sulfate	Sch-I/28.1	1334.4	Process (Tebufenpyrad)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
26	Spent Sulphuric Acid	Sch-I/28.1	65398.2	Process (Lufenuron,Captan, Quinclorac, Carfentrazone, Cypermethric Acid Chloride,3-Methyl Phenol (Meta-Cresol))	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
27	20 % Aluminium Chloride Soln	Sch-I/28.1	90480	Process (Hexaconazole, Clethodim, m-Phenoxy Benzaldehyde, 2-Chloro-4-(4-Chlorophenoxy) Acetophenone)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
28	Potassium Bromide Soln. (27%)	Sch-II-Class B(15)	3774.0	Process (Hexaconazole, Triclopyricarb, 2, -Chloro-4-(4-Chlorophenoxy) Phenacyl Bromide)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
29	Pottasium Methyl Mercaptide	Sch-I/28.1	720.0	Process (Cyproconazole)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
30	Potassium Chloride salt	Sch-I/ 28.1	4140.0	Process (Epoxiconazole, Picoxystrobin, Fluoxastrobin, Cyazofamid, Toprammezone, Methyl-2- [2-(6-Chloro Pyrimidine-4-yl) Oxyphenyl-3-Methoxyprop-2-Enoate)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
31	Potassium Bisulphate	Sch-I/ 28.1	571.2	Process (Epoxiconazole)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
32	Methane Soln.	Sch-I/ 28.2	624.0	Process (Tetraconazole)	Collection, Storage, Transportation & Disposal

					by selling to authorized end user registered under Rule-9.
33	Magnesium Bromide	Sch-I/ 28.3	715.2	Process (Bromuconazole)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
34	Potassium BI Carbonate	Sch-I/ 28.4	1368.0	Process (Bromuconazole, Cyazofamid**)**	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
35	Methane Sulfonic Acid Sodium Salt	Sch-I/ 28.5	2517.6	Process (Penconazole, Mandipropamid)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
36	Sodium Carbonate	Sch-I/ 28.6	3150.0	Process (Picoxystrobin, Methyl-2- [2-(6-Chloro Pyrimidine-4-yl) Oxyphenyl-3-Methoxyprop-2-Enoate)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
37	Sodium Bi Sulphate	Sch-I/ 28.7	2425.2	Process (Kresoxim Methyl, Dimoxystrobin, Halosafen, Fenoxaprop P Ethyl)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
38	Succinamide	Sch-I/ 28.8	504.0	Process (Triclopyricarb)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
39	Methyl Bisulfate	Sch-I/ 28.9	180.0	Process (Trifloxystrobin)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
40	Acetic Acid	Sch-I/ 28.1	458.4	Process (Fluopyram)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
41	Potassium Phenolate	Sch-I/ 28.1	648.0	Process (Sulfosulfuron)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
42	Ammonium Sulphate	Sch-I/ 28.1	4776.0	Process (Prosulfocarb, 2-Hydroxy-4-Methyl Benzotioate (HMBT))	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
43	Sodium Fluoride	Sch-I/28.1	314.4	Process (Cyhalofop-Butyl)	Collection, Storage, Transportation & Disposal by selling to authorized

					end user registered under Rule-9.
44	Sodium Hydroxide Solution	Sch-I/ 28.1	12721.2	Process (Sulfentrazone, Carfentrazone, 3-Methyl 1,2,4 Triazole)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
45	Methylene Chloride	Sch-I/ 28.1	4646.4	Process (Sulcotrione)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
46	Sodium salt of Formic Acid	Sch-I/ 28.1	1089.6	Process (Mepiquate Chloride)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
47	Phosphoric Acid (35%)	Sch-I/28.1	15660.0	Process (CCMP)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
48	8 – 10 % Sodium Hypochlorite Solution	Sch-II-Class B(15)	1044.0	Process (1,1-Dichloro Pinacolin, 2-Chloro-4-Fluorophenol)	Collection, Storage & reuse in manufacturing Plant & excess quantity will be sold to end users having Rule 9 Permission.
49	Spent Nitric Acid	Sch-I/28.1	9720.0	Process (4-Nitro O-Xylene/3-Nitro O-Xylene)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
50	30% Sodium Bi Sulfide Solution	Sch-I/28.1	2340.0	Process (Triclabendazole)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
51	Iron Hydroxide	Sch-I/28.1	6264.0	Process (2,5-Dichloro Aniline)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
52	Sodium Benzoate (10% Soln)	Sch-I/28.1	1800.0	Process (Benzaldehyde)	Collection, Storage, Transportation & Disposal by selling to authorized end user registered under Rule-9.
53	Off specification products	Sch-I/ 36.1	250.0	Storage & handling of Products	Collection, Storage, Transportation and sent for co-processing in cement industries or nearest incineration site.
54	Date expired products	Sch-I/ 36.1	250.0	Storage & handling of Raw Materials and Products	Collection, Storage, Transportation and sent for co-processing in cement industries or nearest incineration site.
	Non hazardous waste				
55	STP sludge	-	10	STP	Collection, storage and

					use as a manure within the premises.
56	Fly ash	-	2205	Boiler house	Collection, storage, transportation and sell to brick manufacturer.

1.11.10 Power Requirement & Supply / Source

Power requirement for proposed project will be taken from DGVCL.

1.12 REHABILITATION AND RESETTLEMENT (R&R) PLAN

1.12.1 Policy to be adopted (Central/ State) in respect of the project affected persons including home oustees, land oustees and landless labourers (a brief outline to be given)

There will be no rehabilitation and resettlement undertaken as labours and workers from local & nearby areas for the proposed construction activity which will be minor as the proposed activity is to be undertaken at the existing plot/shed.

1.13 PROJECT SCHEDULE & COST ESTIMATES:

1.13.1 Likely date of start of construction and likely date of completion (Time schedule for the project to be given)

After obtaining Environmental clearance and Consent to Establish from GPCB, the company shall start the proposed construction and commissioning of the project.

1.13.2 Estimated project cost along with analysis in terms of economic viability of the project

Estimated project cost along with the analysis in terms of economic viability of the project is given as below;

Plant & Machinery, Pipeline & Fittings, Electrical Installation, Safety systems, etc. are the major heads considered in the Capital Cost Projection for the proposed project. Environment Protection has also been considered in planning the Cost Projection, which will include Green belt development, safety systems etc.

CAPITAL COST PROJECTION

No.	Particulars	Cost in Crore
1.	Land	20.0
2.	Building	50.0
3.	Plant , Machinery & utilities	156.8
4.	Environmental Management System (Water/Air/Hazardous waste)	20.0
5.	Occupational/health/safety, PLC /DCS system, fire hydrant and green belt	3.2
	Total Project Cost	**250.0**
	CER activity (2% of capital investment as project is Brownfield)	**5.0**

UTILITIES AND FUEL REQUIREMENT

S. No.	Particulars	Details
	Utilities	
1.	Steam Boiler, TPH	20
2.	Thermic fluid heater:, lakhs kcal/hr.	15
3.	D.G Set:I (Standby), kVA	1000
4.	D.G Set:II (Standby), kVA	1000
5.	Power from DGVCL, kVA	4000
6.	Cooling Tower, TR	1500
7.	Chilling plant, TR	250
8.	Brine chiling plant, TR	200
9.	Nitrogen plant, m3/Hr	50
10.	Air compresser	2 x 250 cfm

PROJECT VIABILITY

S. No.	Particulars	Amount (Crore /Month)
1.	Proposed Sale	30.0
2.	Raw Material Cost	13.6
3.	Power & Fuel	2.5
4.	Labour Cost	2.5
5.	Environmental Management System	4.4
6.	Maintenance Cost	1.0
7.	Selling, packing & Office Expenses	1.0
8.	Proposed Profit	5.0

The company will provide budgetary provision for the recurring expenses for environmental issues while planning the allocation of funds during the monthly budgetary planning.

CAPITAL COST/RECURRING/OPERATING COST

S. No.	Name of the unit	Install capacity	Capital Cost Rs. Lakhs	Operating cost Rs. Lakhs/Month	Maintenance Cost Rs. Lakhs/Month	Total Recurring Cost Rs. Lakhs/Month
1.0	**Water Environment**					
	Primary & secondary ETP for normal effluent stream	627 kL	400.0	20.0	1.0	21.0
	MEE/ATFD	575 kL	4.0	345	5.0	350.0
	RO plant	55 kL	75.0	5.0	0.25	5.25
	CETP membership & disposal charges	-	500.0	7.5	0	7.5
	STP	20 kL	20.0	1.0	0.25	1.25
	Laboratory & Monitoring	-	20.0	0.25	0	0.25
	Total Water environment control	-	**1019.0**	**378.75**	**6.50**	**385.25**
2.0	**Air Environment**					
	Scrubber for Process	-	150.0	10.0	2.0	12.0

S. No.	Name of the unit	Install capacity	Capital Cost Rs. Lakhs	Operating cost Rs. Lakhs/Month	Maintenance Cost Rs. Lakhs/Month	Total Recurring Cost Rs. Lakhs/Month
	Bag filter, ESP & Scrubber for boiler & TFH	-	200.0	5.0	1.0	6.0
	VOC & LDAR monitoring for solvent	-	100.0	5.0	1.0	6.0
	Air monitoring	-	0	5.0	0	5.0
	Total air environment		**450.0**	**25.0**	**4.0**	**29.0**
3.0	**Hazardous Waste**					
	Membership fees & disposal charges	-	10.0	15.0	0	15.0
	Storage facility	-	25.0	0	0	0
	Total		**35.0**	**15.0**	**0**	**15.0**
4.0	**Occupational Health and Safety**					
	OHC	50 m^2	10.0	2.0	0	2.0
	Medical kits & antidotes	-	5.0	0	0	0
	Medical check up	-	0	0.50	0	0.50
	Safety training, safety equipments like PPE's & Fire equipment like fire extinguishers, fire proximity suits		50.0	0	0	0
	Fire hydrant system		100.0	0	5.0	5.0
	DCS/PLC system		150	0	2.0	2.0
	Total		**315.0**	**2.5**	**7.0**	**9.5**
5.0	**Green belt Devlopment**					
	Gardener	-	0	0.5	0	0.5
	Plants, fencing, rain water harvesting	-	5.0	0	0.5	0.5
	Total		**5.00**	**0.5**	**0.5**	**1.0**
6.0	**CER Activity**	2% of additional capital investment	**500**	**0**	**0**	**0**
	Grand Total		**2324**	**421.75**	**18.0**	**439.75**

1.14 ANALYSIS OF PROPOSAL (FINAL RECOMMENDATIONS):

1.14.1 Financial and social benefits with special emphasis on the befit to the local people including tribal population, if any, in the area

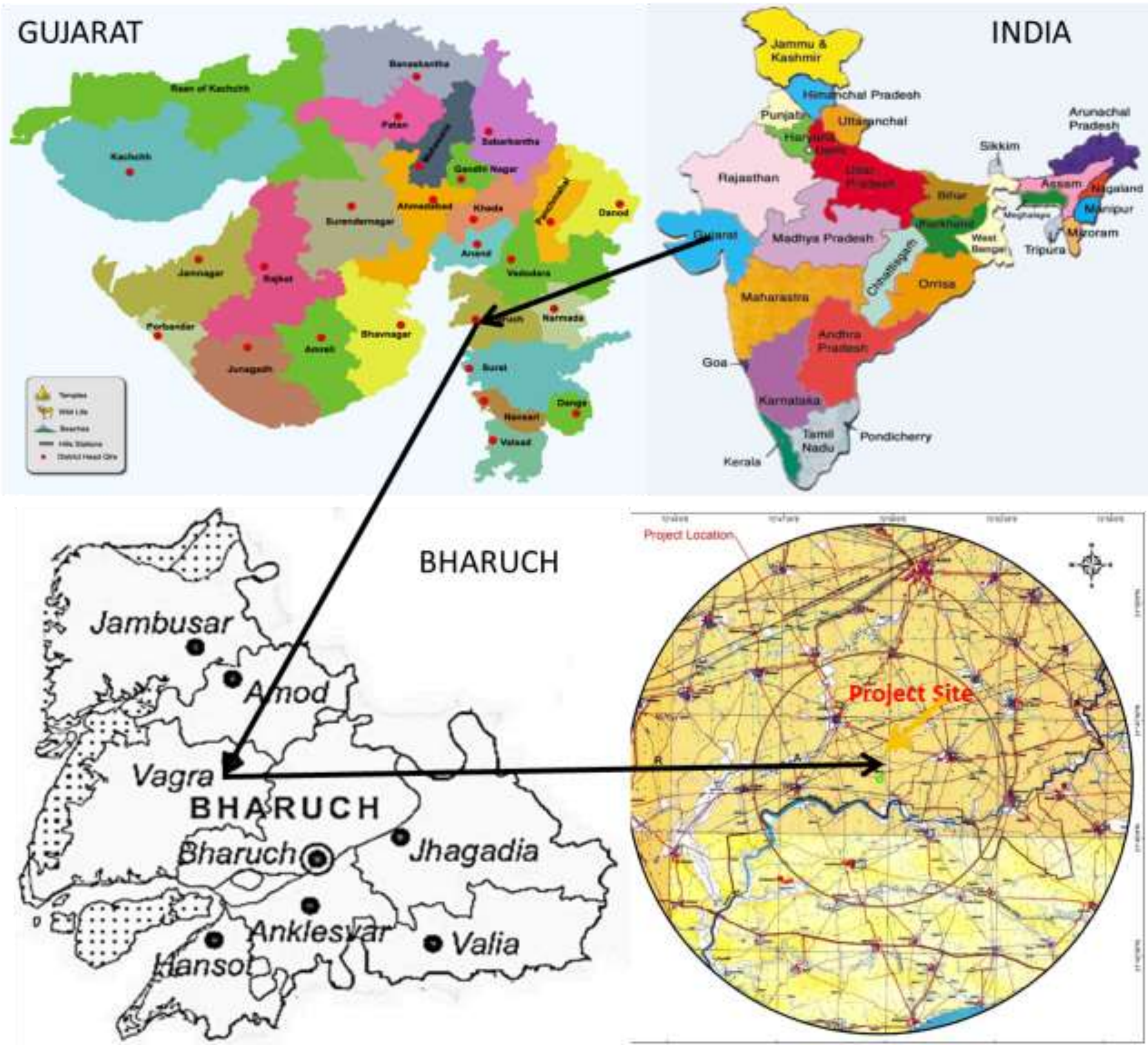
Proposed project activity will provide benefits to the local people in terms of financial and social welfare.

- Local people will get direct financial benefit by way of employment.
- Local people will get some contracts of supply and services to get indirect income.
- Company will contribute in improving education and health facilities in nearby area.

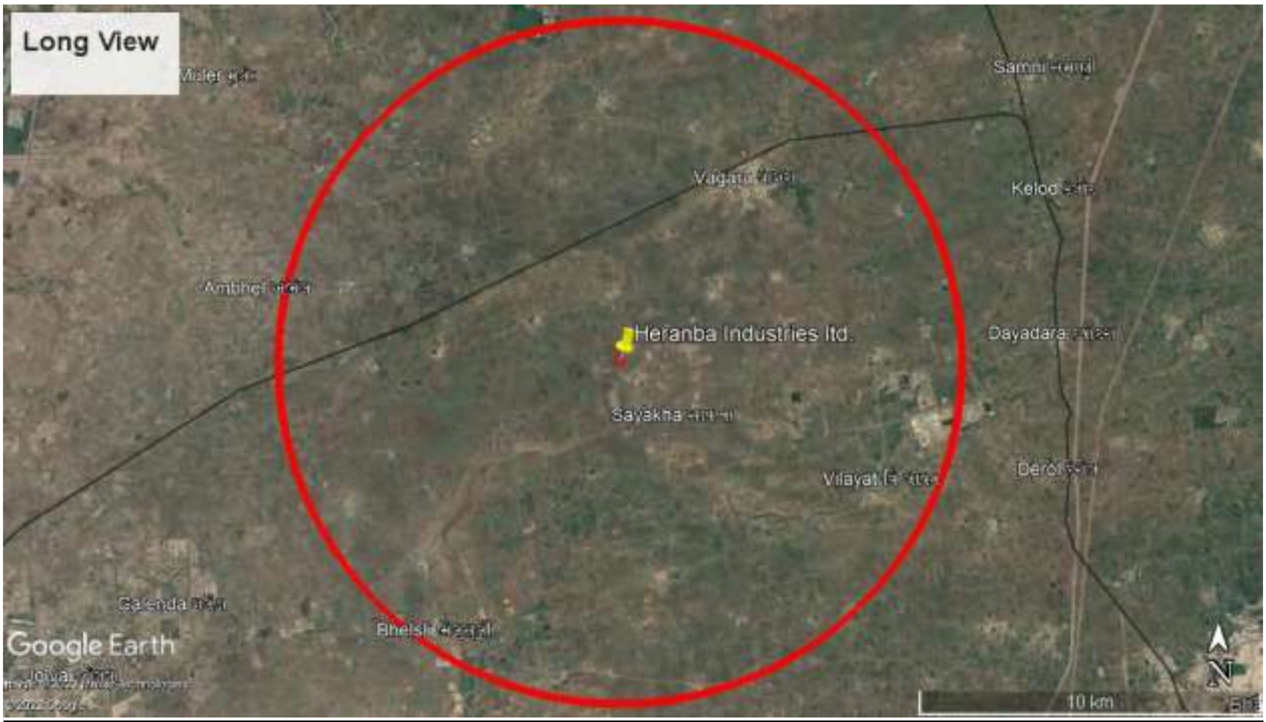
ANNEXURES

ANNEXURE: 1
LOCATION MAP SHOWING THE PROJECT SITE AND INTER-STATE BOUNDARY WITHIN 10 KMS RADIUS

The map showing general location, specific location and project boundary and project site layout of **M/s. Heranba Industries limited (Unit: VI)** located at **Plot No. T-108, T-109, GIDC, Saykha, Ta: Vagra, Di: Bharuch, 392140 (Gujarat).** The location of the project site and topography map is shown below:



Long View of Project Site



Short View of Project Site

ANNEXURE: 2

PLANT LAYOUT

ANNEXURE: 3

MANUFACTURING PROCESS

The company is using the latest available process technology for the production. This chapter includes the manufacturing process of the product, chemical reactions, and material mass balance & mole balance for the product.

❖ **Group -1: Synthetic Pyrethroids Insecticides: -**

1) Cypermethrin Technical & It's All Isomers Beta, Zeta Theta, etc.

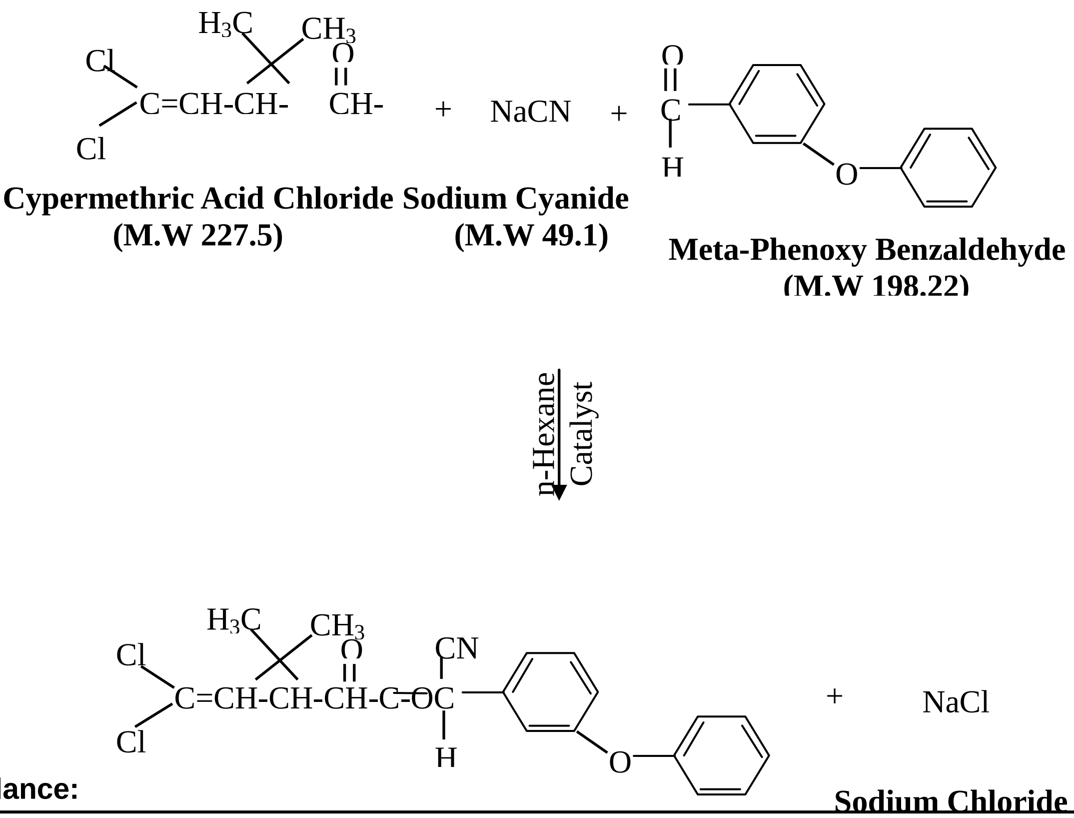
Brief Manufacturing Process: -

Meta Phenoxy Benzaldehyde is reacted with Sodium Cyanide to form Meta Phenoxy Benzaldehyde Cyanohydrin as an intermediate. This on reaction with Cypermethric Acid Chloride forms the final Product Cypermethrin. In this process n- Hexane is used as solvent along with phase transfer Catalyst. The reaction mass of Cypermethrin is washed by Soda Ash solution & Water.

Finally, n-Hexane is stripped off to get pure Cypermethrin.

Aqueous layers which content traces of Sodium Cyanide is detoxified by the treatment of Sodium Hypochlorite 8 - 10% Solution to < 0.2 ppm Level.

Chemical Reactions: -



Mass Balance:

1	Material / Mass Balance of Cypermethrin All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials	Kg/Batch		Product	Kg/Batch
1	Meta Phenoxy Benzaldehyde	500		Cypermethrin	**1000**

2	Cypermethric Acid Chloride	585		Recovered Solvent n-Hexane	2900
3	Solvent n- Hexane	3000		Solvent Loss	100
4	Water for Reaction	500		Detoxified Aq. Layer to ETP	2580
5	Sodium Cyanide	135			
6	Catalyst	10			
7	4 % Soda Ash Solution	500			
8	2% Acetic Acid solution	500			
9	10 % Sodium Hypochlorite Soln	850			
	TOTAL	**6580**		**TOTAL**	**6580**

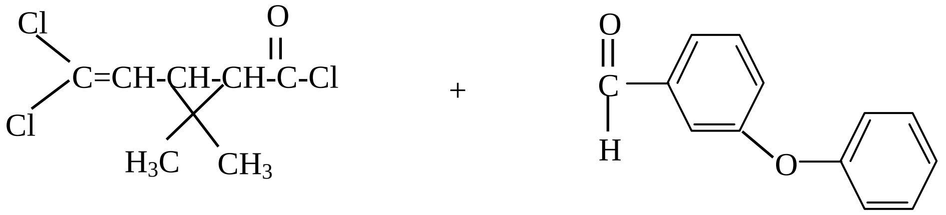
2) Alphacypermethrin Technical
Brief Manufacturing Process: -

Step 1: -Alpha Cypermethric Acid Chloride (CMAC), Meta Phenoxy Benzaldehyde (MPBD) and n-Hexane chilled in a reactor which wasfeededin main reaction reactor where sodium cyanide solution and water, hexane, catalyst is prepared earlier and chilled. The feeding temperature is 20 °C to 25 °C. The reaction was carried in 3 to 4 h. The layer was separated and cyanide layer is kept for detoxification with sodium Hypochlorite. Further reaction mixture layer was washed 4 times with water. The washings are sent to ETP for treatment. Finally, hexane is recovered and high cis Cypermethrin is packed and taken for preparation of Alphacypermethrin (For epimerization reaction).

Step 2: -Alpha Cypermethrin and TEA is taken for epimerization at 28 °C. After Conversion of CIS-I and CIS-II the reaction mass is taken for filtration. The Mother liquor is further treated for recovery of TEA and Cypermethrin. Then the filtered cake is taken for acidification using dil.H_2SO_4in n-hexane. Layer is separated and cooled up to 10 °C and again filtered to get Alphamethrin. The mother liquor is further taken for hexane recovery to get another crop of Cypermethrin.

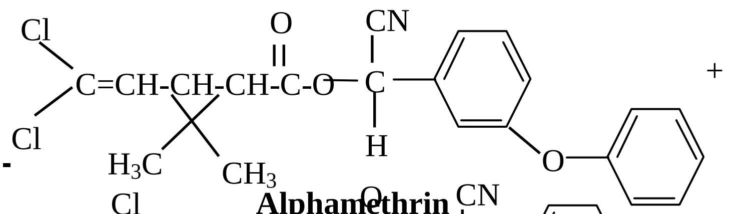
Chemical Reactions: -

Step 1:



Sodium Cyanide
(M.W 49.1)

Meta-Phenoxy Benzaldehyde
(M.W 198.22)

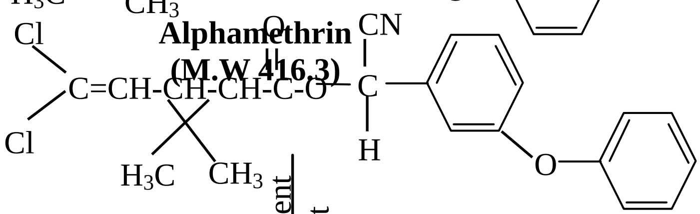


NaCl

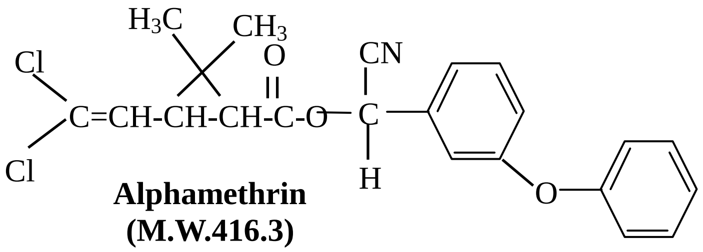
Alphamethrin
(M.W 416.3)

Sodium Chloride
(M.W 58.5)

Step 2: -



Alphamethrin
(M.W.416.3)



Alphamethrin
(M.W.416.3)

Mass Balance:

2	Material / Mass Balance of Alpha Cypermethrin All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg /Batch
1	Meta Phenoxy Benzaldehyde	714		Alpha Cypermethrin Tech	1000
2	Cis Cypermethric Acid Chloride (Cis CMAC)	835		Recovered Isomer of Cypermethric Acid Chloride	412
3	Water	714		Recovered Solvent - n-Hexane	4105
4	Sodium Cyanide	195		Solvent Loss (N-Hexane)	195
5	Solvent – n-Hexane	4300		Detoxified Aqueous Layer to ETP	4030
6	Catalyst	14		Recovered IPA + Catalyst	2450
7	Soda Ash Solution (5 %)	750		Solvent (IPA) + Catalyst Loss	140
8	Acetic Acid Solution (5 %)	500			
9	Water for Washing	750			
10	Sodium HypochloriteSoln (8-10 %)	885			
11	Iso Propyl Alcohol (IPA)	1450			
12	Catalyst for Epimerization	85			
13	IPA for Crystallization and Washing	1140			
	Total	**12332**		**Total**	**12332**

3) Deltamethrin Technical

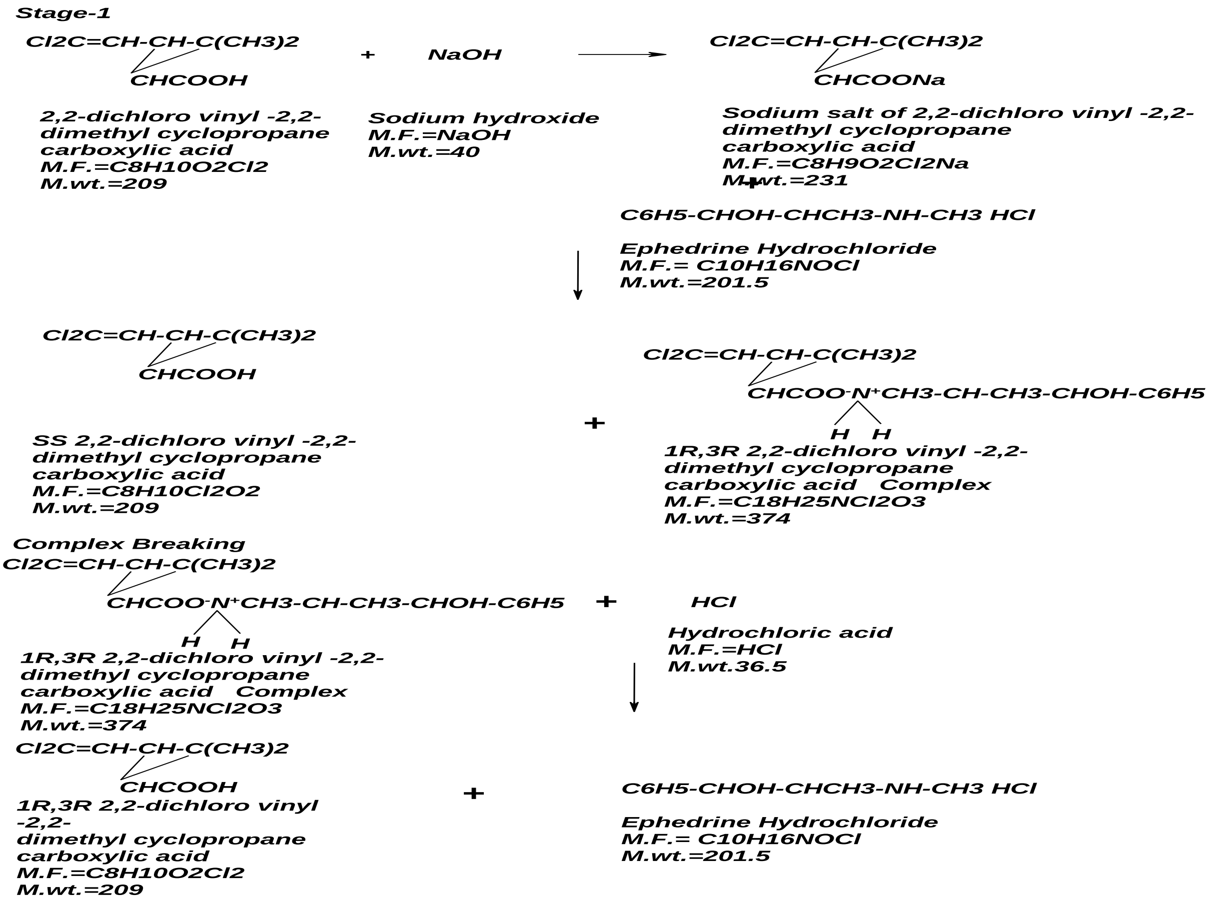
Brief Manufacturing Process: -

High cis Cypermethric Acid is reacting with Catalyst in alkaline condition to separate RR & SS-Cypermethric Acid. Solution of RR- Cypermethric Acid is reacted with Hydrogen Chloride gas in presence of Aluminium Chloride to obtain Tribromo Cypermethric Acid. Tri Bromo Cypermethric Acid is converting into Di Bromo Cypermethric Acid in alkaline condition Di Bromo Cypermethric Acid is reacting with Methanol in Acidic condition to form Di Bromo Cypermethric Ester. This Di Bromo Cypermethric ester is taken for fraction distillation and makes pure Di Bromo Cypermethric ester. Di Bromo Cypermethric Ester is hydrolyzed under alkaline condition at elevated temperature to form Di Bromo Cypermethric Acid. Di Bromo Cypermethric Acid is reacting with Thionyl Chloride in presence of Catalytic amount of DMF to form Di Bromo Cypermethric Acid Chloride.

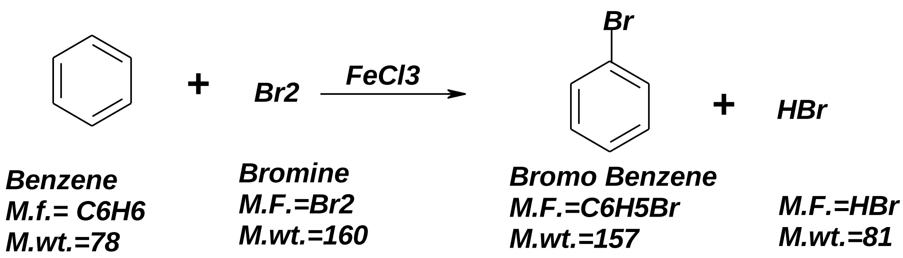
During the reaction Sulphur Dioxide and Hydrogen Chloride Gas in generate, which is scrub in Caustic Solution. Di Bromo Cypermethric Acid Chloride is condensed with M-Phenoxy Benzaldehyde and Sodium Cyanide in presence of Phase Transfer Catalyst and Toluene as Solvent. Separated organic layer and distilled out Toluene to obtain RS-Deltamethrin crude. Make solution of crude RS-Deltamethrin in Isopropyl Alcohol and add Triethyl Amine and maintain for 20 hrs to obtain S-Deltamethrin which is filtered and wash with IPA to obtain wet cake of Deltamethrin. This wet cake is dry to obtain pure Deltamethrin Technical.

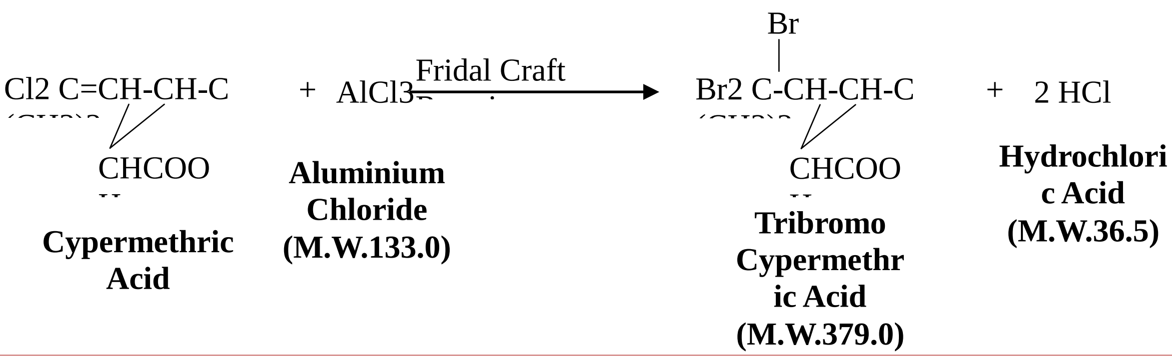
Chemical Reactions: -

Stage-1 Resolution (Reaction chemistry)



Stage-2 Bromination





Stage-3 Dehydro Halogenation & Acidification

Br
Br2HC-CH-CH-C(CH3)2 + *NaOH* + *1/2 H2SO4*
CHCOOH

TribromoCypermethric acid
M.F.=C8H11O2Br3
M.wt.=379

Sodium hydroxide
M.F.=NaOH
M.wt.=40

sulphuric acid
M.F.=H2SO4
M.wt.=98

Dehydrohalogenation ↓

Br2C=CH-CH-C(CH3)2 + *HBr* + *1/2 Na2SO4* + *H2O*
CHCOOH

DibromoCypermethric acid
M.F.=C8H10O2Br2
M.wt.=298

Hydrobromic acid
M.F.=HBr
M.wt.=81

Sodium sulphate
M.F.=Na2SO4
M.wt.=142

water
M.F.=H2O
M.wt.=18

Stage-4 Esterification

Br2C=CH-CH-C(CH3)2 + *CH3OH*
CHCOOH

DibromoCypermethric acid
M.F.=C8H10O2Br2
M.wt.=298

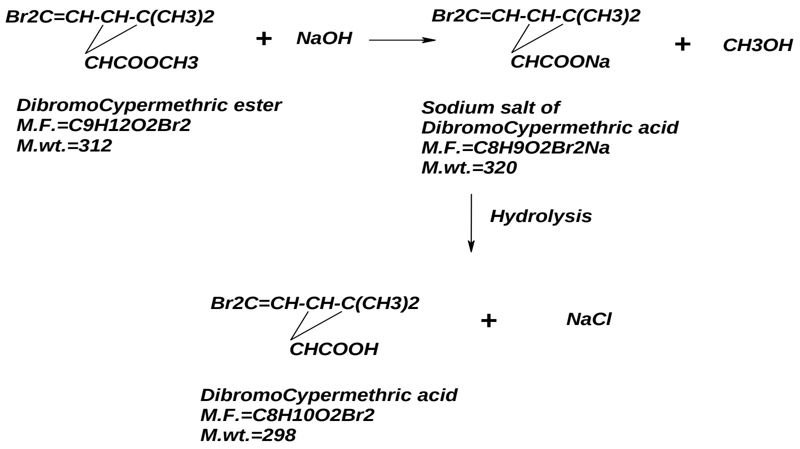
Methanol
M.F.=CH3OH
M.wt.=32

↓ *H2SO4*

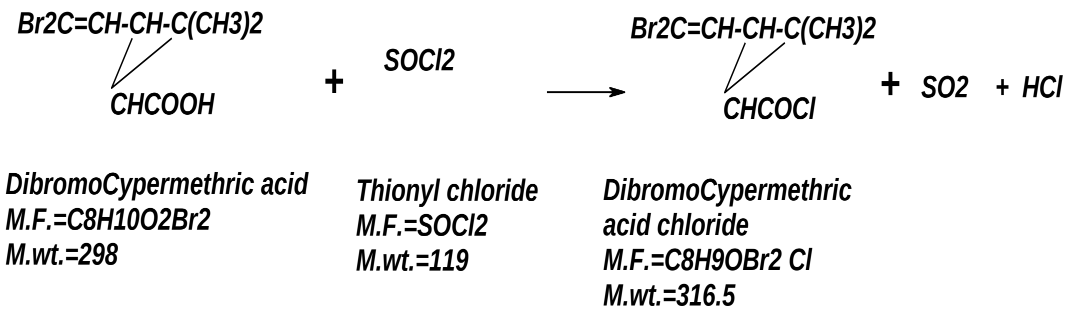
Br2C=CH-CH-C(CH3)2 + *H2O*
CHCOOCH3

DibromoCypermethric ester
M.F.=C9H12O2Br2
M.wt.=312

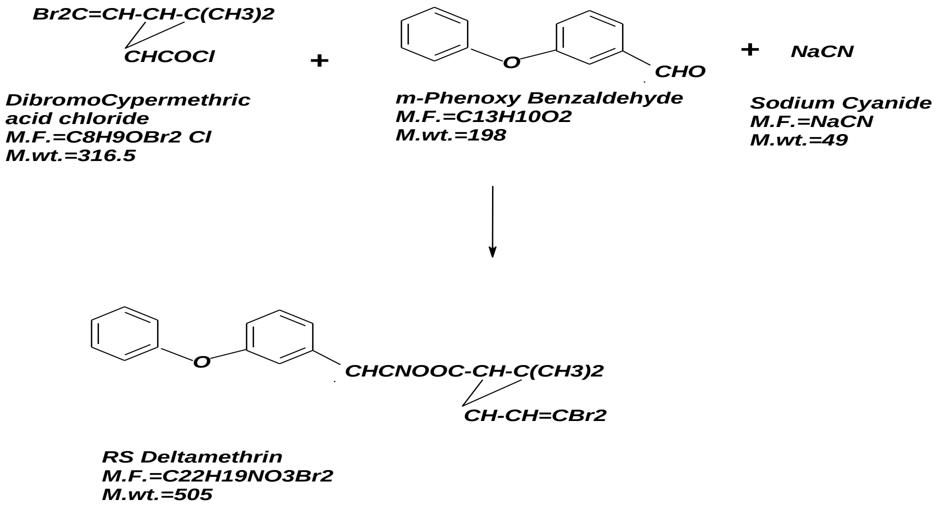
Stage-5 Ester Hydrolysis



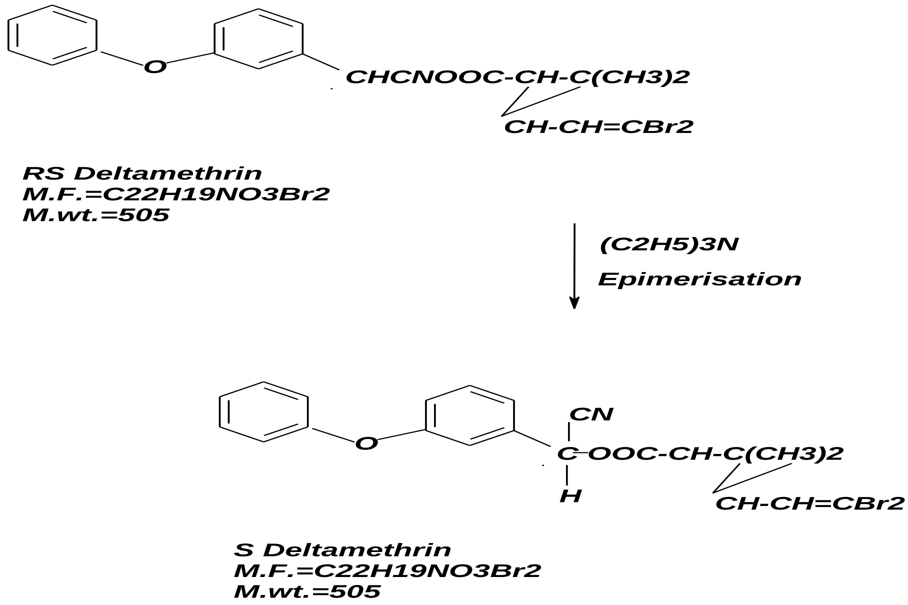
Stage-6 Dibromo Acid Chloride



Stage-7 Condensation



Stage-8 Epimerization & purification



Mass Balance:

3	Material / Mass Balance of RRCMA (All Quantities are in kg)				
Stage -1	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Water	8693		Aqueous Mass for Cypermethric Acid & Catalyst to Stage-2	11738
2	15% CAT-V Solution	7726		15% Soln of Catalyst Recovered & Recycle	6818
3	Caustic Soda Flakes	511		Recovered MDC	1932
4	Cypermethric Acid	2841		MDC Loss	455
5	Methylene Dichloride (MDC)	3182		RR CMA + MDC (4 KM)	2272
6	30% Hydrochloric Acid	455		Recovered Hexane	193
	TOTAL	**23408**		**TOTAL**	**23408**

3	Material / Mass Balance of SS CMA (All Quantities are in kg)				
Stage -2	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Aqueous mass for Cypermethric Acid & Catalyst recovery	11738		SS CMA + MDC (7.36 KM)	5498
2	Methylene Dichloride	3750		15% Soln of Catalyst	2273

	(MDC)			Recovered & Recycle	
3	30% Hydrochloric Acid	682		Aqueous Mass to ETP	9649
4	Water	1250			
	TOTAL	**17420**		**TOTAL**	**17420**

3	**Material / Mass Balance of SS CMAC (All Quantities are in kg)**				
Stage -3	**IN – PUT**			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	SS CMA + MDC (7.36 KM)	5498		Cypermethric Acid Chloride	1903
2	Thionyl Chloride	995		30% Hydrochloric Acid	1017
3	Water for 30 % HCl Soln	715		22% Sodium Sulphite Solution	4929
4	Dilute C.S. Lye Soln	640		Recovered MDC	3409
5	Water for C S Lye Dilution	3580		MDC Loss	142
				Evaporation Loss	28
	TOTAL	**11428**		**TOTAL**	**11428**

3	**Material / Mass Balance Preparation of HBr Gas for Br. CMA (All Quantities are in kg)**				
Stage -4	**IN – PUT**			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Benzene	3481		HBr Gas	2564
2	Iron (II) Chloride	32		Aqueous Mass for Bromine Recovery	2532
3	Bromine	5065		Aqueous Mass to ETP	3923
4	Sodium Thio Sulphate	65		Recovered Benzene - Recycle	649
5	Water	5844		Bromo Benzene	4675
6	Caustic Soda Lye (48%)	19		Residue	468
7	Bromo Benzene	357		Evaporation Loss	52
	TOTAL	**14863**		**TOTAL**	**14863**

3	**Material / Mass Balance of Br. CMA Preparation (All Quantities are in kg)**				
Stage -5	**IN – PUT**			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Methylene Dichloride (MDC)	6000		Reaction Mass	6974
2	Aluminium Chloride	1030		22-25 % Aluminium Chloride Soln	4682
3	Hydrobromic gas	2564		HBr Scrub in NaOH	78

4	30% Hydrochloric Acid	519		Aqueous mass for Bromine recovery	5782
5	Recovered Hydrochloric Acid	6623		Effluent	649
6	Water	1429			
	TOTAL	**18165**		TOTAL	**18165**

3	**Material / Mass Balance of DHH & Acidification (All Quantities are in kg)**				
Stage -6	**IN – PUT**			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Reaction Mass	6974		Reaction Mass	3610
2	Water	4273		Recovered MDC	5844
3	C.S. Flakes	195		MDC loss	156
4	Caustic Soda Lye	404		Aqueous mass for Bromine recovery	5142
5	Methylene Dichloride (MDC)	2571			
6	98% Sulphuric Acid	335			
	TOTAL	**14752**		**TOTAL**	**14752**
3	**Material / Mass Balance of Esterification (All Quantities are in kg)**				
Stage -7	**IN – PUT**			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Reaction Mass	3610		Ester	935
2	Methanol	487		Ester LRT Cut - Recycle	234
3	Sulphuric Acid	252		MDC Loss	143
4	Water	974		Recovered MDC	2857
5	SBC	2		MDC+ Traces of Methanol	97
6	Methylene Dichloride (MDC)	3000		Aqueous Effluent	3809
				Residue	250
	TOTAL	**8325**		**TOTAL**	**8325**

3	**Material / Mass Balance of Ester Hydrolysis & DBCMAC (All Quantities are in kg)**				
Stage -8	**IN – PUT**			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Ester	935		Reaction Mass	2850
2	Water	3828		Recovered Toluene	500
3	C.S. Flakes	278		Toluene loss	100
4	98% Sulphuric Acid	28		Evaporation Loss	10
5	Toluene	2610		Aqueous Mass to ETP	1793

6	30% Hydrochloric Acid	400		30% Hydrochloric Acid	357
7	DMF	8		22% Sodium Sulphite Soln	1827
8	Thionyl Chloride	350		Water + Traces of Methanol to ETP	1000
	TOTAL	**8437**		**TOTAL**	**8437**

3	**Material / Mass Balance of Condensation (All Quantities are in kg)**				
Stage -9	**IN – PUT**			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Reaction Mass	2850		Reaction Mass	1313
2	MPBD	525		Recovered Toluene	3800
3	Water	5250		Toluene loss	150
4	Toluene	2000		Evaporation Loss	50
5	Soda Ash	21		Aqueous Mass to ETP	6408
6	Sodium Cyanide	170			
7	10% Sodium Hypochlorite	900			
8	Acetic Acid	5			
	TOTAL	**11721**		**TOTAL**	**11721**
3	**Material / Mass Balance of Deltamethrin Technical All Quantities are in kg)**				
Stage -10	**IN – PUT**			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Organic Mass	1313		Deltamethrin	1000
2	Iso Propyl Alcohol (IPA)	9036		DM Second Crop - Recycle	313
3	Tri Ethyl Amine	375		Recovered IPA	8600
4	DM Tech	5		IPA Loss	436
5	98% Sulphuric Acid	80		Carbon + Hyflow	8
6	Carbon	4		Recovered Triethyl amine	370
7	Hyflow	4		Triethyl Amine Loss	5
8	Water	400		Aqueous Mass to ETP	485
	TOTAL	**11217**		**TOTAL**	**11217**

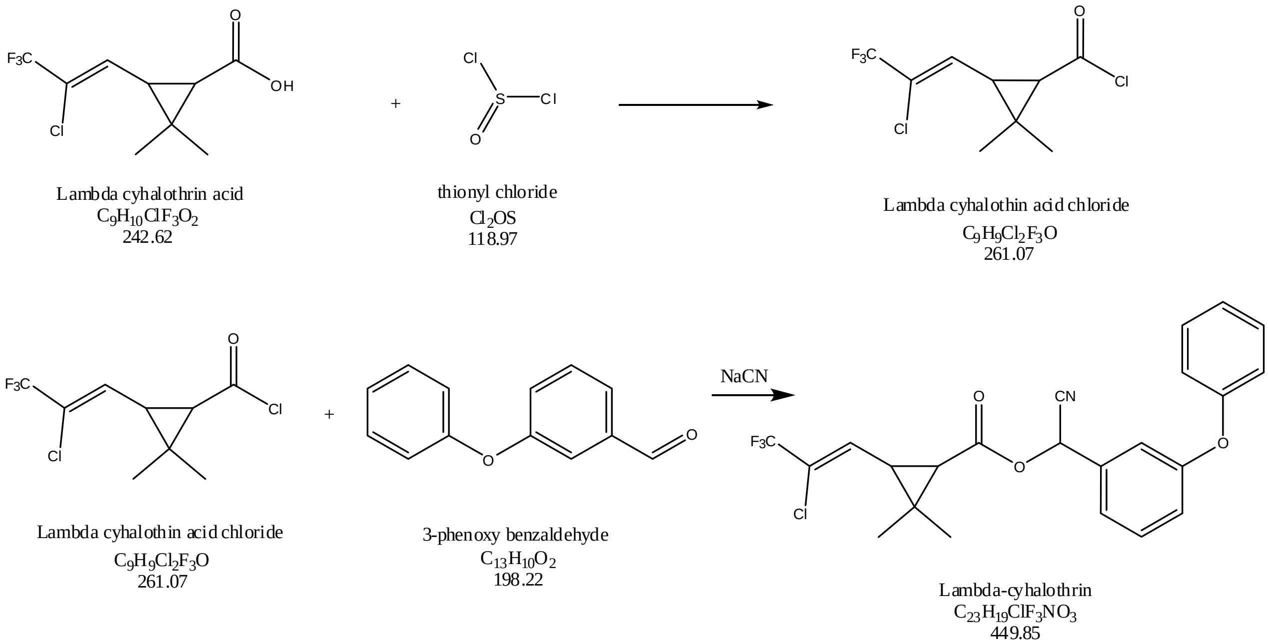
4) Lambda Cyhalothrin Technical

Brief Manufacturing Process: -

Charge Lambda-Cyhalothric Acid and Catalyst N, N-Dimethylformamide. Cool to 20˚C and add Thionyl Chloride for 4 hours. Scrub liberated Hydrogen Chloride and Sulphur Dioxide gases. Rise to 50˚C in 3 hours and maintain for 2 hours. This is Lambda-Cyhalothric Acid Chloride.

Charge N-Hexane, water and Sodium Cyanide. Add Lambda-Cyhalothric Acid Chloride and then 3-Phenoxy Benzaldehyde at 20˚C. Rise to 40˚C and maintain for 6 hours. Cool to 10˚C and separate the phases. Wash with water and recover N-Hexane under reduced pressure. Cool the mass to 5˚C. Charge Isopropyl Alcohol and Di Isopropylamine. Maintain at 5˚C for 16 hours, and then -5˚C for 12 hours. Charge water and separate the phases. Charge Acetic Acid aqueous solution and separate the phases. Rise the temperature to recover Isopropanol under reduced pressure and to obtain Lambda-Cyhalothrin Technical.

Chemical Reactions: -



Mass Balance:

4	**Material / Mass Balance of Lambda Cyhalothrin All Quantities are in kg)**				
	IN PUT			**OUT PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/ Batch**
1	Lambda Cyhalothric Acid	580		**Lambda Cyhalothrin**	**1000**
2	N,N-Dimethyl Formamide	5		30% Hydrochloric Acid	293
3	Thionyl Chloride	290		20% Sodium Sulphite Soln	775
4	n-Hexane	2000		Recovered n-Hexane	1950
5	Sodium Cyanide	115		n-Hexane loss	50
6	3-Phenoxy Benzaldehyde	450		Recovered Isopropyl Alcohol	1960
7	Isopropyl Alcohol	2000		Isopropyl Alcohol	40
8	Di Isopropyl Amine	50		Aqueous Phase	2247
9	Water	2000			
10	Water for HCl	825			
	TOTAL	**8315**		**TOTAL**	**8315**

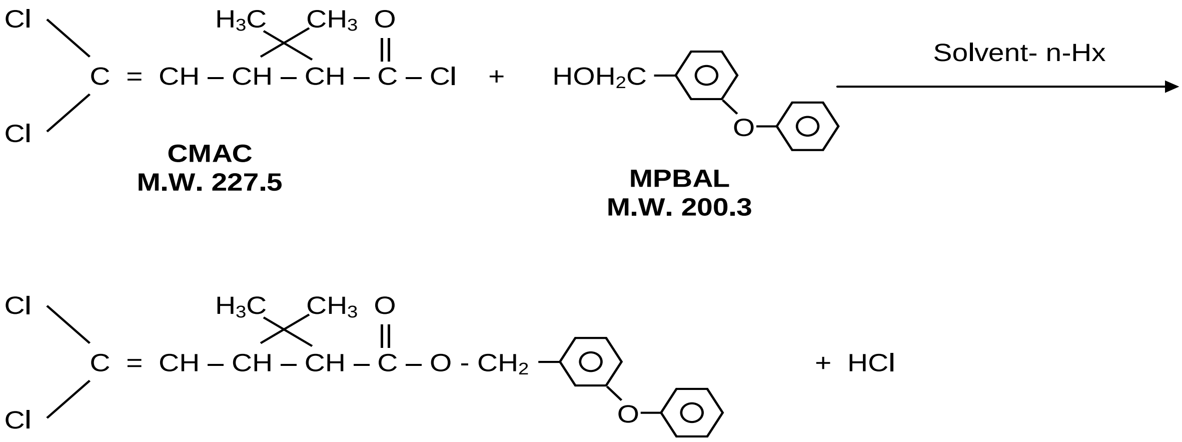
5) Permethrin Technical

Brief Manufacturing Process: -

Meta Phenoxy Benzyl Alcohol is reacted with Cypermethric Acid Chloride (CMAC) in presence of solvent n-Hexane to give the Permethrin mass. Hydrochloric acid gas is generated during the reaction which is scrubbed in water to get 30% solution of hydrochloric acid.

The resulting mass is then washed by soda ash solutions as well as water. Finally, solvent is stripped off to recover it & to get the pure Permethrin Tech.

Chemical Reactions: -



CMAC
M.W. 227.5

MPBAL
M.W. 200.3

PERMETHRIN
M.W. 391.3

HYDROCHLORIC ACID
M.W. 36.5

Mass Balance:

5	**Material / Mass Balance of Permethrin All Quantities are in kg)**				
	IN PUT			**OUT PUT**	
Sr. No	**Raw Materials / Items**	**Kg/ Batch**		**Product / By product**	**Kg/ Batch**
1	Meta Phenoxy Benzaldehyde	550		Permethrin	**1000**
2	Cypermethrin Acid Chloride (CMAC)	642		30% Hydrochloric Acid Solution	335
3	n-Hexane(F)	200		Recovered Solvent-n-Hexane	2800
4	n-Hexane (R)	2800		Residue	150
5	Water for Hydrochloric Acid Scrubbing	235		Aqueous to ETP	115
7	5 % Soda Ash Solution	1000		Detoxified Aq. Mass	1577
9	Water	500			
10	48% Caustic Soda Lye	50			
	TOTAL	**5977**		**TOTAL**	**5977**

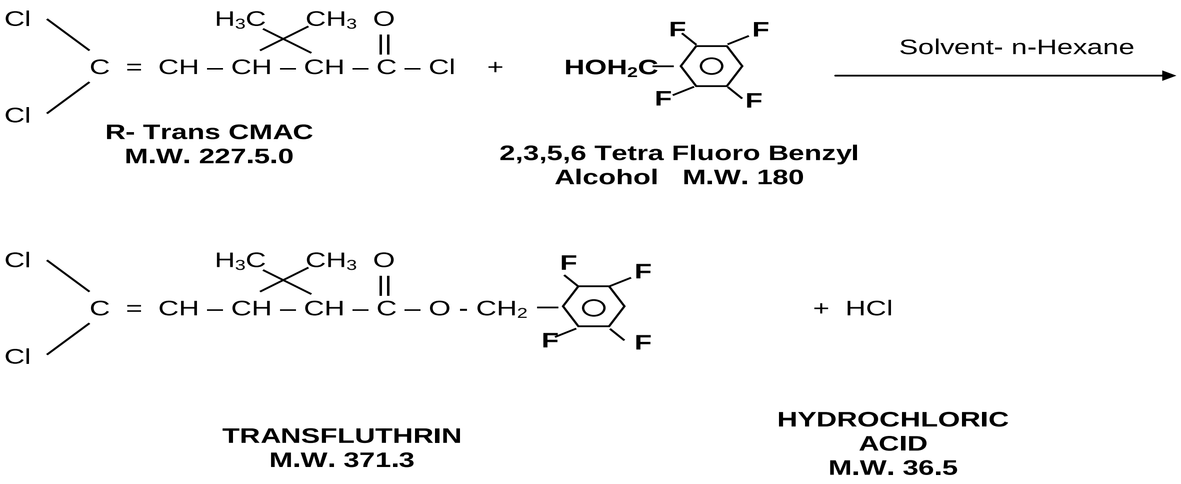
6) Transfluthrin

Brief Manufacturing Process: -

2,3,5,6 - Tetra Fluoro Benzyl Alcohol is reacted with R –Trans Cypermethric Acid Chloride (R-Trans CMAC) in presence of Solvent n-Hexane to give the Transfluthrin mass. Hydrochloric acid gas is generated during the reaction which is scrubbed in water to get 30% solution of hydrochloric acid.

The resulting mass is then washed by Soda Ash solutions as well as water. Finally, solvent is stripped off to recover it & to get the pure Transfluthrin Tech.

Chemical Reactions: -



Mass Balance:

6	Material / Mass Balance of Transfluthrin All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	**Raw Materials**	**Kg/ Batch**		**Product / By product**	**Kg/ Batch**
1	2,3,5,6-Tetra Fluoro Benzyl Alcohol	500		Transfluthrin	**1000**
2	R-Trans Cypermethric Acid Chloride	631		Recovered Solvent - n Hexane	1950
3	Catalyst	12		Solvent Loss n - Hexane	50
4	Solvent Hexane	2000		30 % Hydrochloric Acid Solution	337
5	Water for Hydrochloric Acid Solution	237		Aqueous Layer to ETP	543
6	5 % Soda Ash Solution	250			
7	Water for Washing	250			
	TOTAL	**3880**		**TOTAL**	**3880**

7) Allethrin

Brief Manufacturing Process: -

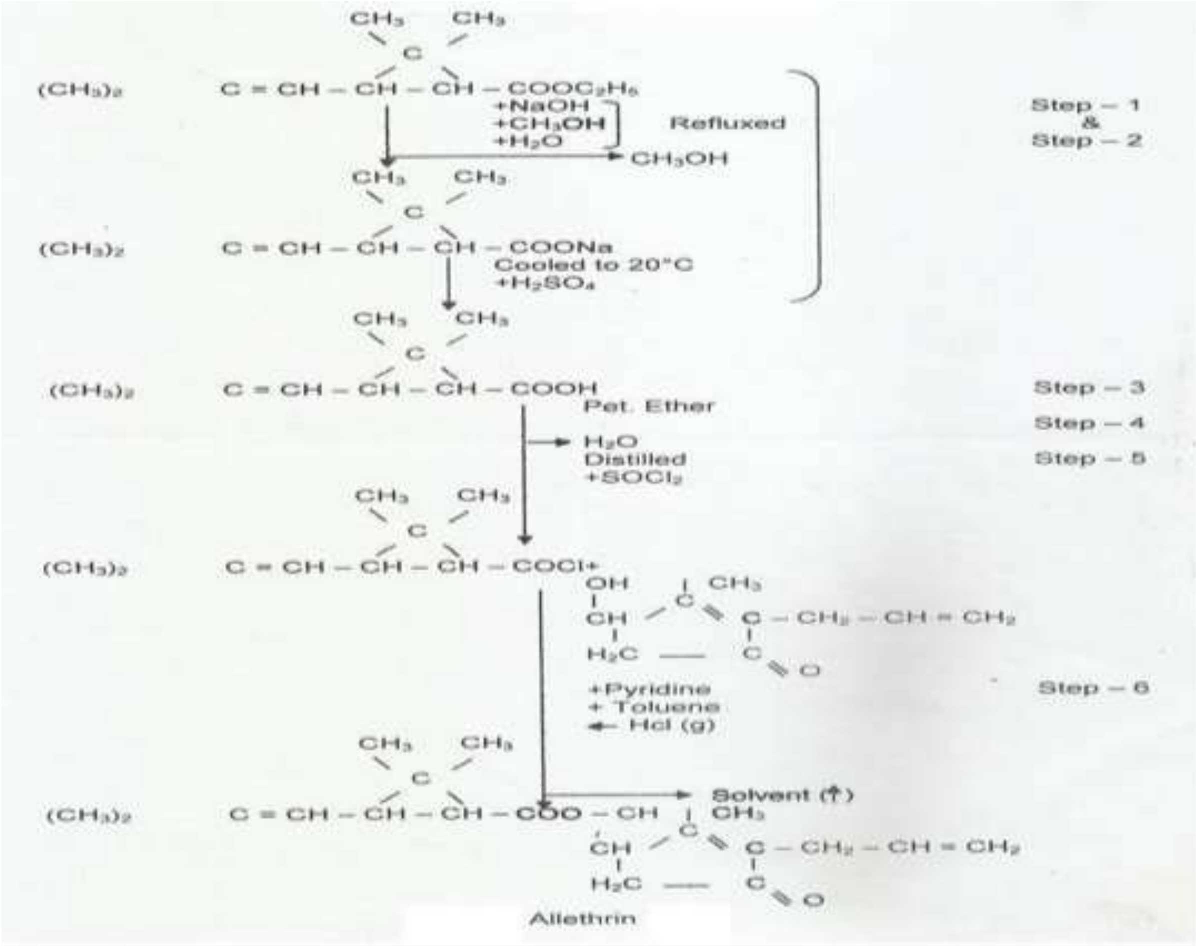
Step 1 - Charge Cyclo hexane, Allethrolone and Pyridine in the reaction vessel. Stir the reaction mass for 1 hour. Charge acid chloride slowly in the reaction in 3-4 hrs and maintain the reaction at 400C for 3 hrs until reaction is complete.

Step 2: - After completion of the reaction step 1 charge water and Hydrochloric Acid. Stir for ½ an hour for Pyridine Hydrochloride separation.

Step 3: - After Hydrochloride separation, neutralize reaction mass with NOH and wash Organic layer with water.

Step 4: - Separate the organic layer. Recover Cyclo Hexane under vacuum. Partially cool it and filter the Allethrin for packing.

Chemical Reactions: -



Mass Balance:

7	Material / Mass Balance of Allethrin All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	**Raw Materials**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Allethrelone	540		Allethrin	**1000**
2	Cyclohexane	1000		Recovered Pyridine	335
3	Pyridine	353		Pyridine Loss	18
4	Acid Chloride	640		Recovered Cyclo Hexane	960
6	30% HCl	125		Cyclo Hexane Loss	40
7	NaOH	10		Aqueous Effluent	4315
9	Water for washing	4000			
	TOTAL	**6668**		**TOTAL**	**6668**

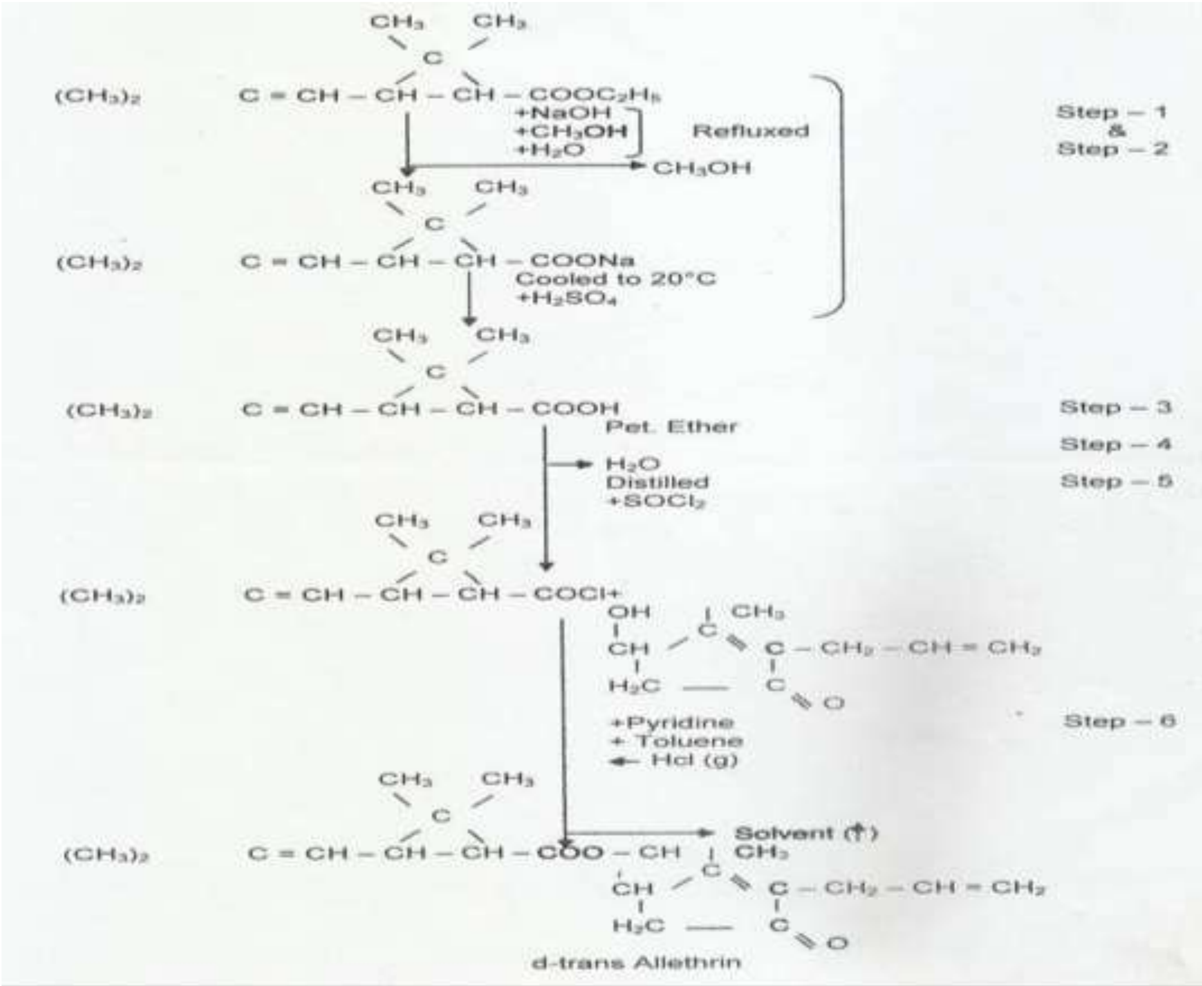
8) D-Allethrin & D- Trans Allethrin Tech.

Brief Manufacturing Process: -

Step 1: - Charge Cyclo Hexane, Allethrolone and Pyridine in the reaction vessel. Stir the reaction mass for 1 hour. Charge Acid C slowly in the reaction in 3-4 hrs and maintain the reaction at 40^0C for 3 hrs until reaction is complete.

Step 2: - After completion of the reaction (stage 1), charge water andH Acid. Stir for ½ an hour for Pyridine Hydrochloride separation.

Step 3: -After Hydrochloride separation, neutralize reaction mass with NOH and wash Organic layer with water.
Step 4: -Separate the Organic layer. Recover Cyclo Hexane under vacuum. Partially cool it and filter the D-Allethrin for packing.
Chemical Reactions: -



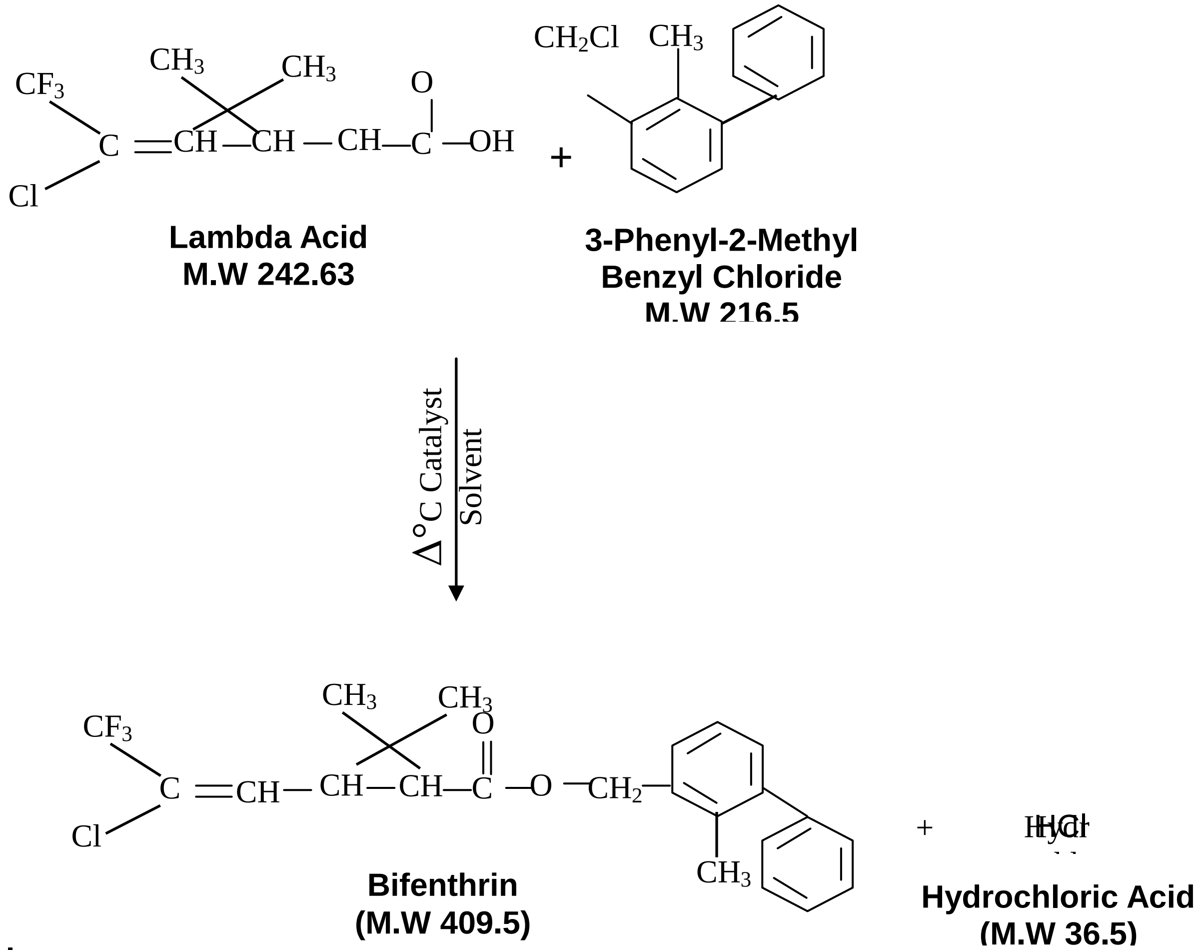
Mass Balance:

8	Material / Mass Balance of D-Allethrin & D- Trans Allethrin All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	**Raw Materials**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Allethrelone	540		D-Allethrin & D- Trans Allethrin	**1000**
2	Cyclohexane	1000		Recovered Pyridine	340
3	Pyridine	353		Pyridine Loss	13
4	Acid Chloride	640		Recovered Cyclo Hexane	200
6	30% HCl	125		Cyclo Hexane Loss	50
7	NaOH	10		Aqueous Effluent	5065
9	Water for washing	4000			
	TOTAL	**6668**		**TOTAL**	**6668**

9) Bifenthrin Technical
Brief Manufacturing Process: -

TFP Acid (Lambda Acid) is reacted with 3-Phenyl 2-Methyl Benzyl Chloride (PMBC) in presence of Solvent & catalyst to give the product Bifenthrin.

Chemical Reactions: -



Mass Balance:

9	Material / Mass Balance of Bifenthrin All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	**Raw Materials**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Lambda Acid	585		Bifenthrin	**1000**
2	3-Phenyl-2-Methyl Benzyl Chloride	558		Recovered Solvent - n Hexane	560
3	Catalyst	25		Solvent Loss n - Hexane	40
4	Solvent- Hexane	600		30 % Hydrochloric Acid	315
5	Water for Hydrochloric Acid	220		Distillation Residue	20
6	Water for Washing	500		Aqueous to ETP	553
	TOTAL	**2488**		**TOTAL**	**2488**

10) Prallethrin

Brief Manufacturing Process: -

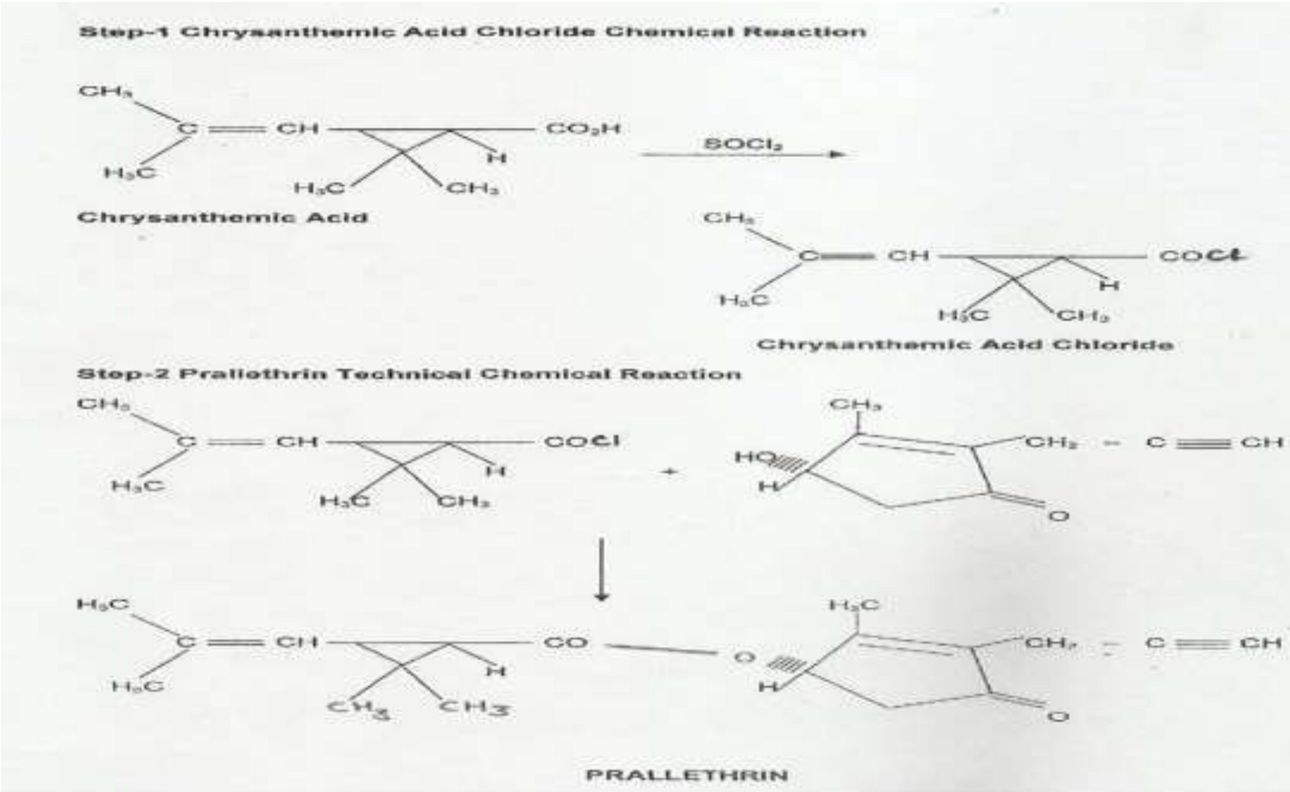
Step 1: - Cyclo Pentene 1-Hydroxy is reacted with Sodium Cyanide to form as an Intermediate. This on reaction with Chrysanthemic Acid Chloride forms the final product Prallethrin. In this process n-Hexane is used as solvent along with TEBA.

Step 2: - The reaction mass of Prallethrin is washed by Soda Ash solution and water.

Step 3: - n-Hexane is distilled off to get pure Prallethrin.

Aqueous layer, which contains traces of Sodium Cyanide, is detoxified by the treatment of Sodium Hypochlorite 10% solution to < 0.2 ppm level.

Chemical Reactions:



Mass Balance:

10	Material / Mass Balance of Prallethrin All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No	Raw Materials / Items	Kg/ Batch		Product / By product	Kg/ Batch
1	Chrysanthemic Acid Chloride	656		Prallethrin	1000
2	Cyclo Pentene 1-Hydroxy	535		Sodium Cyanide Effluent	1112
3	Sodium Cyanide	162		Recovered Hexane	2395
4	n-Hexane	2520		Hexane Loss	125
6	TEBA	15		Mother Liquor	200
7	Hypo Solution	600		Aqueous Effluent	2624
8	Soda Ash	15			
9	Acetic Acid	3			

10	Water	2950			
	TOTAL	**7456**		**TOTAL**	**7456**

11) Cyphenothrin (Tech)

Brief Manufacturing Process: -

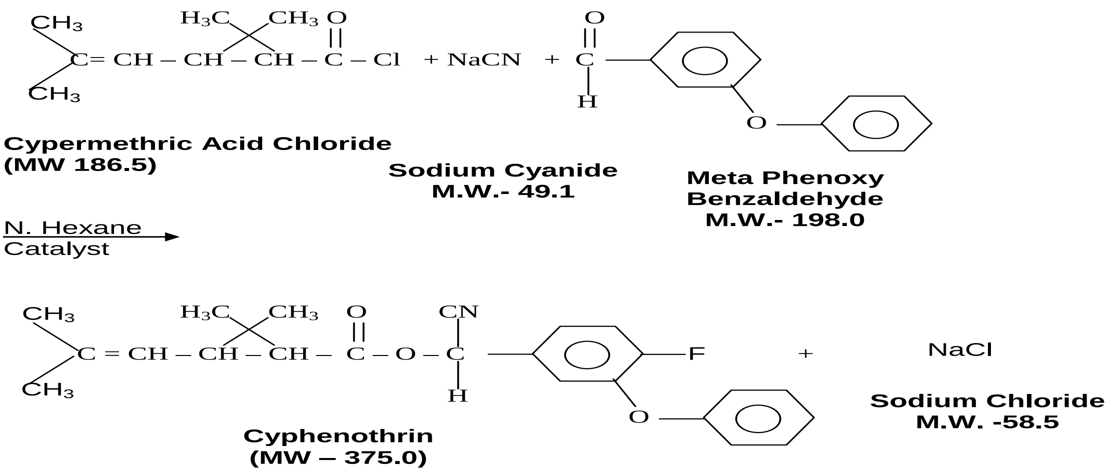
3- Phenoxy Benzaldehyde (Meta Phenoxy Benzaldehyde) is reacted with Sodium Cyanide to form Meta Phenoxy Benzaldehyde Cyanohydrin as an intermediate. This on reaction with Chrysanthemic Acid Chloride (CSAC) forms the final Product Cyphenothrin. In this process n.-Hexane is used as solvent along with phase transfer Catalyst.

The reaction mass of Cyphenothrin is washed by Soda Ash solution & Water.

Finally, n-Hexane is stripped off to get pure Cyphenothrin.

Aqueous layers which content traces of Sodium Cyanide is detoxified by the treatment of Sodium Hypochlorite 8 - 10% Solution to < 0.2 ppm Level.

B) CHEMICAL REACTIONS :-



11	Material Balance / Mass Balance of Cyphenothrin (Tech)(All Quantities are in Kg)				
	IN- PUT			OUT- PUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**kg/Batch**
1	Meta Phenoxy Benzaldehyde	555		Cyphenothrin	1000
2	Chrysanthemic Acid Chloride	535		Recovered Solvent n-Hexane	2870
3	Water for Reaction	500		Solvent Loss n - Hexane	130
4	Sodium Cyanide	150		Detoxified Aqueous to ETP	2690
5	Solvent –n- Hexane	3000			
6	Catalyst	10			
7	5% Soda Ash Solution	500			
8	Water for washing	500			
9	8-10 % Sodium Hypochorite Solution	940			
	Total	**6690**		**Total**	**6690**

12) Etofenprox

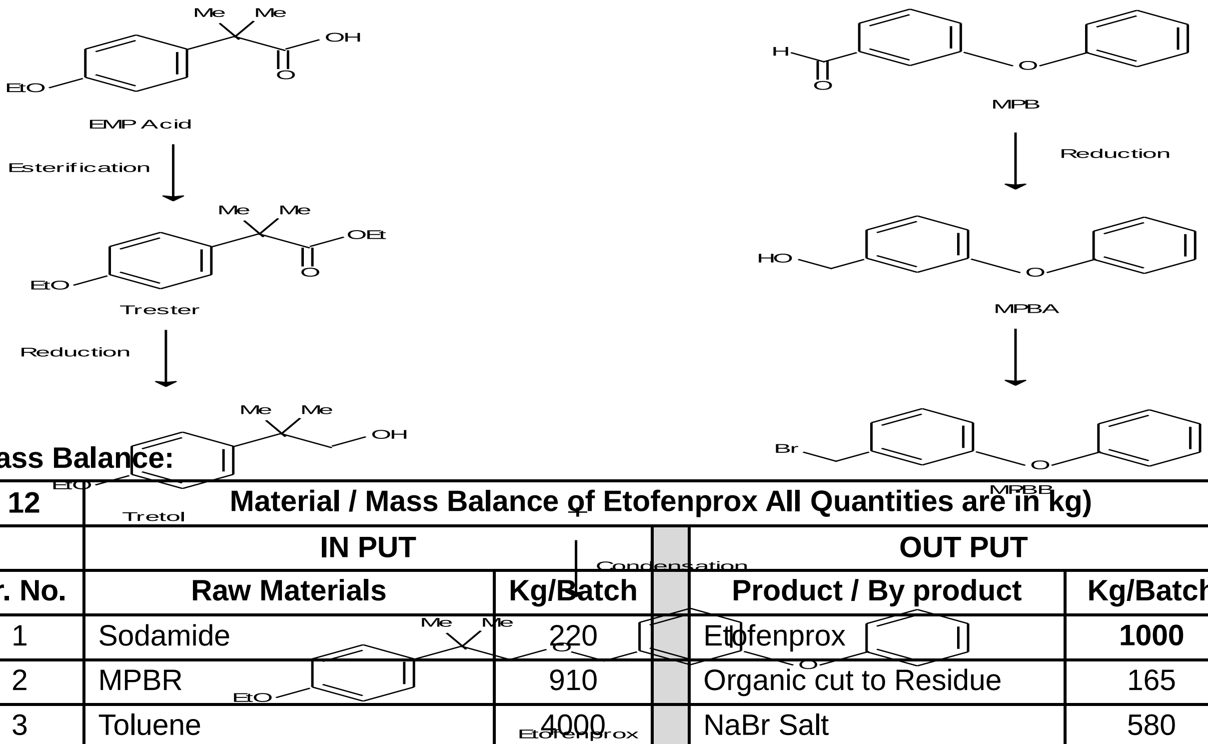
Brief Manufacturing Process: -

Step-1: Trester is treated with Sodium Metal in NBA Solvent at reflux to convert into Trester which is isolated as a solid product.

Step-2: Meta Phenoxy Benzaldehyde undergoes reduction / Hydrogenation by Hydrogen in presence of Solvent & Raney Nickel Catalyst to convert it to Meta Phenoxy Benzyl Alcohol (MPBA). This MPBA separately Brominated with HBr in presence of a Catalyst to obtain Meta Phenoxy Benzyl Bromide (MPBr), which is subsequently converted to Meta Phenoxy Benzyl Alcohol (MPBA) and isolated as Benzyl alcohol.

Condensation reaction between Trester is conducted in presence of strong alkaline reagent to get the active ingredient Etofenprox. Isolation, purification & drying are the unit operations necessary to get technical grade Etofenprox.

Chemical Reactions: -



Mass Balance:

12	Material / Mass Balance of Etofenprox All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	Raw Materials	Kg/Batch		Product / By product	Kg/Batch
1	Sodamide	220		Etofenprox	**1000**
2	MPBR	910		Organic cut to Residue	165
3	Toluene	4000		NaBr Salt	580
4	Tretol	675		Ammonia 25% soln.	98
5	Methanol	180		Rec. Toluene	3900
6	Water	1500		Toluene Loss	100
				Aqueous to ETP	1622
				Residue	20
	TOTAL	**7485**		**TOTAL**	**7485**

13) Fenpropathrin

Brief Manufacturing Process: -

Step 1: - Tetra Methyl Cyclo Propane Carboxylic Acid (TMCPCA) is reacted with Thionyl Chloride in presence of Dimethyl Formamide as well as Hexane. This reaction gives out Tetra Methyl Cyclo Propane Carboxylic

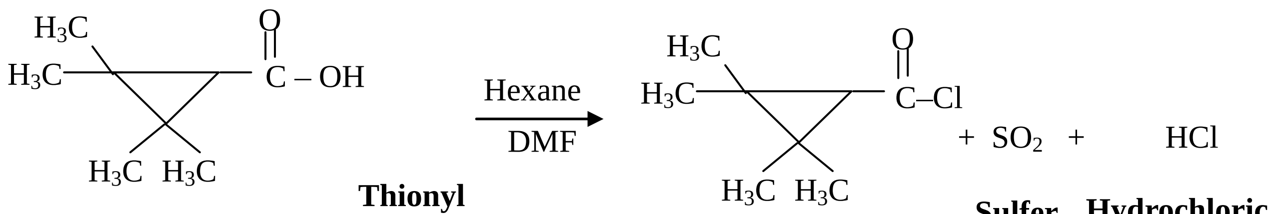
Acid Chloride and Hydrochloric Acid gas along with Sulphur dioxide gas in molar ratio as the Bi Product.

Step 2: - Meta Phenoxy Benzaldehyde is reacted with Sodium Cyanide to form Meta Phenoxy Benzaldehyde Cyanohydrin as an intermediate. This on reaction with Tetra Methyl Cyclo Propane Carboxylic Acid Chloride (TMPAC) form the Product Fenpropathrin. In this process n - Hexane is used as solvent along with phase transfer Catalyst.

The reaction mass of Fenpropathrin is washed by Soda Ash solution as well as water. Solvent- n-Hexane is stripped off to get pure Fenpropathrin. Aqueous layers which contains traces of Sodium Cyanide is detoxified by the treatment of Sodium Hypochlorite Solution (8 - 10%) up to < 0.2 ppm Level.

Chemical Reactions: -

Step 1: -



Tetra Methyl Cyclo Propane Carboxylic Acid (TMCPCA) M.W. 142

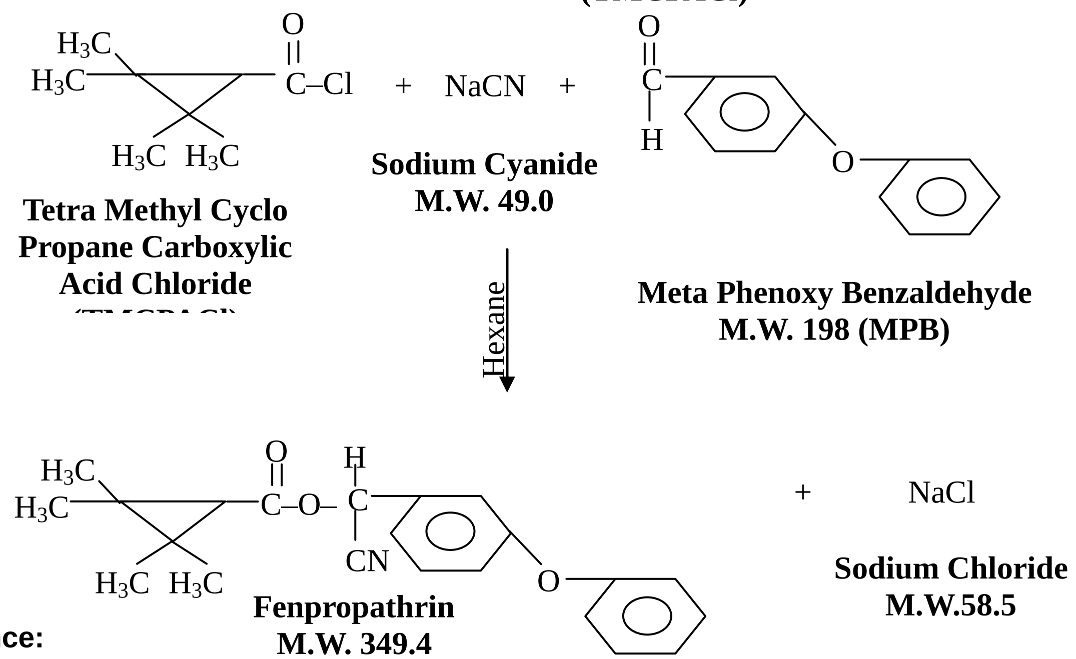
Thionyl Chloride M.W. 119

Tetra Methyl Cyclo Propane Carboxylic Acid Chloride (TMCPACl)

Sulfer Dioxide M.W. 64.0

Hydrochloric Acid M.W.36.5

Step 2: -



Tetra Methyl Cyclo Propane Carboxylic Acid Chloride (TMCPACl)

Sodium Cyanide M.W. 49.0

Meta Phenoxy Benzaldehyde M.W. 198 (MPB)

Fenpropathrin M.W. 349.4

Sodium Chloride M.W.58.5

Mass Balance:

13	Material / Mass Balance of Fenpropathrin All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch

1	Tetra Methyl Cyclo Propane Carboxylic Acid	417		Fenpropathrin	**1000**
2	ThionylChloride	350		Solvent Hexane Recovered	1910
3	Catalyst-DMF	5		Hexane Loss	90
4	Meta Phenoxy Benzaldehyde	580		30% Hydrochloric Acid Solution	357
5	Water for Reaction	500		20% Sodium Sulphite	1662
6	Sodium Cyanide	158		Detoxified Aq. Mass	1538
7	Solvent Hexane	2000			
8	Water for 30% Hydrochloric Acid	250			
9	20% Caustic Lye	1470			
10	Sodium Hypochloirde	627			
11	5%Soda Ash	200			
	TOTAL	**6557**		**TOTAL**	**6557**

14) Cyfluthrin & Beta-Cyfluthrin

Brief Manufacturing Process: -

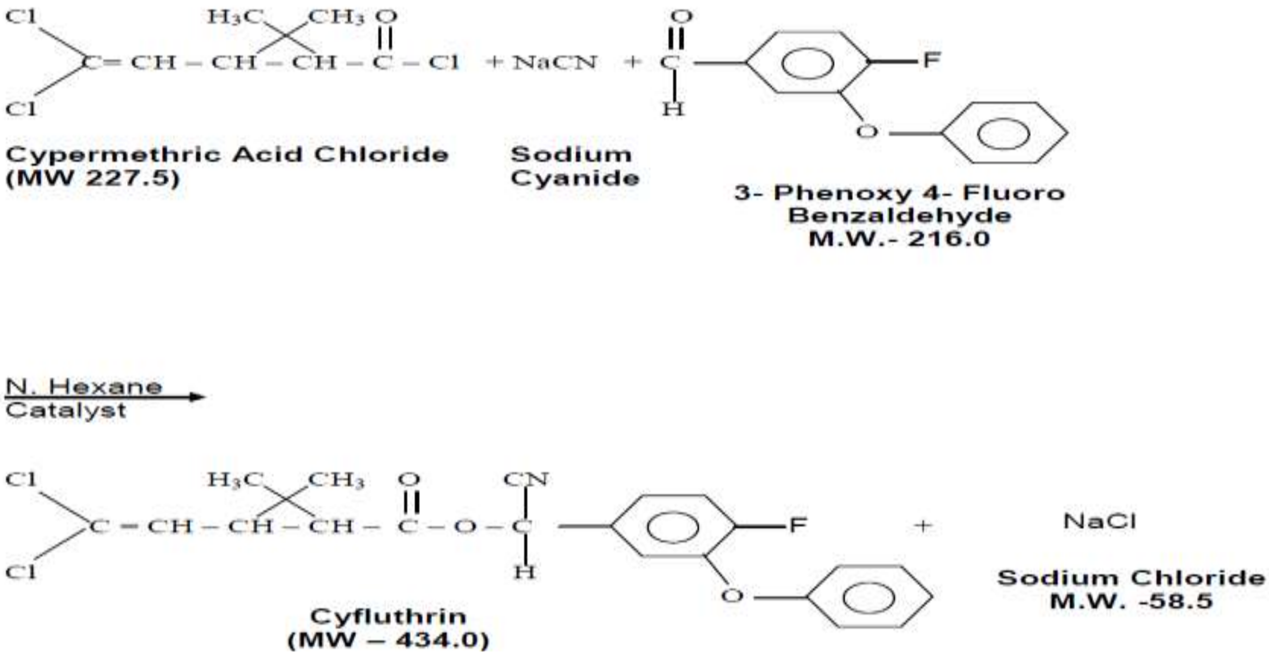
3- Phenoxy 4- Fluoro Benzaldehyde is reacted with Sodium Cyanide to form 3-Phenoxy 4- Fluoro Benzaldehyde Cyanohydrin as an intermediate. This on reaction with Cypermethric Acid Chloride (CMAC) forms the final Product Cyfluthrin. In this process n.- Hexane is used as solvent along with phase transfer Catalyst.

The reaction mass of Cyfluthrin is washed by Soda Ash solution & Water.

Finally, n-Hexane is stripped off to get pure Cyfluthrin.

Aqueous layers which content traces of Sodium Cyanide is detoxified by the treatment of Sodium Hypochlorite 8 - 10% Solution to < 0.2 ppm Level.

Chemical Reactions: -



Mass Balance:

14	Material / Mass Balance of Cyfluthrin All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	Raw Materials / Items	Kg/ Batch		Product / By product	Kg/ Batch
1	3-Phenoxy-4-Fluoro Benzaldehyde	523		Cyfluthrin	1000
2	CMAC-Cypermethric Acid Chloride	578		Recovered Solvent - n Hexane	2850
3	Water for Reaction	500		Solvent Loss n - Hexane	150
4	Sodium Cyanide	136		Detoxified Aqueous to ETP	3047
5	Solvent –n- Hexane	3000			
6	Catalyst	10			
7	5 % Soda Ash Solution	500			
8	5 % Acetic Acid Solution	500			
9	Water for washing	500			
10	8-10 % Sodium Hypochorite Solution	800			
	TOTAL	**7047**		**TOTAL**	**7047**

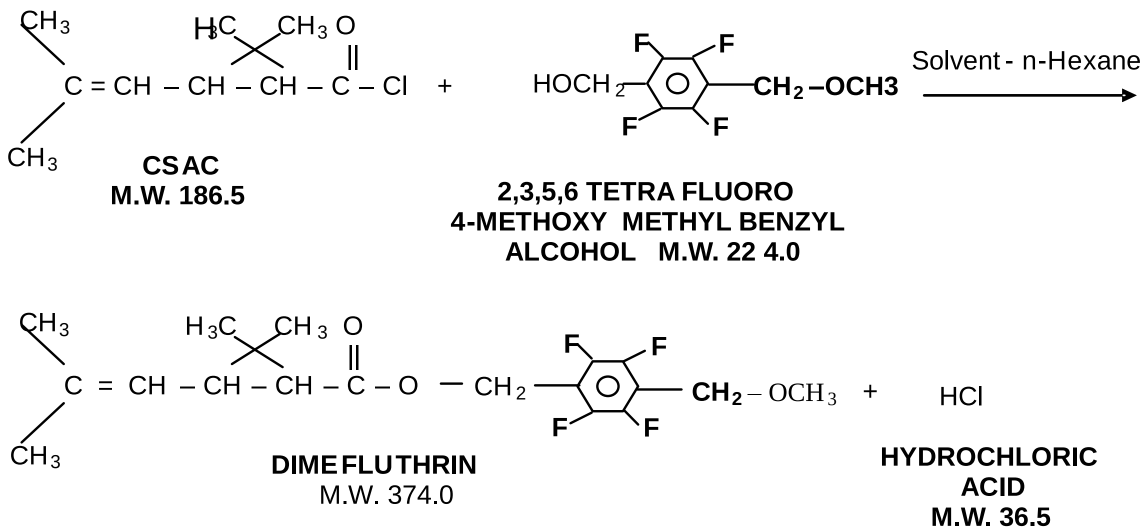
15) Dimefluthrin (Tech)
Brief Manufacturing Process: -

2,3,5,6, Tetra Fluoro 4- Methoxymethyl Benzyl Alcohol (TFMMBAL) is reacted with Chrysanthemic Acid Chloride (CSAC) in presence of solvent n-Hexane to give the Dimefluthrin mass.

Hydrochloric acid gas is generated during the reaction which is scrubbed in water to get 30% solution of hydrochloric acid.

The resulting mass is then washed by soda ash solutions as well as water. Finally, solvent is stripped off to recover it & to get the pure Dimefluthrin Tech.

B) Chemical REACTIONS:



15	Material / Mass Balance of Dimefluthrin All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	2,3,5,6 Tetra Fluoro 3-Methoxymethyl Benzyl Alcohol	611		Dimefluthrin	1000
2	Chrysanthemic Acid Chloride	520		Recovered- n Hexane	1940
3	Catalyst	12		Solvent Loss n - Hexane	60
4	Solvent- Hexane	2000		30 % Hydrochloric Acid Solution	330
5	Water for Hydrochloric Acid Solution	232		Aqueous Layer to ETP	545
6	5 % Soda Ash Solution	250			
7	Water for Washing	250			
	Total	**3875**		**Total**	**3875**

16) Cycloprothrin (T)

Brief Manufacturing Process:

Step-1

Cycloprothrin Acid undergoes chlorination reaction by means of Thionyl Chloride in presence of solvent n-hexane as well as catalyst to give Cycloprothrin Acid Chloride. During the reaction Hydrochloric acid and sulphur dioxide gases are formed which are scrubbed to water and dilute caustic to get the byproduct as 30% Hydrochloric Acid solution and 20% Sodium Sulphite solution respectively.

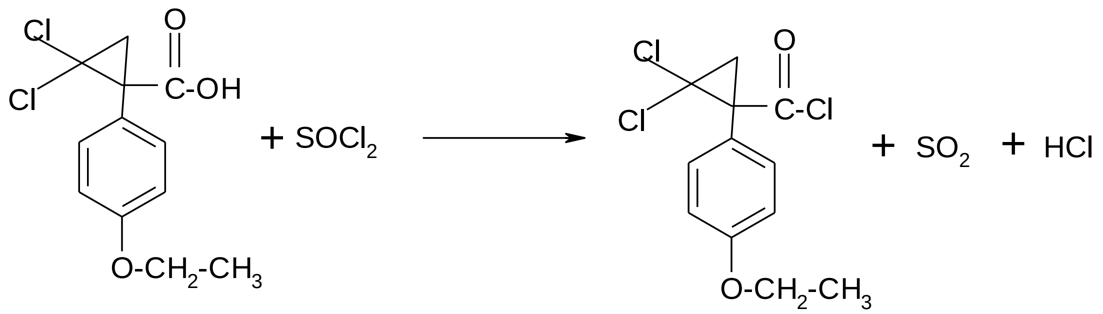
Step-2

MPBAD is first reacted with Sodium Cyanide in presence of solvent n-Hexane to give the intermediate product MPBAD-cyanohydrine which on reaction with Cycloprothrin Acid Chloride in presence of phase transfer catalyst gives the final product Cycloprothrin.

Finally, the mass is washed by soda ash solution and water. Now, Solvent is stripped off to get pure Cycloprothrin. Aqueous layer which contains traces of cyanide is detoxified by treatment of sodium Hypochlorite.

Chemical Reaction:

Step-1



Cycloprothric Acid M.Wt=275

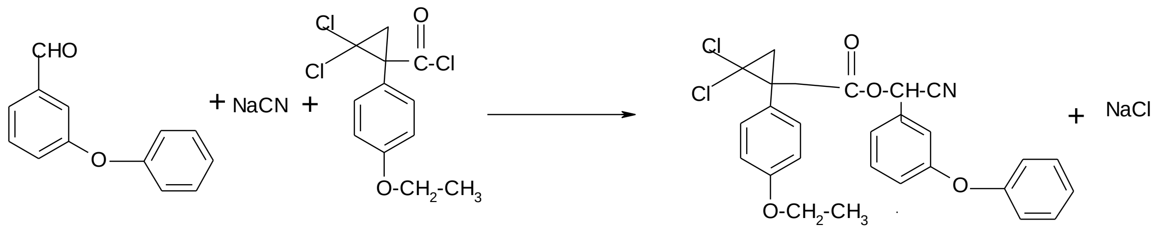
Thionyl Chloride M.Wt=119

Cycloprotric Acid Chloride M.Wt=293.5

Sulphur Dioxide M.Wt=64

Hydrochloric Acid M.W=36.5

Step-2



Meta Phenoxy Benzaldehyde M.Wt=198

Sodium Cyanide M.Wt=49

Cycloprotric Acid Chloride M.Wt=293.5

Cycloprothrin M.Wt=282.1

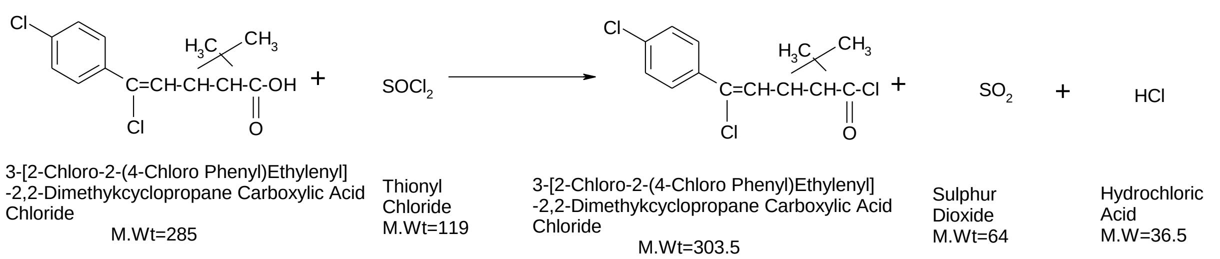
Sodium Chloride M.Wt=58.5

16	Material / Mass Balance of Cycloprothrin All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr No	Raw Materials / Items	Kg/Batch		Product / Bi Product	Qty/Batch
1	MPBAD	430		Cycloprothrin	1000
2	Cycloprothic Acid	640		Recovered Solvent n-Hexane	3900
3	Thionyl Chloride	300		Hexane Loss	100
4	Catalyst for Chlorination	10		Sodium Sulphite Solution	1580
5	Dil. Caustic Solution	1050		30% Hydrochloric Acid Solution	310
6	Water for Hydrochloric Acid Solution Formation	215		Detoxified mass to ETP	2335

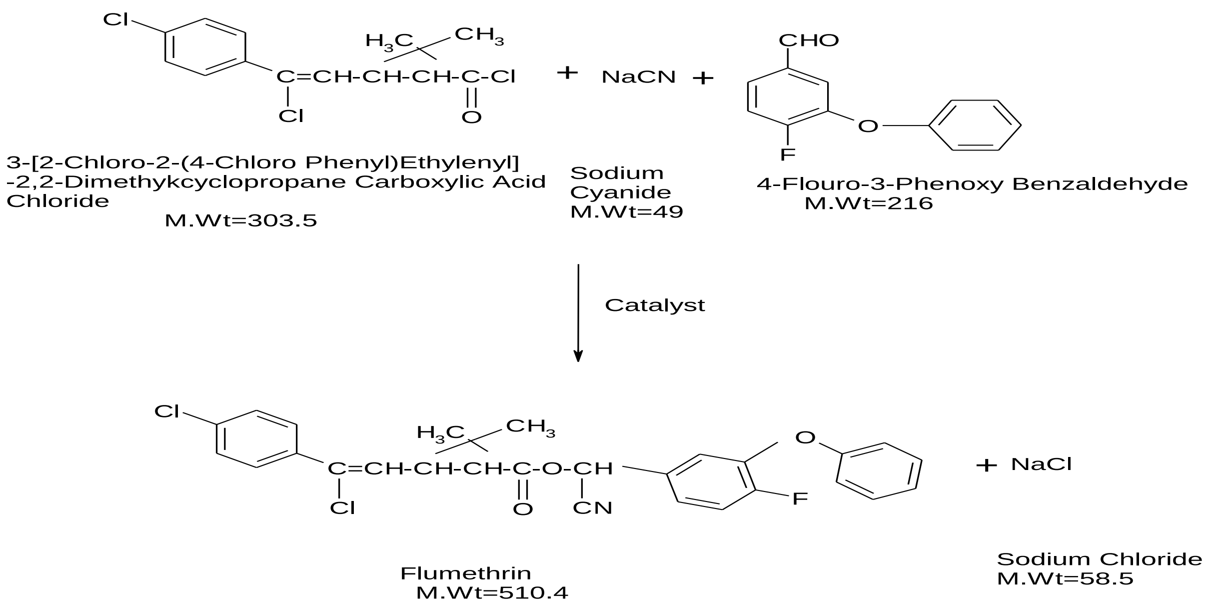
7	Sodium Cyanide	120			
8	Water	550			
9	n-Hexane	4000			
10	Catalyst	10			
11	5% Soda Ash Solution	500			
12	2% Acetic Acid Solution	500			
13	10% Sodium Hypochlorite Soln	900			
	Total	**9225**		**Total**	**9225**

17) Flumethrin (T)
Brief Manufacturing Process:
Step – 1
4-Fluoro 3-Phenoxy Benzaldehyde reacts with sodium cyanide to form an Intermediate 4-Fluoro 3-Phenoxy Benzaldehyde Cyanohydrine in presence of solvent n-Hexane & Water.
Step – 2
Cyanohydrine Intermediate final condensation reaction with 3- [2-chloro-2- [4-chloro phenol] ethynyl] 2, 2 Dimethyl Cyclopropane carboxylic acid chloride in presence of phase transfer catalyst to give the final product Flumethrin.
Finally, excess cyanide is detoxified by sodium hypochlorite solution; solvent n-Hexane is recovered by distillation to get the product Flumethrin.

Chemical Reaction:
Step-1



Step-2



17	Material / Mass Balance of Flumethrin All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr No	Raw Materials / Items	Kg/Batch		Product / Bi Product	Kg/Batch
1	Flumethric Acid	600		Flumethrin	1000
2	Thionyl Chloride	270		Recovered Solvent- n - Hexane	2930
3	Catalyst for Chlorination	10		Hexane Loss	70
4	Hexane	3000		Sodium Sulphite Solution	1145
5	Dil. Caustic Solution	1000		30% Hydrochloric Acid Solution	280
6	Water for Hydrochloric Acid Solution Formation	200		Detoxified mass to ETP	3022
7	4 Fluoro 3 Phenoxy Benzaldehyde	442			
8	Water for Reaction	500			
9	Sodium Cyanide	115			
10	Catalyst	10			
11	5 % Soda Ash Solution	500			
12	Water for washing	500			
13	2% Acetic Acid Solution	500			
14	8-10 % Sodium Hypochlorite Solution	800			
	Total	**8447**		**Total**	**8447**

18) Acrinathrin (T)

Brief Manufacturing Process:

Step-1

Acrinathric Acid undergoes chlorination reaction by means of Thionyl Chloride in presence of solvent n-hexane as well as catalyst to give Acrinathric Acid Chloride. During the reaction Hydrochloric acid and sulphur dioxide gases are formed which are scrubbed to water and dilute caustic to get the byproduct as 30% Hydrochloric Acid solution and 20% Sodium Sulphite solution respectively.

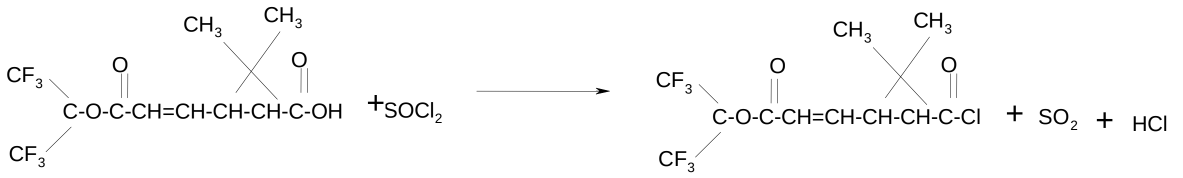
Step-2

MPBAD is first reacted with Sodium Cyanide in presence of solvent n-Hexane to give the intermediate product MPBAD-cyanohydrine which on reaction with Acrinathric Acid Chloride in presence of phase transfer catalyst gives the final product Acrinathrin.

Finally, the mass is washed by soda ash solution and water. Now, Solvent is stripped off to get pure Acrinathrin. Aqueous layer which contains traces of cyanide is detoxified by treatment of sodium Hypochlorite.

Chemical Reaction:

Step-1



Acrinathric Acid M.W =333

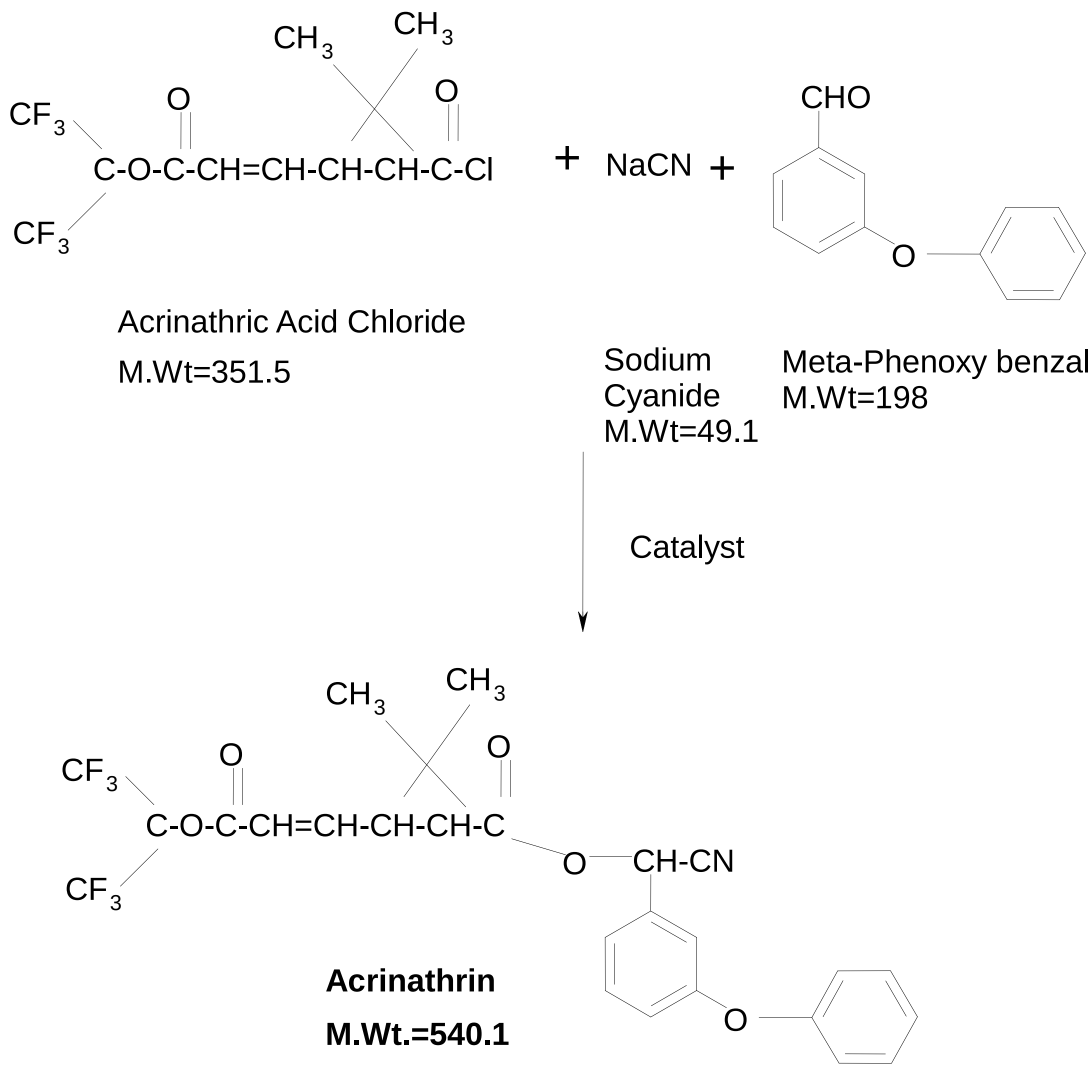
Thionyl Chloride M.W =119

Acrinathric Acid Chloride M.W =351.5

Sulphur Dioxide M.W =64

Hydrochloric Acid M.W =36.5

Step-2



Acrinathric Acid Chloride
M.Wt=351.5

Sodium Cyanide
M.Wt=49.1

Meta-Phenoxy benzaldehyde
M.Wt=198

Acrinathrin
M.Wt.=540.1

Material Balance:

18	**Material / Mass Balance of Acrinathrin All Quantities are in kg)**				
	IN PUT			**OUT PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	Acrinathric Acid	640		Acrinathrin	1000
2	Thionyl Chloride	250		Rec. Hexane	3910
3	Catalyst for Chlorination	10		Hexane Loss	90
4	Dil. Caustic Solution	1010		Sodium Sulphite Solution	1135
5	Water for Hydrochloric Acid Solution Formation	174		30% Hydrochloric Acid Solution	250
6	MPBAD	380		Detoxified Mass to ETP	2329
7	Sodium Cynide	110			
8	Solvent n-Hexane	4000			
9	Water for reaction	440			
10	5% Soda Ash Soln.	450			
11	2% Acetic Acid soln.	450			

12	10% Sodium Hypochlorite soln.	800			
	Total	**8714**			**8714**

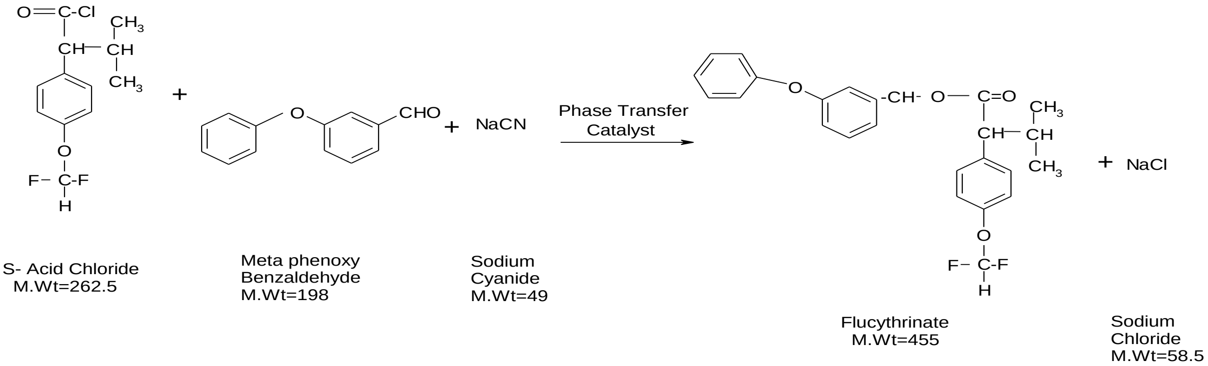
19) Flucythrinate (T)

Brief Manufacturing Process:

MPBAD is first reacted with Sodium Cyanide in presence of solvent n-Hexane to give the intermediate product MPBAD-Cyanohydrin which on reaction with S-Acid Chloride in presence of phase transfer Catalyst gives the final product Flucythrinate.

Finally, the mass is washed by Soda Ash Solution and water. Now, Solvent is stripped off to get pure Flucythrinate. Aqueous layer which contains traces of Cyanide is detoxified by treatment of Sodium Hypochlorite.

Chemical Reaction:



Material Balance

19	Material / Mass Balance of Flucythrinate All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	MPBAD	455		Flucythrinate	1000
2	Sodium Cyanide	130		Rec. Hexane	3900
3	n-Hexane Solvent	4000		Hexane loss	100
4	Catalyst	15		Detoxified Mass to ETP	2470
5	S-Acid Chloride	620		Sodium Chloride	50
6	water for reaction	500			
7	50% Soda Ash Soln.	500			
8	20% HAC soln.	500			
9	10% Sodium Hypochlorite soln.	800			
	Total	**7520**		**Total**	**7520**

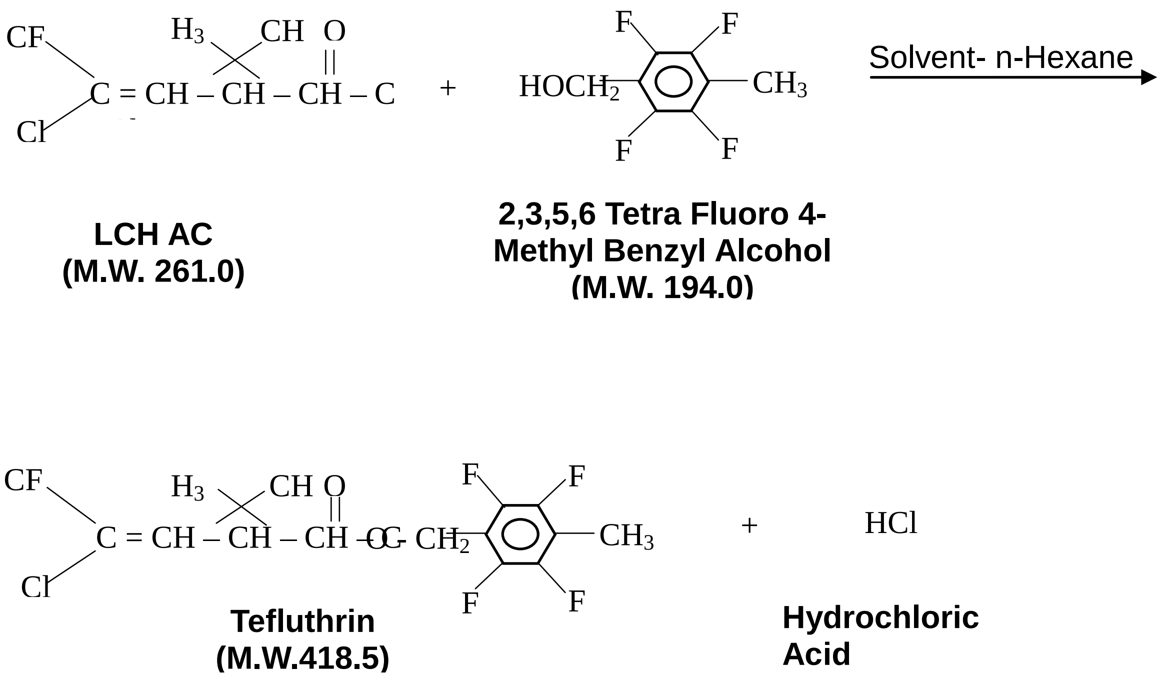
20) Tefluthrin Technical

Brief Manufacturing Process:

2,3,5,6, Tetra Fluoro 4- Methyl Benzyl Alcohol is reacted with Lambda cyhalothrin Acid Chloride (TFP Acid Chloride) in presence of solvent n-Hexane to give the Tefluthrin mass. Hydrochloric acid gas is generated during the reaction which is scrubbed in water to get 30% solution of Hydrochloric Acid.

The resulting mass is then washed by soda ash solutions as well as water. Finally, solvent is stripped off to recover it & to get the pure Tefluthrin Tech.

Chemical Reaction: -



20	Material / Mass Balance of Tefluthrin(All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2,3,5,6,Tetra Fluoro 4-Methyl Benzyl Alcohol	490		Tefluthrin	1000
2	Solvent n-Hexane	2950		30% Hydrochloric Acid	301
3	Lambda Cyhalothrin Acid Chloride	690		Solvent n-Hexane Recovered	2870
5	10% Soda Ash	980		solvent Loss	80
6	Water	700		Aq. Layer to ETP	1434
				Salt	123
				Residue	2
	TOTAL	**5810**		**TOTAL**	**5810**

21) Metofluthrin

Brief Manufacturing Process:

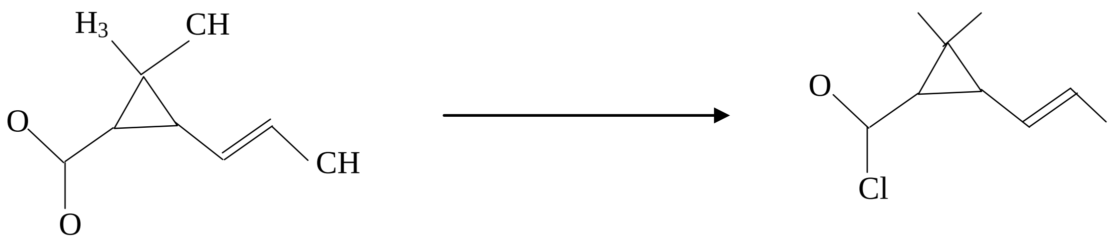
This is two step reaction wherein first step organic acid is converted into Acid Chloride and in second step there is esterification reaction.

Step:1- 2,2-Dimethyl-3-(E)-Prop-1-Enyl) Cyclopropane Carboxylic Acid reacts with Thionyl Chloride to give its Acid Chloride. After degassing of excess Thionyl Chloride, the intermediate is used in second step.

Step:2- (2,3,5,6-Tetrafluoro-4-(Methoxymethyl)Phenyl) Methanol reacts with Acid Chloride in presence of Soda Ash as binding agent and Toluene as Solvent to give esterification reaction. Crude Metofluthrin product is synthesized after completion of reaction, the product is washed with water twice to remove organic impurities. Then Toluene is distilled out to obtain a Pale-Yellow liquid Metofluthrin.

Chemical Reaction:

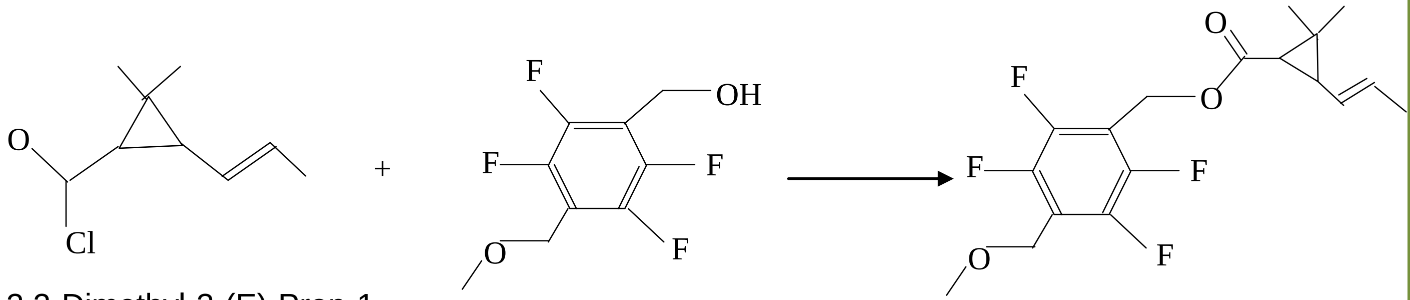
Step-1



2,2-Dimethyl-3-(E)-Prop-1-Enyl) Cyclopropane Carboxylic Acid **(M.W. 154.0)**

2,2-Dimethyl-3-(E)-Prop-1-Enyl) Cyclopropane Carbonyl Chloride

Step-2



2,2-Dimethyl-3-(E)-Prop-1-Enyl) Cyclopropane Carbonyl Chloride

(2,3,5,6-Tetrafluoro-4-(Methoxymethyl) Phenyl) Methanol **(M.W. 224.0)**

Metofluthrin (M.W.360.0)

Mass Balance:-

21	**Material / Mass Balance of Metofluthrin (All Quantities are in kg)**				
	IN PUT			**OUT PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2,2-Dimethyl-3-(E)-Prop-1-Enyl) Cyclopropane Carboxylic Acid	470		Metofluthrin	1000
2	Thionyl Chloride	360		Sodium Sulfite Solution	820
3	Caustic Solution	120		30% Hydrochloric Acid Soln	470
5	(2,3,5,6-Tetrafluoro-4-(Methoxymethyl)Phenyl) Methanol	675		Effluent	2085

6	Water	2750		
	TOTAL	**4375**	**TOTAL**	**4375**

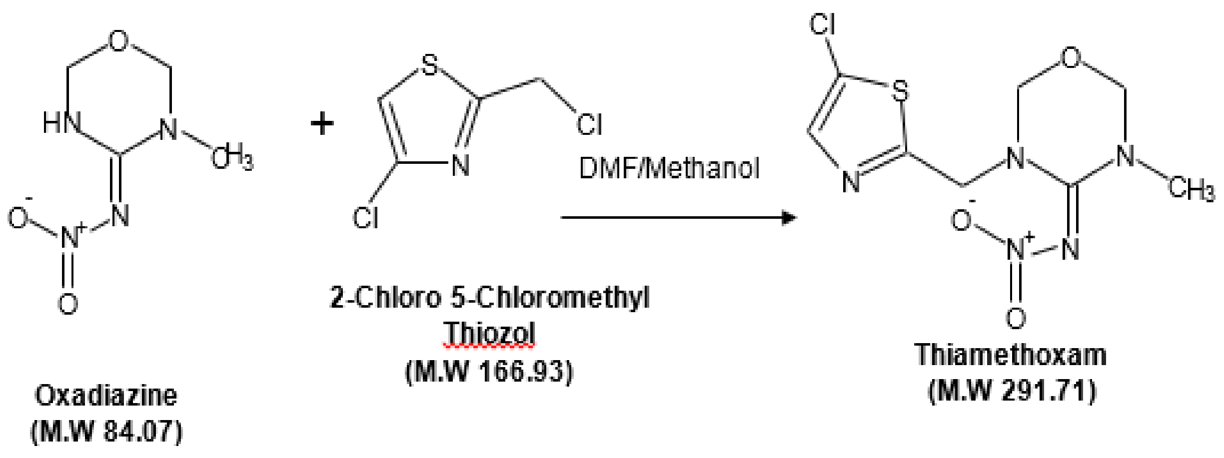
❖ **Group -2: Neo-Nicotinoids Insecticides: -**

22) Thiamethoxam Technical

Brief Manufacturing Process: -

3-Methyl 4-Nitro Imino Per hydro 1,3,5 Oxadiazine is condensed with 2-Chloro 5-Chloromethyl Thiazol (CCMT) in presence of Solvent- DMF to form the final product Thiamethoxam. Organic mass contain Solvent is taken for distillation. After it is diluted with water, neutralized with Hydrochloric Acid, cool it to form Crystal & filtered it to get wet cake & finally it is dried to get Pure Product.

Chemical Reactions: -



Mass Balance:

22	**Material / Mass Balance of Thiamethoxam All Quantities are in kg)**				
	IN PUT			**OUT PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2-Chloro 5-Chloromethyl Thiazole	883		Thiamethoxam	1000
2	3-Methyl 4-Nitroimino 1,3,5 Oxidiazine (MNIO)	962		Recovered DMF	3800
3	DMF	4000		DMF Loss	200
4	Methanol	2000		Recovered Methanol	1925
5	Caustic Soda Flakes	240		Methanol Loss	75

6	Hydrochloric Acid (30%)	28		Aqueous Layer to ETP	2060
7	Water	1000		Distillation Residue	53
	TOTAL	**9113**		**TOTAL**	**9113**

23) Imidacloprid Technical

Brief Manufacturing Process: -

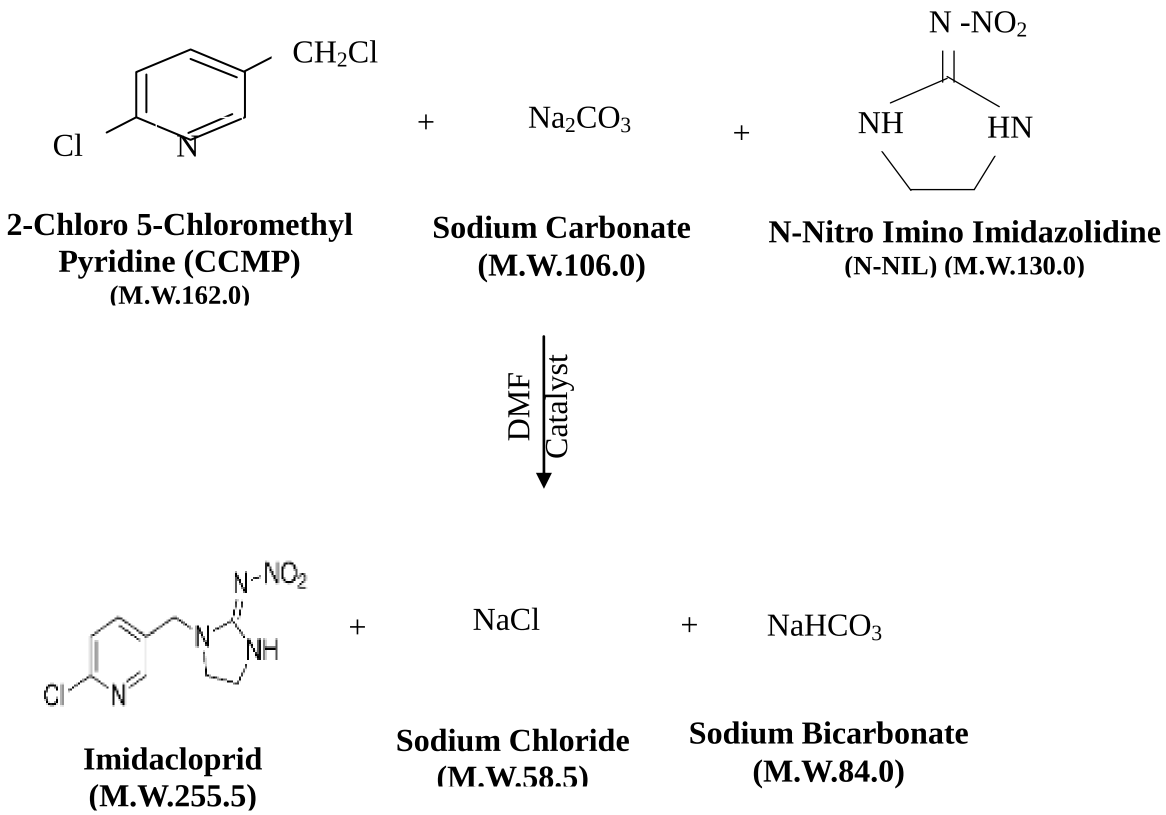
2-Chloro, 5-Chloromethyl Pyridine (CCMP) is reacted with N-Nitro Imino Imidazolidine (N-NII) in present of Catalyst and Solvent.

The Hydrochloric Acid, which is formed during the reaction, is scavenged by putting Sodium Carbonate as acid scavenger. The resulting mass is diluted by Water & filtered to remove the salts of Sodium Chloride (NaCl) & Sodium Bicarbonate.

The Organic mass is then treated with Water and finally Solvent is removed by distillation. The concentrated mass is then crystallized to get pure product – Imidacloprid (Tech).

Finally, Toxic Effluent which contains traces of Pesticides is taken to Hydrolysis stage for detoxification, where aqueous mass is treated at high temperature by Alkali for the rapid hydrolysis of pesticides to simpler non-toxic compounds.

Chemical Reactions: -



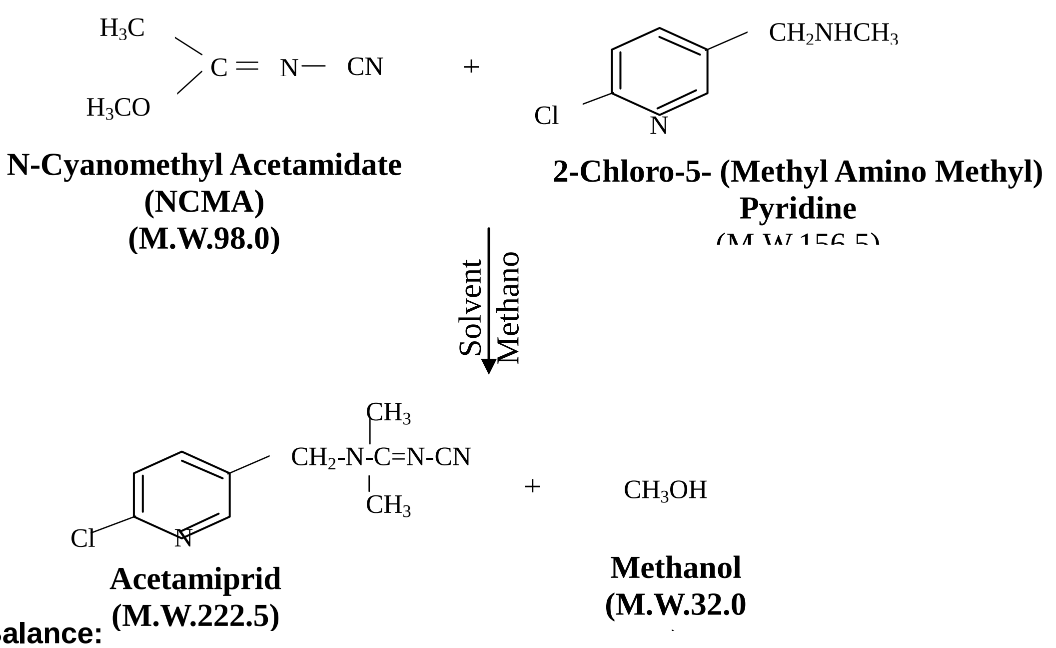
23	Material / Mass Balance of Imidacloprid All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2-Chloro -5-Chloromethyl Pyridine	830		Imidacloprid	1000
2	N- Nitro N- Methyl Imidazolidine	750		Recovered DMF	2140
3	Sodium Carbonate	650		DMF Loss	60
4	Catalyst -1	10		Recovered Methanol	1150
5	Solvent - DMF	2200		Methanol Loss	50
6	Caustic Lye 47-48 %	50		Sodium Chloride Salt & Sodium Bicarbonate Salt	610
7	Solvent - Methanol	1200		Aqueous Layer to ETP	1650
8	Water for Washings	1000		Distillation Residue	30
	TOTAL	**6690**		**TOTAL**	**6690**

24) Acetamiprid Technical

Brief Manufacturing Process: -

N-Cyano Methyl Acetamidate (NCMA) is reacted with 2-Chloro 5- (Methyl amino methyl) Pyridine (CMAMP) in Solvent media. After the reaction is completed the product is filtered and solvent is concentrated to yield more products as well as recover Solvent which is recycled.

Chemical Reactions: -



Mass Balance:

24	Material / Mass Balance of Acetamiprid All Quantities are in kg)		
	IN PUT		OUT PUT

Sr. No.	Raw Materials / Items	Kg/ Batch		Product / By product	Kg/ Batch
1	N-Cyanomethyl -Acetamidate (NCMA)	505		Acetamiprid	**1000**
2	CMAMP	730		Recovered Solvent Methanol	2450
3	Solvent – Methanol	2500		Solvent Loss	50
4	Water for Washing	1200		Distillation Residue	40
5				Recovered Methanol from Process	143
6				Aqueous Layer to ETP	1252
	TOTAL	**4935**		**TOTAL**	**4935**

25) Fipronil Technical

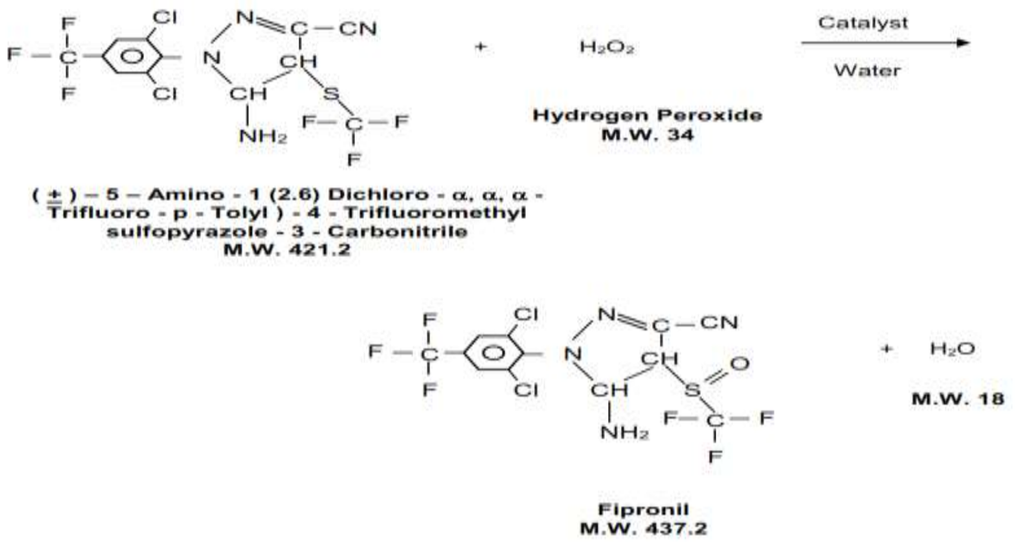
Brief Manufacturing Process: -

(+) - 5 - Amino -1 (2.6) Dichloro - α, α, α -Trifluoro - p - Tolyl) - 4 - Trifluoromethyl Sulfo Pyrazole, - 3- Carbonitrile (ACFTMSC) is under goes oxidation reaction by 50% Hydrogen peroxide solution in presence of Water and Catalyst to form the final product Fipronil Tech.

After completion of reaction, the resulting slurry is filtered out in centrifuge to get wet cake of Fipronil Tech. This product is dried to get pure Fipronil Tech.

Mixed Mother Liquor and water wash of Fipronil wet cake take for water distillation. Recovered distillate Water is recycled back for fresh batches & residue is dispose of to Incineration.

Chemical Reactions: -



Mass Balance:

25	Material / Mass Balance of Fipronil All Quantities are in kg)				
	IN-PUT			OUT-PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch

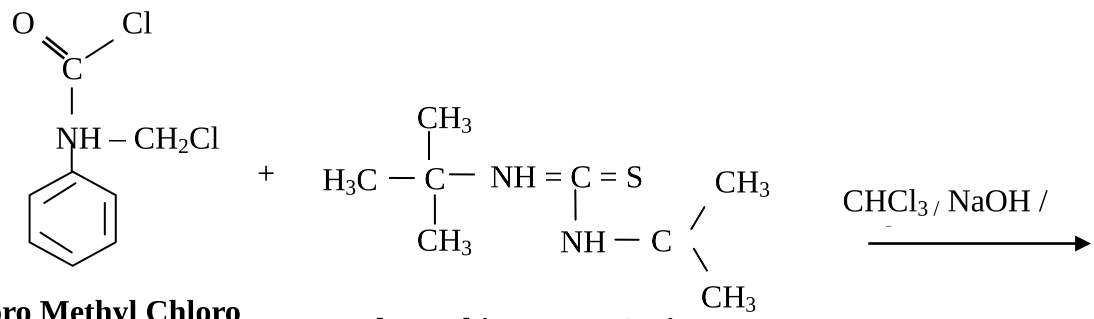
1	(+)-5-Amino-1(2,6)-Dichloro-1,1,1-Trifluoro-P-Tolyl)-4-Trifluoromethyl-Sulfopyrazole-3-Carbonitrile	984		Fipronil	**1000**
2	50% Hydrogen Peroxide Solution	175		Aqueous Layer for ETP	1013
3	Catalyst	5		Drying Loss	244
4	Water for Reaction	693			
5	Water for Washing	400			
	TOTAL	**2257**		**TOTAL**	**2257**

26) Buprofezin Technical

Brief Manufacturing Process:

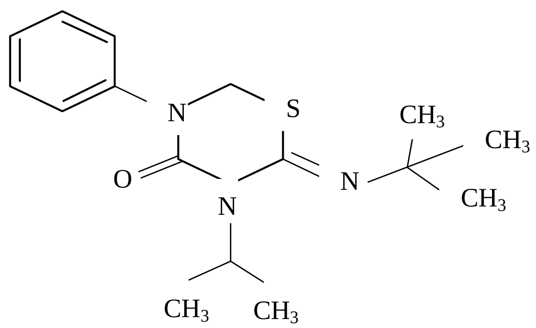
N-Chloromethyl Chloro Carbonyl Aniline (CCA) and Tertiary Butyl Iso Thiocyanate Amino Iso Propionate (BTU) react with each other in presence of Chloroform – Solvent and catalyst, and finally undergoes cyclization reaction to form the final product Buprofezin.

Chemical Reactions: -



N-Chloro Methyl Chloro Carbonyl Aniline (CCA) M.W. 204.0

t-Butyl Iso Thiocyanate Amino Iso Propionate M.W. 174.0



Buprofezin (M.W.305.4)

Mass Balance:

26	**Material / Mass Balance of Buprofezin All Quantities are in kg)**				
	IN PUT			**OUT PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	N-Chloro Methyl Chloro Carbonyl Aniline (CCA)	700		Buprofezin	**1000**
2	Chloroform for CCA	1340		Recovered Chloroform	3264

3	t-Butyl Iso Thiocyanate Amino Iso Propionate	600		Loss Chloroform	66
4	Chloroform for BTU	2200		Recovered Methanol	2150
5	Catalyst	05		Loss Methanol	50
6	Solvent – Chloroform	220		Methanol wash Recycle	850
7	20 % Caustic Solution	1650		Aqueous Layer to ETP	2270
8	Catalyst	10		Distillation Residue	35
9	Methanol for Crystallization	2200		Drying Loss	40
10	Methanol for Washing (Recovered)	800			
	TOTAL	**9725**		**TOTAL**	**9725**

27) Thiacloprid

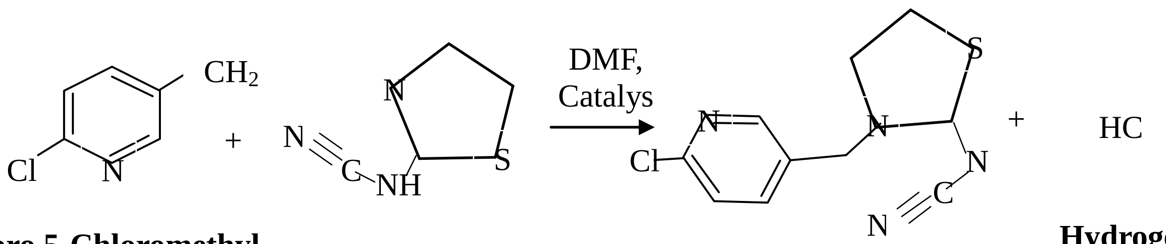
Brief Manufacturing Process: -

2-Chloro, 5-Chloro methyl Pyridine (CCMP) is reacted with 2-(Cyanoimino)-Thiazolidinein present of Catalyst and Solvent. The Hydrochloric Acid, which is formed during the reaction, is scavenged by putting Sodium Carbonate as Acid scavenger. The resulting mass is diluted by water and filtered to remove the salts of Sodium Chloride (NaCl) and Sodium Bicarbonate.

The organic mass is then treated with water. Finally, solvent is removed by distillation. The concentrated mass is then crystallized to get pure product – Thiacloprid Technical.

Finally, Toxic Effluent, which contains traces of pesticides, is taken to hydrolysis stage for detoxification. Where aqueous mass is treated at high temperature by Alkali for the rapid hydrolysis of pesticides to simpler non-toxic compounds.

Chemical Reactions: -



2-Chloro 5-Chloromethyl Pyridine (CCMP) (M.W.162.0) + **2-(Cyanoimino)-Thiazolidine** (M.W.130.0) → **3-(6-Chloro-3-Pyridylmethyl)-1,3-Thiazolidin-2-Ylidenecyanamide** + **Hydrogen Chloride**

Mass Balance:

27	Material / Mass Balance of Thiocloprid All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2-Chloro, 5-Chloro Methyl Pyridine	900		Thiocloprid	**1000**
2	2-(Cyanoimino)-Thiazolidine	750		Recovered Solvent DMF	2050
3	DMF	2200		DMF Loss	150

4	Catalyst	10		Recovered Methanol	360
5	Sodium Carbonate	706		Methanol Loss	40
6	Water	1000		Mother liquor	470
7	Methanol	400		Waste water to ETP	940
8	Caustic Soda Lye	50		Water Loss	50
9				Mix salt	956
	TOTAL	**6016**		**TOTAL**	**6016**

28) Ethiprole:

Brief Manufacturing Process:

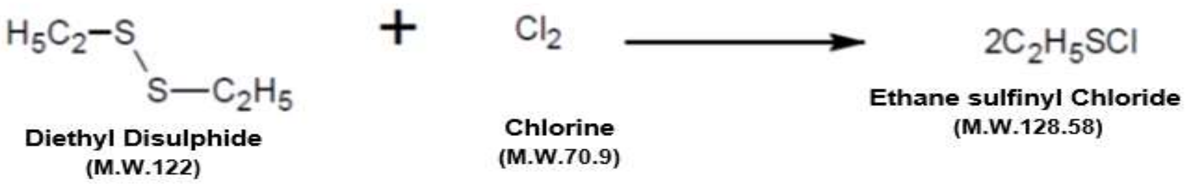
Step: 1: -Diethyl Disulfide undergoes Chlorination reaction by Chlorine in presence of Methanol. This reaction gives out Ethane Sulfinyl Chloride.

Step: 2: - Ethane Sulfinyl Chloride further reacted with **-** 1-(2,6-Dichloro-4-(Trifluoromethyl) Phenyl)-3- Cyano-5-Amino Thiazolein presence of DMF. This reaction gives out Pyrazole Sulfide.

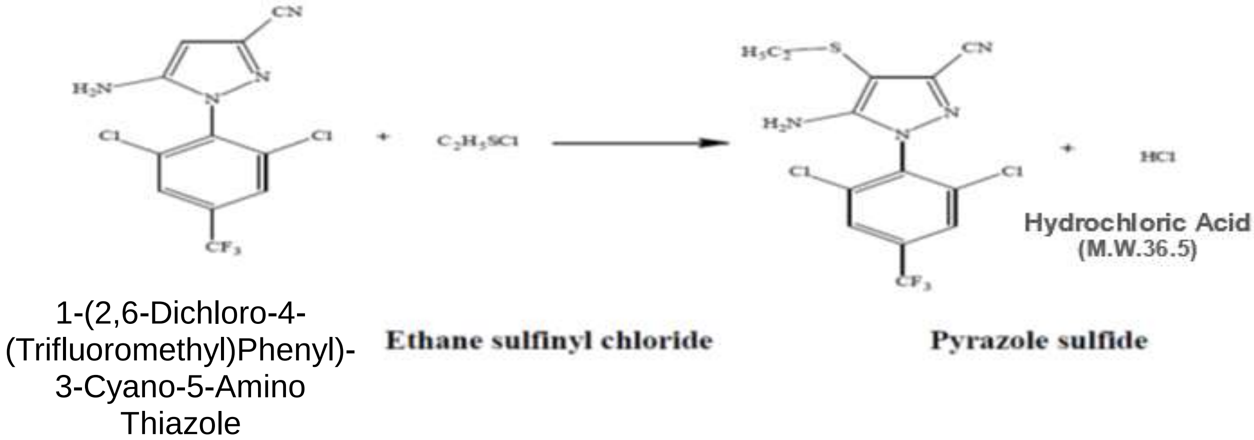
Step: 3: - PyrazoleSulfide then reacted with Hydrogen Peroxide in presence of Solvent Ethylene Dichloride as well as Catalyst Formic Acid and Methane Sulfonic Acid to give Ethiprole as a Final Product.

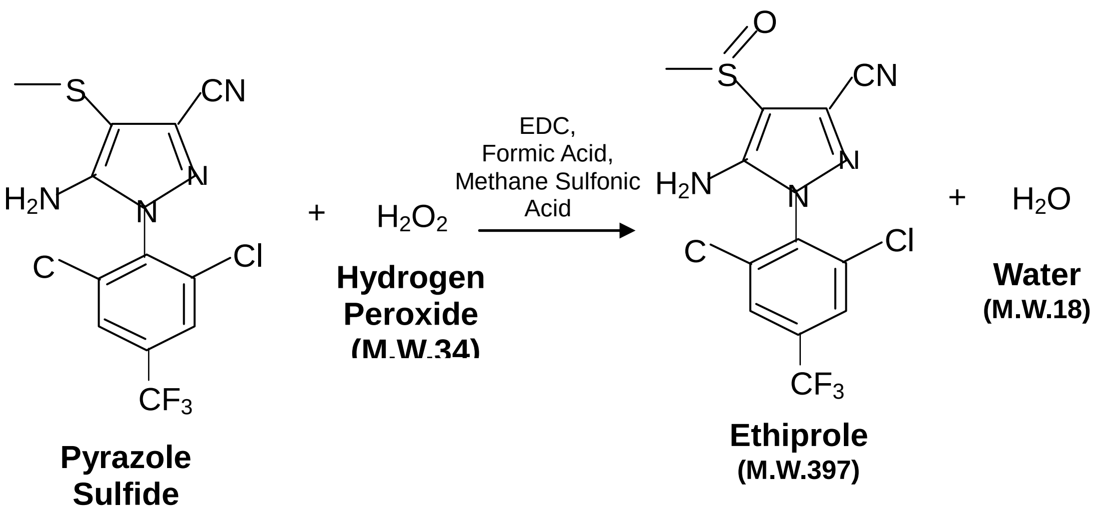
At the end of the reaction Water is separated and Ethylene Dichloride is distilled out. The reaction mixture is recrystallized from Ethanol and dried. Sulfide is recycled. and crude product is crystallised using Methanol.

Chemical Reactions: -
Step: 1: -



Step: 2: -





28	Material / Mass Balance of Ethiprole All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Diethyl Sulfide	340		**Ethiprole**	1000
2	Chlorine Gas	200		Recovered Methanol	1910
3	1-(2,6-Dichloro-4-(Trifluoromethyl)Phenyl)-3-Cyano-5-Amino Thiazole	880		Methanol Loss	90
4	Hydrogen Peroxide	95		DMF Recovered	1750

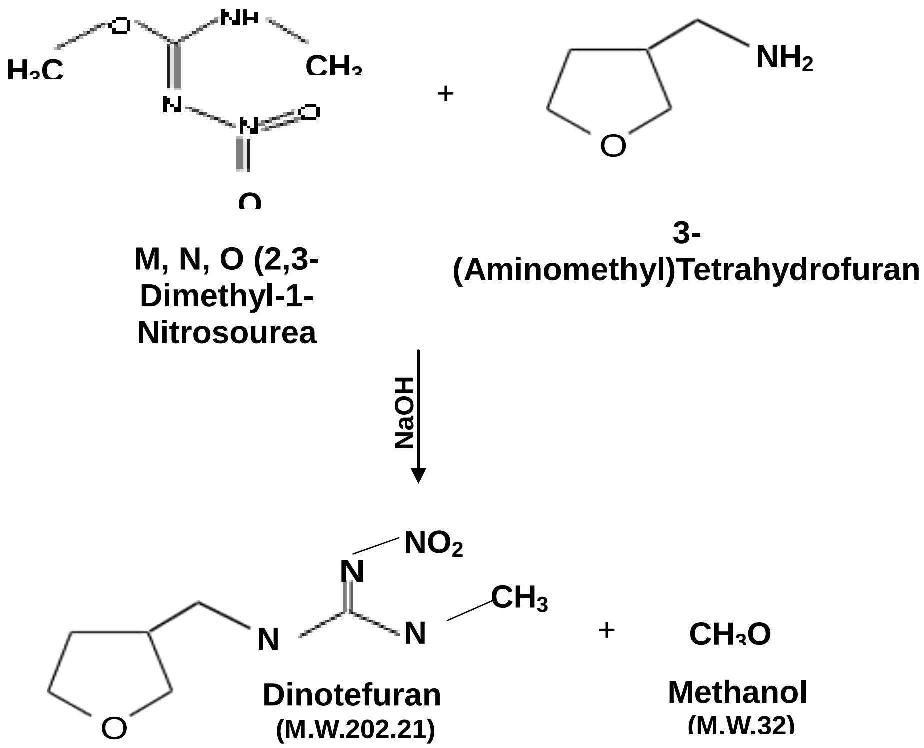
5	Methanol	2000		DMF Loss	50
6	DMF	1800		EDC Recovered	2350
7	EDC	2400		EDC Loss	50
8	Formic Acid	112		Hydrochloric Acid (30%)	350
9	Methane Sulfonic Acid	112		Aqueous Layer To ETP	3774
10	Water	3385			
	TOTAL	**11324**			**11324**

29) Dinotefuran:

Brief Manufacturing Process: -

M, N, O (2,3-Dimethyl-1-Nitrosourea reacted with 3- (Amino methyl) Tetrahydrofuran in presence of Sodium Hydroxide. This Reaction gives out Dinetofuran as a Final Product. Methanol gets separated out from the reaction mass as a By-product

Chemical Reactions: -



29	Material / Mass Balance of Dinotefuran (All Quantities are in kg)				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	M, N, O (2,3-Dimethylal-Nitrosourea	700		Dinotefuran	**1000**
2	3- Aminomethyl) Tetrahydrofuran	534		Methanol	160
3	Water	2400		Aqueous Layer	2494
4	Sodium Hydroxide	20			
	TOTAL	**3654**		**TOTAL**	**3654**

30) Nitenpyram:
Brief Manufacturing Process: -

Step 1: - 1,1,2-Trichloroethane is reacted with Sodium Hydroxide to form 1,1-Dichloroethylene in water at 80^0C. After completion of reaction 1,1-Dichloroethylene is directly separated in layer separator at hot conditions.

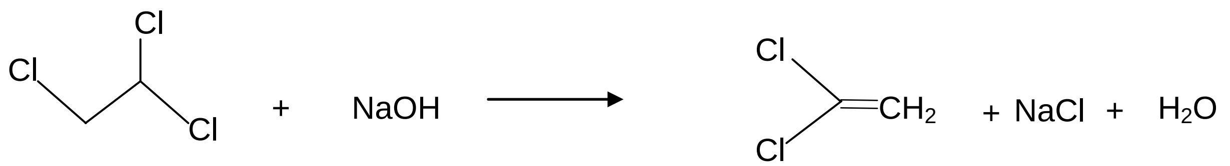
Step 2: - 1,1-Dichloroethylene is reacted with Nitric Acid and Hydrogen Chloride in excess Hydrochloric Acid medium to form a 1,1,1-Trichloro-2- Nitroethane. The NIT-02 formed is distilled under vacuum to obtain 99% pure material.

Step 3: - 2-Chloro-5- Chloromethyl Pyridine is reacted with ethylamine in water to form a 2-Chloro 5- Ethylaminomethyl Pyridine and liberated Hydrogen Chloride is Scrubbed to water to get 30% Hydrochloric Acid Solution.

Step 4: - 2-Chloro-5-Ethylaminomethyl Pyridine is reacted with Trichloro-2-Nitroethane to form (E)-1-Chloro-N-(6-Chloropyridin-3-yl) Methyl)-N-Ethyl-2- Nitroetenamine (NIT-04)

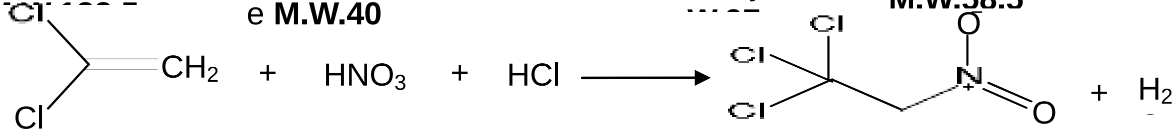
Step 5: NIT-04 is then reacted with methyl amine to form a (Z)-N-((6- Chloropyridin-3-yl) Methyl)-N-Ethyl-N-Methyl-2-Nitroethene-1,1-Diamine (Nitenpyram). After the completion of the reaction Solvent MDC is recovered under vacuum and Methanol is added to Crystallize the material to obtain 98% pure Nitenpyram.

Chemical Reactions: -
Step: -1



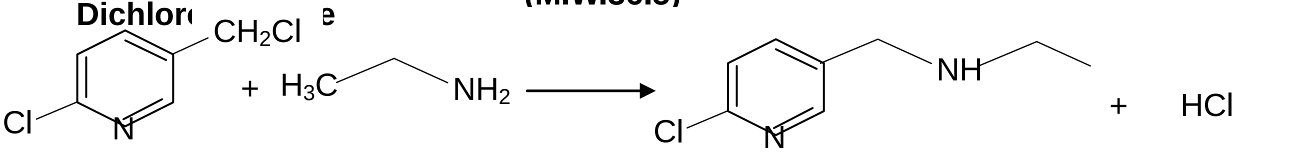
1,1,2-Trichloroethane | Sodium Hydroxide **M.W.40** | 1,1-Dichloroethylene**M.** | Sodium Chloride **M.W.58.5** | Water**M.W.18**

Step 2: -



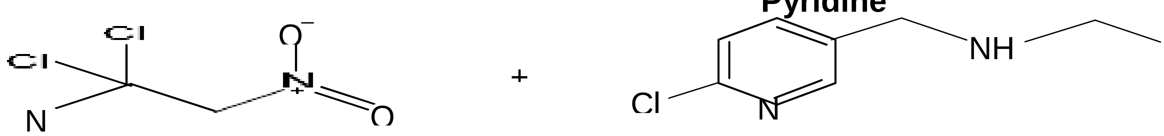
1,1-Dichlor...e | **Nitric Acid** | **Hydrochloric Acid (M.W.36.5)** | **1,1,1-Trichloro-2-Nitroethane** | **Water (M.W.18**

Step 3: -



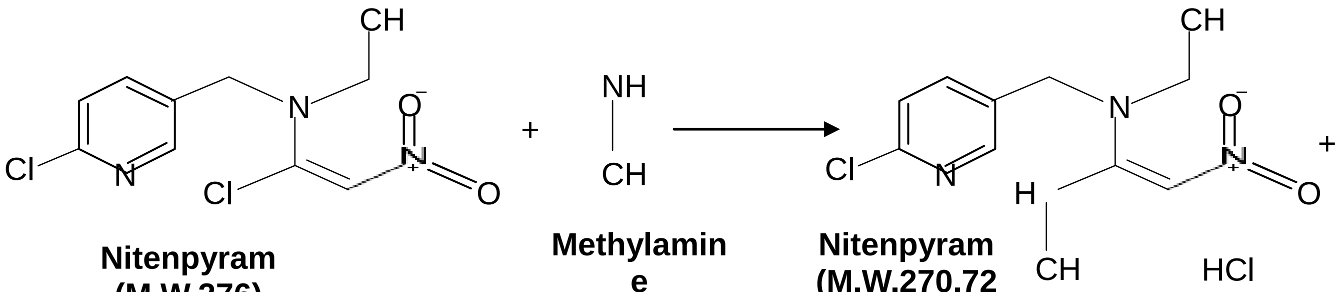
CCMP (M.W.162.0 | **Ethylamine (M.W.45.03)** | **2-Chloro-5-Ethylaminomethyl Pyridine** | **Hydrochloric Acid (M.W.36.5)**

Step 4: -



1,1,1-Trichloro-2-Nitroethane (M.W.178.4) | **2-Chloro-5-Ethylaminomethyl Pyridine (M.W.170.6)**

Step 5: -



Nitenpyram (M.W.276) + **Methylamine** → **Nitenpyram (M.W.270.72** + HCl **Hydrochloric Acid**

30	Material / Mass Balance of Nitenpyram All Quantities are in kg)			
	IN – PUT		**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**	**Product / By product**	**Kg/Batch**
1	1,1,2-Trichloroethane	755	Nitenpyram	**1000**
2	Sodium Hydroxide (48%)	472	Sodium Chloride	366
3	Nitric Acid (85%)	419	Water formed	133
4	Hydrochloric Acid (36%)	573	30% Hydrochloric Acid	898
5	2-Chloro-5-Chloromethyl Pyridine	917	MDC Recovered	1786
6	Ethyl Amine (70%)	364	MDC Loss	2
7	Methyl Amine (40%)	440	MDC in Residue	34
8	Methylene Dichloride (MDC)	1822	Methanol Recovered	1995
9	Methanol	2100	Methanol Loss	114
10	Water	2600	Methanol to Wastewater	21
11			Methanol in Residue	70
12			1,1,2-Trichloroethane	262
13			2-Chloro-5-Chloromethyl Pyridine	318
14			Recovered Ethyl Amine (70%)	88
15			Methyl Amine (40%)	61
16			Nitric Acid (85%)	123
17			Waste Water	3191
	TOTAL	**10462**	**TOTAL**	**10462**

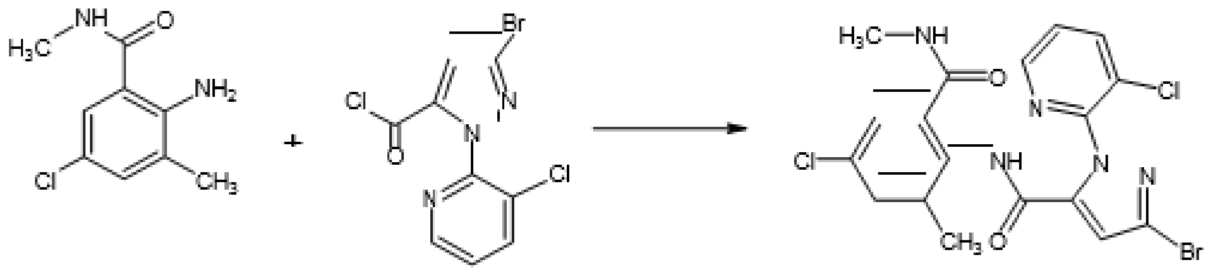
31) Chlorantraniliprole:

Brief Manufacturing Process: -

The desired quantities of 2-Amino-5-Chloro-N,3-Dimethylbenzamide, Toluene, 3-Bromo-1-(3-Chloropyridin-2-yl)-1H-Pyrazole-5-Carbonyl Chloride and Triethyl Amine are charged in to the

reactor and stirred at desired temperature until reaction is over.
Once the reaction is completed, water is added in to the reaction mass, Heat the mass up to desired temperature then layers are separated, Organic layer is cooled and the product is isolated by filtration and Solvent is recovered from ML for recycle.

Chemical Reactions: -



2-amino-5-chloro- *N*,3-dimethylbenzamide

MF= $C_9H_{11}ClN_2O$
FW= 198.64944

3-bromo-1-(3-chloropyridin-2-yl)-1 *H*-pyrazole-5-carbonyl chloride

MF= $C_9H_4BrCl_2N_3O$
FW= 320.95756

Chlorantraniliprole

MF= $C_{18}H_{14}BrCl_2N_5O_2$
FW= 483.14606

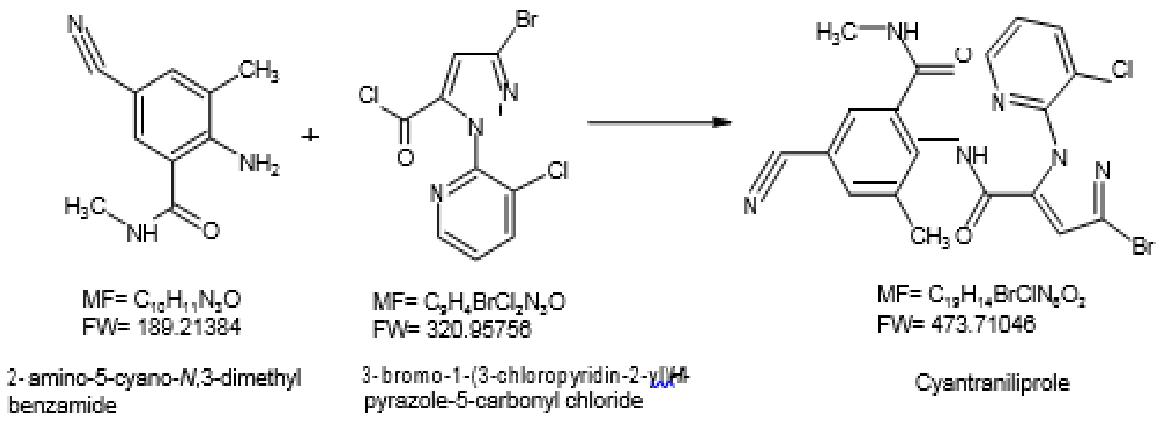
31	Material / Mass Balance of Chlorantraniliprole All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2-Amino-5-Chloro-N,3-Dimethylbenzamide	440		Chlorantraniliprole	**1000**
2	3-Bromo-1-(3-Chloropyridin-2-yl)-1H-Pyrazole-5-Carbonyl Chloride	706		Recovered Toluene	3050
3	Triethyl Amine	225		Toluene Loss	100
4	Toluene	3150		Residue	46
5	Water	2300		Aqueous Layer to ETP	2467
				Drying Loss	158
	TOTAL	**6821**		**TOTAL**	**6821**

32) Cyantraniliprole

Brief Manufacturing Process: -

Thedesired quantities of Xylene, 2-Amino-5-Cyano-N,3-Dimethylbenzamide, 3-Bromo-1-(3-Chloropyridin-2-yl)-1H-Pyrazole-5-Carbonyl chloride and Triethyl Amine are charged in to the reactor. The reaction mass is stirred at the desired temperature until reaction is over. Once the reaction is completed, water is added in to the reaction mass and heated up to desired temp., then layers are separated, Organic layer is cooled to isolate the product by filtration and dried the product. solvent is recovered from Organic ML andreused.

Chemical Reactions: -



32	Material / Mass Balance of Cyantraniliprole (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2-Amino-5-Cyano-N,3-Dimethyl Benzamide	430		Cyantraniliprole	**1000**
2	3-Bromo-1-(3-Chloropyridin-2-yl)-1H-Pyrazole-5-Carbonyl Chloride	725		Xylene	3154
3	Triethyl amine	230		Residue	155
4	Xylene	3320		Aq. Layer	2730
5	Water	2500		Drying Loss	166
	TOTAL	**7205**		**TOTAL**	**7205**

33) Tetraniliprole

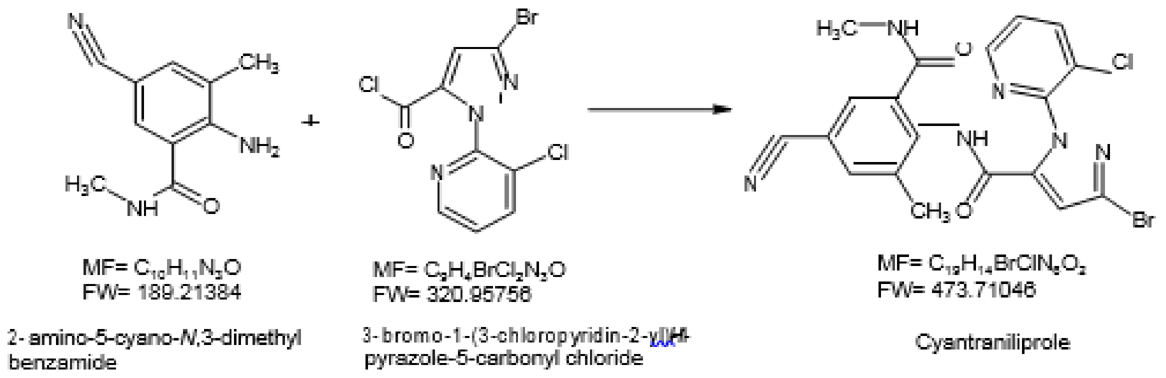
Brief Manufacturing Process: -

Step 1: -2-Amino-5-Cyano-N,3-Dimethyl Benzamide is reacted with 3-bromo-1-(3-chloropyridin-2-yl)-1H-pyrazole-5-carbonyl chloride in presence of Xylene as well as Triethyl Amine. This reaction gives out Cyantraniliprole. After completion of reaction Xylene is recovered from the reaction mass.

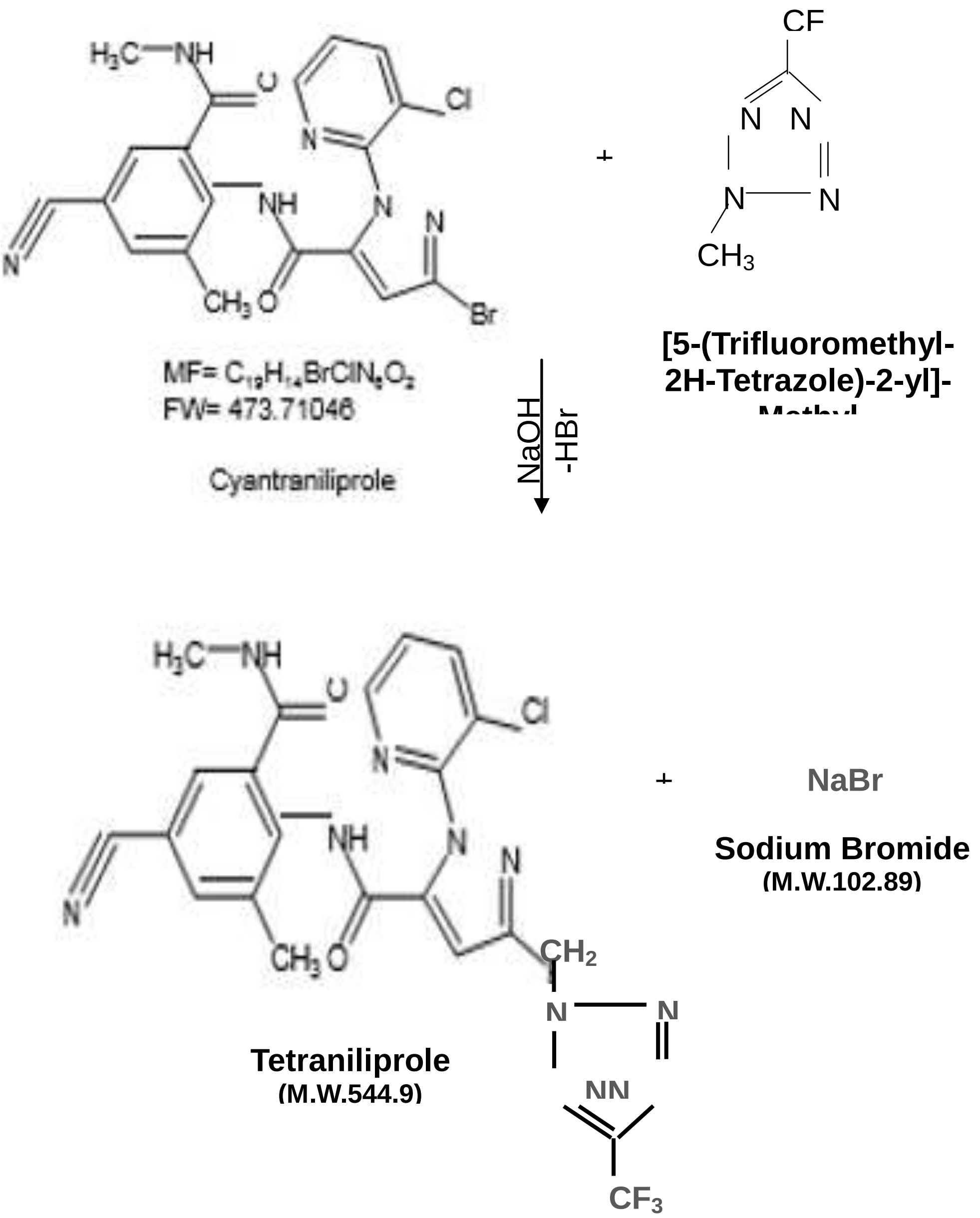
Step 2: -Bromine group of Cyantraniliprole is replaced by Condensation process by [5-(Trifluoromethyl)-2H-Tetrazol-2-yl] methyl group in presence of Sodium Hydroxide. This reaction gives out Tetraniliprole as a final product.

Chemical Reactions: -

Step 1: -


MF= $C_{10}H_{11}N_3O$
FW= 189.21384
2-amino-5-cyano-N,3-dimethyl benzamide
MF= $C_9H_4BrCl_2N_3O$
FW= 320.95756
3-bromo-1-(3-chloropyridin-2-yl)-1H-pyrazole-5-carbonyl chloride
MF= $C_{19}H_{14}BrClN_6O_2$
FW= 473.71046
Cyantraniliprole

Step 2: -


MF= $C_{19}H_{14}BrClN_6O_2$
FW= 473.71046
Cyantraniliprole
[5-(Trifluoromethyl-2H-Tetrazole)-2-yl]-
NaOH
-HBr
NaBr
Sodium Bromide
(M.W.102.89)
Tetraniliprole
(M.W.544.9)

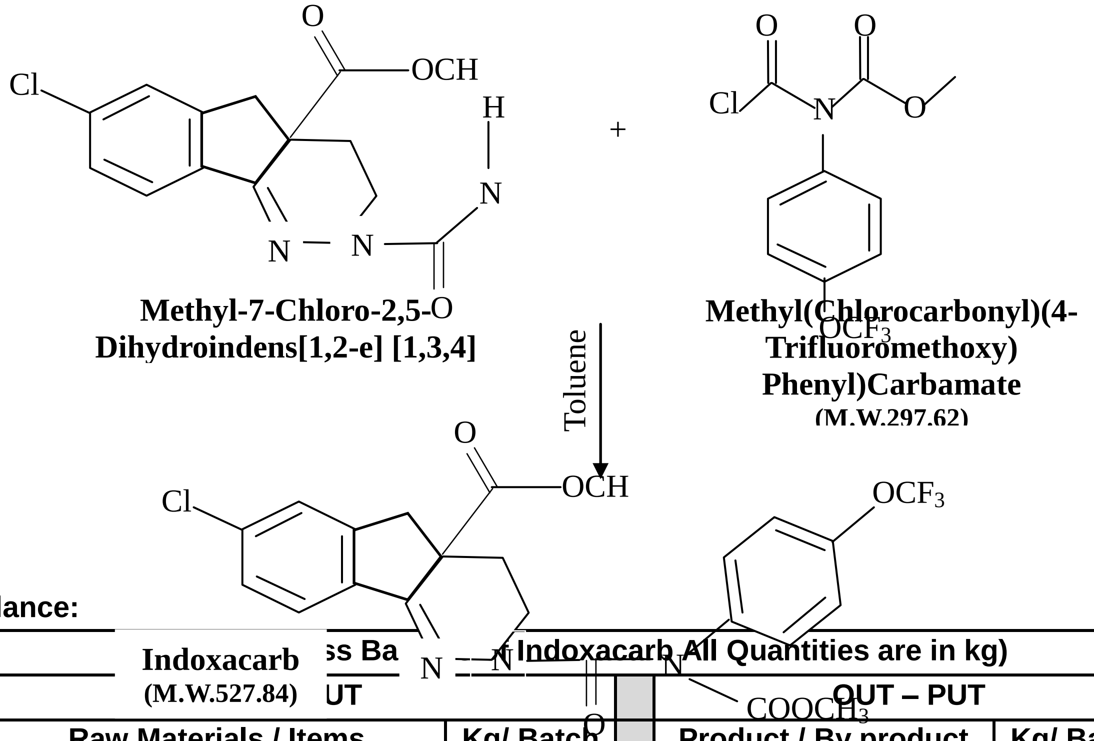
33	Material / Mass Balance of Tetraniliprole All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2-Amino-5-Cyano-N,3-Dimethyl Benzamide	380		Tetraniliprole	**1000**
2	3-Bromo-1-(3-Chloropyridin-2-yl)-1H-Pyrazole-5-Carbonyl Chloride	641		Xylene	2791
3	Triethyl amine	204		Residue	137
4	Xylene	2938		Aq. Layer	2416
5	Water	2212		Drying Loss	146
6	Solvent - Toluene	2200		Recovered Solvent	2110
7	Catalyst	15		Solvent Loss	90
8	[5-(Trifluoromethyl)-2H-Tetrazole-2-yl] Methyl	290		Aqueous layer to ETP	634
9	Water for Reaction and Washing	1250		NaBr Soln	950
10	Caustic Soda Lye	170		Distillation Residue	26
	TOTAL	**10300**		**TOTAL**	**10300**

34) Indoxacarb

Brief Manufacturing Process: -

Methyl-7-Chloro-2,5-Dihydroindeno[1,2-e][1,3,4]Oxadiazine-4a(3H0-Carboxylate reacted with Methyl (Chlorocarbonyl) [4-(trifluoromethoxy) phenyl] carbamate in presence of Solvent as well as Catalyst. This reaction gives out Indoxacarb as a final product.

Chemical Reactions: -



Mass Balance:

34	ss Ba Indoxacarb All Quantities are in kg)				
	UT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/ Batch		Product / By product	Kg/ Batch

1	Methyl-7-Chloro-2,5-Dihydroindeno[1,2-e]Oxadiazine-4a(3H-Carboxylate)	600		Indoxacarb	**1000**
2	n-Methyl(Chlorocarbonyl)[4-Trifluoromethoxy Phenyl]Carbamate	300		Recovered Catalyst	192
3	Catalyst	200		Aqueous Layer	1188
4	Toluene	550		Recovered Toluene	500
5	Caustic Lye	80		Toluene Loss	50
6	Water	1200			
	TOTAL	**2930**		**TOTAL**	**2930**

35) Flonicamide

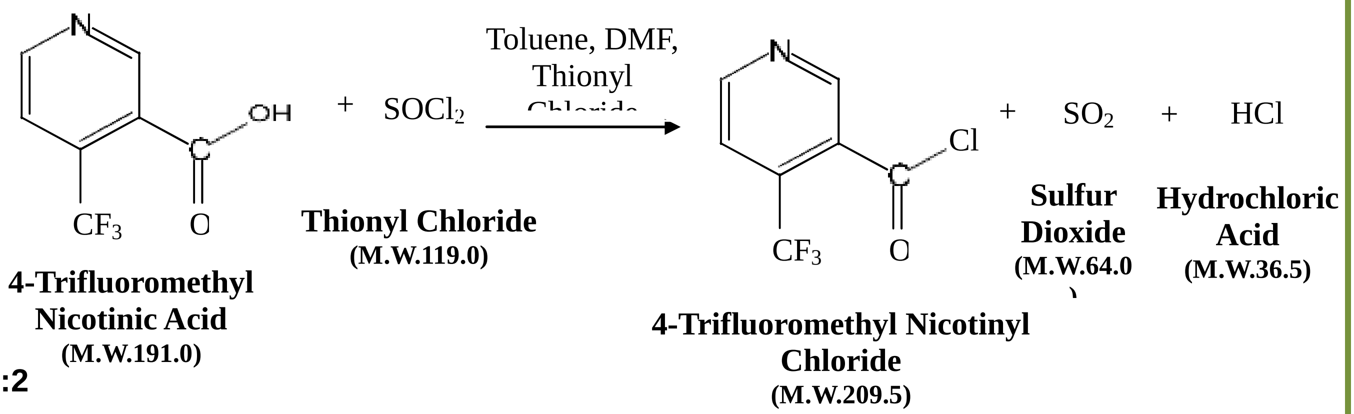
Brief Manufacturing Process: -

Step 1: - To a solution of 4- Trifluoromethyl nicotinic acid in toluene, catalytic amount of dimethyl Formamide (DMF) is added and molar equivalent of thionyl chloride is added over a period of time and the mixture is heated at 60^{o} C until completion of reaction. Hydrogen chloride gas and sulphur dioxide formed is scrubbed in a caustic scrubber.At the end of reaction toluene is completelydistilledoffandtheresideistakentonextreactionwithoutfurtherpurifications.

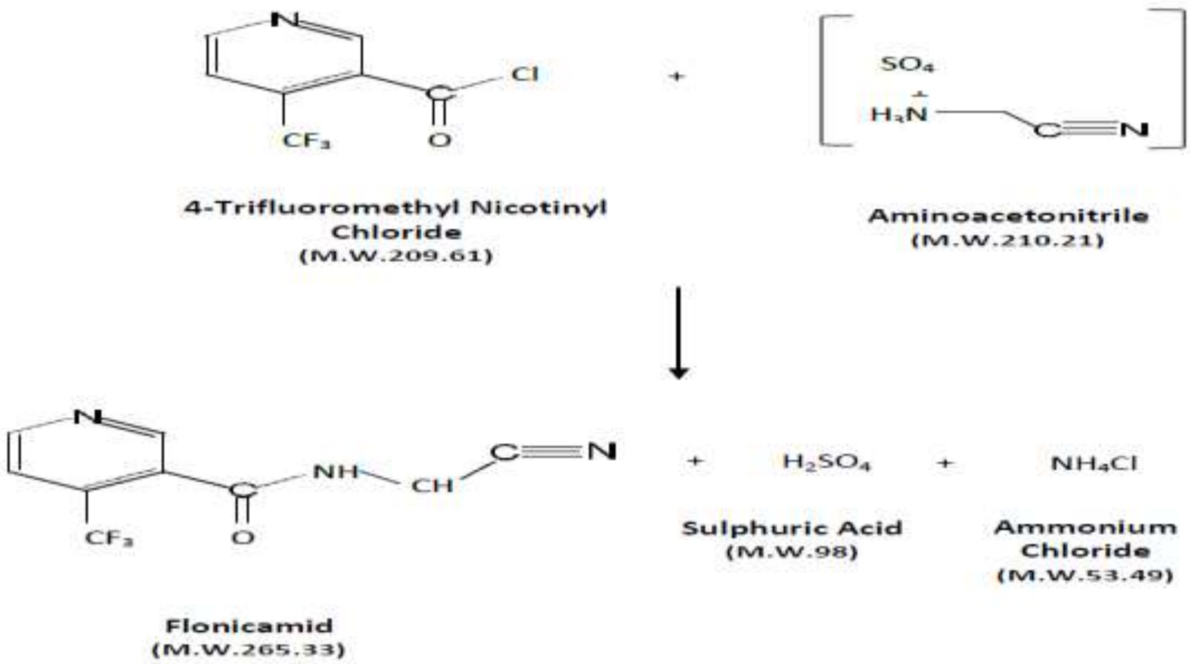
Step 2: - The reside from previous reaction containing 4- Trifluoromethyl Nicotinyl chloride is dissolved in ethylene dichloride and 50% molar excess of Triethyl amine is added followed by amino acetonitrile sulphate. The reaction mixture is stirred at room temperature overnight to complete the reaction. The reaction mixture is thoroughly washed with water and solvent is concentrated. The residue is recrystallized from methanol.

Chemical Reactions: -

Step 1: -



Step:2



35	Material / Mass Balance of Flonicamid (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	4-Trifluoromethyl Nicotinic Acid	895		Flonicamid	**1000**
2	Thionyl Chloride	443		Hydrochloric Acid (30%)	500
3	Amino Acetonitrile Sulfate	984		Sodium Sulfite Soln (28%)	1200
4	Caustic	298		Ammonium Chloride	203
5	Dimethyl Formamide (DMF)	615		Water	134
6	Toluene	4600		Sodium Sulfate	529
7	Ethylene Dichloride (EDC)	9900		DMF Recovered	595
8	Methanol	2000		DMF Loss	20
9	Water	2000		EDC Recovered	9700

10	Triethyl Amine	381		EDC Loss	200
11				Methanol Recovered	1900
12				Methanol Loss	100
13				Toluene Recovered	4470
14				Toluene Loss	130
15				Triethyl Amine	310
16				Waste Water	1125
	TOTAL	**22116**		**TOTAL**	**22116**

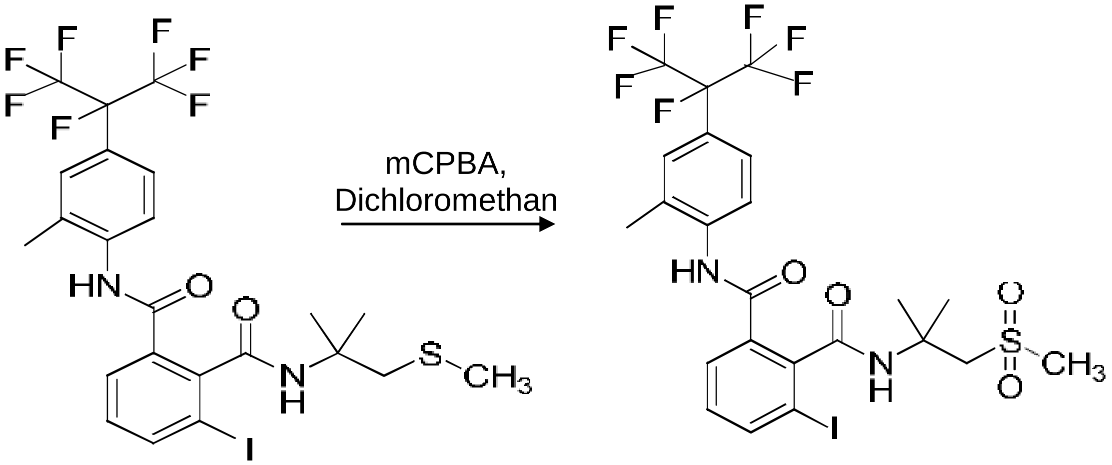
36) Flubendiamide:

Brief Manufacturing Process: -

Charge 3-Iodo-N2-(2-Methyl-1-(Methylthio) Propane- 2- yl) -N1 - (2-Methyl – 4 -(Perfluoropropan-2-yl) Phenyl) Phthalimide (IMMTPMPFPPP) and dichloromethane. Add 3-Chloro Peroxy Benzoic Acid (m-CPBA) lot-wise slowly for 6 hours and maintain for 4 hours. After completion of the reaction add water and separate the aqueous phase. Cool the organic phase to 0-5^{o}C and filter the slurry. Dry to obtain Flubendiamide Technical.

Chemical Reactions: -

Step 1: -



3-Iodo-N2-(2-Methyl-1-(Methylthio) Propan-2-yl)-N1-(2-Methyl-4-(Perfluoropropan-2- yl) Phenyl) Phthalamide(IMMTPMPFPPP)

Flubendiamide (M.W.680.5)

Mass Balance:

36	**Material / Mass Balance of Flubendiamide All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Dichloromethane	3000		Flubendiamide	**1000**
2	3-Iodo-N2-(2-Methyl-1-(Methylthio) Propane- 2- yl) -N1 - (2-Methyl – 4 -(Perfluoropropan-2-yl) Phenyl) Phthalimide	1000		Dichloromethane	2950

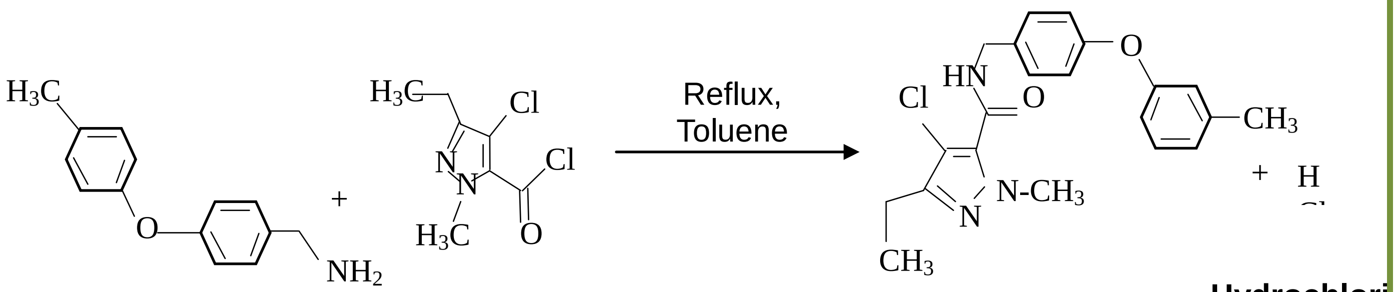
3	3-Chloro Peroxy Benzoic Acid	550		Organic Residue	50
4	Water	1000		Drying loss	100
5				Aqueous Effluent	1450
	TOTAL	**5550**		**TOTAL**	**5550**

37) Tolfenpyrad

Brief Manufacturing Process: -

In solvent toluene 4-(4-Methylphenoxy)-Benzylamine is taken and under reflux, the Acid Chloride of 4-Chloro-3-Ethyl-1-Methyl Pyrazole-5-Carboxylic Acid is added and the reaction is completed. After completion of the reaction, the reaction mass is cooled to 40 degrees and washed with water and the solvent is refluxed to remove traces of water. Finally, the organic mass is cooled and crystalized, filtered and dried to get product.

Chemical Reactions: -



4-(4-Methylphenoxy)-Benzylamine (M.W.213.0)

4-Chloro-3-Ethyl-1-Methyl-Pyrazol-5-yl Carboxylic Chloride

Tolfenpyrad (M.W.383.5)

Hydrochloric Acid (M.W.36.5)

Mass Balance:

37	**Material / Mass Balance of Tolfenpyrad All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Toluene	1000		Tolfenpyrad	**1000**
2	4-(4-Methylphenoxy) Benzyl Amine	553		Toluene Recovered	950
3	4-Chloro-3-Ethyl-1-Methyl Pyrazole-5-yl Carboxylic Chloride	540		Toluene loss	50
4	Water for quenching	2000		30 % Hydrochloric Acid	316
5	Water for Hydrochloric Acid Soln	221		Mother liquor Recycle	1912
6				Drying Water loss	53
7				Organic Impurity	33
	TOTAL	**4314**		**TOTAL**	**4314**

Group 3: Neo Nicotinoids Insecticides G-2

38)Cyclaniliprole

Brief Manufacturing Process: -

Step 1: - PPOA is reacted with NBSC in presence of solvent-A and organic base as acidbinder to form PPNS.

Step 2: - PPNS is reacted with aq. HBr/ Ac2O and then reaction mass is extracted insolvent B, then neutralized with base and the solvent B is recovered from the reaction mass. The compound (BDPA) is taken in solvent -C.

Step 3: - It is taken in solvent -C and oxidized using inorganic reagent, and furthercrystallized using solvent -D and neutralized to form stage-3 (BPPA).

Step 4: - BPPA is reacted with bromine and inorganic base in Solvent-E, adjusted pH withinorganic acid and filtered. The crude purified is purified by acid - base treatment followed by filtration and drying. The gas is not involved or generated during reaction. Solvents / partial distilled water from the process are recovered and recycled to avoid the environmental pollution. The aqueous effluent having residual solvent will be incinerated.

Chemical Reactions: -

$$\underset{\text{PPOA}}{C_{21}H_{21}Cl_2N_5O_3} + \underset{\text{NBSC}}{C_6H_4ClNSO_4} + \underset{\text{Base}}{C_6H_{15}N} \text{ ------> } \underset{\text{PPNS}}{C_{27}H_{24}Cl_2N_6O_7S} + \underset{\text{Salt}}{C_6H_{16}NCl}$$

$$\underset{\text{PPNS}}{C_{27}H_{24}Cl_2N_6O_7S} + \underset{\text{Acid}}{HBr} + \underset{\text{Base}}{NaOH} \text{ ------> } \underset{\text{BDPA}}{C_{21}H_{20}BrCl_2N_5O_2} + \underset{\text{Salt}}{C_6H_4NSO_5Na} + \underset{\text{water}}{H_2O}$$

$$\underset{\text{BDPA}}{C_{21}H_{20}BrCl_2N_5O_2} + \underset{\text{Oxidant}}{Na_2S_2O_8} \text{ ------> } \underset{\text{BPPA}}{C_{21}H_{18}Br\,Cl_2N_5O_2} + \underset{\text{salt}}{Na_2H_2S_2O_8}$$

$$\underset{\text{BPPA}}{C_{21}H_{18}Br\,Cl_2N_5O_2} + \underset{\text{Bromine}}{Br_2} + \underset{\text{Base}}{NaOH} \text{ --------> } \underset{\text{Cyclaniliprole}}{C_{21}H_{17}Br_2Cl_2N_5O_2} + \underset{\text{salt}}{NaBr} + \underset{\text{water}}{H_2O}$$

38	Material / Mass Balance of Cyclaniliprole All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Solvent A	3915		Cyclaniliprole	**1000**
2	PPOA	1171		Solvent A Recovery	3708
3	Organic Base	414		Solvent A Loss	207
4	NBSC	693		Solvent B Recovery	5035
5	Process Water	2500		Solvent B Loss	465
6	Acetic Anhydride	1551		Solvent C Recovery	3800
7	Aqueous HBr	572		Solvent - C Loss	200
8	Sodium Hydroxide	1067		Waste Organic Salt	57

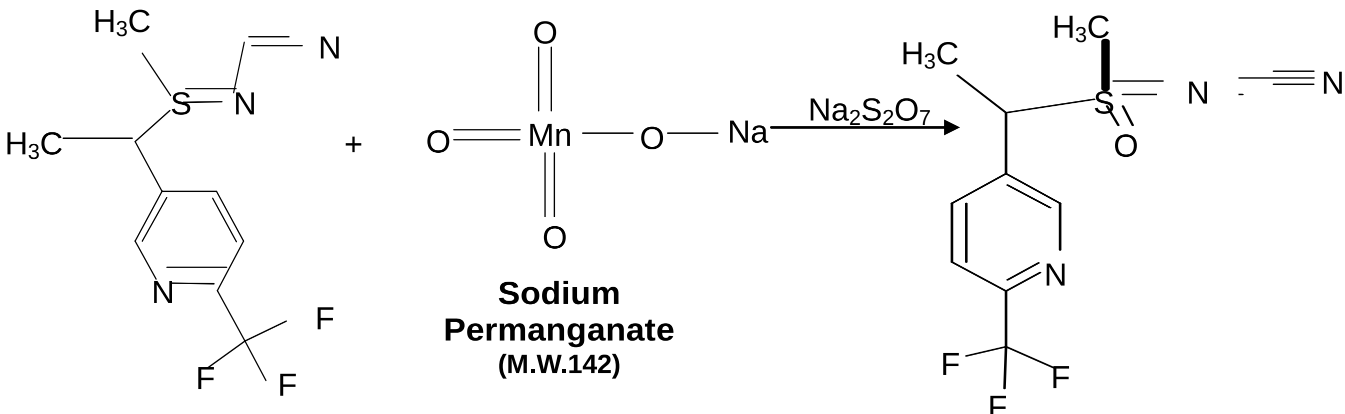
9	Solvent B	5500		Vapours to Scrubber	344
10	Solvent C	4000		Waste Water	3590
11	Oxidant - Sodium Peroxydisulfate	1055		Solvent C + Waste Water	7777
12	Solvent D	6375		Solvent D Recovery	3733
13	Water for Washing	10000		Solvent D + Waste Water	4818
14	Solvent E	5000		Solvent E Recovery	4096
15	Bromine	453		Organic Base Recovery	372
16	Inorganic Acid	89		Wash Water	5153
	TOTAL	**44355**		**TOTAL**	**44355**

39) Sulfoxaflor:

Brief Manufacturing Process: -

Sulfilimine dissolve in ethylene dichloride and added sodium permanganate at 0-5° C digest for 4-5 h. After 5 h added sodium bisulphite dissolve in water at room temperature maintain for 5-6 h and the product is filtered, washed and dried to get the desiredproduct.

Chemical Reactions: -



Sulfilimine
(M.W.261.27)

Sodium Permanganate
(M.W.142)

Sulfoxaflor
(M.W.277.27)

39	**Material / Mass Balance of Sulfoxaflor All Quantities are in kg)**				
IN – PUT				**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Sulfilimine	1070		Sulfoxaflor	**1000**
2	Sodium Permanganate	581		Recovery EDC	4922
3	Ethylene Dichloride	5350		Loss EDC	428
4	Sodium Bisulphite	778		Aqueous waste	7850
5	Water	6420			
	TOTAL	**14199**		**TOTAL**	**14200**

40) Clothianidin

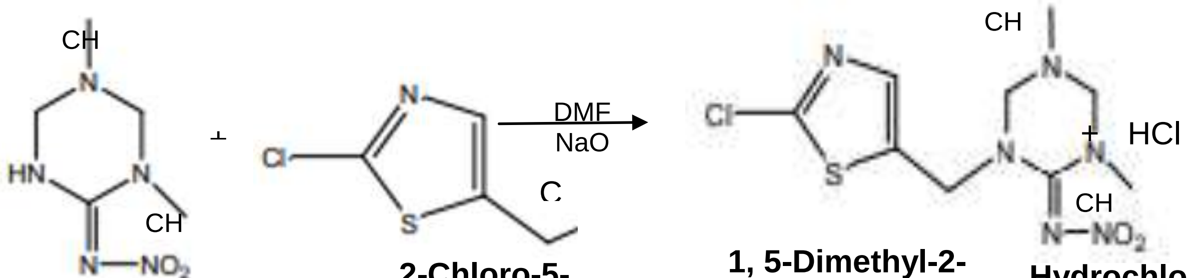
Brief Manufacturing Process: -

Step-1: 1,5-Dimethyl-2-Nitroimino Hexahydro-1,3,5-Triazine is dissolved in dried DMF. Slowly add Sodium Hydroxide solution to the mixture with cooling. The mixture is stirred for 1 h at room temperature then the mixture heated with stirring further for 1 h at 50° C. To this mixture, a solution of 2-Chloro-5-Chloromethyl Thiazole in dried DMF added drop wise at 40–50° C. After this addition, the reaction mixture heated with stirring for two hours at 70– 80° C. The mixture poured into ice-water and filtered.

Step-2: Take ethanol & hydrochloric acid & add the crude Clothianidin and maintain for 10-12 hours at 75-80°C, after completion of reaction, cool at 20°C and filter. Dry the material to get ClothianidinTechnical andN, N-Bis (Dichloromethyl) Methyl Amine as by Product.

Chemical Reactions: -

Step 1: -



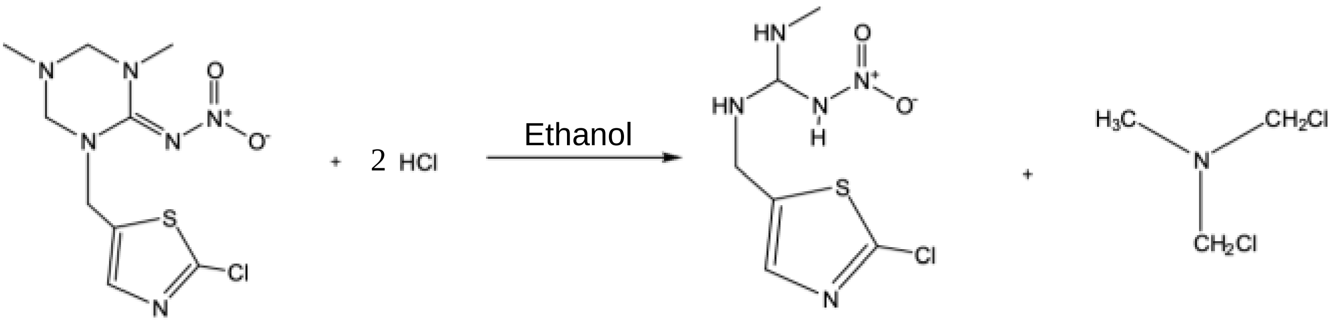
1,5-Dimethyl-2- Nitroimino

2-Chloro-5- Chloromethyl

1, 5-Dimethyl-2- Nitroimino-3-(2- Chlorothiazolylmethyl) Hexahydro-1, 3, 5-

Hydrochloric Acid

Step:2



1, 5-Dimethyl-2- Nitroimino-3-(2- Chlorothiazolylmethyl) Hexahydro-1, 3, 5- Triazine $C_9H_{13}N_6SO_2Cl$ (M.W.304.5)

Hydrochloric Acid (M.W.36.5×2)

Clothianidin $C_6H_8N_5SO_2Cl$ (M.W.249.5)

N, N-Bis (Dichloromethyl) Methyl Amine $C_3H_7NCl_2$ (M.W.128)

40	Material / Mass Balance of Clothianidin All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product/By product	Kg/Batch
1	1,5-Dimethyl-2-Nitro iminohexahydro -1,3,5-Triazine(1,5-	740		Clothianidin	**1000**

	DMNIHH-1,3,5-Triazine)			
2	Dimethyl Formamide	2000	Recovered Dimethyl Formamide	1950
3	Sodium Hydroxide	170	Dimethyl Formamide Loss	50
4	Water	850	Ethanol Recovered	2900
5	2-Chloro-5-Chloromethyl Thiazol	715	Ethanol Loss	100
6	Ethanol	3000	N, N-Bis (Dichloromethyl) Methyl Amine	515
7	Ice Water	5000	Aqueous Effluent to ETP	6560
8	Hydrochloric Acid	600		
	TOTAL	**13075**	**TOTAL**	**13075**

41) Pymetrozine Technical

Brief Manufacturing Process: -

Step 1: - 3- Cyano Pyridine undergoes hydrogenation reaction in presence of water, Ammonium Hydroxide, Hydrochloric Acid and Catalyst. it gives an intermediate as 3-Pyridine Carbaldehyde. After completion of reaction, resulting product is isolated by filtration and the Catalyst is recovered & recycled.

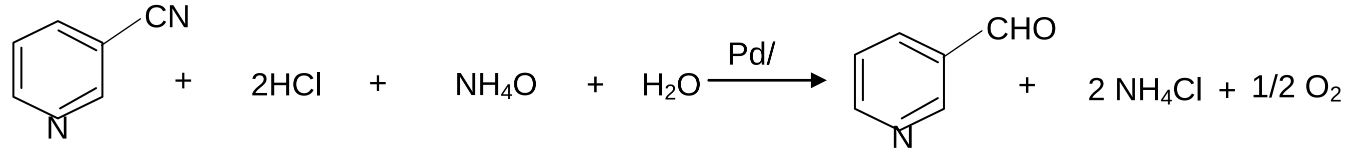
Step 2: -

N-(6-Methyl-3-oxo-2, 5-Dihydro-3H [1, 2, 4] triazin-4-yl)-Acetamide when reacted with Conc. Hydrochloric Acid (HCl) in presence of Solvent as Methanol it gives second intermediate as 4-Amino-6-Methyl-3-Oxo-2,3,4,5-Tetrahydro-1,2,4-Triazin-3-(2H)-one. After completion of reaction, the reaction is treated by Caustic Lye & pH adjusted to slightly alkaline & this resulting Mass is then forwarded to next step for condensation as such.

Step 3: - 4-Amino-6-Methyl-3-Oxo-2, 3, 4, 5-Tetrahydro-1, 2, 4-Triazin-3-(2H)-one is undergoes condensation with 3-Pyridinaaldehyde in presence of Solvent- Methanol and maintain reaction for 8.0 to 9.0 hours at 65 to 68°C. Finally, reaction mass cooled and filtered to give pure product as Pymetrozine Technical.

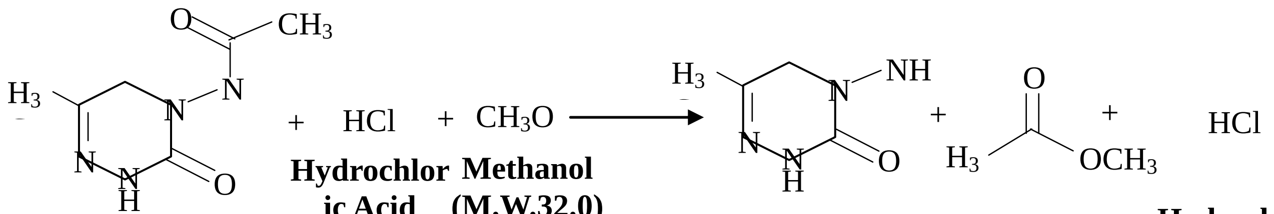
Chemical Reactions: -

Step 1: -



3- Cyano Pyridine (M.W.104.) | **Hydrochloric Acid** (M.W.2×36.5) | **Ammonium Hydroxide** (M.W.35.0) | **Water** (M.W.18.0) | **3-Pyridine Carboxaldehyde** (M.W.107.0) | **Ammonium Chloride** (M.W.2×53.5) | **Oxygen** (M.W.8.0)

Step 2: -



N-(6-Methyl-3-oxo-2, 5-Dihydro-3H [1, 2, 4] triazin-4-yl)-Acetamide $C_6H_{10}N_4O_2$

Hydrochloric Acid (M.W.36.5)

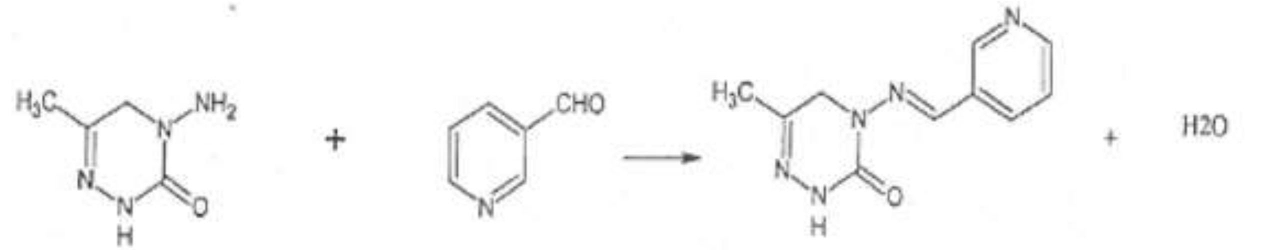
Methanol (M.W.32.0)

4-Amino-6-Methyl-4, 5-Dihydro-2H [1, 2, 4] Triazin-3-one $C_4H_8N_4O$ (M.W.128.0)

Methyl Acetate $C_3H_6O_2$ (M.W.74.0)

Hydrochloric Acid (M.W.36.5)

Step 3: -



4-amino-6-methyl-4,5-dihydro-1,2,4-triazin-3(2H)-one M.W.=128.13

pyridine-3-carbaldehyde M.W.=107.11

6-methyl-4-[(E)-(pyridin-3-ylmethylidene)amino]-4,5-dihydro-1,2,4-triazin-3(2H)-one M.W.=217.23

H_2O Mol. Wt.: 18.02

Mass Balance:

41	Material / Mass Balance of Pymetrozine All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	Raw Materials / Items	Kg/ Batch		Product / By product	Kg/ Batch
1	3- Cyano Pyridine	532		Pymetrozine	**1000**
2	Ammonium Hydroxide	170		Recovered Solvent-Methanol	1900
3	Pd/C Catalyst	15		Methanol Loss	100
4	N-(6-Methyl-3-oxo-2, 5-Dihydro-3H [1, 2, 4] triazin-4-yl)-Acetamide	870		Ammonium Chloride	495
5	Concentrated Hydrochloric Acid	709		Methyl Acetate	345
6	Caustic Soda Lye	472		30 % Hydrochloric Acid	565
7	Solvent-Methanol	2000		Sodium Chloride Salt	298
8	Water	5000		Aqueous Layer to ETP	5014
9				Oxygen	36
				Recovered Catalyst	14
				Catalyst loss	1
	TOTAL	**9768**		**TOTAL**	**9768**

Group -4: Organo Phosphorus Insecticides/Aromatic Ethers, Carbamate, Benzoyl Urea, Oxadiazine, Pyrazole & Other Miscellaneous Insecticides/ Acaricides Compounds/ Benzoylurea/ Other IGRs/ Natural Products: -

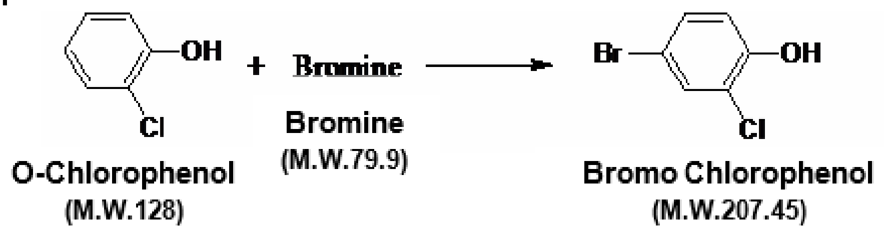
42)Profenophos

Brief Manufacturing Process: -

Reaction of *o*-Chlorophenol with Bromine gives Bromo Chlorophenol (BCP). Bromo Chlorophenol (BCP) with Diethyl Thiophosphoryl Chloride (DETCl) in presence of sodium Hydroxide (NaOH) to yield intermediate A. Intermediate A and Trimethylamine, to give Q-Salt. Finally, reaction of Q-salt with n-propyl bromide gives Profenophos technical.

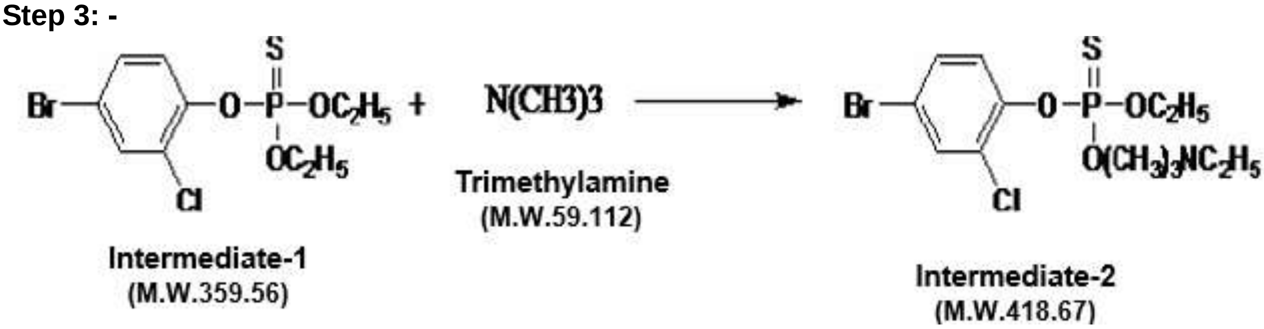
Chemical Reactions: -

Step 1: -

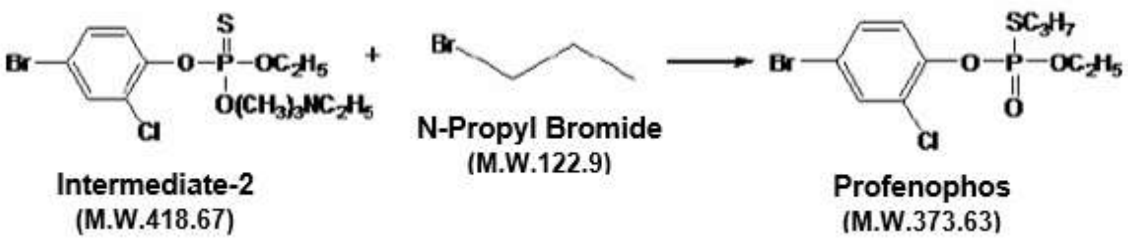


Step 2:-

Step 3: -



Step 4: -



Mass Balance:

42	Material / Mass Balance of Profenophos All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Ortho-Chloro Phenol	398		Profenophos	**1000**
2	Liquid Bromine	485		Hydro Bromic acid	206
3	Diethyl Thiophosphoryl Chloride	566		TMA Recovered	214
4	Trimethyl Aluminium (TMA)	709		TMA Loss	495
5	Propyl Bromide	363		Aqueous Waste	4773
6	Water	4661		Sodium Bromide	261
7	Sodium Hydroxide	215		Organic Impurity	448
	TOTAL	**7397**		**TOTAL**	**7397**

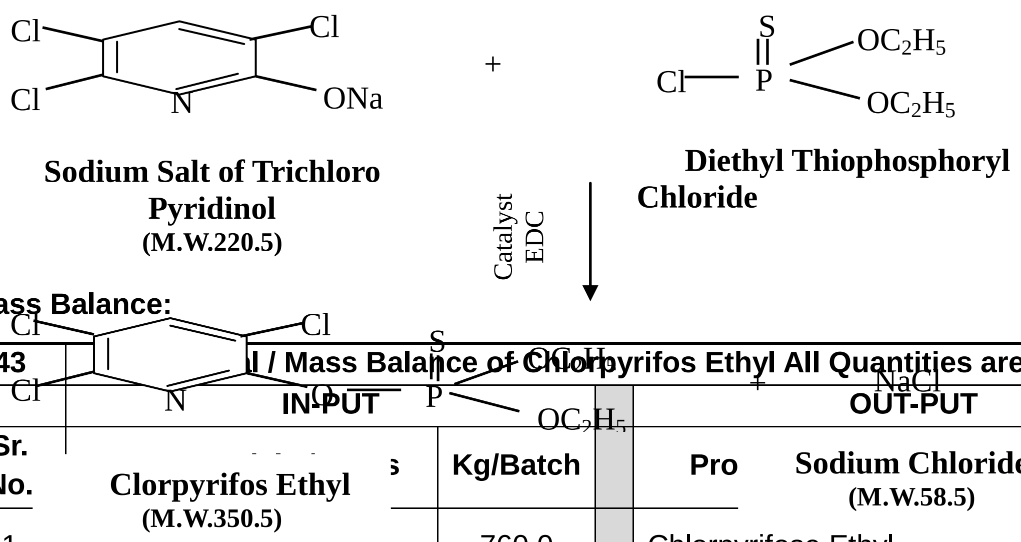
43) Chlorpyrifose Ethyl

Brief Manufacturing Process: -

Sodium Salt of 3,5,6 Trichloro Pyridinol (Na-TCP) is reacted with O, O Di Ethyl Thio Phosphoryl Chloride (DETC) in presence of Catalyst and Solvent to get Chlorpyrifos Tech. of 94% purity. Recovered solvent is recycled in next batch.

Finally, Toxin Effluent which contains traces of pesticides is taken to Hydrolysis stage for detoxification. Where Aqueous Mass is treated at high temp. By Alkali for the rapid hydrolysis of pesticides to simpler non- toxic compounds.

Chemical Reactions: -



Sodium Salt of Trichloro Pyridinol
(M.W.220.5)

Diethyl Thiophosphoryl Chloride

Clorpyrifos Ethyl
(M.W.350.5)

Sodium Chloride
(M.W.58.5)

Mass Balance:

43	…l / Mass Balance of Chlorpyrifos Ethyl All Quantities are in kg)				
	IN-PUT			OUT-PUT	
Sr. No.	**…s**	**Kg/Batch**		**Pro…**	**…/Batch**
1	Trichloro Pyridinol	760.0		Chlorpyrifose Ethyl	**1000**
2	O, O Di Ethyl Thio Phosphoryl Chloride	590.0		Recovered Solvent EDC	2700

3	EDC	2800		EDC loss	100
4	Water for Reaction	4760		Water Loss	164
5	Catalyst	10		Aqueous Mass to ETP	5056
6	Caustic Soda Lye 48%	100		Na- TCP Wet Cake recycle	150
7	Water for Washing	150			
8					
	TOTAL	**9170**		**TOTAL**	**9170**

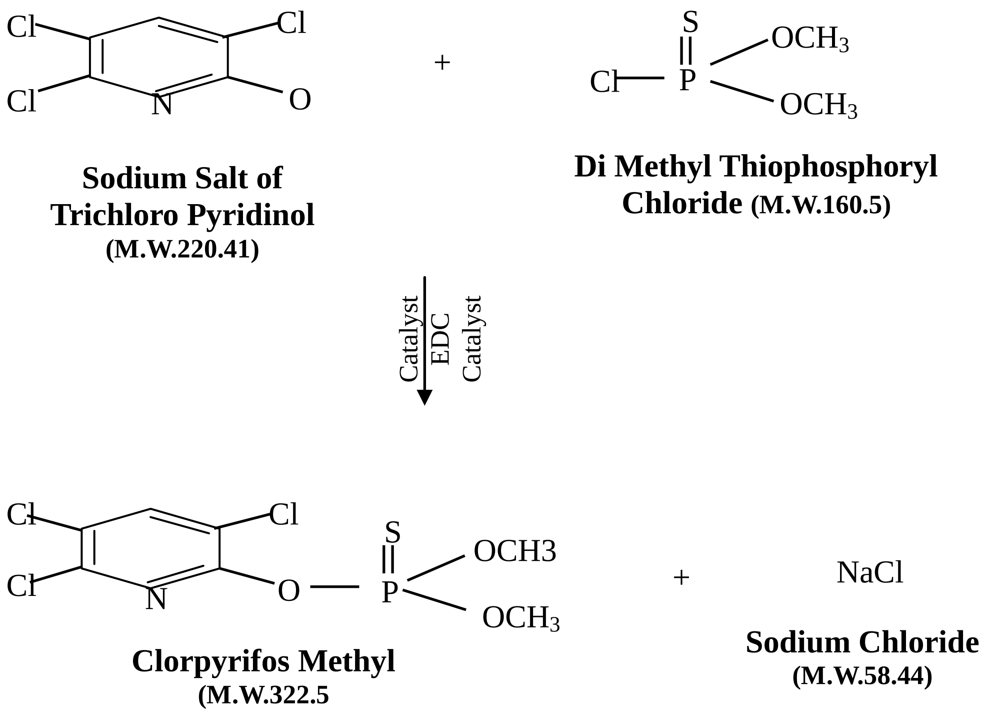
44) Chlorpyrifose Methyl

Brief Manufacturing Process: -

Sodium Salt of 3,5,6 Trichloro Pyridinol (Na-TCP) is reacted with O, O Di Methyl Thio Phosphoryl Chloride (DMTC) in presence of Catalyst and Solvent to get Chlorpyrifos Tech. of 94% purity. Recovered solvent is recycled in next batch.

Finally, Toxin Effluent which contains traces of pesticides is taken to Hydrolysis stage for detoxification. Where Aqueous Mass is treated at high temp. By Alkali for the rapid hydrolysis of pesticides to simpler non- toxic compounds.

Chemical Reactions: -



Mass Balance:

44	Material / Mass Balance of Chlorpyrifos Methyl All Quantities are in kg)				
	IN-PUT			OUT-PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Sodium Salt of-3,5,6	763		Chlorpyrifose Methyl	**1000**

	Trichloro Pyridinol				
2	DMTC	553		Recovered Solvent EDC	3840
3	EDC	4000		EDC loss	160
4	Water for Reaction	4760		Water Loss	164
5	Catalyst	10		Wet Cake NaTCP Recycle	150
6	Caustic Soda Lye 48%	100		Aqueous Mass to ETP	5022
7	Water for Washing	150			
	TOTAL	**10336**		**TOTAL**	**10336**

45) Temephos Technical

Brief Manufacturing Process: -

Step 1: - 4-4’-Thio Di Phenol (TDP) reacts with Caustic Soda to convert to Sodium salt of 4-4’-Thio Di Phenol.

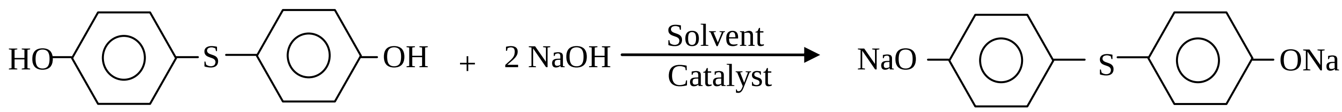
Step 2: -This Sodium Salt is then reacted with O, O Di Methyl Thio Phosphoryl Chloride (DMTC) in presence of Solvent – Toluene & Catalyst.

The reaction mass is finally washed out by water and Aqueous Wash is separated from Organic mass. Finally, solvent is stripped-off from Organic mass under vacuum to get the final product Temephose.

Finally, Toxic Effluent which contains traces of Pesticides is taken to Hydrolysis stage for detoxification. Where Aq. Mass is treated at high temp.by Alkali for the rapid hydrolysis of pesticides to simpler non-toxic compounds.

Chemical Reactions: -

Step 1: -



4,4’-Thio Diphenol (M.W. 218.0)

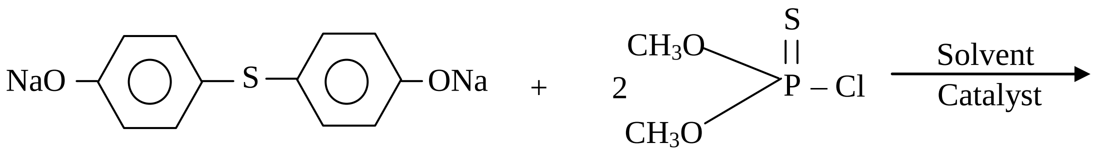
Sodium Hydroxide (M.W. 40.0)

Sodium Salt of4,4’-Thio Diphenol (M.W. 262.0)

+ $2H_2O$

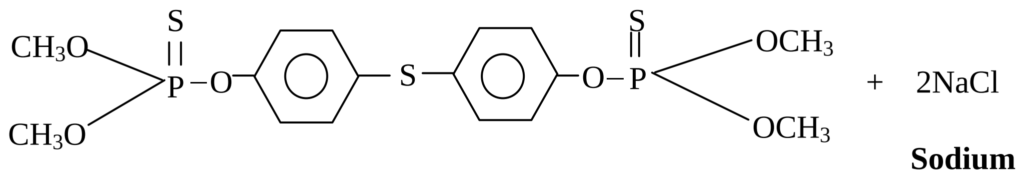
Water (M.W. 18.0)

Step 2: -



Sodium Salt of4,4'-Thio Diphenol (M.W. 262.0)

O, O Di Methyl Thio Phosphoryl Chloride (DMTC) (M.W.160.5)



Temephose (M.W.466.5)

Sodium Chloride (M.W.58.5)

Mass Balance:

45	Material / Mass Balance of Temephos All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	4,4' Thio Di Phenol	515		Temephos	**1000**
2	Solvent Toluene	1500		Recovered Solvent Toluene	1400
3	Catalyst	10		Toluene loss	100
4	Catalyst Lye 47%	600		Sodium Chloride Salt	440
5	O, O Di Methyl Thio Phosphoryl Chloride	653		Water Loss	197
6	Water	1200		Aqueous Layer to ETP	1841
7	Caustic Soda Lye	100			
8	Water for Washing	400			
	TOTAL	**4978**		**TOTAL**	**4978**

46) Malathion

Brief Manufacturing Process: -

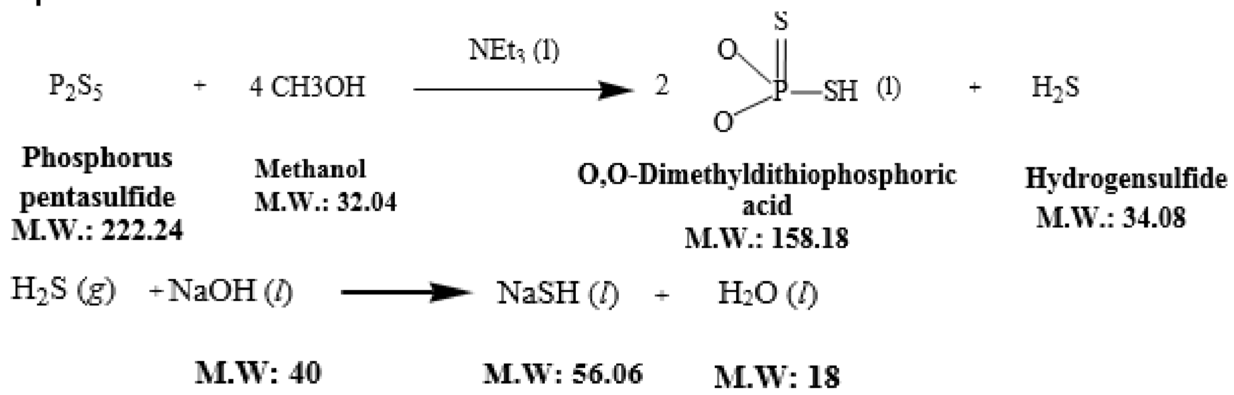
Step 1: -Phosphorus pentasulfide, Methanol and Triethylamine (cat) are reacted at elevated temperature. Hydrogen sulfide gas evolved from reaction is scrubbed into sodium hydroxide scrubber and resulted into 28% Aq. NaSH (Sodium hydrogen sulfide) as byproduct. After completion of reaction, low volatile material entrapped in reaction mass is stripped out and it is transferred for incineration. O, O-Dimethyldithiophosphoric acid (DMTA) in reactor is cooled and transferred to step-2.

Step 2: -DMTA is mixed with 30% Hydrochloric acid. Diethyl maleate is added. After completion of reaction, water added for quenching, then after agitation it is allowed for settling and phase separation. The aqueous phase is transferred to waste treatment. The organic phase is washed with dilute sodium hydroxide as per above same pattern. The alkaline aqueous phase is transferred for waste treatment. The organic phase is washed with water. The aqueous phase transferred for waste treatment. The organic phase is transferred for purification.

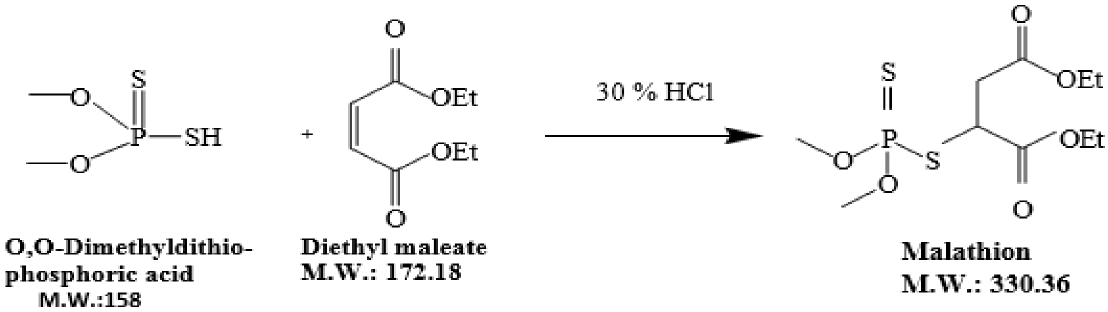
Step 3: -Water, Sodium nitrite, ethanol and sulfuric acid is charged in a reactor and mixed well. Then organic from step-2 is mixed with above. Aqueous phase is separated and transferred for treatment. Organic phase transferred for removal of low volatile matter from the mixture. Low volatile is mainly containing water, ethyl nitrate and organic impurities which is transferred for incineration. The mass remain in reactor is cooled and packed as final Malathion.

Chemical Reactions: -

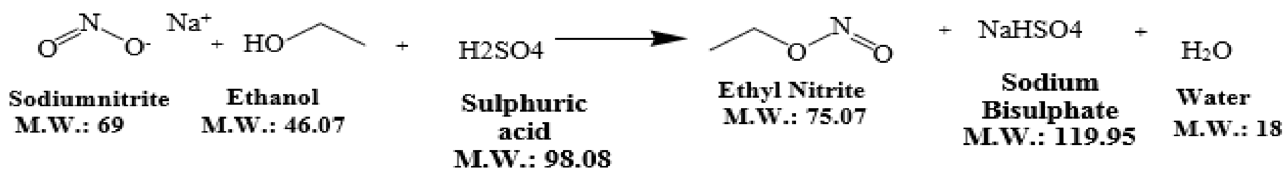
Step 1: -



Step 2: -



Step 3: -



Mass Balance:

46	Material / Mass Balance of Malathion All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch

1	Phosphorus Pentasulfide	480		Malathion	**1000**
2	Methanol	313		NaSH Solution (20%)	453
3	Triethylamine	1		Water to ETP	2363.15
4	30% Hydrochloric Acid	488		Volatile Material	68.46
5	Diethyl Maleate	840		Recovered Organic Volatile	135
6	Water for Washings	1096.5		Aq. Phase-1	1526
7	Dilute Caustic Lye Soln 5%	1058		Aq. Phase-4	305
8	Water for Quenching	1058			
9	Sodium Nitrite	0.21			
10	Ethanol	0.19			
9	Sodium Nitrite	0.21			
10	Sulphuric Acid	4			
11	C.S Lye 40 %	161.5			
12	Caustic Lye 48 %	350			
	TOTAL	**5850.61**		**TOTAL**	**5850.61**

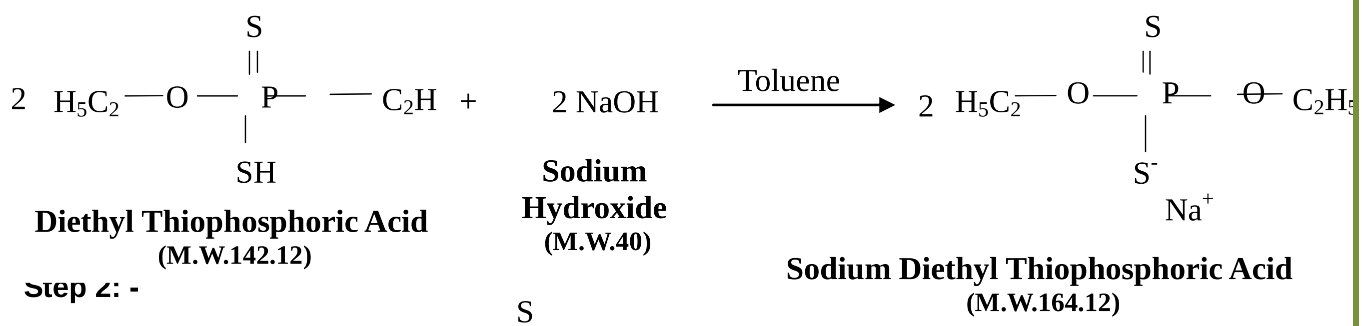
47) Ethion

Brief Manufacturing Process: -

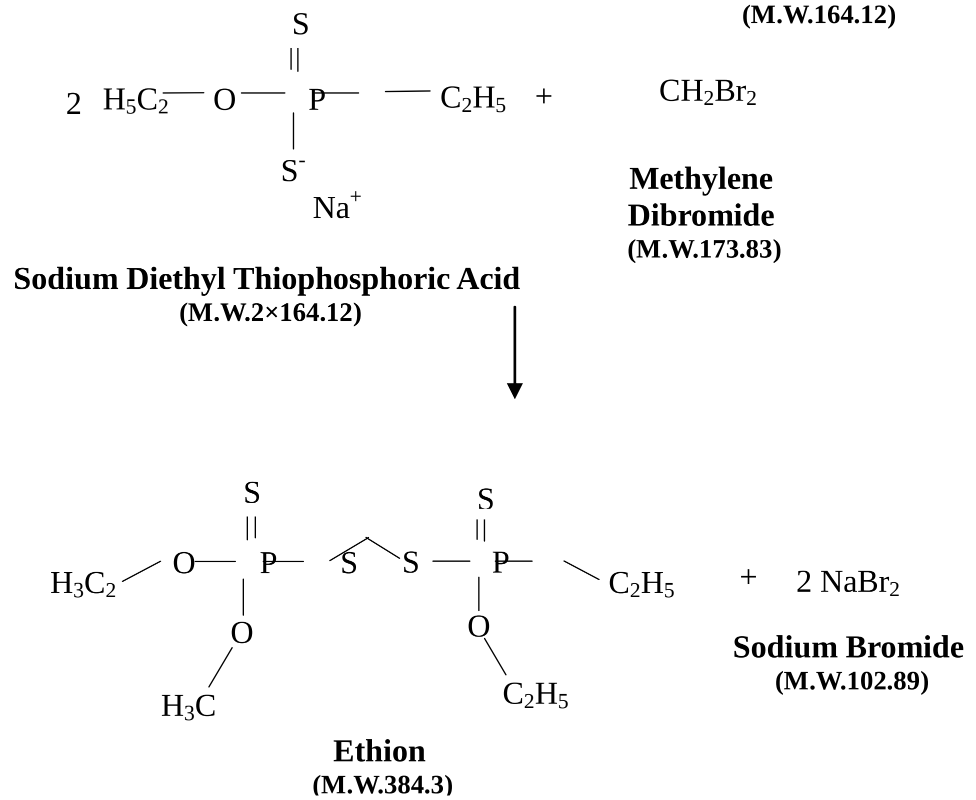
Step 1: - Diethyl Thiophosphoric Acid is neutralized with 35% Sodium Hydroxide to get Sodium Diethyl Thiophosphoric Acid.
Step 2: - Sodium Diethyl Thiophosphoric Acid is reacted with Methylene Dibromide to get Ethion and Sodium Bromide Organic layer contains Ethion and Aqueous layer contains Sodium Bromide, aqueous layer (Sodium Bromide layer) selling as a bi product. Organic layer to bepurified. Crude Ethion steam spurging to be done to get pure Ehion, Technical. Recovery organic residue sent to incinerator and aqueous layer is sent to ETP for furthertreatment.

Chemical Reactions: -

Step 1: -



Step 2: -



Mass Balance:

47	Material / Mass Balance of Ethion All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Diethyl Thiophosphoric Acid	998		Ethion	**1000**
2	35% NaOH Solution	660		Recovered Toluene	1920
3	Solvent Toluene	2000		Toluene Loss	80
4	Water for Reaction-1	500		20-25% NaBr	2760
5	Catalyst-1	12		Aq. Layer to ETP	696
6	Water for NaBr formation	1800			
7	Methylene Dibromide	486			
	TOTAL	**6456**		**TOTAL**	**6456**

48) Acephate

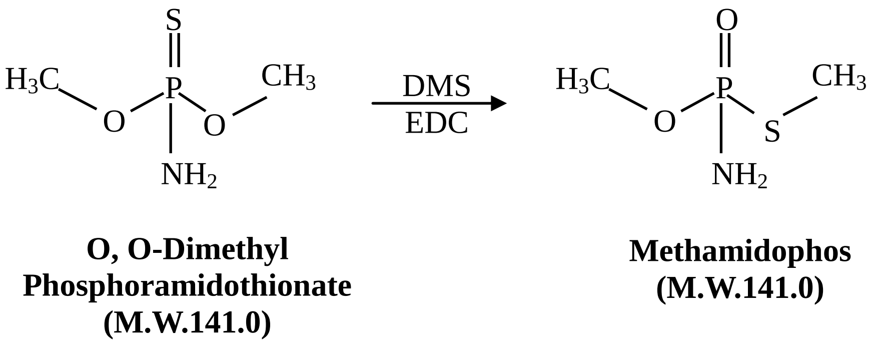
Brief Manufacturing Process: -

Step 1: - Synthesis of Methamidophos from O, O-Dimethyl Phosphoramidothioate (DMPAT) by isomerization.ToasolutionofDMPATinEDC(ethylenedichloride),catalyticamountof isomerization catalyst dimethyl sulphate is added and heated to 50^o C for 8 hr to convert DMPAT to Methamidophos.

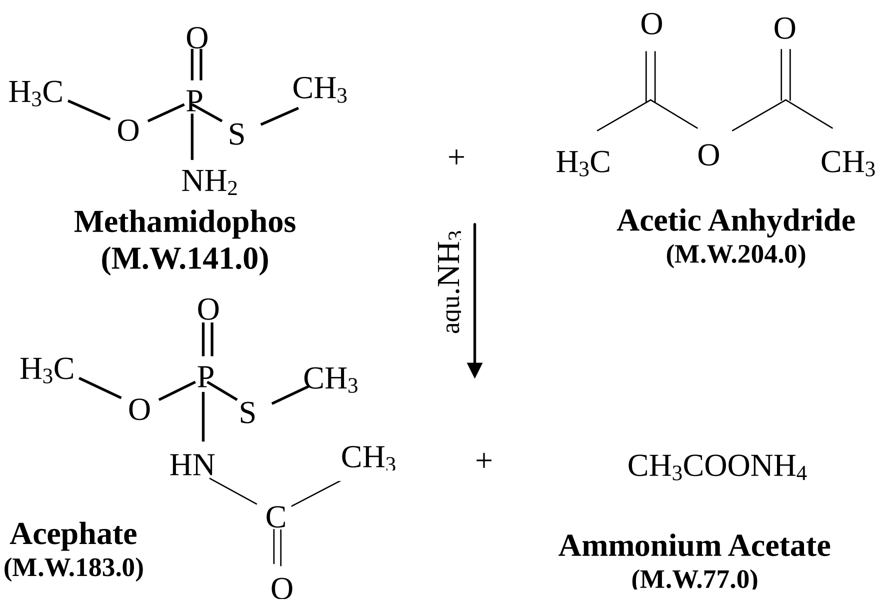
Step 2: - Synthesis of Acephate from Methamidophos. To Methamidophos in EDC taken in a reactor, acetic anhydride is continuously added keeping the temperature below 60^{o}C. Two hours after addition, the reaction mixture is cooled and neutralized with 10% aqueous ammonia. The organic layer is separated and concentrated to recover EDC. The product is recrystallized from ethyl acetate and dried.

Chemical Reactions: -

Step 1: -



Step 2: -



Mass Balance:

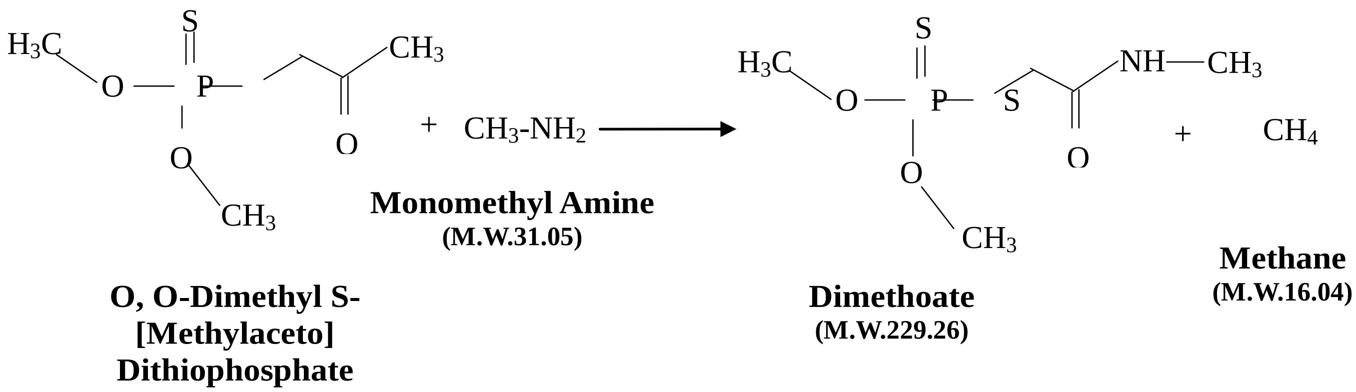
48	Material / Mass Balance of Acephate All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/ Batch**		**Product / By product**	**Kg/ Batch**
1	O, O-Dimethyl Phosphoramidothioate	998		Acephate	**1000**
2	Acetic Anhydride	722		Ammonium Acetate	88
3	Ammonia (10%)	1203		Ethyl Acetate Recovered	883
4	Ethyl Acetate	925		Ethyl Acetate Loss	18
5	Ethylene Dichloride (EDC)	2000		Ethyl Acetate to Wastewater	9
6	Water	1300		Ethyl Acetate in Residue	15
7				EDC Recovered	1950
8				EDC Loss	5
9				EDC in Residue	45
10				O, O-Dimethyl Phosphoramidothioate	250
11				Acetic Anhydride	185
12				Ammonia	300
13				Waste Water	2400
	TOTAL	**7148**		**TOTAL**	**7148**

49) Dimethoate

Brief Manufacturing Process: -

O, O-Dimethyl S-[Methylaceto] Dithiophosphate is reacted with Monomethyl Amine solution (40%) to get Dimethoate. Ethylene dichloride is used to extract the product and distilled to get Dimethoate technical.

Chemical Reactions: -



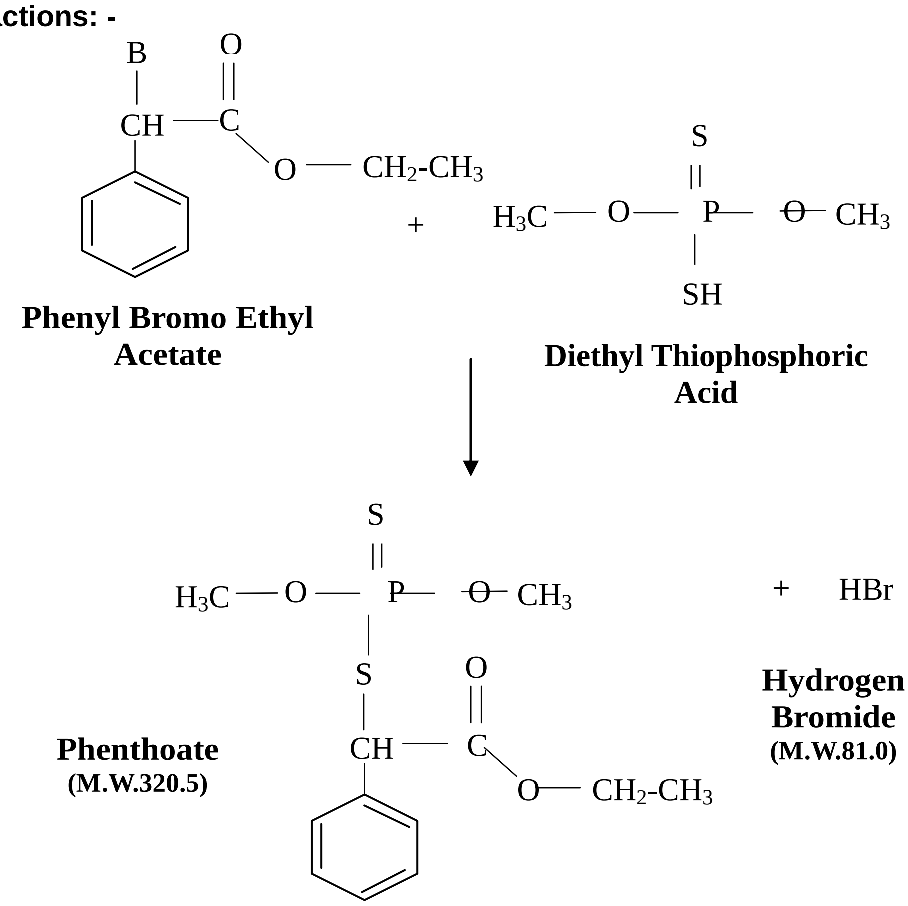
Mass Balance:

49	Material / Mass Balance of Dimethoate All Quantities are in kg)		
	IN – PUT		OUT – PUT

Sr. No.	Raw Materials / Items	Kg/ Batch		Product / By product	Kg/ Batch
1	O, O-Dimethyl S-[Methylaceto] Dithiophosphate	840		Dimethoate	**1000**
2	Solvent EDC	2200		Recovered EDC	2130
3	40% Mono Methyl Amine	355		Solvent EDC Loss	70
4	Catalyst	10		Methane Loss	73
				Aq. Layer to ETP	132
	TOTAL	**3405**		**TOTAL**	**3405**

50) Phenthoate Technical
Brief Manufacturing Process: -
Phenyl Bromo Ethyl Acetate reacted with Di methyl Thio phosphoric Acid. This reaction gives out Phenthoate as a Final product.

Chemical Reactions: -



Mass Balance:

50	Material / Mass Balance of Phenthoate All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product	Kg/Batch
1	Phenyl Bromo Ethyl Acetate	791		Phenthoate	**1000**

2	Solvent EDC	2400		Recovered EDC	2320
3	Catalyst (PTC)	12		EDC Loss	80
4	O, O-Dimethyl Thio Phosphoric Acid	460		28-30% Hydrobromic Soln	880
5	Water for 28-30% Hydrobromic Soln	617			
	TOTAL	**4280**		**TOTAL**	**4280**

51) Spirotetramat Technical

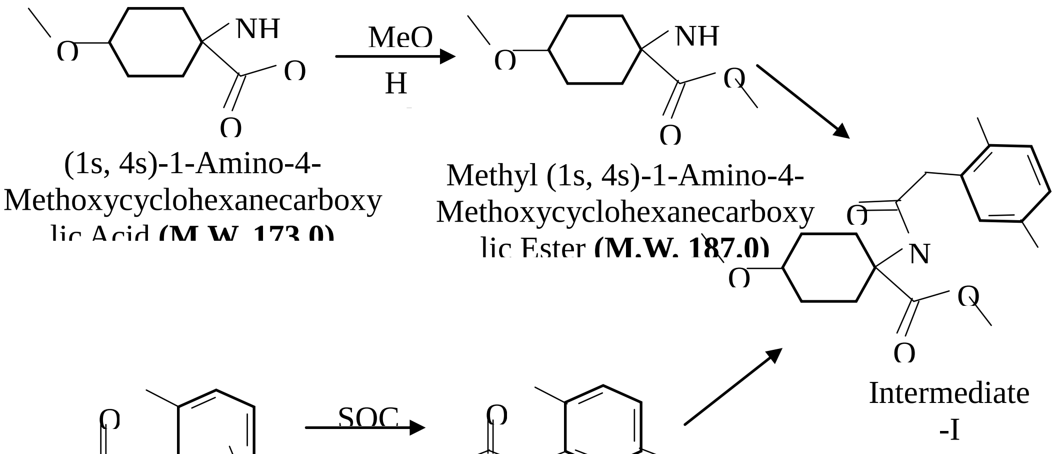
Brief Manufacturing Process:

Charge Benzene Acetic Acid, 2,5-Dimethyl (2,5-DMBAA) And Dichloroethane. Rise to 60°C and add Thionyl Chloride for 2 hours. Rise to reflux and reflux for 4 hours. Cool the Acid Chloride mass to 30°C, say Mass 1. Charge Dichloroethane, Methanol, Hydrochloric Acid and (1s,4s)-1-Amino-4-Methoxy CyclohexaneCarboxylic Acid (1s,4s-1AMCHCA). Rise to reflux and remove water azeotropically. Cool to 50°C and add Mass 1 slowly for 3 hours. Rise to 100°C and maintain for 4 hours. Cool to 60°C. Charge Potassium Carbonate lot-wise for 3 hours at 60°C and maintain for 3 hours. Cool to 30°C, add water and Hydrochloric Acid to pH 2-3.

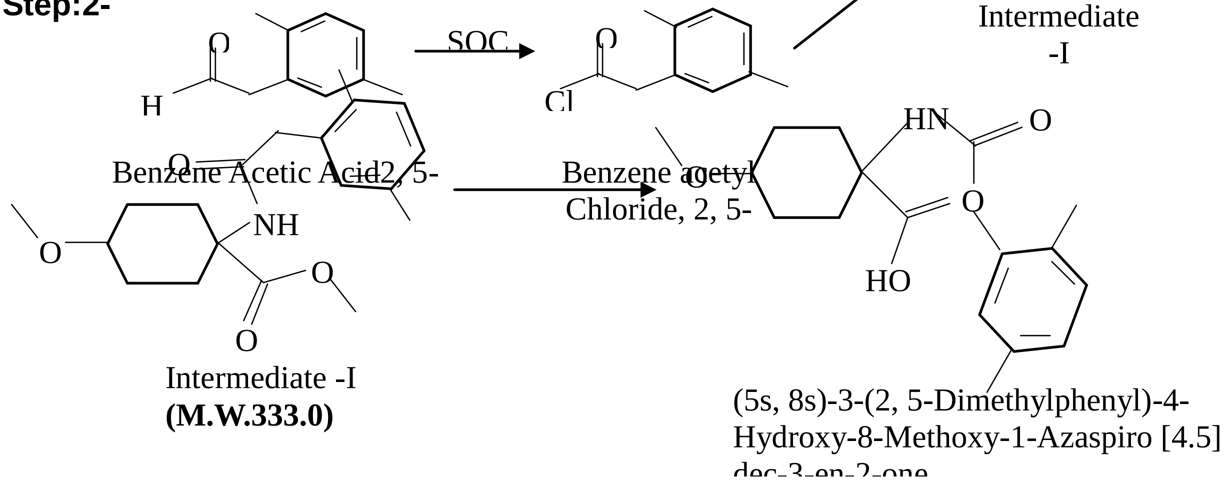
Separate the aqueous phase and organic phase. Charge organic phase and rise to 50°C. Add Ethoxy Formyl Chloride (EFC) for 2 hours and rise to reflux. Reflux for 4 hours and cool to 20°C. Add water and separate the aqueous phase. Cool the organic phase to 10-15°C and filter the slurry. Dry the wet cake to obtain Spirotetramat technical.

Chemical Reaction:

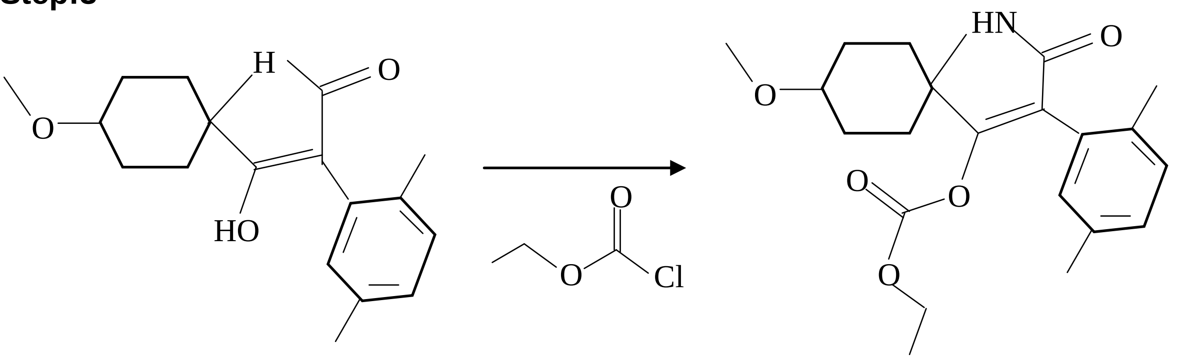
Step:1-



Step:2-



Step:3-



(5s, 8s)-3-(2, 5-Dimethylphenyl)-4-Hydroxy-8-Methoxy-1-Azaspiro [4.5]

Spirotetramat
(M.W.333.0)

51	Material / Mass Balance of Spirotetramat (All Quantities are in kg)				
Stage-I	**IN PUT**			**OUT PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Dichloroethane	1500		Mass-I	2050
2	2,5-Dimethyl, Benzene Acetic Acid	475		30% Hydrochloric Acid	335
3	Thionyl Chloride	350		Sodium Sulfite Solution	1200

4	Water for Hydrochloric Acid	235			
5	Caustic Solution for Sodium Sulfite Soln	1025			
	TOTAL	**3585**		**TOTAL**	**3585**

51	**Material / Mass Balance of Spirotetramat (All Quantities are in kg)**				
Stage-II	**IN PUT**			**OUT PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Mass-I	2050		Reaction Mass	4010
2	Dichloroethane	1500		30% Hydrochloric Acid Soln	335
3	Methanol	100		Effluent	50
5	30% Hydrochloric Acid Soln	10			
6	(1s,4s)-1-Amino-4- Methoxy CyclohexaneCarboxylic Acid	500			
7	Water for Hydrochloric Acid Soln	235			
	TOTAL	**4395**		**TOTAL**	**4395**

51	**Material / Mass Balance of Spirotetramat (All Quantities are in kg)**				
Stage-III	**IN PUT**			**OUT PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Reaction Mass	4010		Spirotetramat	1000
2	Potassium Carbonate	400		Recovered Dichloroethane	2950
3	Ethoxy Formyl Chloride	310		Drying Loss	135
5	30% Hydrochloric Acid Soln	375		Organic Residue	50
6	Water	2000		Effluent	2960
	TOTAL	**7095**		**TOTAL**	**7095**

52) Triflumezopyrim Technical

Brief Manufacturing Process

Step:1-

The Solvent Toluene and **2-[3-Trifluoromethyl) Phenyl Propanedioic Acid** (2-TFMPPDA) are charged. The Catalyst is added and the temperature is raised to 40^{o}C and **Thionyl Chloride** is added for 8 hours and the by-product Hydrogen Chloride gas is scrubbed in water and Sulphur Dioxide is scrubbed in caustic lye solution. The reaction is maintained at 40^{o}C for 4 hours to complete. The reaction mass of **2- [3-(Trifluoro Methyl) Phenyl] Propanedioyl Dichloride** in Toluene is cooled to 30^{o}C.

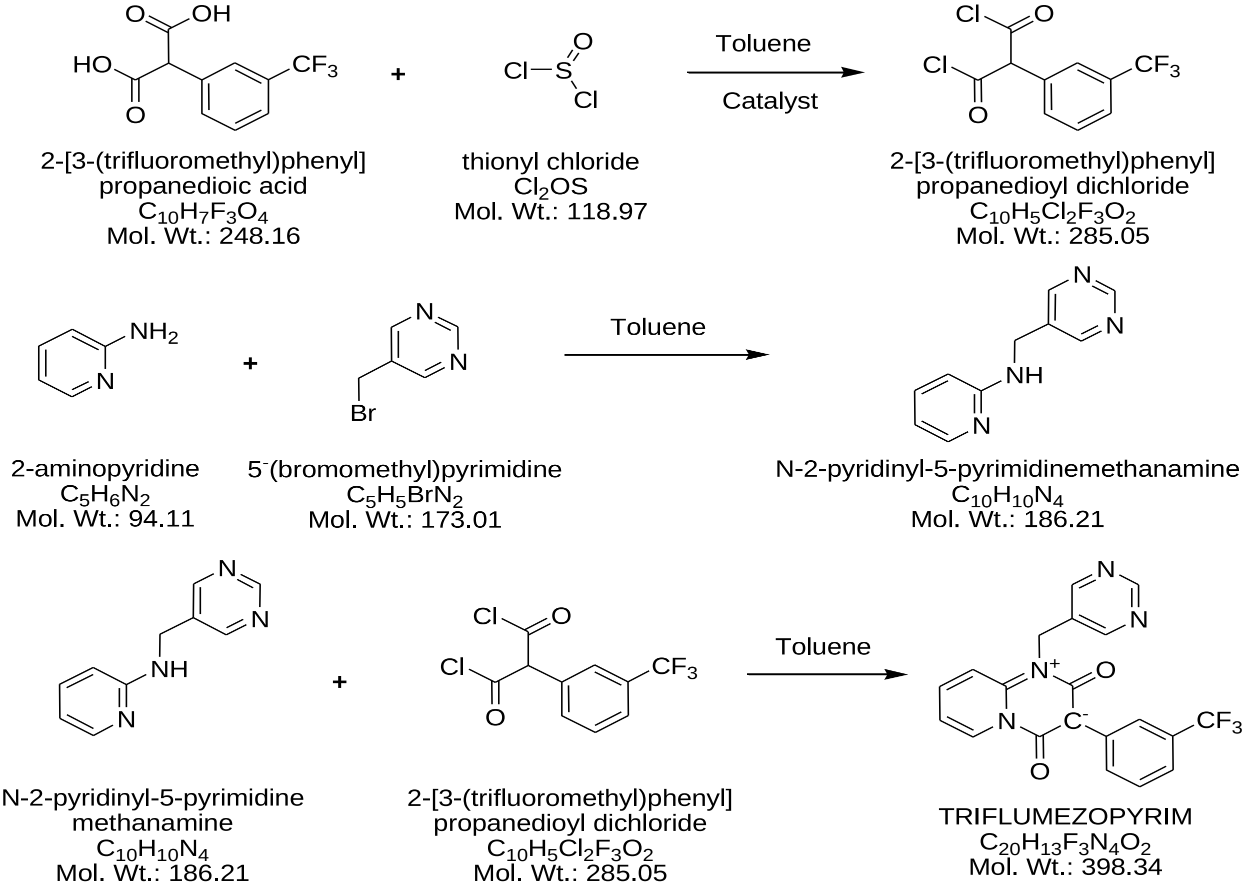
Step:2-

The solvent Toluene and **5-(Bromomethyl) Pyrimidine (5-BMP)** are charged. The temperature is lowered to 10^{o}C and Sodium Bicarbonate is charged. **2-Amino Pyridine** is added for 4 hours and maintained for 4 hours. After completion of the reaction, water is added and the aqueous phase is separated. The organic phase is **N-2-Pyridinyl-5-Pyrimidine Methanamine** in Toluene.

Step:3-

The reaction mass of **2-[3-(Trifluoromethyl) Phenyl] Propanediol Dichloride** in Toluene is added to the reaction mass of **N-2-Pyridinyl-5-Pyrimidine Methanamine** in Toluene for 4 hours at 30^{o}C. The temperature of the mass slowly raised to reflux and reflux for 4 hours. The by-product Hydrogen Chloride Gas is scrubbed in water. After completion of the reaction, water is added and the aqueous phase is separated. The organic phase is cooled to 0^{o}C. The slurry is filtered and dried to obtain Triflumezopyrim TC.

Chemical reactions:



52	Material / Mass Balance of Triflumezopyrim All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2-[3-Trifluoromethyl) Phenyl Propanedioic Acid	800		**Triflumezopyrim**	**1000**
2	Thionyl Chloride	390		Recovered Solvent Toluene	4800
3	5-(Bromomethyl) Pyrimidine (5-BMP)	550		Toluene Loss	200
4	Sodium Bicarbonate	275		30% Hydrochloric Acid	750
5	2-Amino Pyridine	300		Sodium Sulfite Soln	800
6	Toluene	5000		Aqueous Layer to ETP	3470
7	Catalyst	5		Organic Residue	100
8	Caustic Solution	600		Drying Loss	50

9	Water	2750			
10	Water for Hydrochloric Acid	500			
	TOTAL	**11170**		**TOTAL**	**11170**

53) Fenazaquin (3- [2- [4-(1, 1-dimethylethyl) phenyl] Ethoxy] Quinazoline)

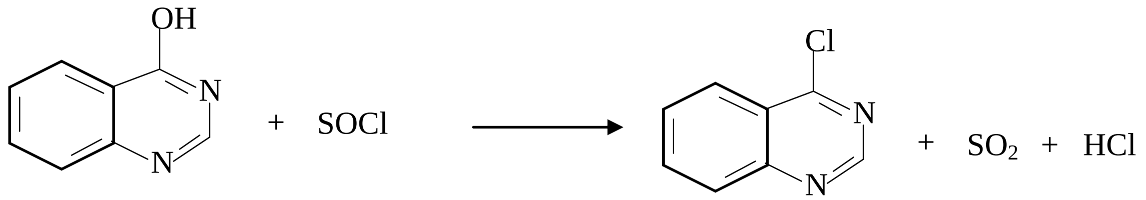
Brief ManufacturingProcess:

Step-1: -4-OHQ is added in Solution of Thionyl Chloride in reactor to form 4-CQ.

Step-2: -4-CQandTBPEbothchemicalsaretreatedinareactionvesseltoformFNZQ.

Chemistry Reaction: -

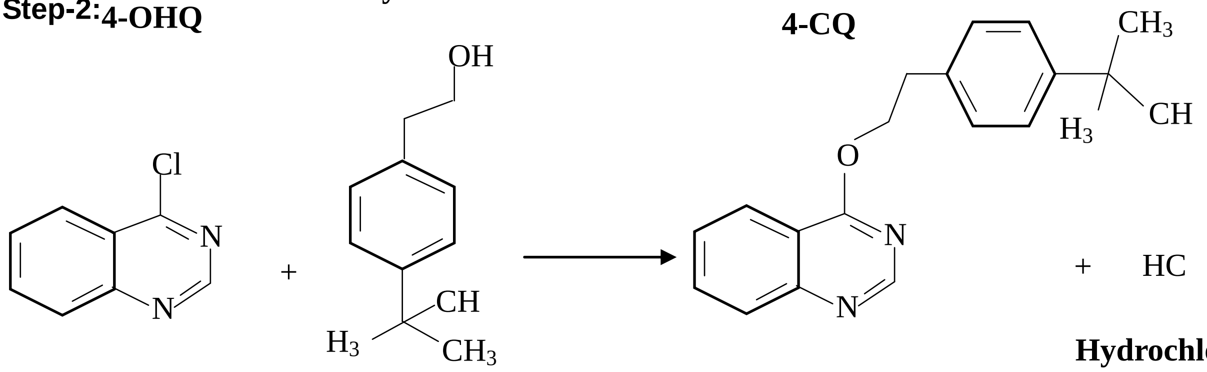
Step-1:



Thionyl

4-OHQ **4-CQ**

Step-2:



4-CQ **TBP**

Fenazaquin(**M.W.306.0)**

Hydrochloric Acid (M.W.36.5)

Mass Balance: -

53	Material / Mass Balance of Fenazaquin All Quantities are in kg)				
	IN PUT			**OUT PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	4-Hydro Quinazolin	175		Fenazaquin	1000
2	Tert-Butyl phenyl Ethanol	229		Hydrochloric Acid Soln	143
3	ThionylChloride	1504		ScrubberspenttoMEE	564
4	CausticSolution	492		EffluenttoETP	1420
5	Water	1320		EffluenttoMEE	593
	TOTAL	**3720**		**TOTAL**	**3720**

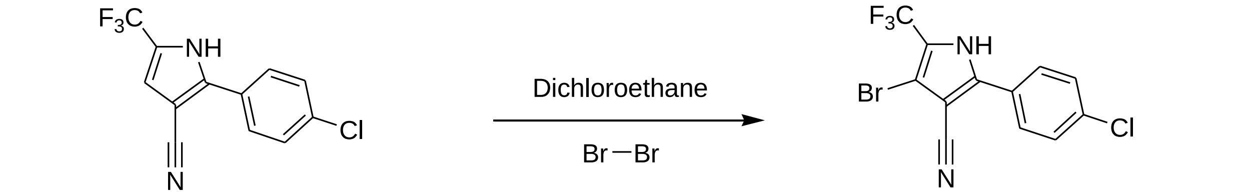
54) Chlorfenapyr

Brief Manufacturing Process:

TheSolvent Dichloroethane and 2-(4-Chlorophenyl)-5-Trifluoromethyl)-1H-Pyrazole-3-Carbonirile (2-CPTFMPC) are charged. The temperature is lowered to 10^{o}C and bromine is added for 6 hours. The mass is maintained for 4 hours to complete the reaction. After completion of the reaction,

water is added and the aqueous phase is separated.
The temperature of the organic phase is raised to 50^{o}C and (Chloromethoxy)Ethane is added for 4 hours. The mass is refluxed for 8 hours and the by-product Hydrogen Chloride is scrubbed in water. After completion of the reaction, water is added and the aqueous phase is separated. The organic phase is cooled to 0^{o}C. The slurry is filtered and dried to obtain Chlorfenapyr TC.

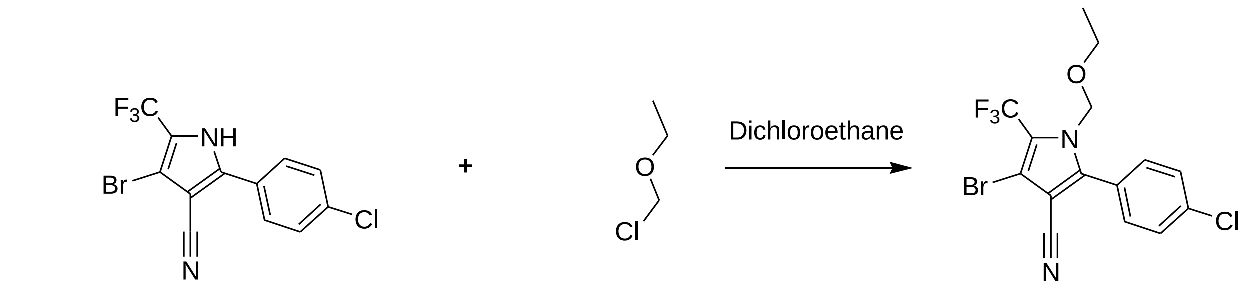
Chemical Reaction:



2-(4-chlorophenyl)-5-(trifluoromethyl)-1*H*-pyrrole-3-carbonitrile
$C_{12}H_6ClF_3N_2$
Mol. Wt.: 270.64

bromine
Br_2
Mol. Wt.: 159.91

4-bromo-2-(4-chlorophenyl)-5-(trifluoromethyl)-1*H*-pyrrole-3-carbonitrile
$C_{12}H_5BrClF_3N_2$
Mol. Wt.: 349.53



4-bromo-2-(4-chlorophenyl)-5-(trifluoromethyl)-1*H*-pyrrole-3-carbonitrile
$C_{12}H_5BrClF_3N_2$
Mol. Wt.: 349.53

(chloromethoxy)ethane
C_3H_7ClO
Mol. Wt.: 94.54

CHLORFENAPYR
$C_{15}H_{11}BrClF_3N_2O$
Mol. Wt.: 407.61

54	Material / Mass Balance of Chlorfenapyr (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product/ Byproduct**	**Kg/Batch**
1	2-(4-Chlorophenyl)-5-Trifluoromethyl)-1H-Pyrazole-3-Carbonirile	820		**Chlorfenapyr**	**1000**
2	(Chloromethoxy)Ethane	260		Recovered Dichloroethane	2900
3	Bromine	500		Dichloroethane Loss	100
4	Dichloroethane	3000		Hydrobromic Gas	225
5	Water	2000		30% Hydrochloric Acid Soln	300
6	Water for Hydrochloric Acid	210		Aq. Layer	2215
7				Drying Loss	50
	Total	**6790**		**Total**	**6790**

55) Difenthiuron Technical

Brief Manufacturing Process: -

Step 1: - 2,6-Diisopropyl Aniline is brominated in the Para position by Bromine in presence of Hydrochloric Acid. The reaction is carried out at 30 °C and the solution is neutralized by Caustic. This reaction gives out 4-Bromo-2, 6-Diisopropyl Aniline.

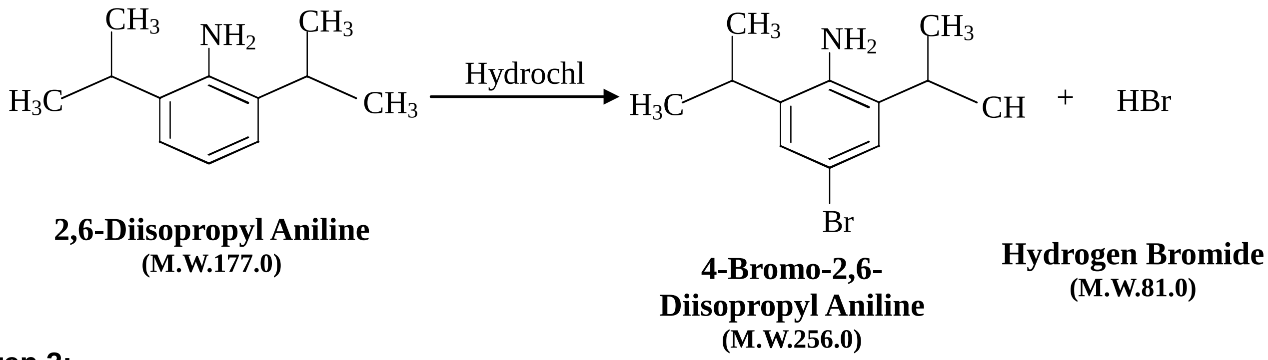
Step 2: - 4-Bromo-2, 6-Diisopropyl Aniline is reacted with Potassium Phenate in DMF in presence of Copper powder as Catalyst. After completion of reaction, the solvent is distilled out and the product is taken in Xylene and washed with water and filtered to remove impurities and finally taken for next stepreaction.

Step 3: - Phenoxy Derivative as 2,6 Di Isopropyl 4- Phenoxy Aniline is further reacted with Sodium Thiocyanate to get Thiourea derivative.The product is washed with water and dried. The dried product is converted into Isothiocyanate under Nitrogen atmosphere and the product is washed with water and dried to get pure Isothiocyanate.

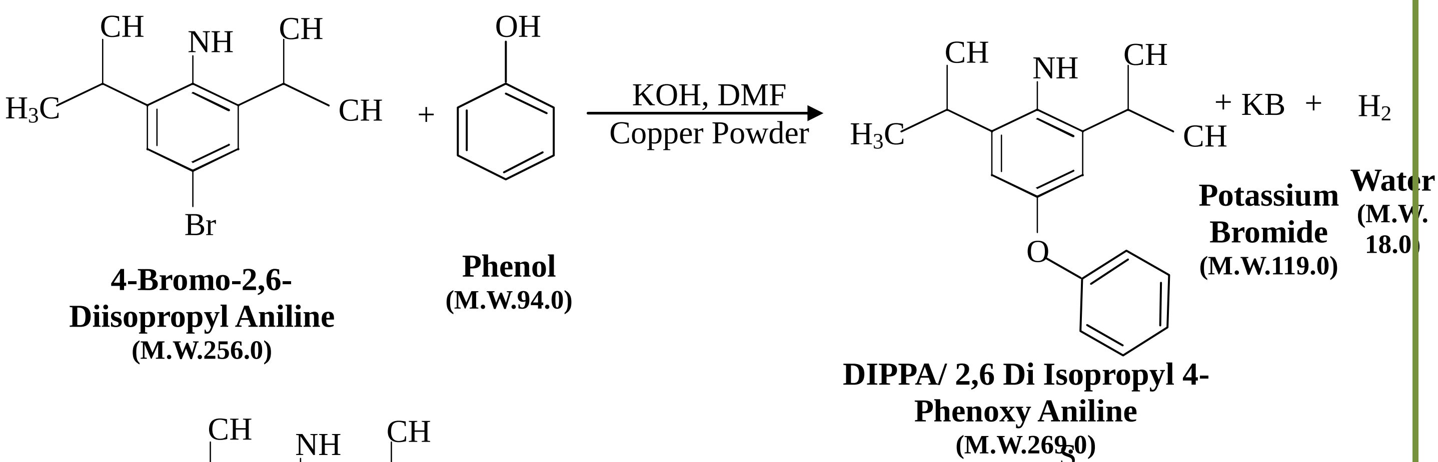
Step 4: - Isothiocyanate product is finally reacted with *t*-Butyl Amine in Solvent and crystallized from Methanol to get the desired product Diafenthiuron astechnical.

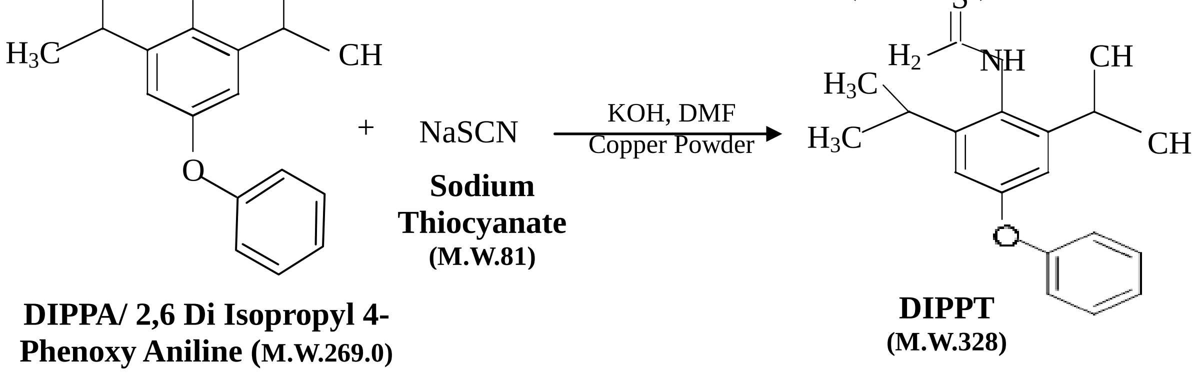
Chemical Reactions: -

Step 1:

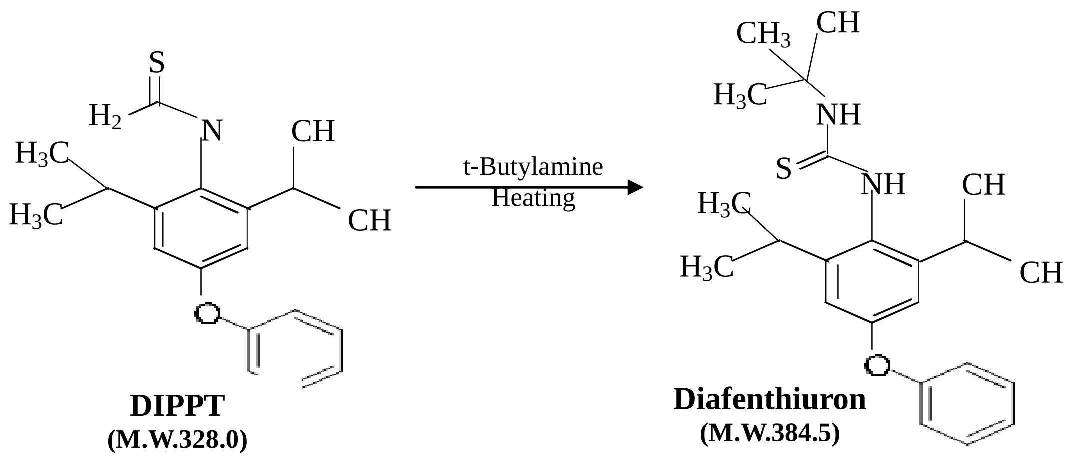


Step 2: -





Step 4: -



Mass Balance:

55	Material / Mass Balance of Diafenthiuron All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2,6-Diisopropyl Aniline	540		Difenthiuron	1000
2	Phenol	260		Recovered DMF	2120
3	Solvent DMF	2200		DMF loss	80
4	Solvent - Xylene	2000		Recovered Xylene	1950
5	Sodium Thiocyanate	230		Xylene loss	50
6	30% Hydrochloric Acid	350		Recovered Methanol	1750
7	Water	500		Methanol loss	100
8	Bromine Liquid	440		45% HBr Solution	468
9	Sodium Hydroxide (30%)	465		KBr Salt	340
10	Solvent - Methanol	1850		Evaporation Loss	120
11	Pottasium Hydroxide (85%)	345		Organic Residue	50
12	t-Butylamine	200		Aq. For ETP	1610
13	Water for HBr Solution	258			
	TOTAL	**9638**		**TOTAL**	**9638**

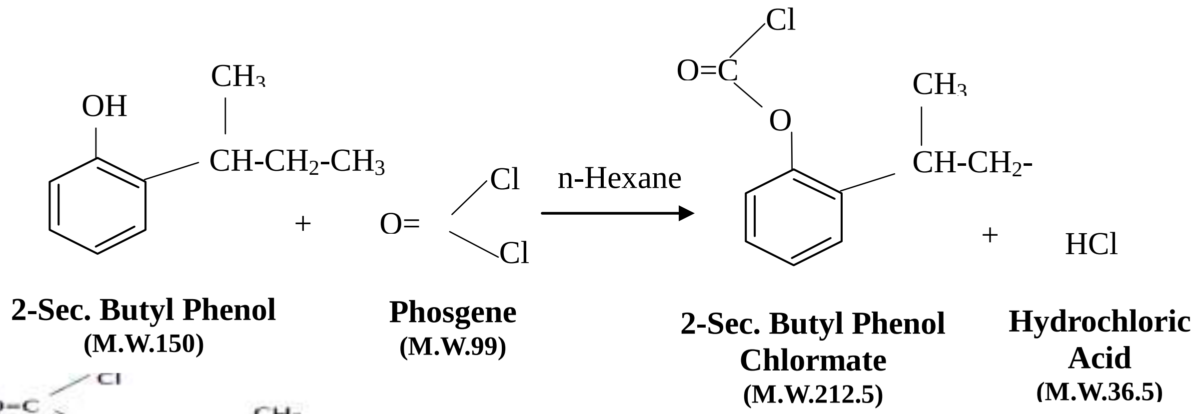
56) Febunocarb Technical

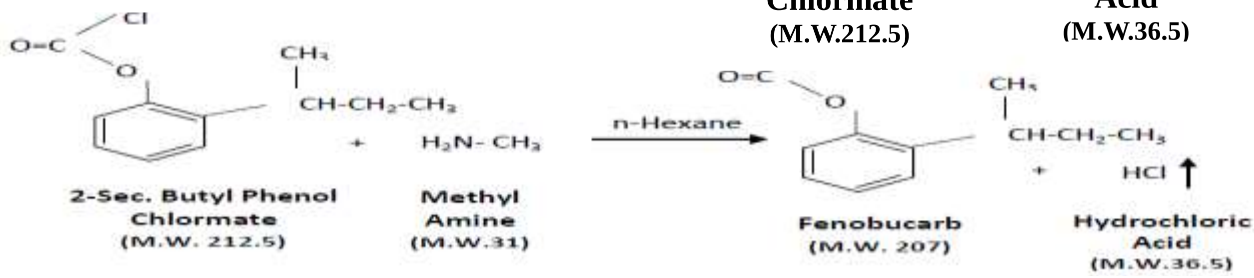
Brief Manufacturing Process: -

Step 1: - 2-Sec. Butyl Phenol undergoes Chlorination reaction by Phosgene in presence of Solvent n-Hexane as well as Catalyst it gives an Intermediate as 2-Sec. Butyl Phenol Chlormate.

Step 2: - 2-Sec. Butyl Phenol Chlormate undergoes Condensation reaction in presence of Solvent n-Hexane it gives the final Product Fenobucarb.

Chemical Reactions: -
Step 1: -





Mass Balance:

56	Material / Mass Balance of Fenobucarb All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2-Sec. Butyl Phenol	677		Fenobucarb	**1000**
2	n-Hexane	2200		Recovered n-Hexane	2130
3	Catalyst	12		n-Hexane Loss	70
4	Phosgene	500		30% Hydrochloric Acid Soln	550
5	Water for Reaction	510		Aqueous Layer to ETP	647
6	Water for 30% Hydrochloric Acid	386		Distillation Residue	38
7	Methyl Amine	150			
	TOTAL	**4435**		**TOTAL**	**4435**

57) Propargite

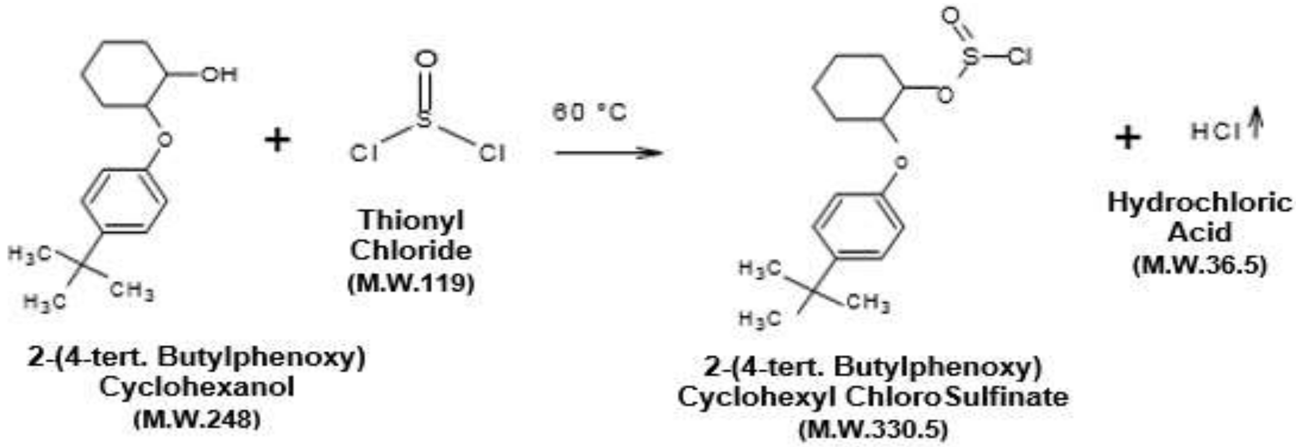
Brief Manufacturing Process: -

Step 1: - Initially 2-(4-tert. Butylphenoxy) Cyclohexanol and Thionyl Chloride are reacted in Toluene to form the 2-(4-tert. Butylphenoxy) Cyclohexyl Chlorosulphite intermediate at 50 -55°C. Hydrochloric Acid&Sulfur Dioxidegas evolved during the reaction is removed by scrubbing with water & Caustic Soda solution respectively.
Step 2: - The resulting reaction mixture containing 2-(4-Tert.Butylphenoxy) Cyclohexyl Chlorosulphite intermediate is then treated with Propargyl alcohol and Triethylamine. The reaction

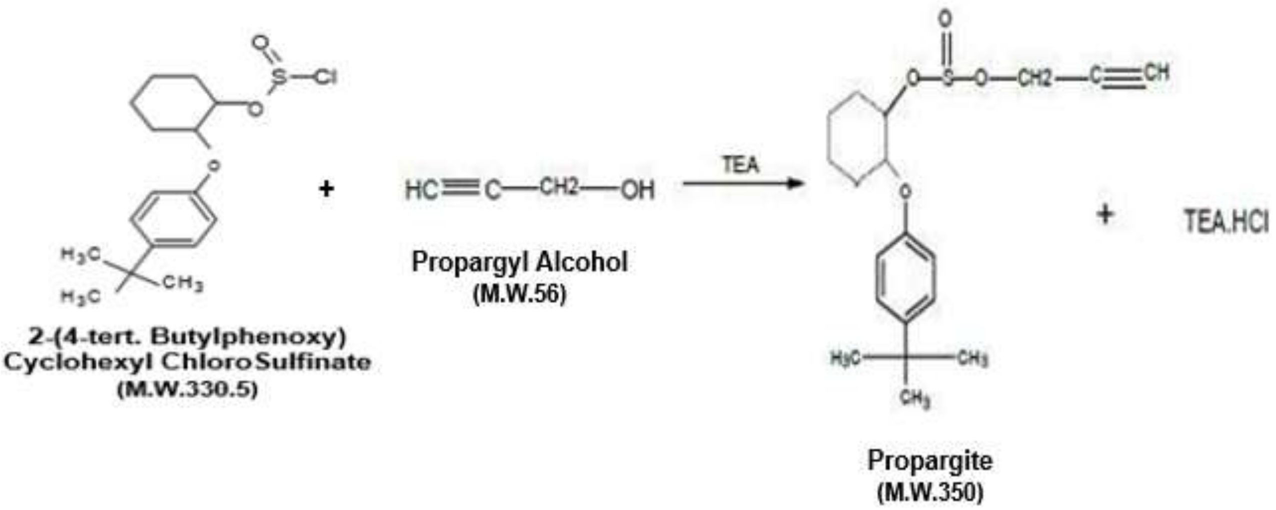
mixture is filtered to remove TEA. HCl. Washing of organic layer with water is done followed by recovery of toluene by distillation to give Propargite Technical.

Chemical Reactions: -

Step 1: -



Step 2: -



Mass Balance:

57	Material / Mass Balance of Propargite All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2-(4-Tert Butyl Phenoxy Cyclohexanol	706		Propargite	**1000**
2	Thionyl Chloride	540		30% Hydrochloric Acid	345
3	Toluene	1000		Recovered Toluene	950
4	Propargyl Alcohol	160		Toluene Loss	50
5	Triethyl Amine	183		TEA HCl	286
6	Water for Washing	500		Aqueous Layer	700
7	Water for Hydrochloric Acid	242			

	TOTAL	**3331**		**TOTAL**	**3331**

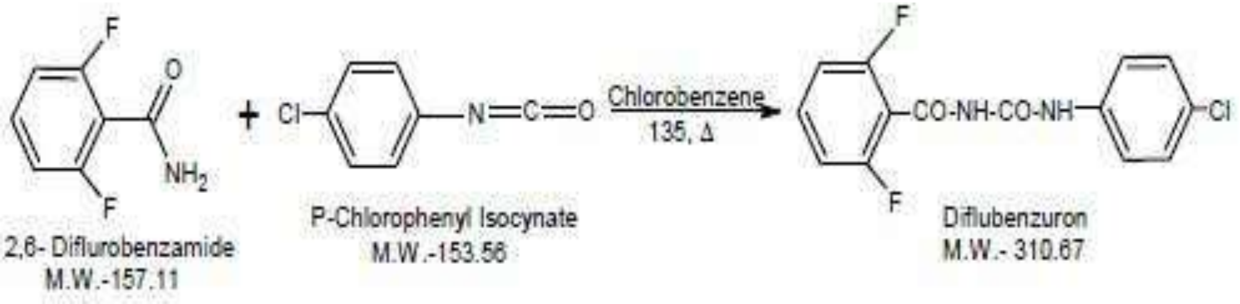
59) Diflubenzuron

Brief Manufacturing Process: -

2, 6-Difluorobenzamide is mixed with 4-Chloro Phenyl Isocyanate in presence of solvent Chlorobenzene. Mixture is heated up to 135°C and cooked till completion of reaction.

The reaction mass is cooled to room temperature, filtered and dried to get Diflubenzuron technical. Solvent is recovered from ML by distillation.

Chemical Reactions: -



Mass Balance:

58	**Material / Mass Balance of Diflubenzuron All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2, 6 Difluorobenzamide	510		Diflubenzuron	**1000**
2	4 Chloro Phenyl Isocyanate	560		Recover MCB	1740
3	Mono Chlorobenzene	1800		Loss MCB	60
				Residue	70
	TOTAL	**2870**		**TOTAL**	**2870**

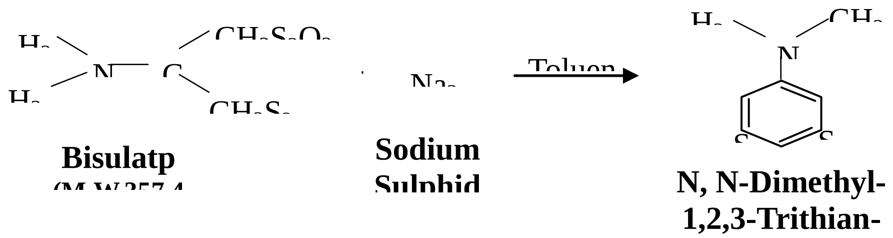
59) Thiocyclam Oxalate

Brief Manufacturing Process: -

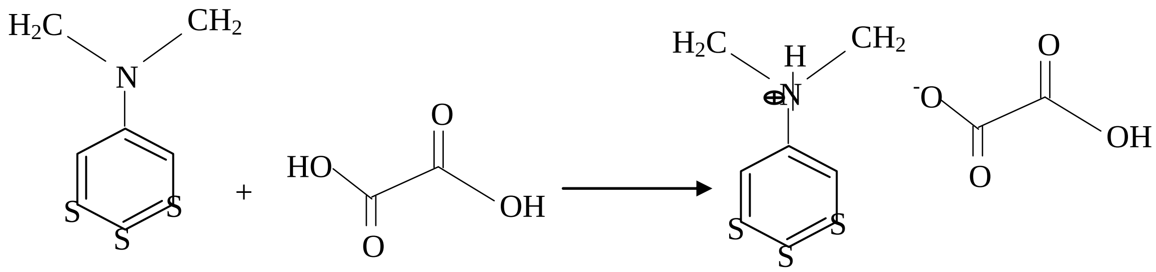
Bisulatp is reacted with Sodium Sulphide in presence of Toluene at 0^{o} C. After the completion of the reaction solids are filtered and washed with water. The filtrate is subjected to layer separation and oily layer was heated to 20^{o} C and slowly Oxalic Acid is added and stirred for 2 hours. The obtained mass is cooled and filtered to obtain pure Thiocyclam Oxalate solids.

Chemical Reactions: -

Step 1: -



Step 2: -



N, N-Dimethyl-1,2,3-Trithian-5-Amine

Oxalic Acid (M.W.50.05)

Thiocyclam Oxalate (M.W.271.57)

Mass Balance:

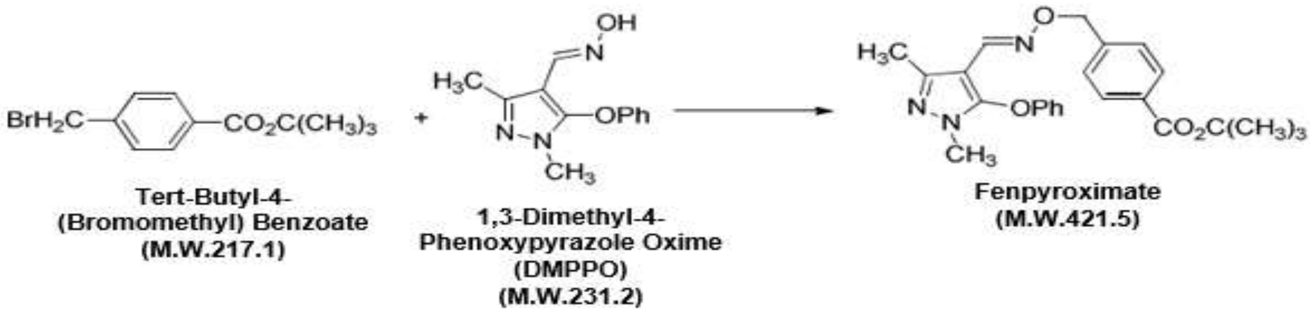
59	Material / Mass Balance of Thiocyclam All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Bisultap	1333		Thiocyclam	**1000**
2	Sodium Sulphide	290		Sodium Sulphite	928
3	Oxalic Acid	337		Toluene Recovered	4775
4	Water	1000		Toluene Loss	20
5	Toluene	5000		Toluene to wastewater	20
6				Toluene in Residue	185
7				Oxalic Acid	5
8				Sodium Sulphide	5
9				Waste Water	1000
10				Bisultap	22
	TOTAL	**7960**		**TOTAL**	**7960**

60) Fenpyroximate

Brief Manufacturing Process: -

Tert-Butyl-4- (Bromomethyl) Benzoate (TBB) reacted with 1,3-Dimethyl-4-Phenoxypyrazole Oxime (DMPPO) in presence of KOH by using Dimethyl Formamide as a Solvent at 120 °C for 10 h. After completion of reaction Solvent is recovered and to the residual mass MDC is taken and stirred till complete dissolution. Water is added and the organic phase is thoroughly washed. Layers are separated and MDC is recovered to get Fenpyroximate which is dried till constant weight.

Chemical Reactions: -



Mass Balance:

60	Material / Mass Balance of Fenpyroximate All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/ Batch		Product / By product	Kg/ Batch
1	Tert-Butyl-4- (Bromomethyl) Benzoate (TBB)	755		Fenpyroximate	**1000**
2	1,3-Dimethyl-4-Phenoxypyrazole Oxime (DMPPO)	647		Hydrogen Bromide	192
3	Potassium Hydroxide	172		Recovered DMF	3810
4	DMF	4000		DMF Loss	190
5	MDC	4500		Recovered MDC	4275
				MDC Loss	225
				Organic Impurities	382
	TOTAL	**10074**		**TOTAL**	**10074**

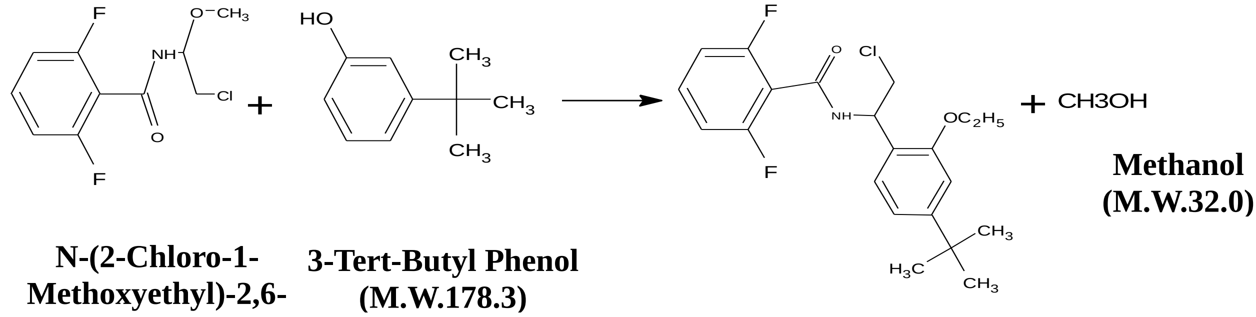
61) Etoxazole

Brief Manufacturing Process: -

N-(2-chloro-1-methoxyethyl)-2,6-difluorobenzamide reacts with 3-tert-Butyl Phenol in Xylene to form N-[1-(4-tert-butyl-2-ethoxyphenyl)-2-chloroethyl]-2,6-difluorobenzamide. Which further react with Caustic Soda in Xylene after reaction filter it to remove NaCl. Then distilled out Xylene to get Etoxazole.

Chemical Reactions: -

Step 1: -



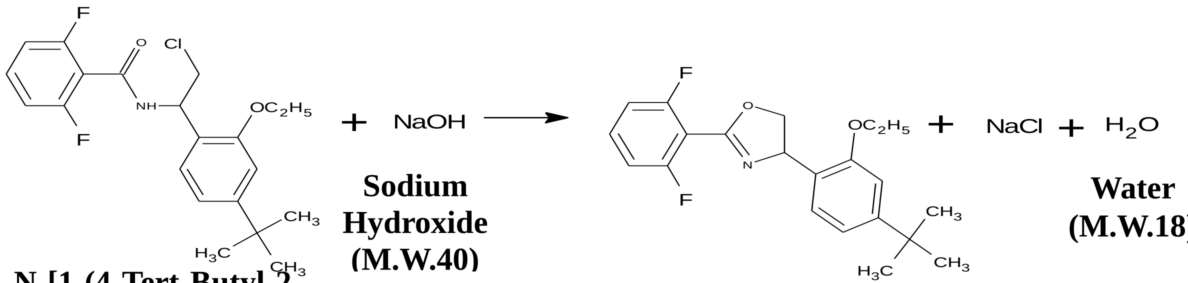
N-(2-Chloro-1-Methoxyethyl)-2,6-Difluorobenzamide (M.W.249.6)

3-Tert-Butyl Phenol (M.W.178.3)

N-[1-(4-tert-butyl-2-ethoxyphenyl)-2-chloroethyl]-2,6-difluorobenzamide(M.W.359.

Methanol (M.W.32.0)

Step 2: -



N-[1-(4-Tert-Butyl-2-Ethoxyphenyl)-2-Chloroethyl]-2,6-Difluorobenzamide(M.W.359.9)

Sodium Hydroxide (M.W.40)

Etoxazole (M.W.359.4

Sodium Chloride (M.W.58.5)

Water (M.W.18)

Mass Balance:

61	**Material / Mass Balance of Etoxazole All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	N-(2-Chloro-1-Methoxyethyl)-2,6-Difluorobenzamide	832		Etoxazole	**1000**
2	3-Tert-Butylphenol	652		Recovered Xylene	2910
3	Solvent-Xylene	3000		Xylene Loss	90
4	Sodium Hydroxide	180		Aqueous Layer to ETP	1982
5	Water	1500		NaCl Salt	182
	TOTAL	**6164**		**TOTAL**	**6164**

62) Hexythiazox

Brief Manufacturing Process: -

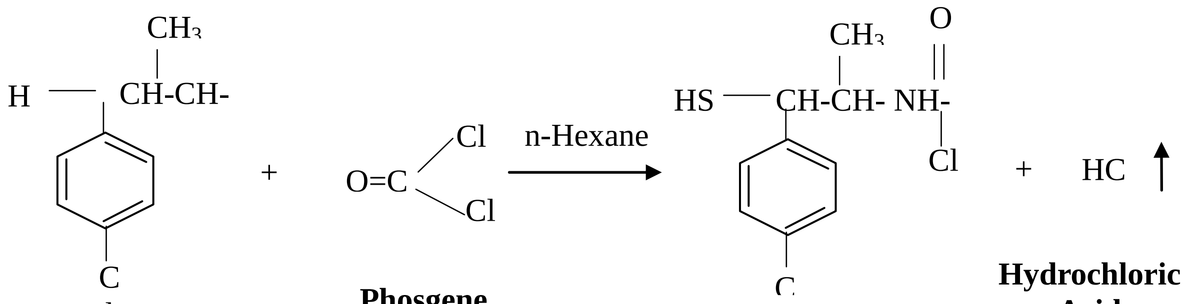
Step 1: - 1-Methyl-2-Mercapto-2-Parachloro Phenyl Ethyl Amine when undergoes Chlorination reaction by Phosgene in presence of Solvent n-Hexane as well as Catalyst it gives an Intermediate Carbonyl Chloride Derivative.

Step 2: - Carbonyl Chloride Derivative undergoes Cyclization reaction to form one Intermediate as 5-(4-Chlorophenyl)-4-Methyl-2-Oxo-1,3-Thiazolidine-3-Carboxamine in presence of Solvent Toluene add Catalyst.

Step3: -Compound 5-(4-Chlorophenyl)-4-Methyl-2-Oxo-1,3-Thiazolidine-3-Carboxamine when undergoes Condensation reaction with Cyclohexyl Isocyanate in presence of Catalyst and Solvent it gives the final product Hexythiazox.

Chemical Reactions: -

Step 1: -



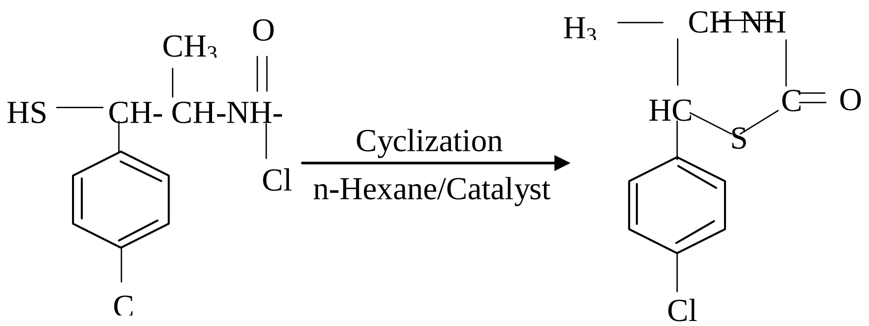
1-Methyl-2-Mercapto-2-Parachloro Phenyl Ethyl Amine (M.W.201.5)

Phosgene (M.W.99)

Intermediate-1 (M.W.)

Hydrochloric Acid (M.W.36.5)

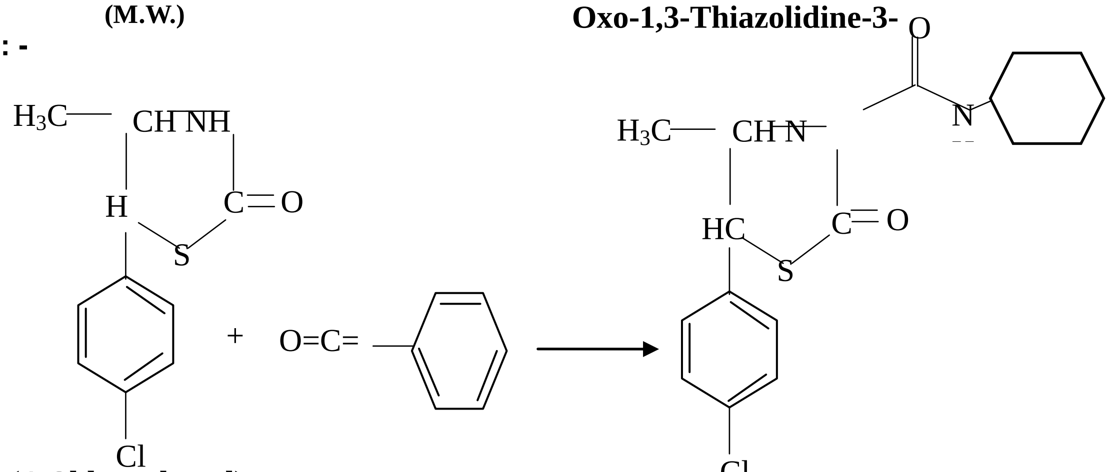
Step 2: -



Intermediate-1 (M.W.)

5-(4-Chlorophenyl)-4Methyl-2-Oxo-1,3-Thiazolidine-3-

Step 3: -



5-(4-Chlorophenyl)-4Methyl-2-Oxo-1,3-Thiazolidine-3-Carboxamine

Cyclohexyl Isocyanate (M.W.125.16)

Hexythiazox (M.W.352.5)

Mass Balance:

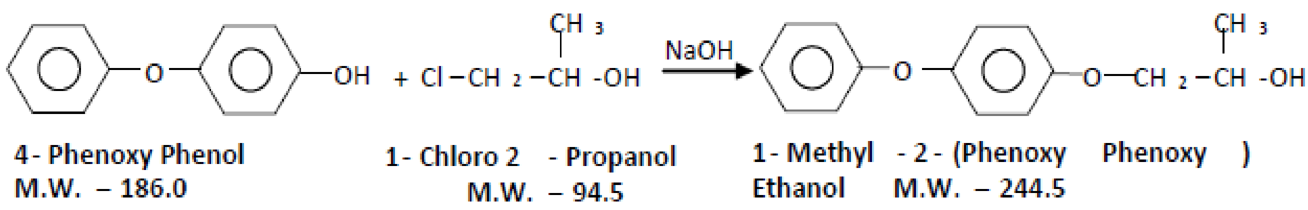
62	Material / Mass Balance of Hexythiazox All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	1-Methyl-2-Mercapto-2-Parachloro Phenyl Ethyl Amine	1000		Hexythiazox	**1000**
2	Phosgene	410		Recovered n-Hexane	2910
3	Solvent n-Hexane	3000		n-Hexane Loss	90
4	Catalyst-1	12		30% Hydrochloric Acid Soln	510
5	Water for Hydrochloric Acid Formation	358		Aqueous Layer to ETP	1310
6	Water for Reaction	550		Distillation Residue	42
7	Catalyst-2	12			
8	Cyclohexyl Isocyanate	520			
	TOTAL	**5862**		**TOTAL**	**5862**

63) Pyriproxyfen

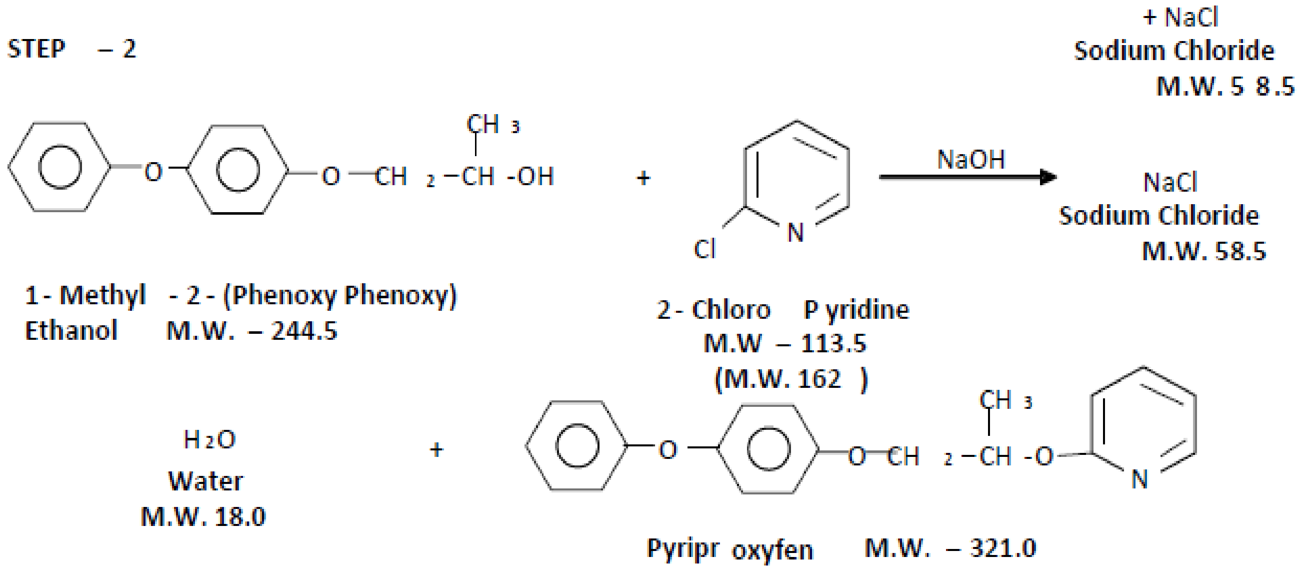
Brief Manufacturing Process: -
Step 1: - 4-Phenoxy Phenol is reacted with 1- Chloro -2- Propanol in presence of Sodium Hydroxide to get 1- Methyl -2- (4- Phenoxy Phenoxy) Ethanol. This Intermediate is extracted by using the solvent – Toluene and then mass is filtered to isolate the Sodium Chloride salt & organic mass is taken for further stage.
Step 2: - 1-Methyl -2- (4-Phenoxy Phenoxy) Ethanol reacts with 2- Chloro Pyridine in presence of Sodium Hydroxide to form Pyriproxyfen. This product is finally extracted by using Methanol - Solvent to isolate Sodium Chloride salt from the reaction mass. Filtrate ML is than taken for crystallization to get the pure product.

Chemical Reactions: -

STEP – 1



STEP – 2



Mass Balance:

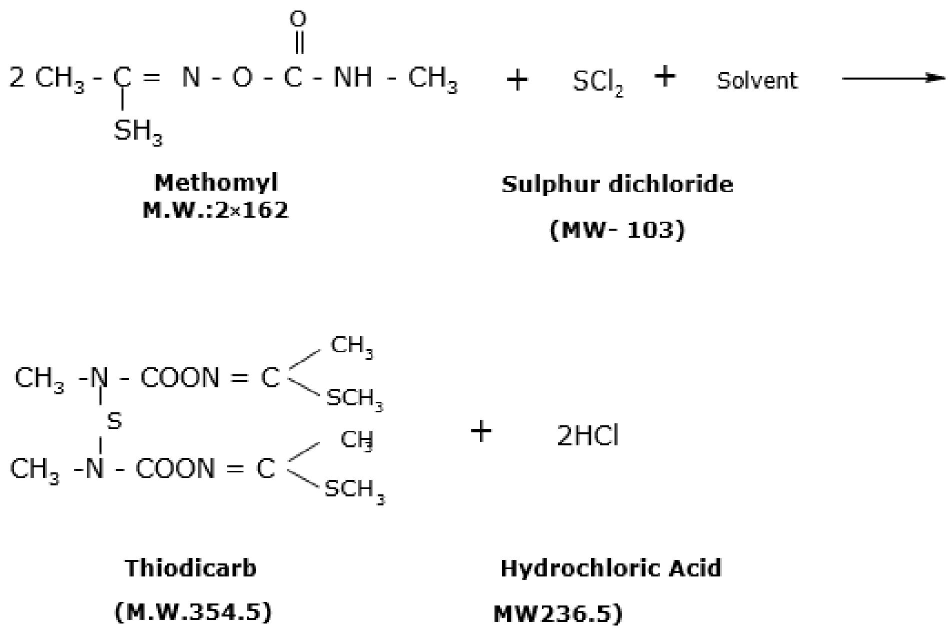
63	Material / Mass Balance of Pyriproxyfen All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	4-Phenoxy Phenol	595		Pyriproxyfen	**1000**
2	1-Chloro -2- Propanol	305		Recovered Toluene	1640
3	Sodium Hydroxide	255		Toluene Loss	60
4	2-Chloro Pyridine	362		Sodium Chloride	378
5	Solvent -Toluene	1700		Water Distillate	130
6	Solvent - Methanol	1800		Recovered Methanol	1740
7	Water	660		Methanol Loss	60
8				Aqueous Layer to ETP	645
9				Distillation Residue	24
	TOTAL	**5677**		**TOTAL**	**5677**

64) Thiodicarb

Brief Manufacturing Process: -

In a glass lined reactor charge Methomyl Tech – Powder and solvent Toluene at room temperature then add sulphur dichloride to get Thiodicarb Tech. During reaction Hydrogen Chloride gas generates is absorbs in water in scrubbing system this Hydrochloric Acid is used for neutralisation or to sell out.

Chemical Reactions: -



Mass Balance:

64	Material / Mass Balance of Thiodicarb All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Methomyl	972		Thiodicarb	**1000**
2	Sulfur Dichloride	315		Hydrochloric Acid 30%	730
3	Solvent Toluene	3200		Recovered Toluene	2950
4	Water for Hydrochloric Acid	511		Toluene Loss	250
				Organic Residue	68
	TOTAL	**4998**		**TOTAL**	**4998**

65) Spirodiclofen

Brief Manufacturing Process: -
Step:1-
1- [2 [(2,4-Dichloro-Phenyl)-2-Acetoxy]-1-Cyclohexane Carboxylic Acid Methyl Esterand Magnesium Ethoxide in Ethanol to get a Cyclised product, 3-(2,4-Dichlorophenyl)-4-Hydroxy-1-Oxaspiro [4.5] Decan-2-One (DPHD). After Most of the Solvent Distilled off 5% Hydrochloric Acid was added. extracted with Ethyl Acetate, washed with Water, dried over anhydrous Sodium Sulfate, and concentrated to give solid crude product. after recrystallization from ethanol to give 1-

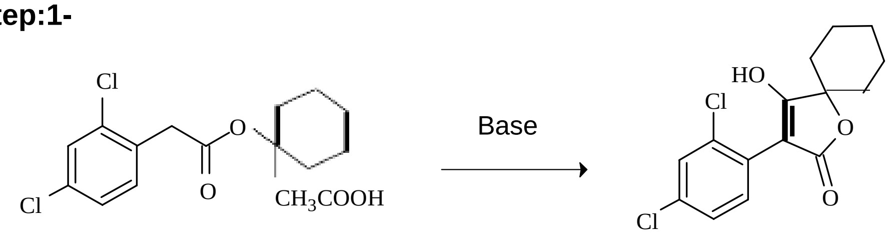
(2,4-Dichlorophenyl)-4-Hydroxy-1-Oxaspiro [4.5] Decan-2-One.

Step 2: -

Then1-(2,4-Dichlorophenyl)-4-Hydroxy-1-Oxaspiro [4.5] Decan-2-One is reacted with 2,2 -Dimethylbutanoyl Chloride in presence of base to produce the product Spirodiclofen.

Chemical Reactions: -

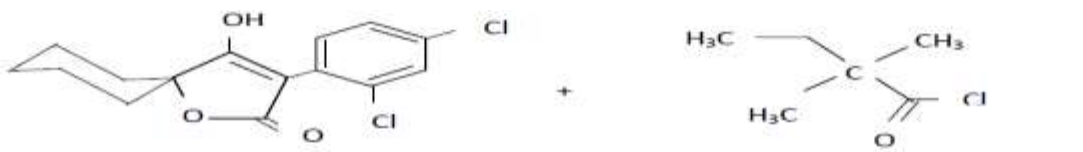
Step:1-



1-[2[(2,4-dichloro-phenyl)-2-acetoxy]-1-cyclohexanecarboxylicacidmethylester (M.W.346.5)

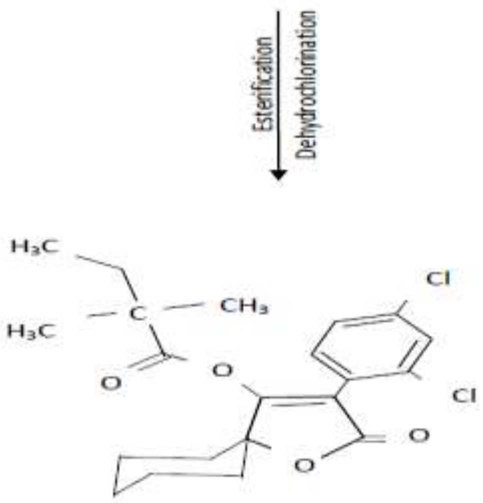
3-(2,4-dichlorophenyl)-4-hydroxy-1-oxaspiro-dec-3-en-2-one (M.W.313.0)

Step:2-



3-(2,4-Dichlorophenyl)-4-Hydroxy-5,5-Pentamethylene-Dihydrofurane-2-One (M.W.313.2)

2,2-Dimeththylbutyryl Chloride (M.W.134.6)



Spirodiclofen (M.W.411.3)

Mass Balance:

65	**Material / Mass Balance of Spirodiclofen All Quantities are in kg)**		
	IN – PUT		**OUT – PUT**

Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	1- [2 [(2,4-Dichloro-Phenyl)-2-Acetoxy]-1-Cyclohexane Carboxylic Acid Methyl Ester	890		Spirodiclofen	**1000**
2	Magnesium Ethoxide	300		30% Hydrochloric Acid	295
3	2,2 - Dimethylbutanoyl Chloride	345		Recovered Ethanol	1950
4	Ethanol	2000		Ethanol Loss	50
5	5% Hydrochloric Acid	200		Organic Impurities	127
6	Ethyl Acetate	300		Aqueous Layer to ETP	2020
7	Sodium Sulfate	200			
8	Water	1000			
9	Water for Hydrochloric Acid	207			
	TOTAL	**5442**		**TOTAL**	**5442**

66) Pyrithiobac

Brief Manufacturing Process: -

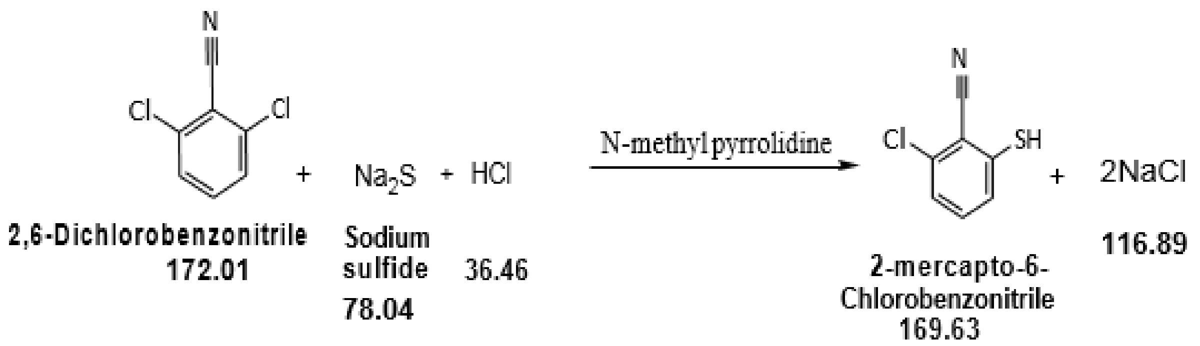
Step 1: - 2, 6-Dichlorobenzonitrile reacts with Sodium Sulphide in presence of N-methyl Pyrrolidine to give Intermediate-1.

Step 2: - Intermediate-1 undergoes hydrolysis with Sodium Hydroxide and Hydrochloric acid in presence of Dichloro Methane to form Intermediate-2.

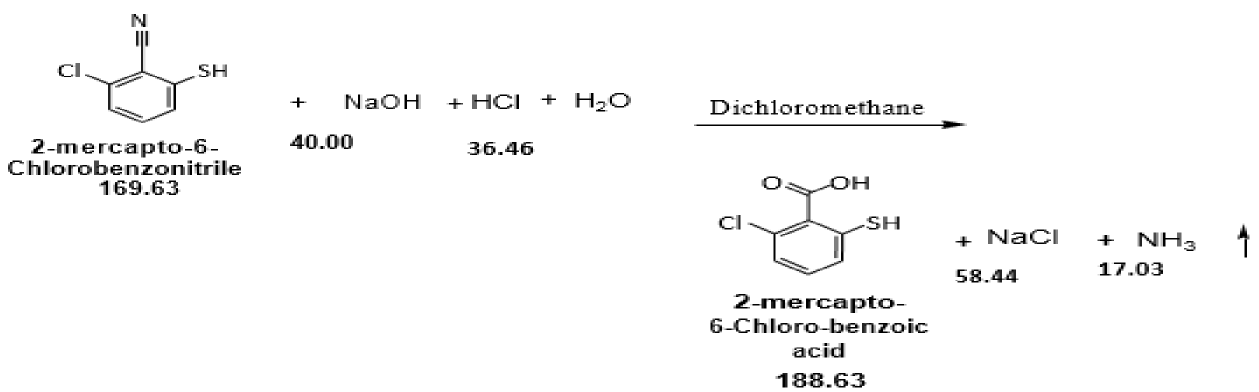
Step 3: - Intermediate-2 reacts with 2 -Methanesulfonyl -4,6-dimethoxy-pyrimidine in presence of Dichloro methane to give Pyrithiobac Sodium as a finalproduct

Chemical Reactions: -

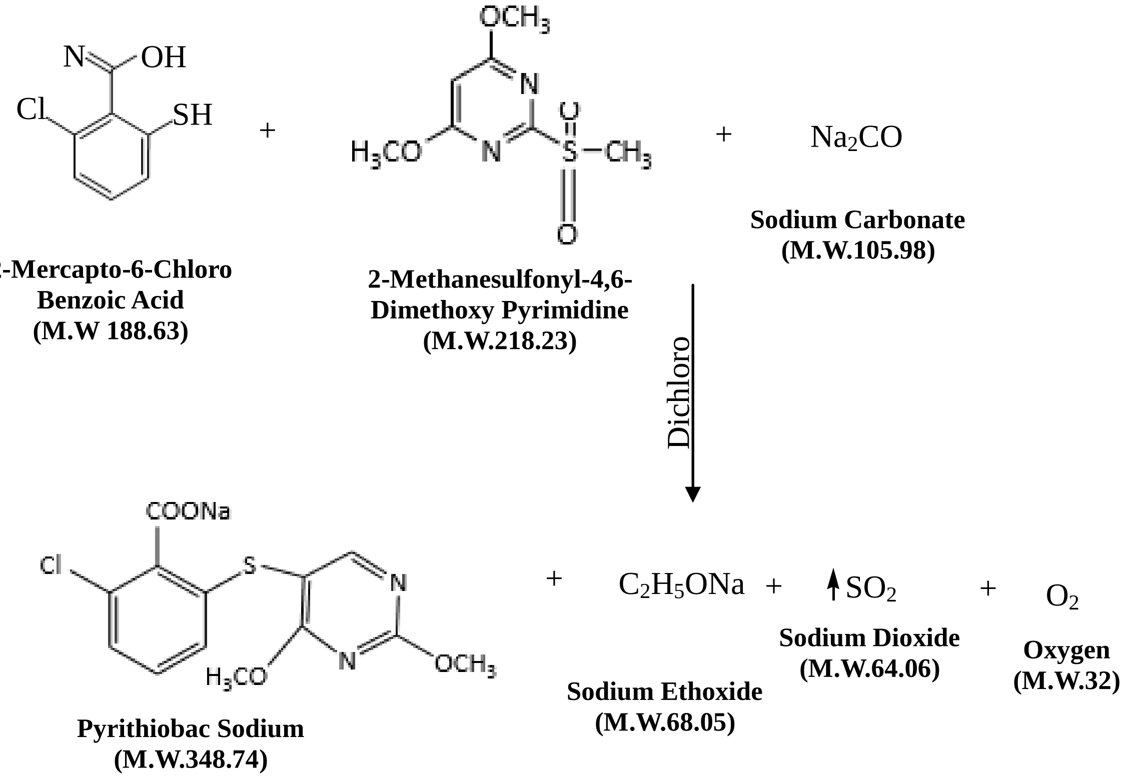
Step 1: -



Step 2: -



Step 3: -



Mass Balance:

66	Material / Mass Balance of Pyrithiobac Sodium All Quantities are in kg)				
Stage-1	**IN – PUT**			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2,6-Dichlorobenzonitrile	727		Stage-1	627
2	Sodium Sulphide	327		Recovered N-Methyl Pyrrolidine	3893
3	Hydrochloric Acid (25%)	616		N-Methyl Pyrrolidine Loss	80
4	N-Methyl Pyrrolidine	4100		Effluent Water	909
5	Water	900		Water from Hydrochloric Acid	462
6				Sodium Chloride	494
7				Organic Residue	90
8				Distillation Residue	53
9				N-Methyl Pyrrolidine	62
	TOTAL	**6670**		**TOTAL**	**6670**

66	Material / Mass Balance of Pyrithiobac Sodium All Quantities are in kg)				
Stage-2	**IN – PUT**			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**

1	Stage-1	627		Stage-2	618
2	Sodium Hydroxide	145		Dichloromethane Recovery	1727
3	Hydrochloric acid (25%)	536		Dichloromethane loss	36
4	Dichloromethane	1818		Effluent Water	3570
5	Water	3636		Water from Hydrochloric Acid	400
6				Sodium Chloride	214
7				Organic Residue	128
8				Distillation Residue	6
9				Process Emission	63
	TOTAL	**6762**		**TOTAL**	**6762**

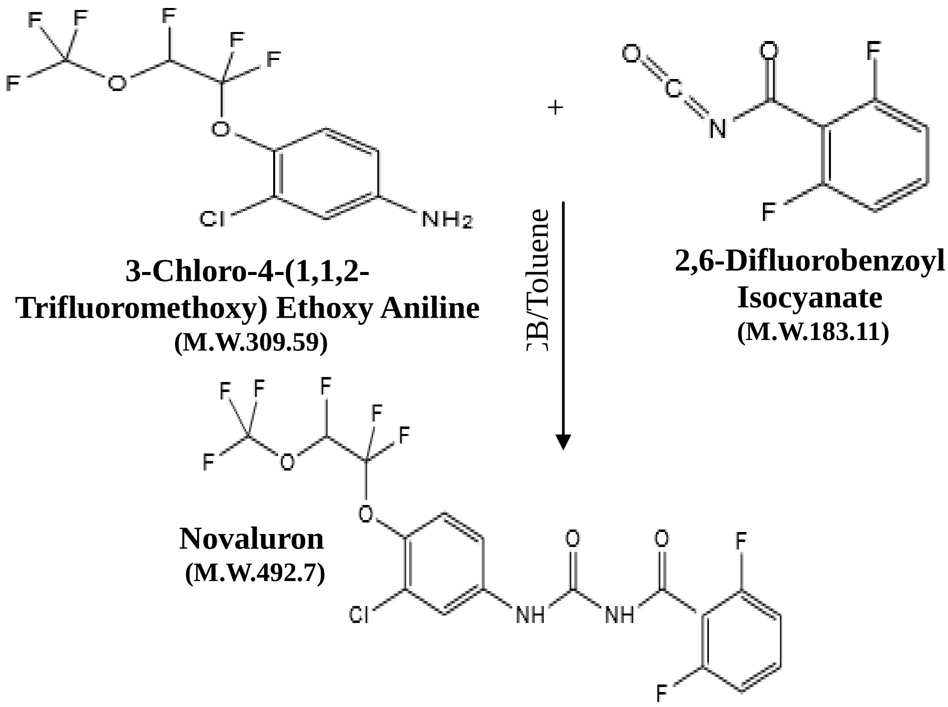
66	**Material / Mass Balance of Pyrithiobac Sodium All Quantities are in kg)**				
Stage-3	**IN – PUT**			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Stage-2	618		Pyrithiobac Sodium	**1000**
2	2-Methanesulfonyl-4,6-Dimethoxy-Pyrimidine	715		Dichloromethane Recovery	1727
3	Sodium carbonate	347		Dichloromethane Loss	36
4	Dichloromethane	1818		Effluent Water	1818
5	Water	1818		Sodium Ethoxide	222
6				Sulphur Dioxide	210
7				Organic Residue	143
8				Distillation Residue	54
9				Oxygen	105
	TOTAL	**5316**		**TOTAL**	**5315**

67) Novaluron

Brief Manufacturing Process: -

3-Chloro-4-(1,2,2-Trifluoromethoxy) Ethoxy Aniline reacted with 2,6-Difluorobenzoyl Isocyanate in presence of Monochloro Benzene as well as Toluene. This reaction gives out Novaluron as a final product. After completion of the reaction, the reaction mass is cooled, filtered and washed with water.Novaluron wet cake is then recrystallized with Toluene, filtered and dried to get Novalurontechnical.

Chemical Reactions: -



67	Material / Mass Balance of Novaluron All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2,6-Difluoro Benzoyl Isocyanate	320		Novaluron	**1000**
2	3-Chloro-4-(1,1,2-Trifluoro-2-[Trifluoromethoxy] Ethoxy) Aniline	792		Recovered Toluene	880
3	Monochloro Benzene	546		Loss Toluene	20
4	Water	1000		Aqueous Layer to ETP	1108
5	Toluene	900		Residue	4
6				Recovered MCB	529
7				Loss MCB	17
	TOTAL	**3558**		**TOTAL**	**3558**

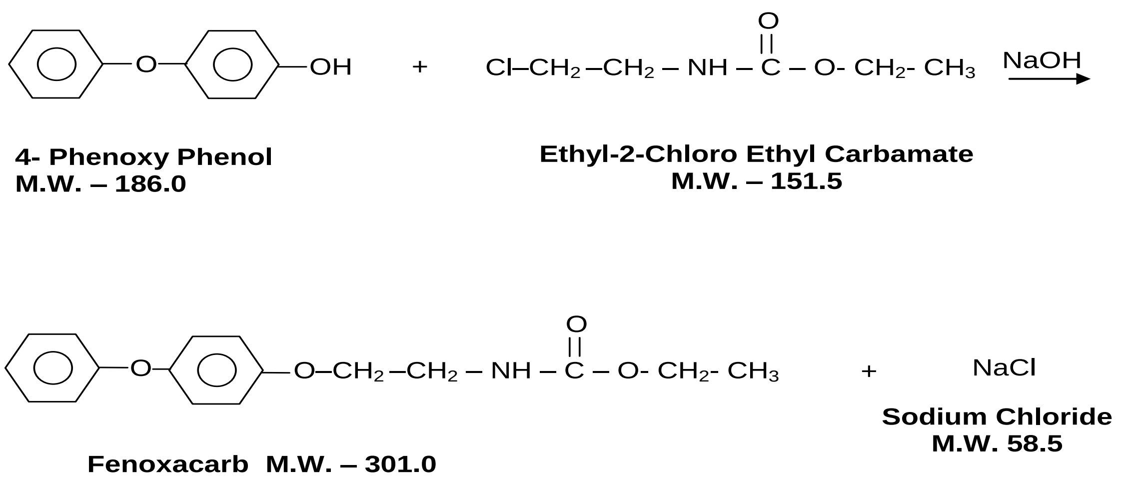
68) Fenoxycarb (Tech)

Brief Manufacturing Process: -

4-Phenoxy Phenol is reacted with Ethyl -2- Chloro Ethyl Carbonate in presence of Sodium Hydroxide to get Fenoxycarb. The reaction mass is taken for solvent extraction using Toluene where by Product dissolves in Solvent and Sodium Chloride is isolated from mass by Filtration. Finally, solvent is stripped off under vacuum to get the pure Product Fenoxycarb.

Chemical Reaction:

STEP – 1



68	**Material / Mass Balance of Fenoxycarb All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	4- Phenoxy Phenol	630		Fenoxycarb	1000
2	Ethyl -2- Chloro Ethyl Carbamate	505		Recovered Solvent -Toluene	1340
3	Sodium Hydroxide	135		Toluene Loss	60
4	Solvent -Toluene	1400		Sodium Chloride	190
5	Water	560		Water Distillate	55
				Distillation Residue	20
				Aqueous Layer to ETP	565
	Total	**3230**		**Total**	**3230**

69) Pyridaben

Brief Manufacturing Process: -

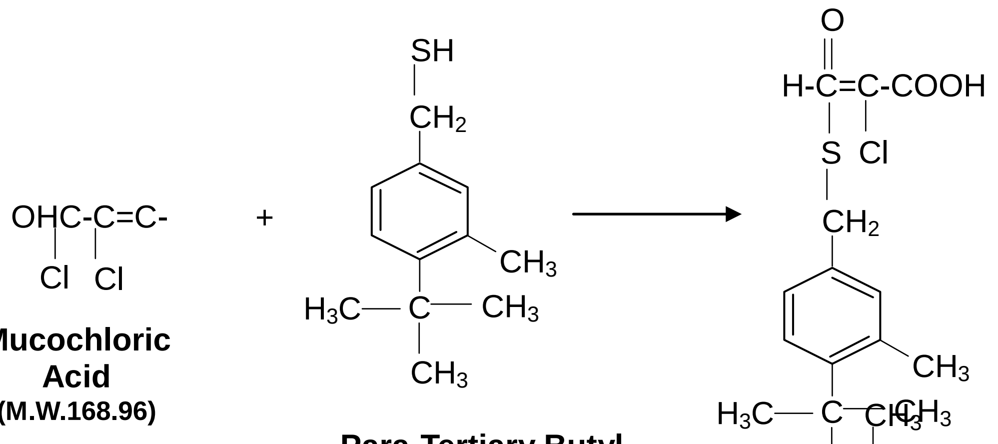
Step 1: - Mucochloric is reacted with Para-Tertiary Butyl Benzyl Mercaptan in presence of Catalyst. This reaction gives out Intermediate-1.

Step 2: - ThisIntermediate-1 further reacted with Para-Tertiary Butyl Hydrazine in presence of Catalyst. This reaction gives out Pyridaben as a crude product.

After completion of reaction crude product is distilled out to get pure product.

Chemical Reactions: -

Step 1: -

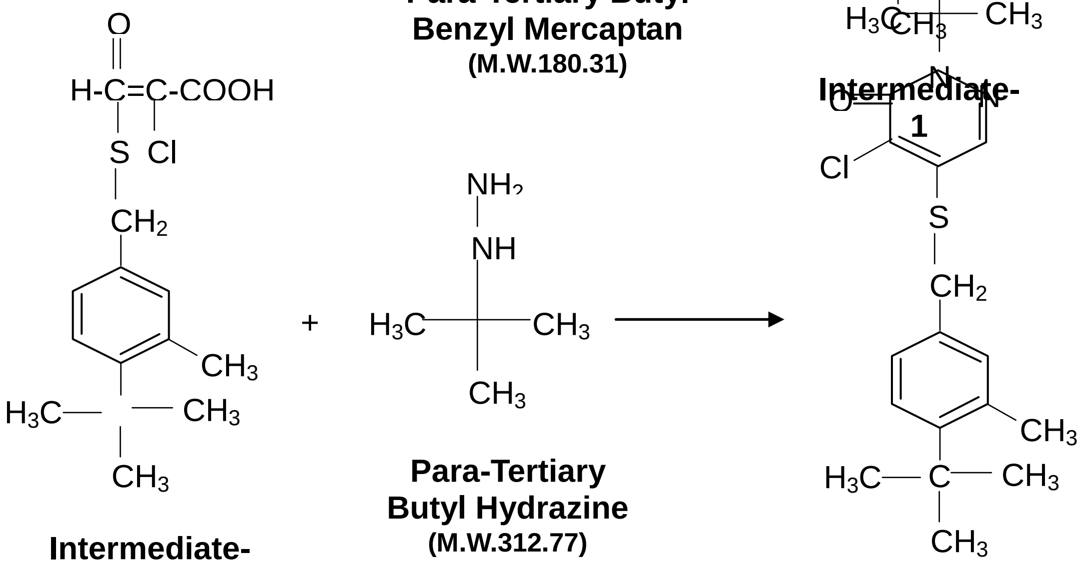


Mucochloric Acid
(M.W.168.96)

Para-Tertiary Butyl Benzyl Mercaptan
(M.W.180.31)

Intermediate-1

Step 2:-



Intermediate-1

Para-Tertiary Butyl Hydrazine
(M.W.312.77)

Pyridaben
(M.W.364.9)

Mass Balance:

69	Material / Mass Balance of Pyridaben All Quantities are in kg)				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Mucochloric Acid	510		Pyridaben	**1000**
2	Para-Tertiary Butyl Benzyl Mercaptan	548		Recovered Solvent	1910
3	Para-Tertiary Butyl Hydrazine	254		Solvent Loss	90
4	Solvent n-Hexane	2000		30% Hydrochloric Acid Soln	368
5	Catalyst - PTC	18		Aqueous Water	1448
6	Water for Reaction	1250		Distillation Residue	22
7	Water for 30% Hydrochloric Acid formation	258			
	TOTAL	**4838**		**TOTAL**	**4838**

70) Spiromesifen:

Brief Manufacturing Process: -

Step 1: -In the manufacturing process, 1-[2-(2,4,6-Trimethyl-Phenyl)-Acetoxy]-Cyclopentane Carboxylic Acid Ethyl Ester is goes into cyclisation with Tetraonic Acidwhich gives Intermediate -1.

Step 2: - Intermediate -1reacts with Tert-Butyl Acetyl Chloridepresence of Solvent Toluene.The Toluene Solvent isdistilled partially and crystallized, filtered and dried to get the product.

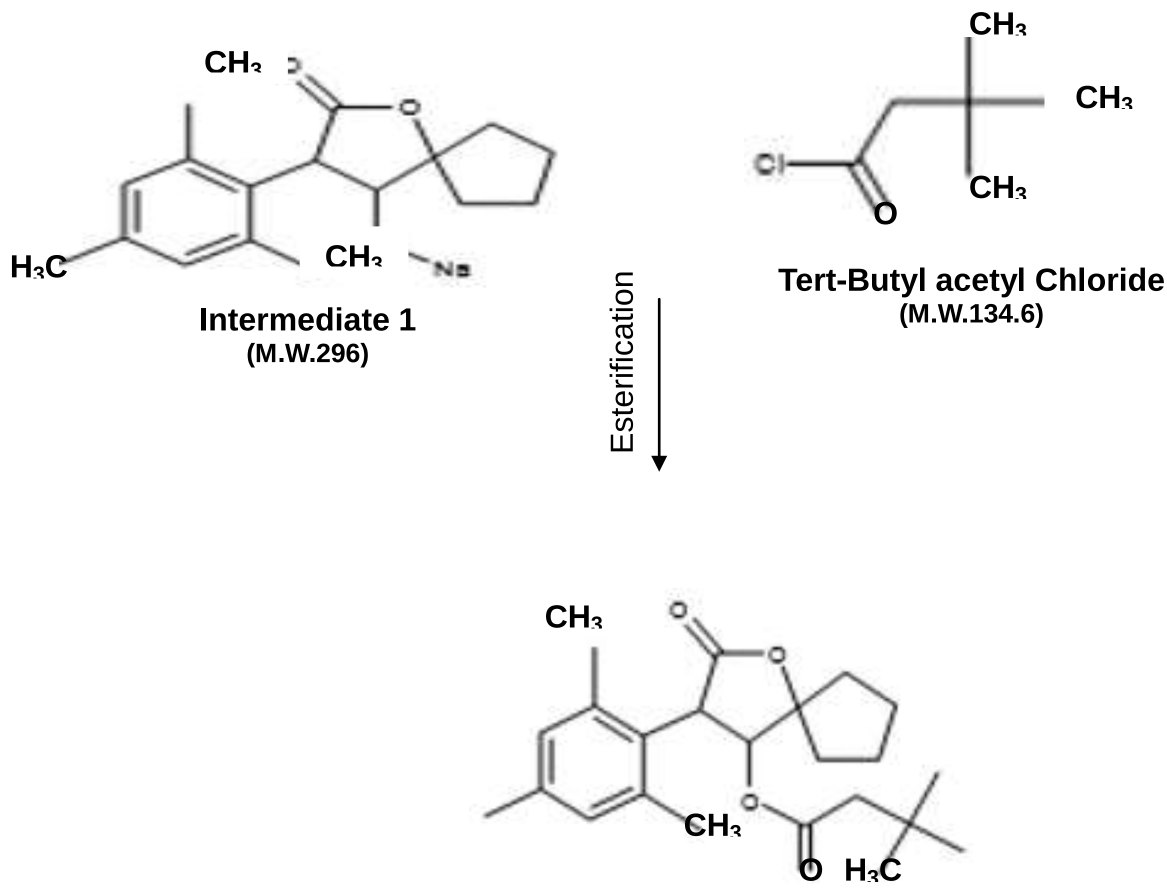
Chemical Reactions: -

Step 1 :-

1-[2-(2,4,6-Trimethyl-Phenyl)-Acetoxy]-Cyclopentane Carboxylic Acid Ethyl Ester
(M.W.318.42)

Intermediate 1

Step 2: -



Intermediate 1
(M.W.296)

Tert-Butyl acetyl Chloride
(M.W.134.6)

Spiromesifen
(M.W.372.5)

70	Material / Mass Balance of Spiromesifen All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	DMF	1947		**Spiromesifen**	**1000**
2	Sodium Hydroxide	124		DMF	1947
3	Ester	941		Water	53
4	Toluene	1480		Ethyl Alcohol	135
5	Tert-Butyl Acetyl Chloride	438		Water	2123
6	3% Sodium Bicarbonate	1480		Sodium Chloride	224
7	Water	592		Carbon Dioxide Gas	25
8	Water wash	500		Toluene Recovered	1465
9				Organic Impurities	125
10				Aq. wash	390
11				Toluene loss	15
	TOTAL	**7502**		**TOTAL**	**7502**

71) Tebufenpyrad:

Brief Manufacturing Process: -

Stage-1: Intermediate EMCA: Methyl Ethyl ketone and Diethyl oxalate are reacted in presence as Sodium Ethoxide to give an intermediate -1

Step -2: intermediate -1 reacts with hydrazine Hydrate in presence of Sulfuryl Chloride to get cyclized intermediate as **4-Chloro-3-Ethyl-1H-Pyrazole-5-Carboxylic Acid**.

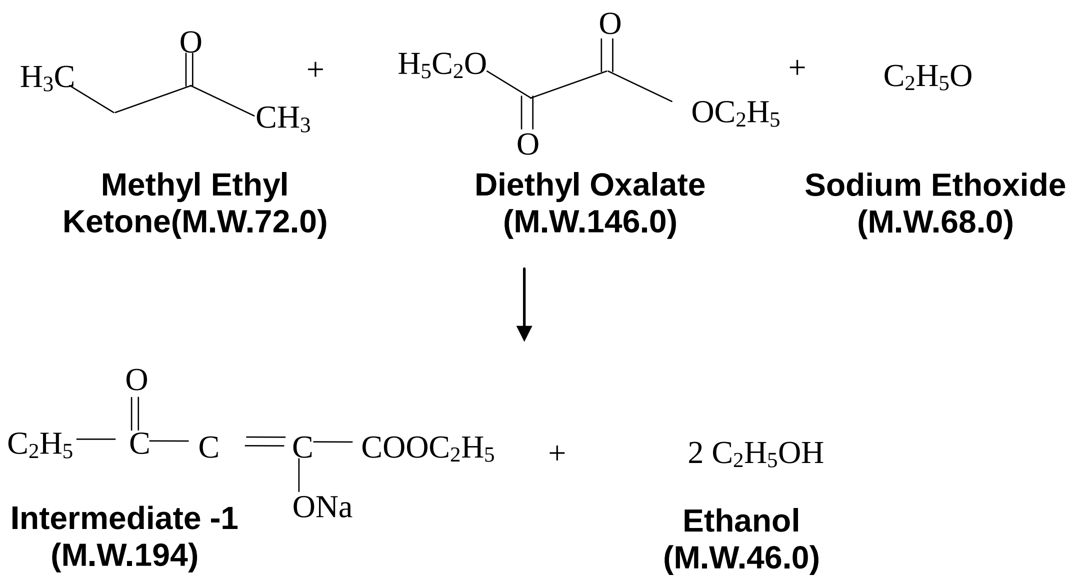
Step-3:4-Chloro-3-Ethyl-1H-Pyrazole-5-Carboxylic Acid. is further reacted with Dimethyl Sulphate in presence of Sodium Hydroxide to give an intermediate as EMCA **[4-Chloro-3-Ethyl-1-Methyl-1H-Pyrazole-5-Carboxylic Acid**].

Stage-4:4-Chloro-3-Ethyl-1-Methyl-1H-Pyrazole-5-Carboxylic Acid. [EMCA] is reacted with Thionyl Chloride to form Acid Chloride.

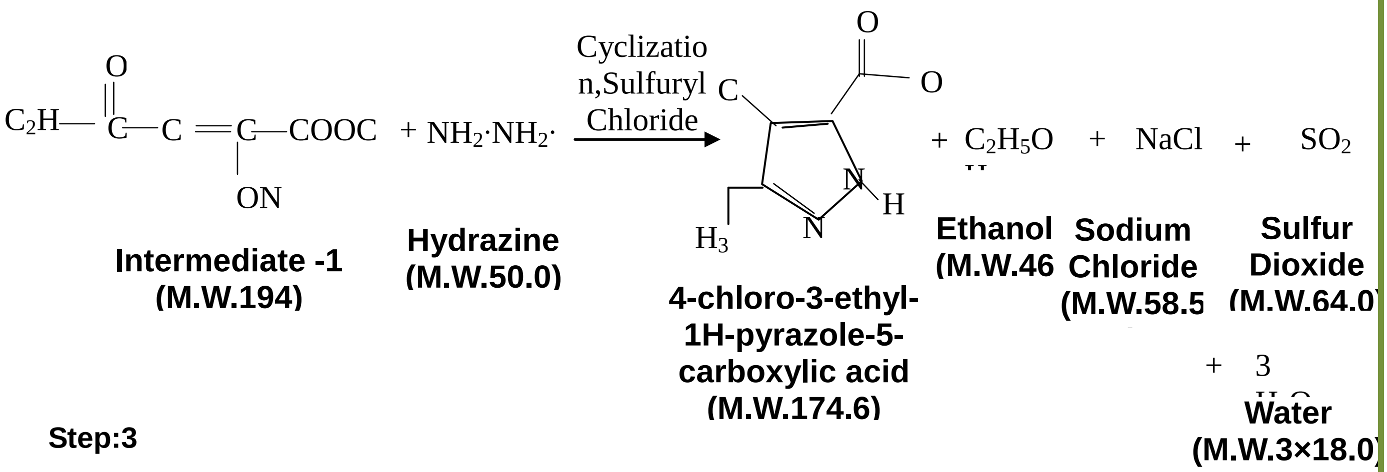
Step-5:**-Chloro-3-Ethyl-1-Methyl-1H-Pyrazole-5-Carboxylic Chloride** finally reacted with 4-Tertiarybutyl Benzyl Amine in presence of sodium hydroxide base in Toluene solvent to obtain Tebufenpyrad.

Chemical Reactions: -

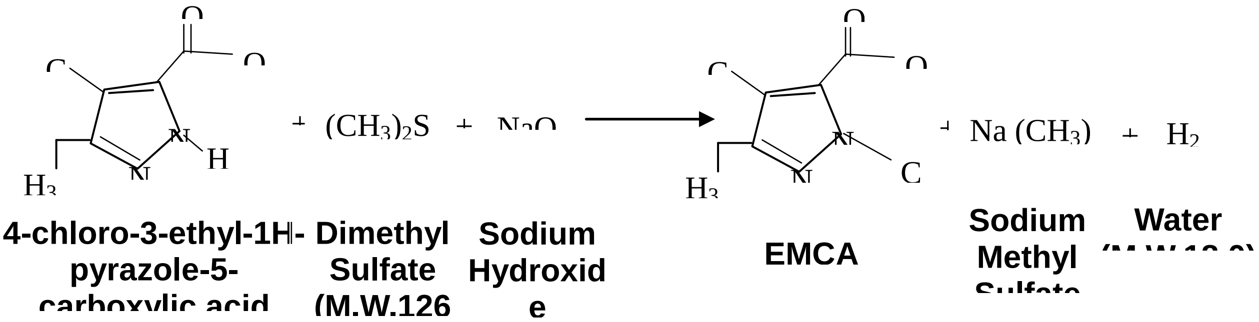
Step:1



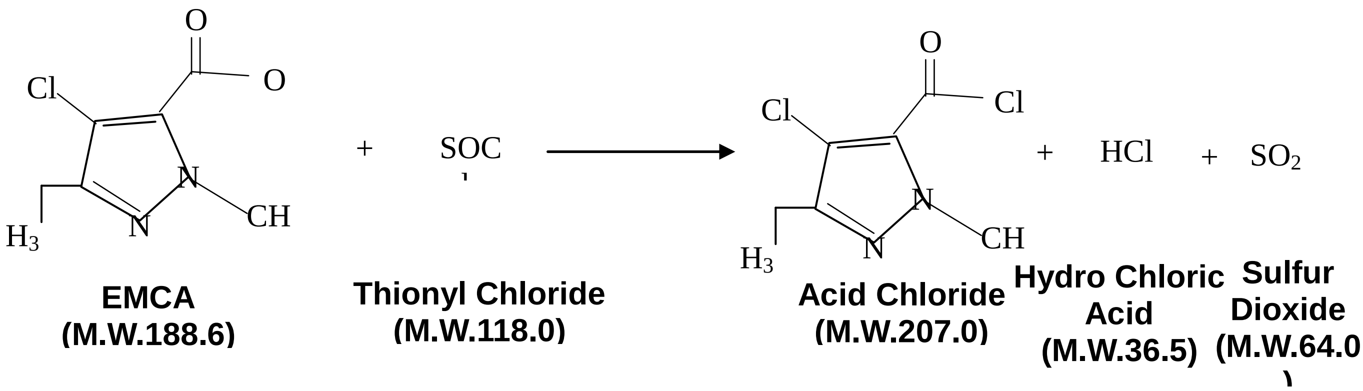
Step:2



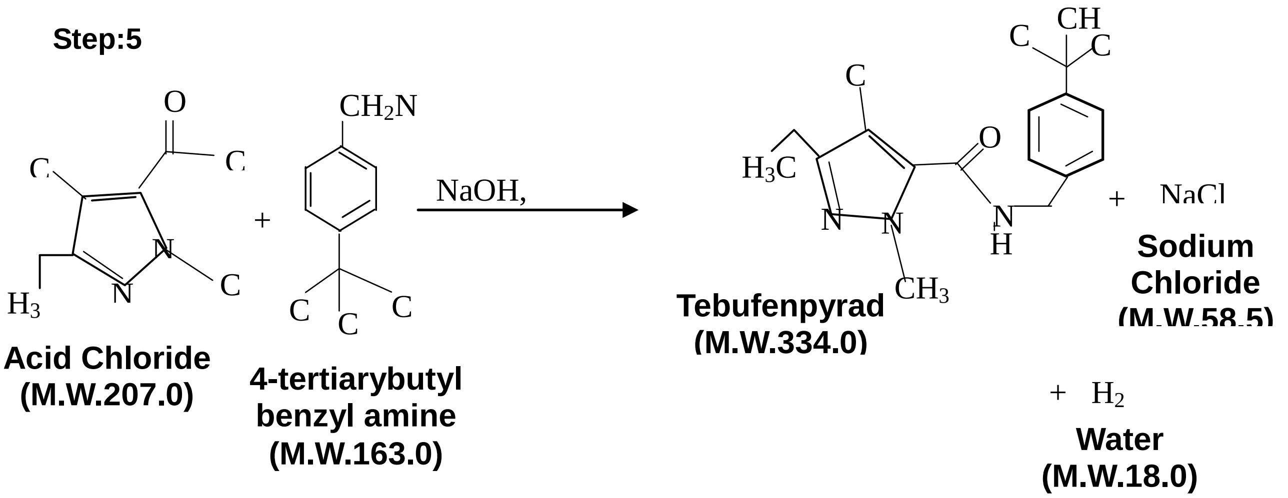
Step:3



Step:4



Step:5



71	Material / Mass Balance of Tebufenpyrad All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Methyl Ethyl ketone	300		**Tebufenpyrad**	**1000**
2	Diethyl Oxalate	620		Recovered Toluene	2046
3	Hydrazine Hydrate (80%)	260		Toluene Loss	80
4	Dimethyl Sulphate	263		Recovered Methanol	1400
5	Sodium Hydroxide (25%)	540		Methanol Loss	100
6	Sodium Hydroxide (30%)	1110		Hydrochloric Acid (30%) Soln	455
7	Sulfuryl Chloride	563		20% Sodium Sulfite Soln	2936
8	Thionyl Chloride	396		Evaporation Loss	100
9	4-TertiaryButyl Benzyl Amine	545		Aqueous Effluent to ETP	2065
10	Toluene	2126		Ethanol (Process)	550
11	Sodium Ethoxide (98%)	298		Sodium Methyl Sulfate	556
12	Dichloromethane	844		Sodium Chloride Salt	350
13	Methanol	1500		Organic Residue	45
14	Water for Hydrochloric Acid	318			
15	Water	2000			
	TOTAL	**11683**		**TOTAL**	**11683**

72) Lufenuron:

Brief Manufacturing Process: -

Step 1: -1,1,2,3,3,3-Hexafluoro Propoxy-2,5-Dichloro Benzene undergoes Nitration reaction by Nitric Acid and Concentrated Sulphuric Acid in presence of Solvent Ethylene Dichloride (EDC). This reaction gives out 1,1,2,3,3,3-Hexafluoro Propoxy-2,5-Dichloro-4-Nitrobenzene. Spent

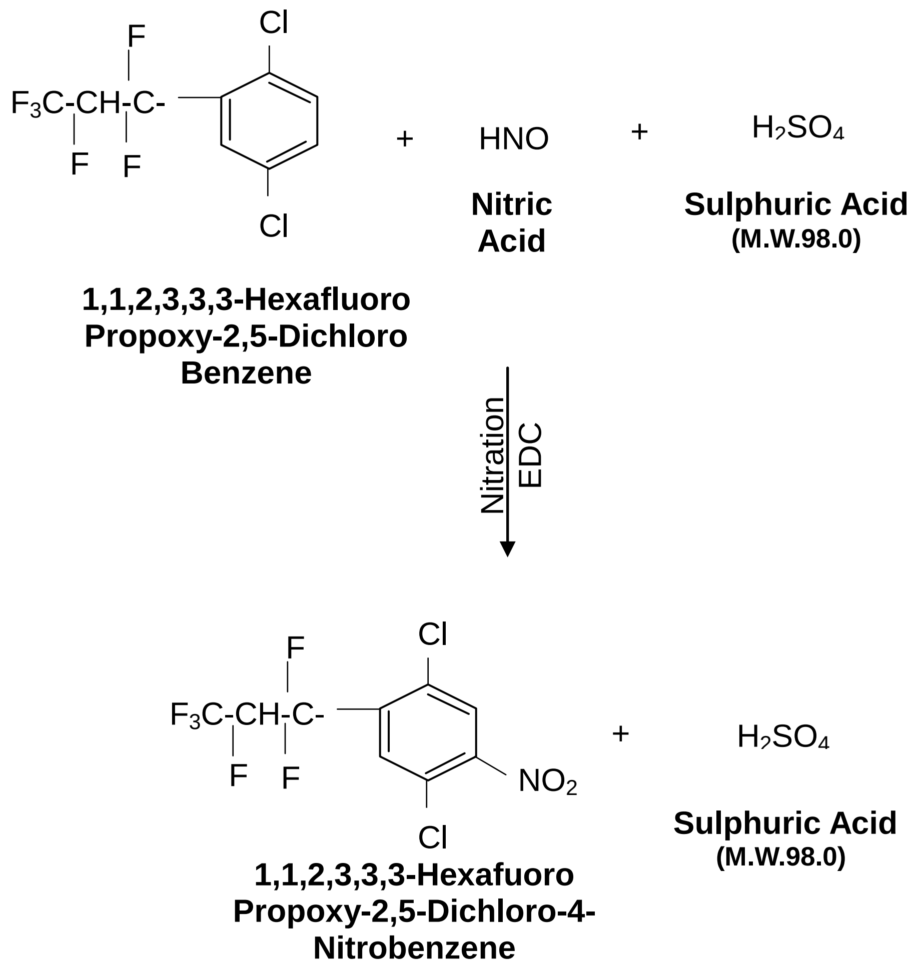
Sulphuric Acid is recovered from reaction mass.

Step 2: -1,1,2,3,3,3-Hexafluoro Propoxy-2,5-Dichloro-4-Nitrobenzene is undergoing Hydrogenation reaction by Hydrogen (H_2) in presence of Solvent Ethylene Dichloride as well as Catalyst. This reaction gives out 1,1,2,3,3,3-Hexafluoro Propoxy-2,5-Dichloro-4-Aminobenzene. After Completion of reaction Ethylene Dichloride is recovered from reaction mass.

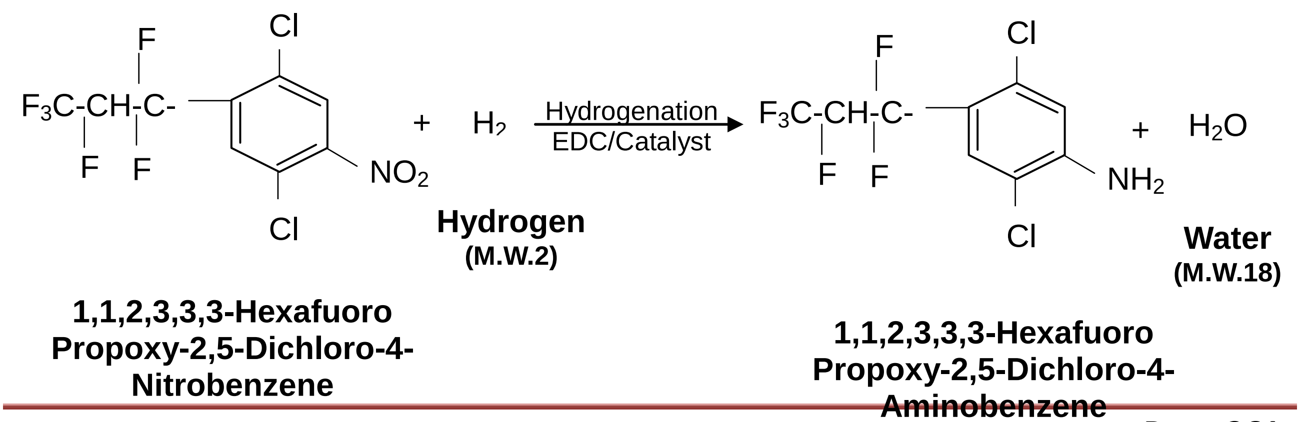
Step 3: - 1,1,2,3,3,3-Hexafluoro Propoxy-2,5-Dichloro-4-Aminobenzene undergoes Condensation reaction by 2,6-Difluoro Benzyl Isocyanate in presence of Solvent Toluene as well as Catalyst. This reaction gives out Lufenuron as a crude product. After completion of reaction Toluene is recovered from reaction mass and crude product is distilled out to get pure product.

Chemical Reactions: -

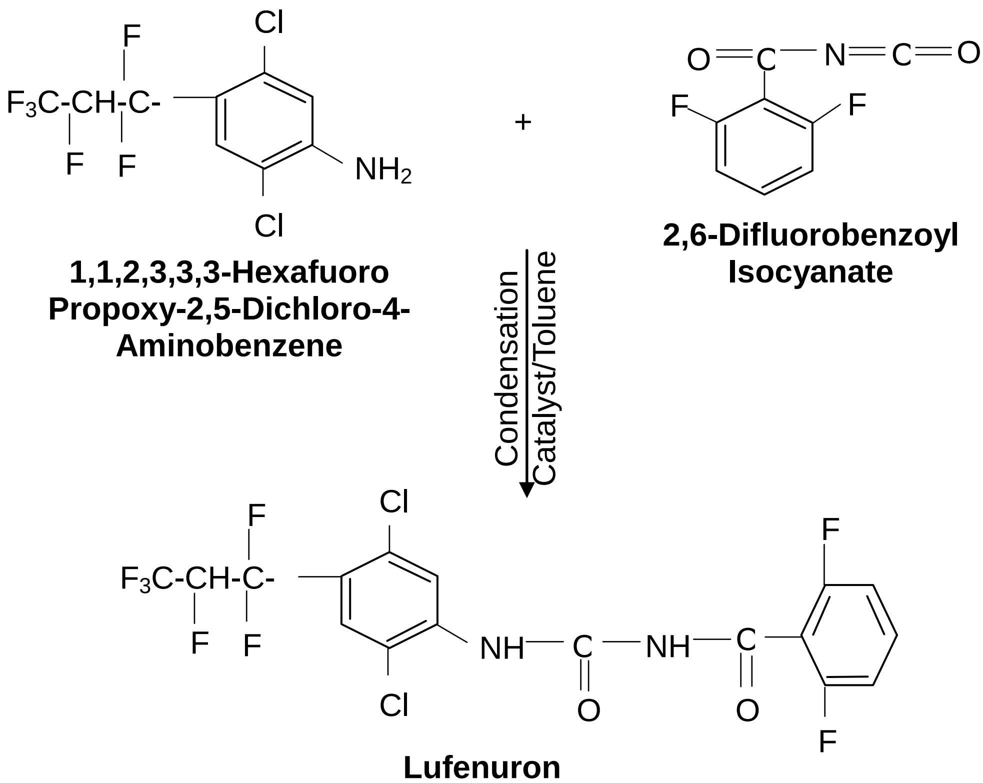
Step 1: -



Step 2: -



Step 3: -



1,1,2,3,3,3-Hexafuoro Propoxy-2,5-Dichloro-4-Aminobenzene

2,6-Difluorobenzoyl Isocyanate

Lufenuron
(M.W.511.15)

72	Material / Mass Balance of Lufenuron All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	1,1,2,3,3,3-Hexafluoro Propoxy-2,5-Dichloro Benzene	650		Lufenuron	**1000**
2	Nitric Acid	130		Recovered Toluene	2120
3	Sulphuric Acid	200		Loss Toluene	80
4	Hydrogen Gas	40		75% Spent Sulfuric Acid	260
5	Catalyst Pd/C	18		Aqueous Layer to ETP	854
6	2,6-Difluorobenzoyl Isocyanate	380		Distillation Residue	24
7	Solvent - Toluene	2200		Hydrogen Gas in air	30
8	Water	750			
	TOTAL	**4368**		**TOTAL**	**4368**

73) Methoxyfenozide:

Brief Manufacturing Process: -

Step 1: - 3,5-Dimethyl Benzoyl Hydrazide undergoes Condensation reaction with Tert-Butyl Alcohol in presence of Catalyst PTSA as well as Solvent Toluene. This reaction gives out Intermediate-1. After completion of reaction solvent Toluene is recovered from reaction mass.

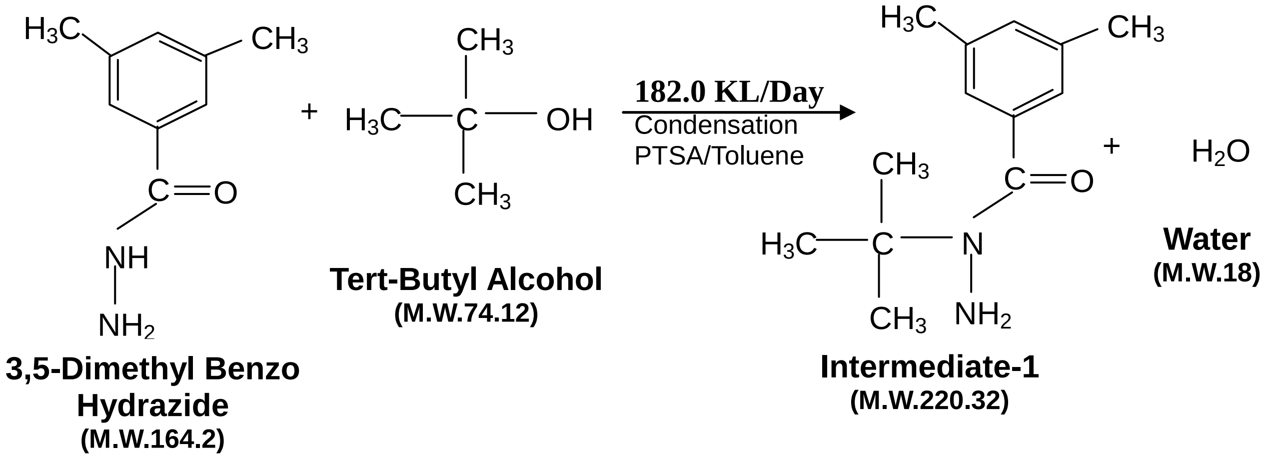
Step 2: - Intermediate-1 further reacted with 3-Methoxy-2-Methyl Benzoyl Chloride as well as Sodium Soda Lye in presence of Catalyst TBAB and Solvent. This reaction gives out

Methoxyfenozide as a crude product.

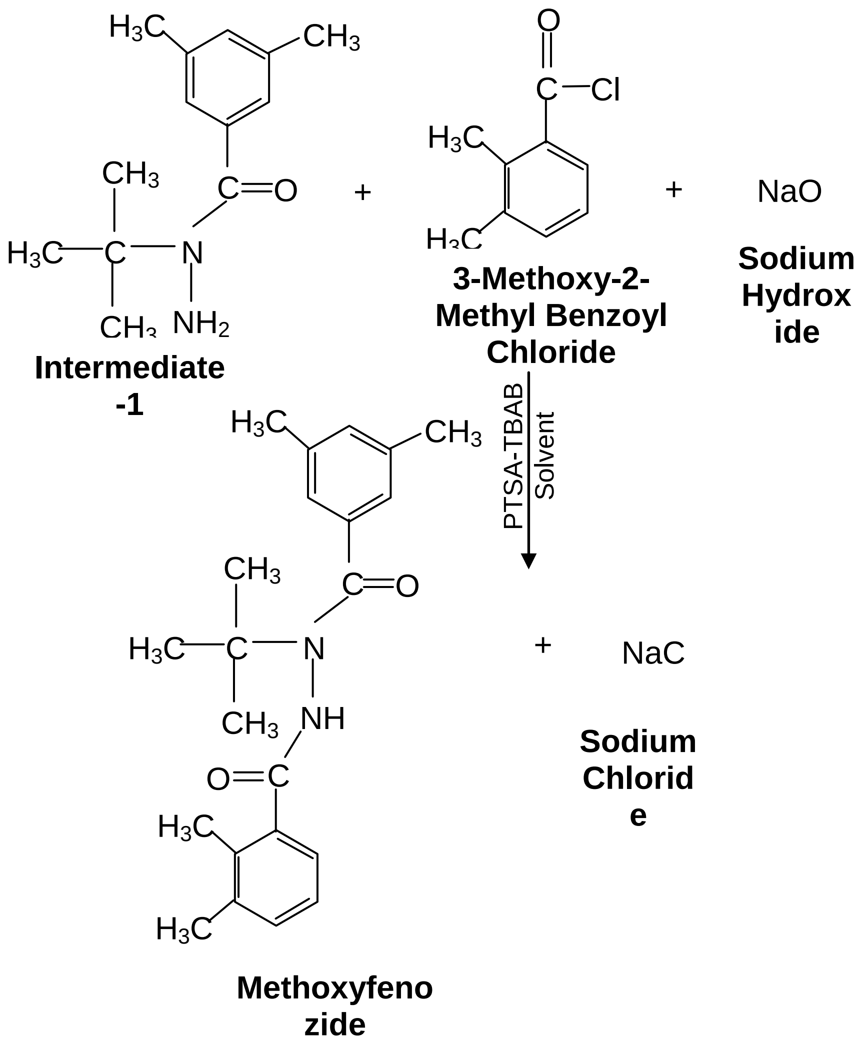
After completion of reaction Catalyst TBA is recovered from the reaction mass, Solvent is recovered at the end of reaction. Crude product is distilled out to get pure product.

Chemical Reactions: -

Step 1: -



Step-2: -



73	Material / Mass Balance of Methoxyfenozide All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	3,5 Dimethyl Benzo hydrazide	472		Methoxyfenozide	**1000**
2	Solvent - Toluene	2000		Recovered Solvent	1930
3	Catalyst - PTSA	16		Loss Solvent	70
4	Tert-Butyl Alcohol	450		Waste Water	1930
5	3-Methoxy 2-Methyl Benzoyl Chloride	516		Recovered TBA	240
6	Catalyst - TBAB	16			
7	Water for Process	1450			
8	48% Caustic Soda Lye	250			
	TOTAL	**5170**		**TOTAL**	**5170**

74) Spinetoram:

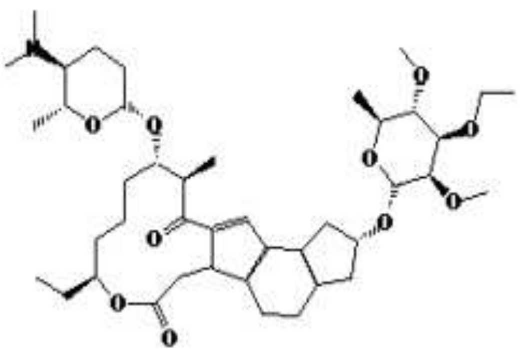
Brief Manufacturing Process: -

1) Mixture of **3**'-Ortho-Ethyl-5,6-Dihydro Spinosyn J and 3'- Ortho-Ethyl Spinosyn L is undergoing Fermentation reaction. This reaction gives out Spinetoram as a final product.

Or

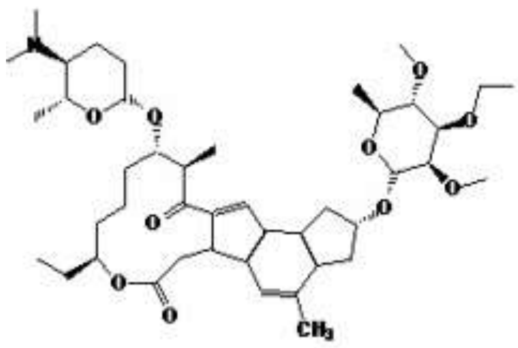
2) Mixture of **3**'-Ortho-Ethyl-5,6-Dihydro Spinosyn J and 3'- Ortho-Ethyl Spinosyn L is undergoing Hydrogenation reaction by Hydrogen gas in the presence of Homogenous Catalyst at temperature between 15^{0} Cand100^{0} C. This reaction gives out Spinetoram as a final product.

Chemical Reactions: -



3'-Ortho-Ethyl-5,6-Dihydro Spinosyn J (Major Component of Spinetoram)

+



3'-Ortho-Ethyl Spinosyn L (Minor Component of Spinetoram)

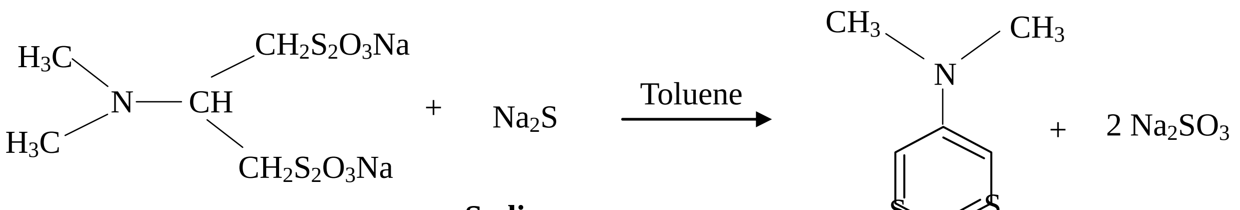
75) Thiocyclam Oxalate

Brief Manufacturing Process: -

Bisultap is reacted with Sodium Sulphide in presence of Toluene at 0^{o} C. After the completion of the reaction solids are filtered and washed with water. The filtrate is subjected to layer separation and oily layer was heated to 20^{o} C and slowly Oxalic Acid is added and stirred for 2 hours. The obtained mass is cooled and filtered to obtain pure Thiocyclam Oxalate solids.

Chemical Reactions: -

Step 1: -



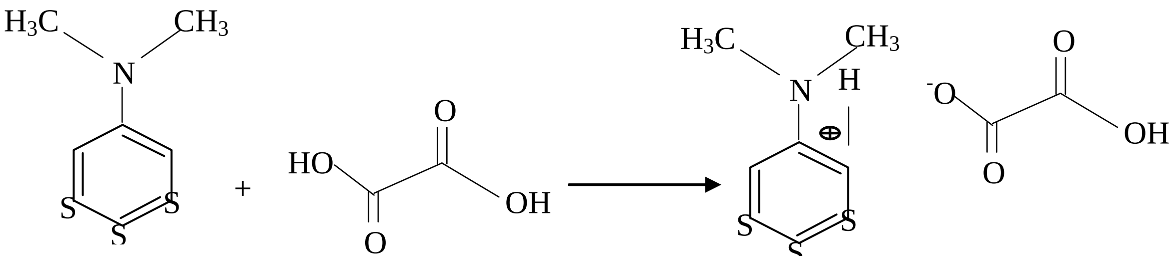
Bisultap (M.W.357.4)

Sodium Sulphide (M.W.75)

N, N-Dimethyl-1,2,3-Trithian-5-Amine

Sodium Sulfite

Step 2: -



N, N-Dimethyl-1,2,3-Trithian-5-Amine

Oxalic Acid (M.W.50.05)

Thiocyclam Oxalate (M.W.271.57)

Mass Balance:

75	Material / Mass Balance of ThiocyclamOxalate All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Bisultap	1333		Thiocyclam Oxalate	**1000**
2	Sodium Sulphide	290		Sodium Sulphite	933
3	Oxalic Acid	337		Toluene Recovered	4775
4	Water	1000		Toluene Loss	20
5	Toluene	5000		Toluene to wastewater	20
6				Toluene in Residue	185
7				Oxalic Acid	5
8				Waste Water	1000
9				Bisultap	22
	TOTAL	**7960**		**TOTAL**	**7960**

GROUP5: - SBI-Triazole Fungicides /Conazole Fungicides/Triazolopyrimidines Fungicide

76) Hexaconazole

Brief Manufacturing Process: -

Step 1: -Meta-Dichloro Benzene reacted with Pentanoyl Chloride in presence of Aluminium Chloride and solvent Ethylene Dichloride. This process gives product 2,4-Dichloro Valerophenone.

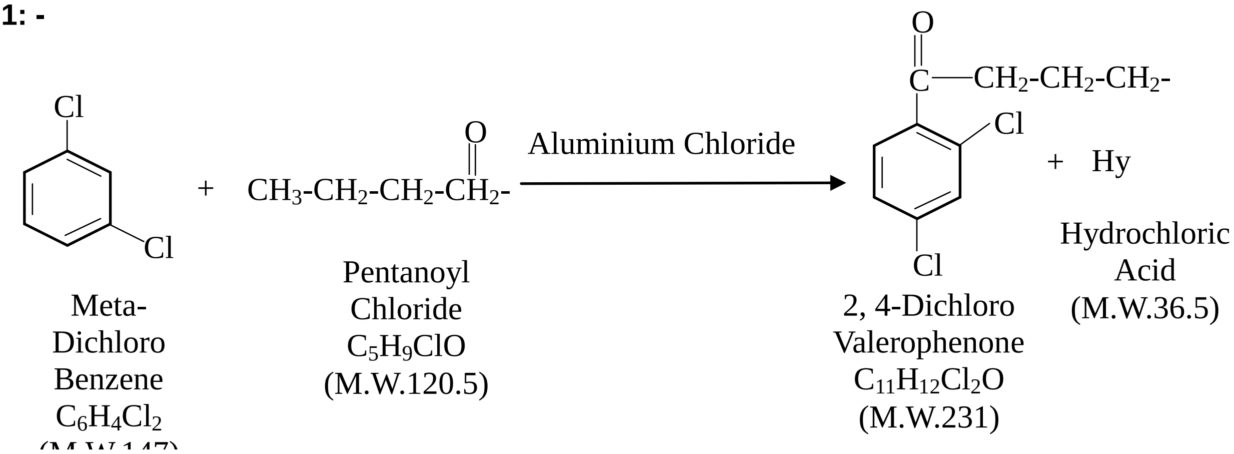
Step 2: - 2,4-Dichloro Valerophenone reacted with Methylene-Triphenyl phosphorane in presence of solvent THF to get 2-(2,4-Dichloro Phenyl)-n-hex-1-ene.

Step 3: - 2-(2,4-Dichloro Phenyl)-n-hex-1-ene reacted with Bromine and Hydrogen peroxide in presence of Ethylene Dichloride to get 1-Bromo-2--(2,4-Dichloro Phenyl)-hexane-2-ol.

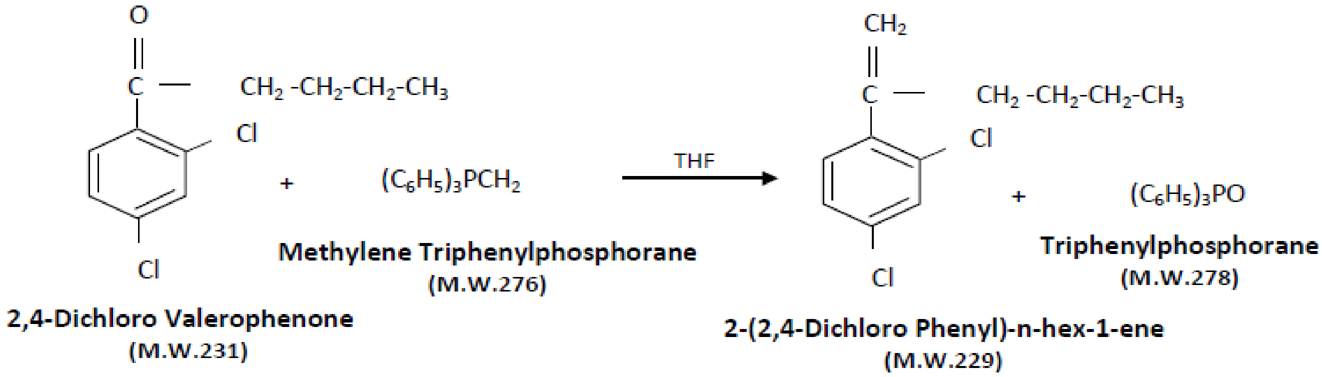
Step 4: - 1-Bromo-2--(2,4-Dichloro Phenyl)-hexane-2-ol further reacted with 1,2,4-Triazole in presence of Potassium Hydroxide and solvent DMF to get final product Hexaconazole.

Chemical Reactions: -

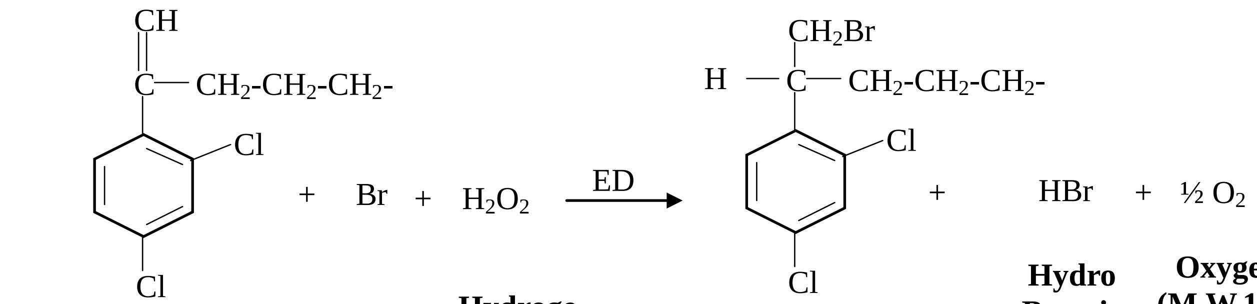
Step 1: -



Step 2: -

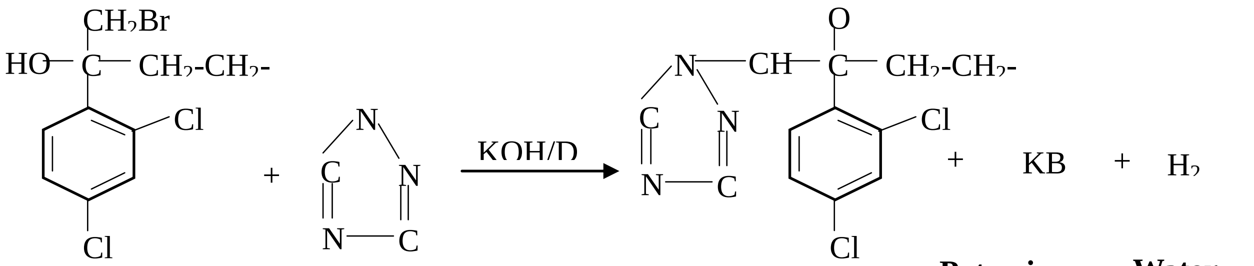


Step 3: -



2-(2, 4-Dichloro Phenyl)-n-Hex-1-ene (M.W.229.0) | **Bromine (M.W.160.0)** | **Hydrogen Peroxide** | **1-Bromo-2-(2, 4-Dichloro Phenyl)-hexane-2-ol** | **Hydro Bromic Acid (M.W.81.0** | **Oxygen (M.W.16.0**

Step 4: -



1-Bromo-2-(2, 4-Dichloro Phenyl)-hexane-2-ol | **1, 2, 4-Triazole** | **Hexaconazole** | **Potassium Bromide (M.W.119.** | **Water (M.W.18.0)**

Mass Balance:

76	Material / Mass Balance of Hexaconazole All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Meta-Dichlorobenzene	522		Hexaconazole	**1000**
2	Pentanoyl Chloride	422		Recovered EDC	1940
3	Aluminium Trichloride	650		EDC loss	60
4	EDC	2000		20 % Aluminium Chloride Soln	3250
5	Methyl Triophenyl Phosphorane	956		30% Hydrochloric Acid	435
6	Tetrahydro Furan	1500		Recovered Tetra Hydro Furan	1465
7	Bromine	545		Tetrahydro Furan loss	35
8	Hydrogen Peroxide	120		Triphenyl Phosphorane	970
9	1,2,4 Traizole	225		28% Hydrobromic Acid	1020
10	Potassium Hydroxide	190		Recovered Dimethyl Formamide	1460

11	Dimethyl Formamide	1500		Solvent Loss Dimethyl Formamide	40
12	Water	4000		Potassium Bromide	425
13				Aqueous Layer to ETP	505
14				Tarry Waste	25
	TOTAL	**12630**		**TOTAL**	**12630**

77) Tebuconazole

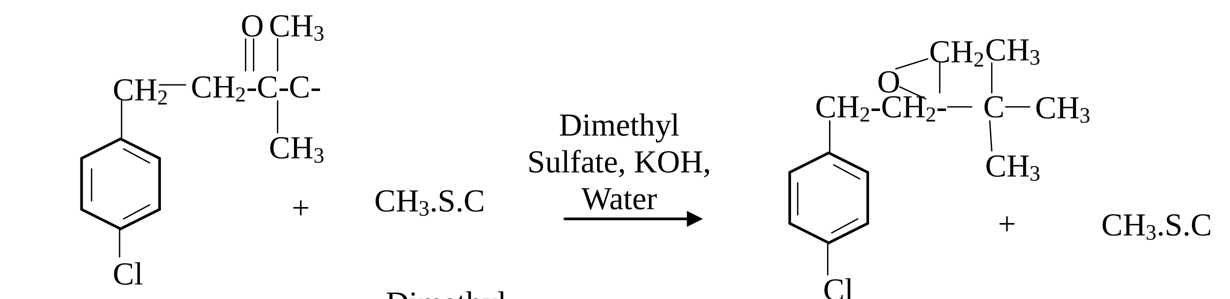
Brief Manufacturing Process: -

Step 1: Dimethyl Sulfate is added to a Solution of water, Dimethyl Sulfide and 1-(4-Chlorophenyl)-4, 4-Dimethyl-3- Pentanone at 40°C for 1 hour. The reaction mass is maintained for 6 hours at 40-42°C and cooled to 30°C. Potassium Hydroxide is added slowly at 30-35°C and the reaction mass is maintained for 18 hours at 42°C. After completion of the reaction, the temperature is raised to recover Dimethyl Sulfide till 80°C. The mass is cooled to 40°C and water is added. The reaction mass is extracted with Dichloromethane for 3-4 times at room temperature. All the Dichloromethane extracts are combined and distilled out under reduced pressure till temperature 85°C to recover Dichloromethane and leaving 2-(2-(4-Chlorophenyl) Ethyl)-2-(1, 1-Dimethyl Ethyl) Oxinane.

Step 2: 2-(2-(4-Chlorophenyl) Ethyl)-2-(1, 1-Dimethyl Ethyl) Oxinane. and N-Methyl Pyrrolidinone are charged and the temperature of the mass is raised to 120°C. Sodium Hydroxide Flakes, 1,2,4-Triazole and water are added to the reaction mass at 120°C. The reaction mass is maintained at 120°C for 4 hours. After completion of the reaction, the solvent is removed at 80°C under reduced pressure. Water is added to the molten mass at 70-80°C and the mass is slowly cooled to 20°C. The slurry mass is filtered at 20°C to obtain wet product. The wet product is charged into Cyclohexane and the mass is maintained at 70°C for 1 hour. The mass is cooled to 20°C, filtered and dried at 50°C to get Tebuconazole-Technical.

Chemical Reactions: -

Step 1: -



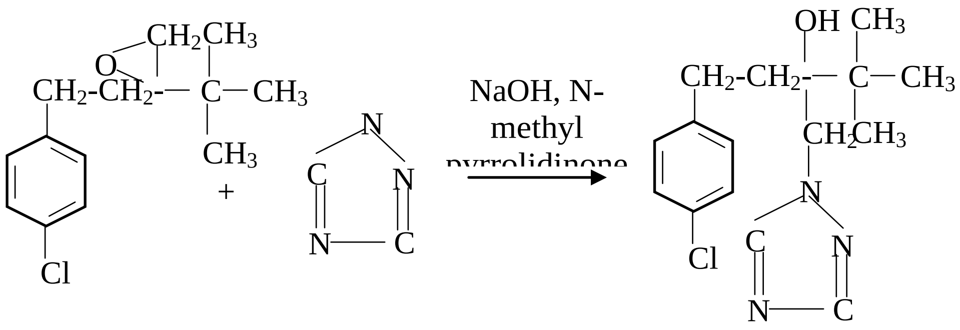
1-(4-Chlorophenyl)-4, 4-Dimethyl-3-Pentanone $C_{13}H_{17}ClO$

Dimethyl Sulfide (M.W.62.0)

2-(2-(4-chlorophenyl) Ethyl)-2-(1, 1-Dimethyl Ethyl) Oxinane /2-(4-chlorophenethyl)-2-tert-butyloxirane $C_{14}H_{19}ClO$ (M.W.238.5)

Dimethyl Sulfide (M.W.62.0)

Step 2: -



2-(2-(4-chlorophenyl) Ethyl)-2-(1, 1-Dimethyl Ethyl) Oxinane /2-(4-chlorophenethyl)-2-tert-butyloxirane
$C_{14}H_{19}ClO$
(M.W.238.5)

1, 2, 4-Triazole

Tebuconazole
$C_{16}H_{22}ClN_3O$
(M.W.307.5)

Mass Balance:

77	Material / Mass Balance of Tebuconazole All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	1-(4-Chlorophenyl)-4, 4-Dimethyl-3- Pentanone	768		**Tebuconazole**	**1000**
2	Dimethylsulfate	239		Recovered Dimethyl Sulfide	212
3	Dimethyl Sulphide	212		Recovered Dichloromethane	3880
4	Potassium hydroxide	160		Dichloromethane Loss	120
5	1,2,4 Triazole	236		Recovered Cyclohexane	970
6	N-Methyl-2-Pyrrolidone (NMP)	1000		Cyclohexane Loss	30
7	Caustic Flakes	40		Recovered NMP	970
8	Dichloromethane	4000		NMP Loss	30
9	Cyclohexane	1000		Organic Residue	61
10	Water	4000		Waste Water to ETP	4382
	TOTAL	**11655**		**TOTAL**	**11655**

78) Difenoconazole

Brief Manufacturing Process: -

Step 1: -Meta-Dichloro Benzene reacted with Acetyl Chloride in presence of Aluminium Chloride and solvent Ethylene Dichloride. This process gives product 2,4-Dichloro Acetophenone.

Step 2: -2,4-Dichloro Acetophenone further reacted with 4-Chloro Phenol in presence of Potassium Hydroxide and solvent DMF. This process gives product 2-Chloro-4-(4-Chlorohenoxy) Acetophenone.

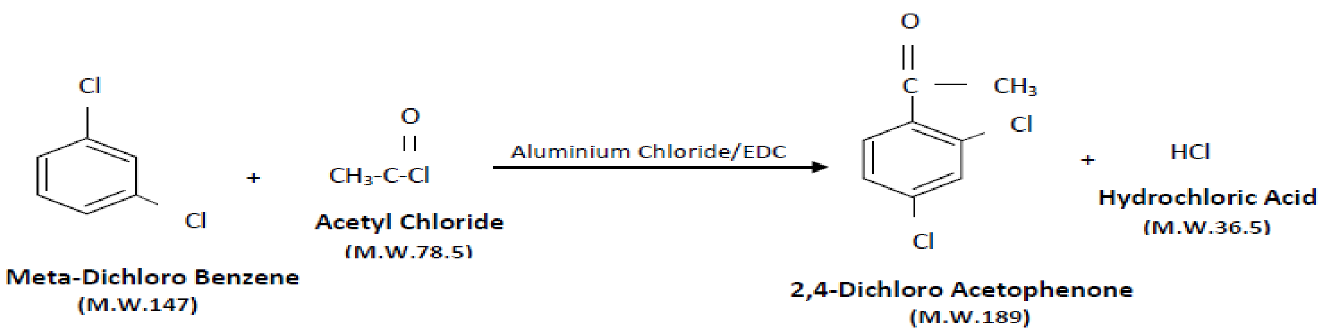
Step 3: -2, -Chloro-4-(4-Chlorophenoxy) Acetophenone further reacted with Bromine in presence of catalyst and solvent Ethylene Dichloride. This process gives product **2-Chloro-4-(4-Chlorophenoxy) Phenacyl Bromide**

Step 4: -2-Chloro-4-(4-Chlorophenoxy) Phenacyl Bromide reacted with Propylene Glycol in presence solvent Toluene to get product 3-chloro-4-(2-Bromomethyl-1,3-Dioxolane-2-yl)-4'-Chloro Diphenyl Ether.

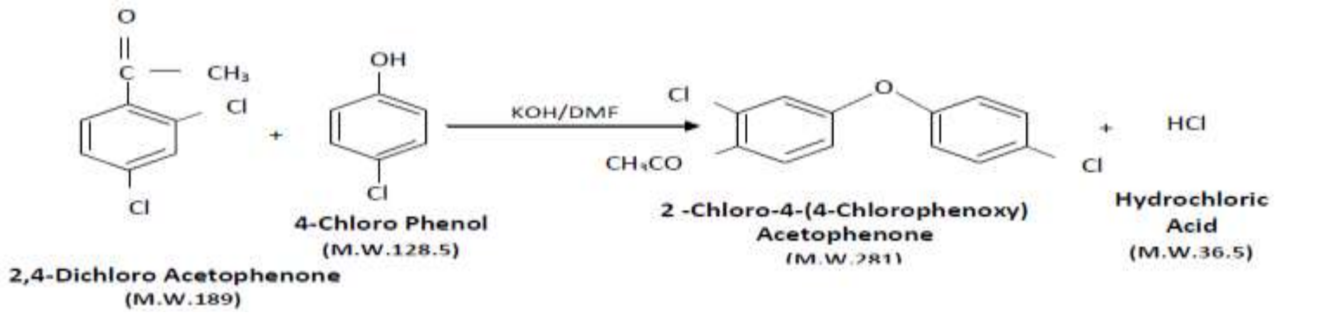
Step 5: -3-chloro-4-(2-Bromomethyl-1,3-Dioxolane-2-yl)-4'-Chloro Diphenyl Ether further reacted with 1,2,4-Triazole in presence of Potassium Hydroxide and solvent DMF to get product final product Difenoconazole.

Chemical Reactions: -

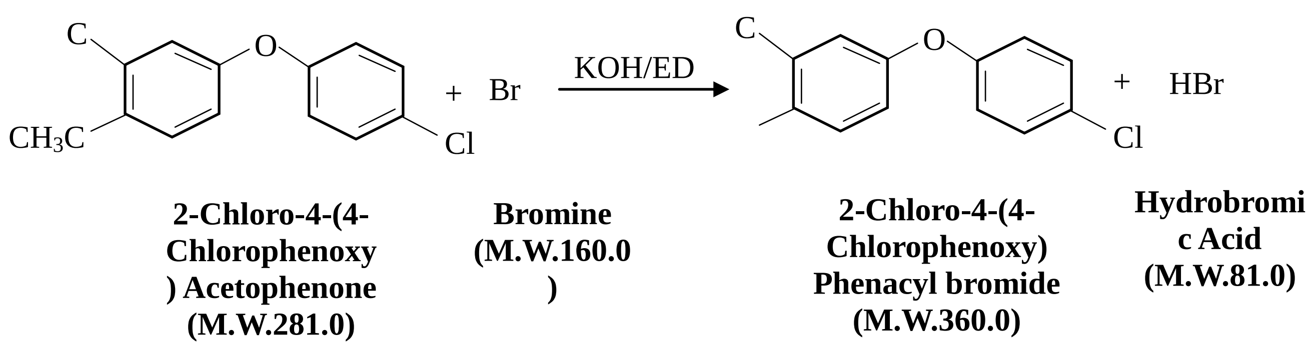
Step 1:



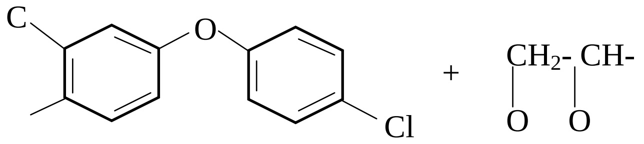
Step 2: -



Step 3: -



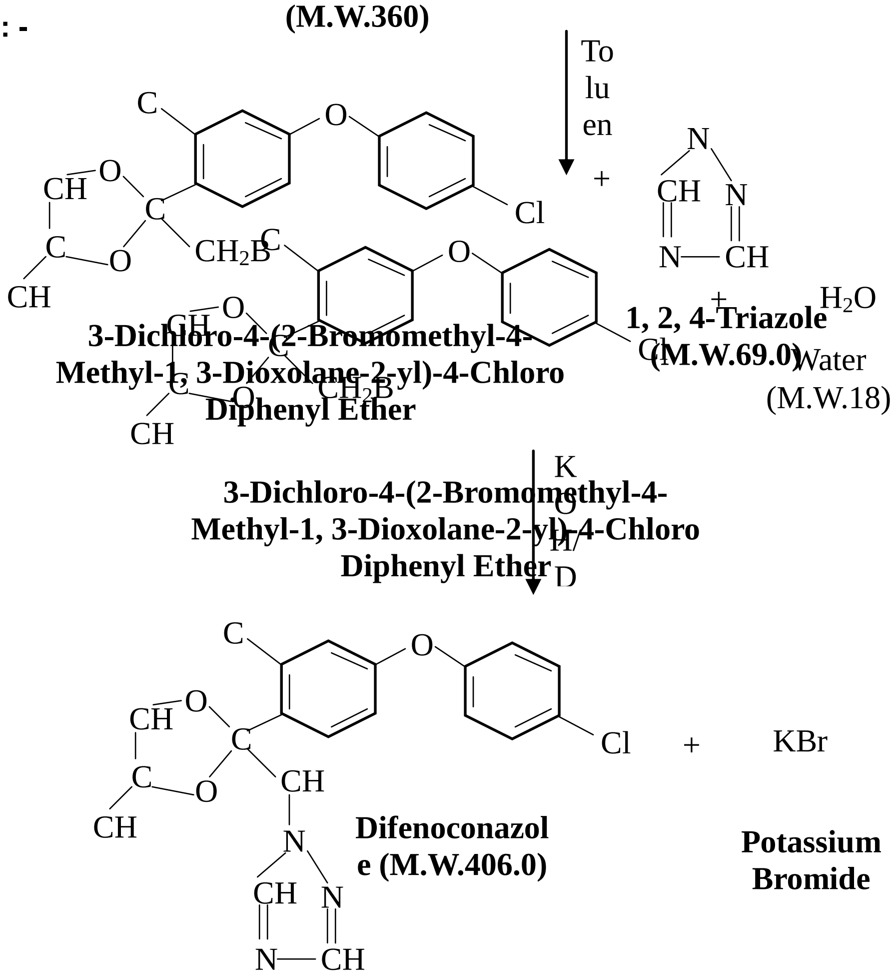
Step 4: -



2-Chloro-4-(4-Chlorophenoxy) Phenacyl bromide (M.W.360)

Propylene Glycol

Step 5: -



3-Dichloro-4-(2-Bromomethyl-4-Methyl-1, 3-Dioxolane-2-yl)-4-Chloro Diphenyl Ether

3-Dichloro-4-(2-Bromomethyl-4-Methyl-1, 3-Dioxolane-2-yl)-4-Chloro Diphenyl Ether

Difenoconazole (M.W.406.0)

Potassium Bromide

Water (M.W.18.0)

Mass Balance:

78	Material / Mass Balance of Difenoconazole All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Meta-Dichlorobenzene	402		**Difenoconazole**	**1000**
2	Acetyl Chloride	225		Recovered EDC	2910
3	Aluminum Chloride	520		Loss EDC	90
4	EDC	3000		20 % Aluminum Chloride Soln	2600
5	4 Chloro Phenol	345		30% Hydrochloric Acid	598

6	Dimethyl Formamide	2100		Recovered Catalyst	10
7	Potassium Hydroxide	300		28% Hydrobromic Acid	710
8	Catalyst	12		Recovered Toluene	1170
9	Bromine	410		Loss Toluene	30
10	Proplyene Glycol	205		Recovered Dimethyl Formamide	2040
11	Toluene	1200		Loss Dimethyl Formamide	60
12	Water	3300		Potassium Bromide	300
13	1,2,4 Traizole	182		Tarry Waste	15
14				Aqueous Layer to ETP	668
	TOTAL	**12201**		**TOTAL**	**12201**

79) Propiconazole

Brief Manufacturing Process: -

Step 1: -Meta-Dichloro Benzene reacted with Acetyl Chloride in presence of Aluminium Chloride and solvent Ethylene Dichloride. This process gives product 2,4-Dichloro Acetophenone.

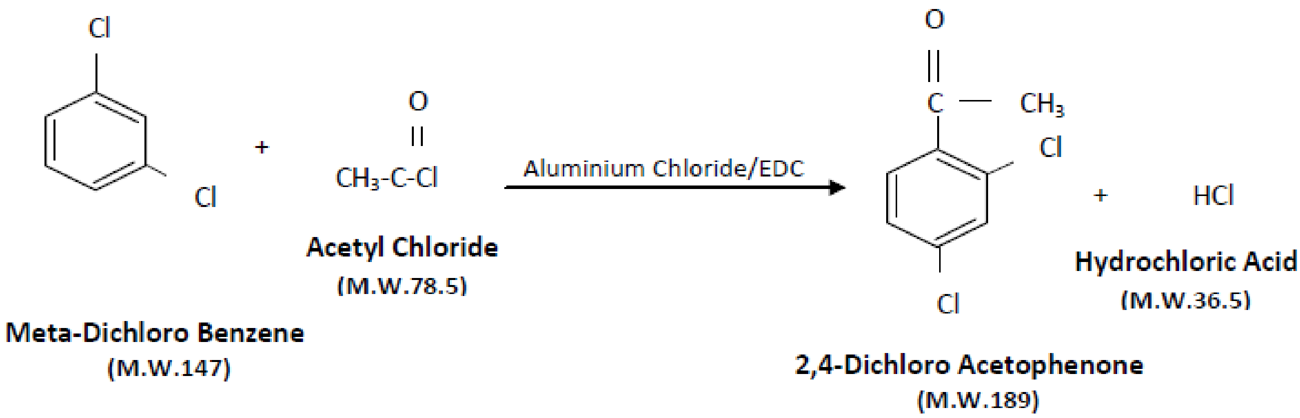
Step 2: -2,4-Dichloro Acetophenone reacted with Bromine in presence of solvent Ethylene Dichloride to get 2,4-Dichloro Phenacyl Bromide.

Step 3: -2,4-Dichloro Phenacyl Bromide reacted with 1,2-Pentanediol in presence of Toluene to get 4-(2-Bromomethyl-4-Propyl-1,3-Dioxolane-2yl)-1,3-Dichlorobenzene.

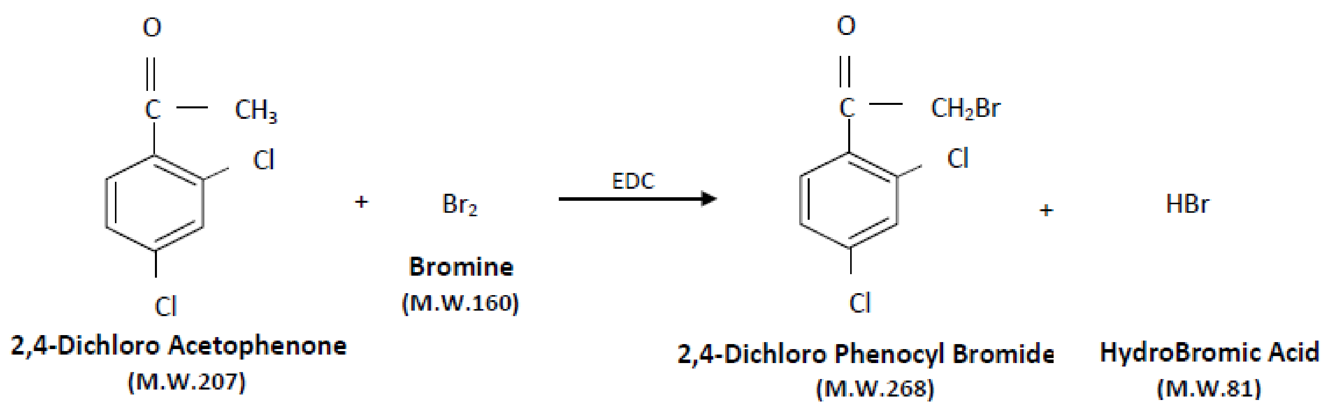
Step 4: -4-(2-Bromomethyl-4-Propyl-1,3-Dioxolane-2yl)-1,3-Dichlorobenzene reacted with 1,2,4-Triazole in presence solvent Toluene to give final product Penconazole.

Chemical Reactions: -

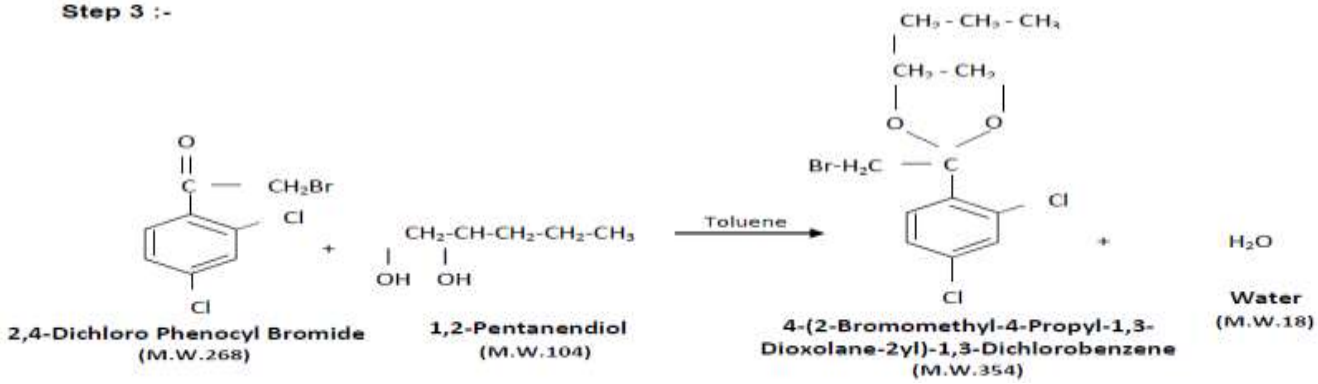
Step 1: -



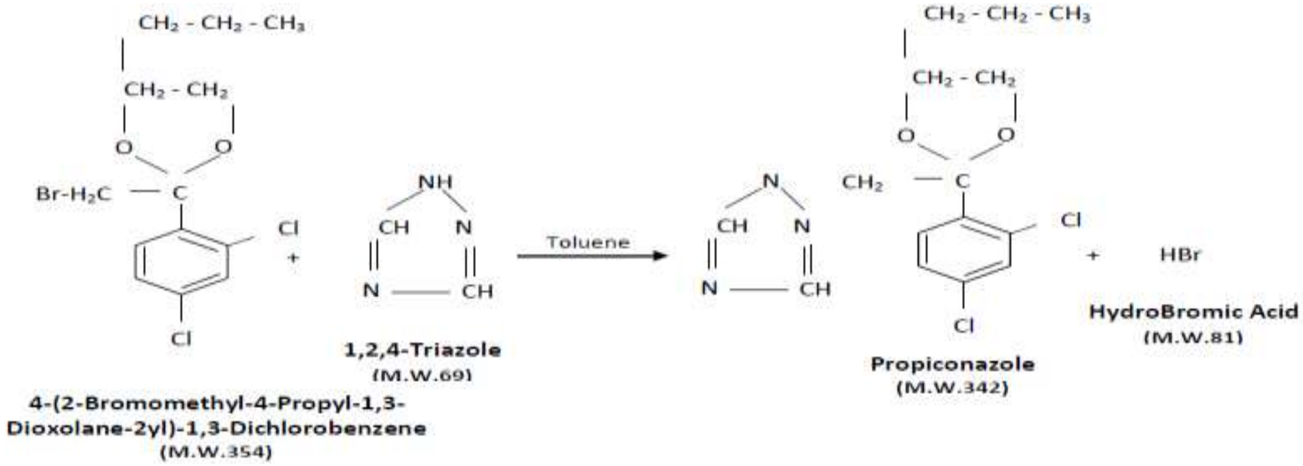
Step 2: -



Step 3 :-



Step 4: -



Mass Balance:

79	Material / Mass Balance of Propiconazole All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Meta Dichloro Benzene	460		**Propiconazole**	**1000**
2	Acetyl Chloride	245		20 % Aluminium Chloride Soln	2800

3	Aluminium Trichloride	560		Recovered EDC	3880
4	Ethyelene Dichloride	4000		EDC LOSS	120
5	Br2	555		30% Hydrochloric Acid	380
6	1,2 Pentane Diol	330		27% HBr Solution	900
7	Catalyst	15		Recovered Catalyst	15
8	Water	3920		Recovered DMF	1455
9	Toluene	1200		Water to ETP	955
10	1,2,4 Triazole	215		DMF Loss	45
11	Pottasium Hydroxide	170		Pottasium Bromide Salt	400
12	DMF	1500		Recovered Toluene	1170
13				Toluene Loss	30
14				Tarry Waste	20
	TOTAL	**13170**		**TOTAL**	**13170**

80) Metconazole

Brief Manufacturing Process: -

Step 1: -Methyl-3,3, -Dimethyl-2-Oxo-Cyclopentane Carboxylate reacts with 4-Chloro Benzyl Chloride in presence of Solvent and catalyst to give 1-(4-Chloro Benzyl) Methyl-3,3-Methyl-2-Oxo Cyclopentane Carboxylate-(A).

Step 2: -1-(4-Chloro Benzyl) Methyl-3,3-Methyl-2-Oxo Cyclopentane Carboxylate undergoes rearrangement reaction on heating with catalyst gives the intermediate B as **5-(4-Chloro Benzyl)2, 2-Dimethyl-1-Oxo Cyclopentane.**

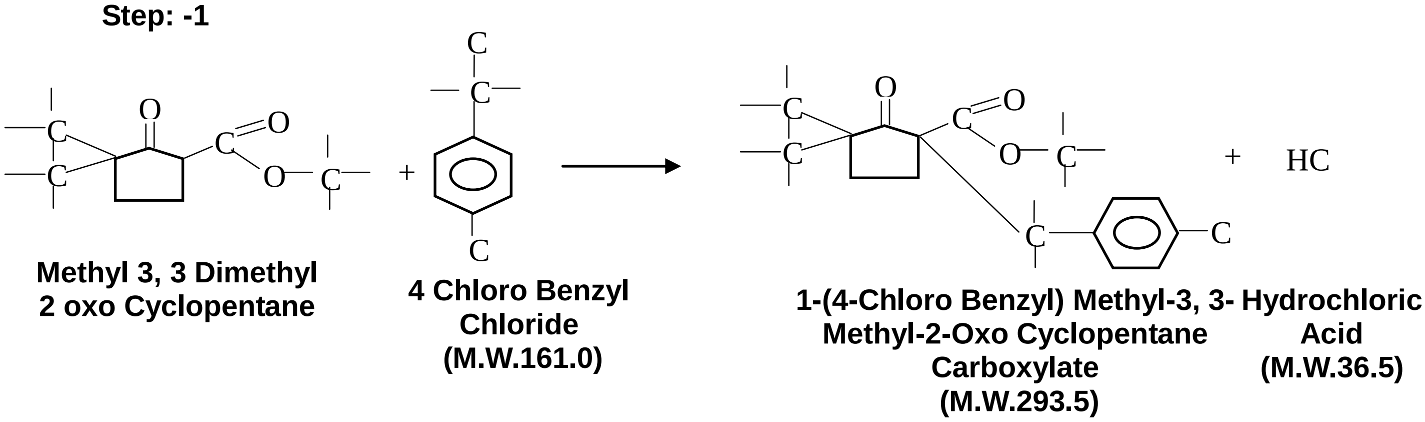
.

Step 3: -5-(4-Chloro Benzyl)2, 2-Dimethyl-1-Oxo Cyclopentane undergoes reaction in presence of catalyst to give Intermediate C **7-(4-Chloro Benzyl)-4, 4-Dimethyl-1-Oxaspiro [2,4] Heptane.**

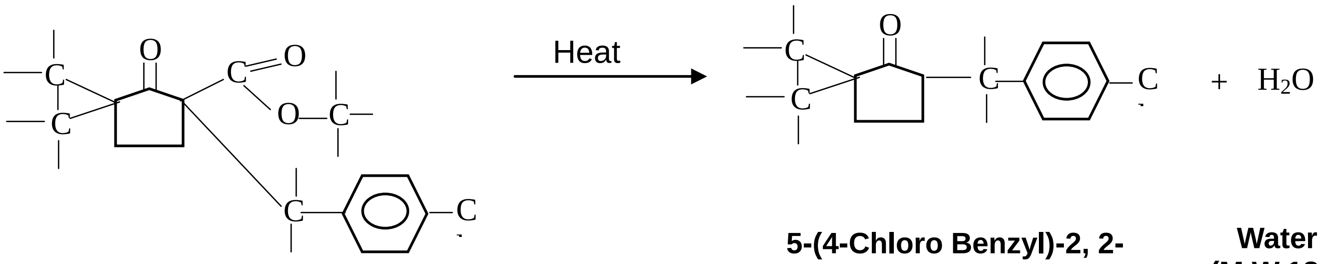
Step 4: 7-(4-Chloro Benzyl)-4, 4-Dimethyl-1-Oxaspiro [2,4] Heptane finally reacts with 1,2,4-Triazole in presence of solvent as well as catalyst to give the final product **Metconazole**.

Chemical Reactions:

Step: -1



Step-2: -

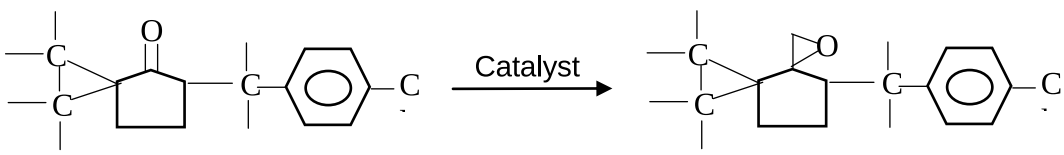


1-(4-Chloro Benzyl) Methyl-3, 3-Methyl-2-Oxo Cyclopentane Carboxylate (M.W.293.5)

5-(4-Chloro Benzyl)-2, 2-Dimethyl-1-Oxo Cyclopentane (M.W.235.5)

Water (M.W.18.0)

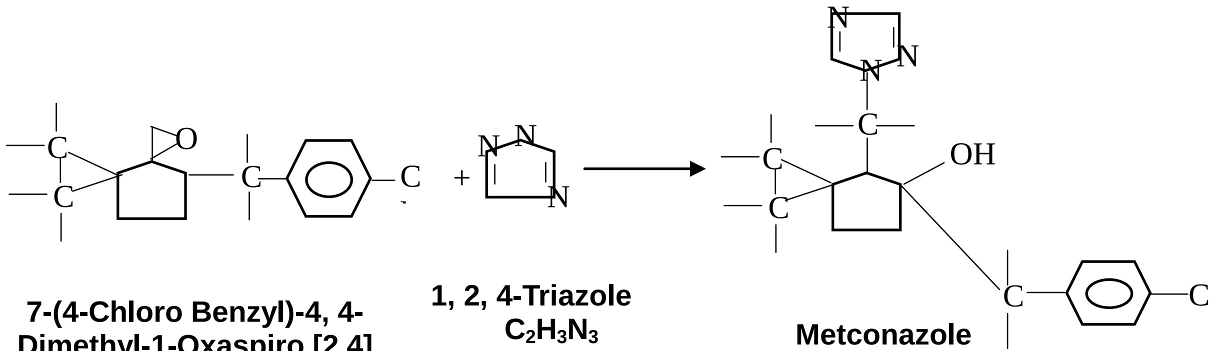
Step3: -



5-(4-Chloro Benzyl)-2, 2-Dimethyl-1-Oxo Cyclopentane (M.W.235.5)

7-(4-Chloro Benzyl)-4, 4-Dimethyl-1-Oxaspiro [2,4] Heptane (M.W.249.5)

Step 4: -



7-(4-Chloro Benzyl)-4, 4-Dimethyl-1-Oxaspiro [2,4] Heptane (M.W.249.5)

1, 2, 4-Triazole $C_2H_3N_3$ (M.W.69)

Metconazole $C_{17}H_{22}ClN_3O$ (M.W.319.5)

Mass Balance:

80	Material / Mass Balance of MetconazoleAll Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Methyl-3,3-Dimethyl-2-Oxo-Cyclopentane Caboxylate	365		Metconazole	**1000**
2	4-Chloro Benzyl Chloride	540		Recovered Solvent (Toluene)	2140
3	Catalyst	25		Solvent Loss	60
4	1,2,4 Triazole	220		30 % Hydrochloric Acid	380

				Solution	
5	Solvent Toluene	2200		Aqueous Layer to ETP	770
6	Water for Reaction and Washing	1000			
	TOTAL	**4350**		**TOTAL**	**4350**

81) Cyproconazole

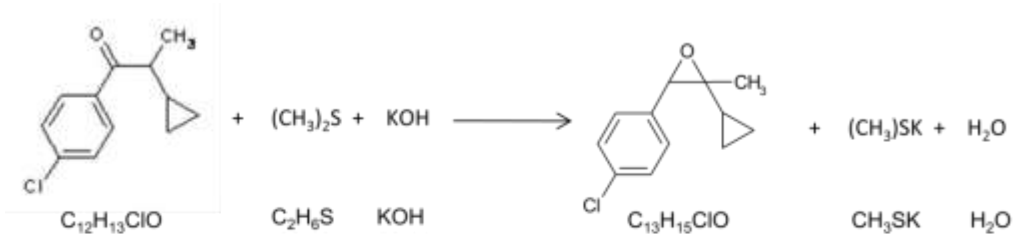
Brief Manufacturing Process: -

Stage 1:1-(4-Chlorophenyl)-2-Cyclopropyl-Propan-1-One (CPDP Propanone) is epoxidized to 2-(4-Chlorophenyl)-2-(1-Cyclo Propylethyl) Oxiraneusing Dimethyl Sulfide and Potassium Hydroxide. The converted Chlorophenyl)-2-(1-Cyclo Propylethyl) Oxirane extracted into Toluene and washed with water. The organic layer of Oxirane with Toluene is taken to the stage 2.

Stage 2: The organic layer of Oxirane with Toluene is condensed with 1,2,4-Triazole using catalyst Potassium Carbonate. After completion of the reaction, the mass is washed with water and distilled out to recover Toluene partly and cooled. The cooled mass is filtered and dried to obtain Cyproconazole-technical.

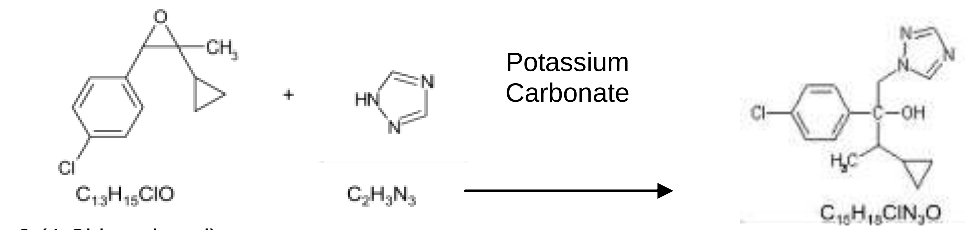
Chemical Reactions: -

Step 1:



1-(4-Chlorophenyl)-2-Cyclopropyl-Propanone M.W.208.5 | Dimethyl Sulfide M.W.62.0 | Potassium Hydroxide M.W.56.0 | 2-(4-Chlorophenyl)-2-(1-Cyclo Propylethyl) Oxirane M.W.223.0 | Potassium Methyl Mercaptide M.W.86.0 | Water M.W.18.0

Step 2:



2-(4-Chlorophenyl)-2-(1-cyclo Propylethyl) Oxirane M.W.223.0 | 1,2,4 – Triazole M.W.69.0 | Cyproconazole M.W.291.5

81	Material / Mass Balance of Cyproconazole All Quantities are in kg)		
	IN – PUT		**OUT – PUT**

Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	1-(4-Chlorophenyl)-2-Cyclopropyl-Propanone	760		Cyproconazole	**1000**
2	Dimethyl Sulfide	225		Recovered Toluene	2200
3	Potassium Hydroxide	200		Toluene Loss	50
4	1,2,4 Triazole	250		Recovered Catalyst	20
5	Toluene	2250		Potassium Methyl Mercaptide	300
6	Potassium Carbonate	20		Aqueous Layer to ETP	885
7	Water	750			
	TOTAL	**4455**		**TOTAL**	**4455**

82)Epoxiconazole

Brief Manufacturing Process: -

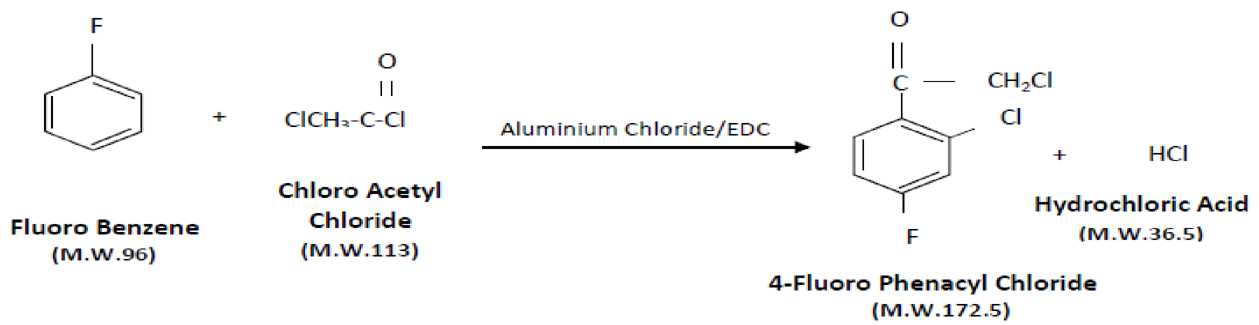
Step 1: -Fluorobenzene is reacted with Chloro Acetyl chloride in presence of Aluminium chloride and Solvent - Ethylene Di Chloride to get 4-Fluoro Phenacyl Chloride.

Step 2: -4-Fluoro Phenacyl Chloride reacted with 1,2,4-Triazole in presence of Potassium Hydroxide and Solvent DMF to give 2-(1H-1,2,4-Triazole-1-yl)-4-Fluoro Acetophenone.

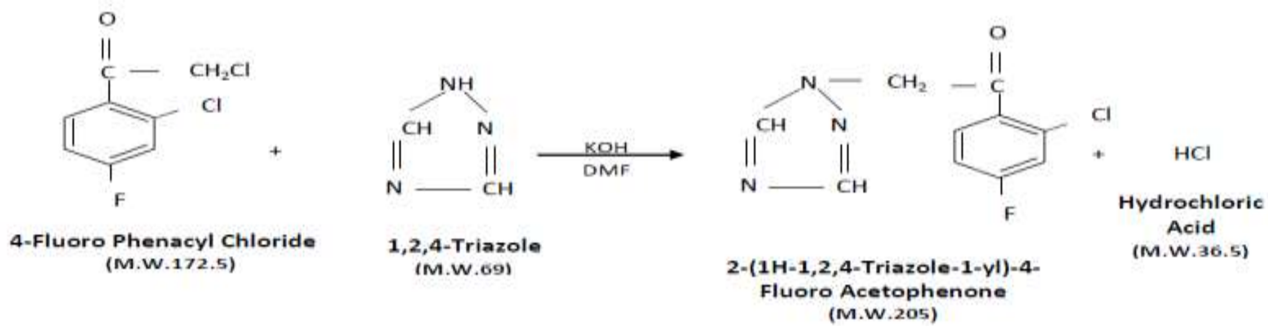
Step 3: -2-(1H-1,2,4-Triazole-1-yl)-4-Fluoro Acetophenone reacted with 2-Chloro benzyl chloride and Dimethyl Sulphide in presence of Potassium Hydroxide and Solvent DMF to give the final product.

Chemical Reactions: -

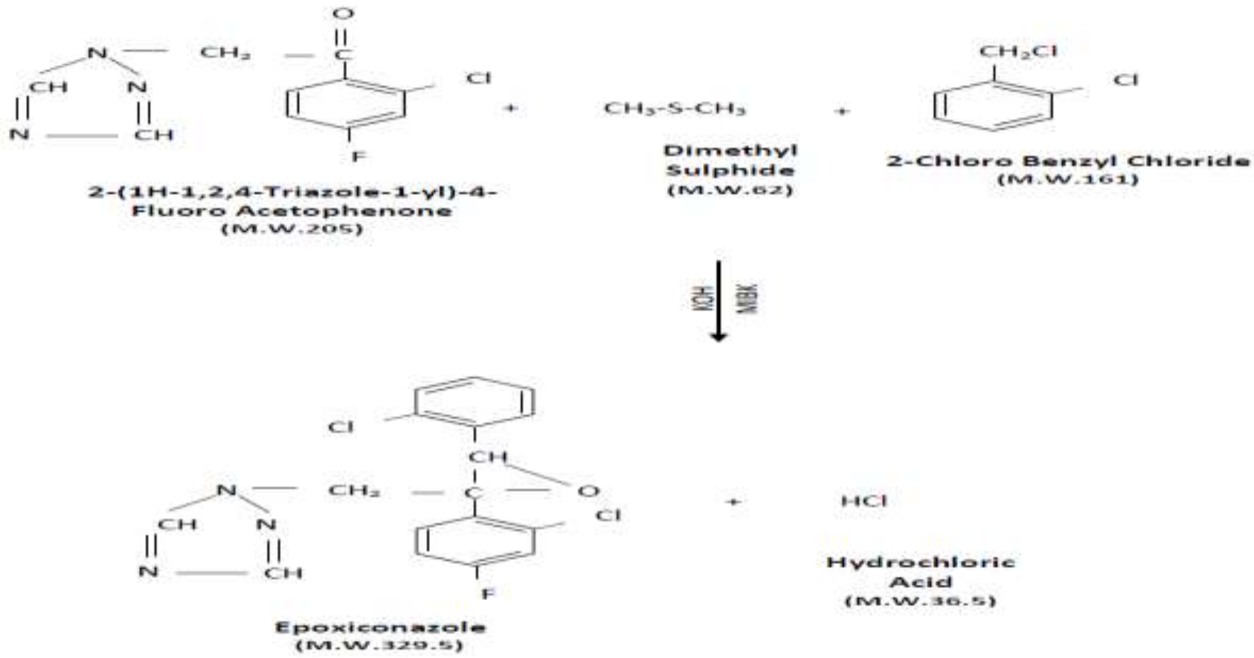
Step 1: -



Step 2: -



Step 3: -



Mass Balance:

82	Material / Mass Balance of Epoxiconazole All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Fluoro Benzene	320		Epoxiconazole	**1000**
2	Chloro Acetyl Chloride	375		Recovered Solvent - EDC	1260
3	Aluminum Chloride	400		Solvent Loss EDC	40
4	Solvent - EDC	1300		20 % Aluminum Chloride	2033
5	Potassium Hydroxide	555		30 % Hydrochloride Solution	406
6	1,2,4 - Triazole	228		Recovered Solvent - DMF	1765
7	Solvent – Dimethyl Formamide	1800		Solvent loss - DMF	35
8	2- Chloro Benzyl Chloride	530		Potassium Chloride	502
9	Di Methyl Sulphide	202		Potassium Bisulphate	238
10	Water	2440		Aqueous Layer to ETP	853
11				Distillation Residue	18
	TOTAL	**8150**		**TOTAL**	**8150**

83) Fenbuconazole

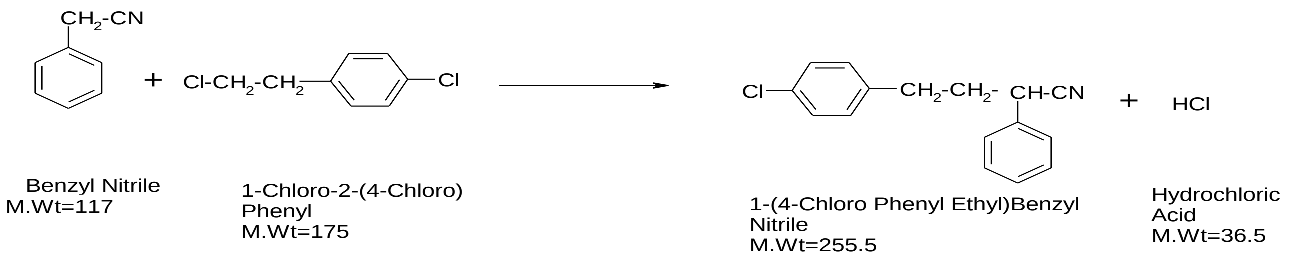
Brief Manufacturing Process: -

Step 1: -Benzyl Nitrile is reacted with p-Chloro Ethyl Chlorobenzene in presence of solvent & Catalyst to form 1-(4-Chlorophenyl) Ethyl Benzyl Nitrile.

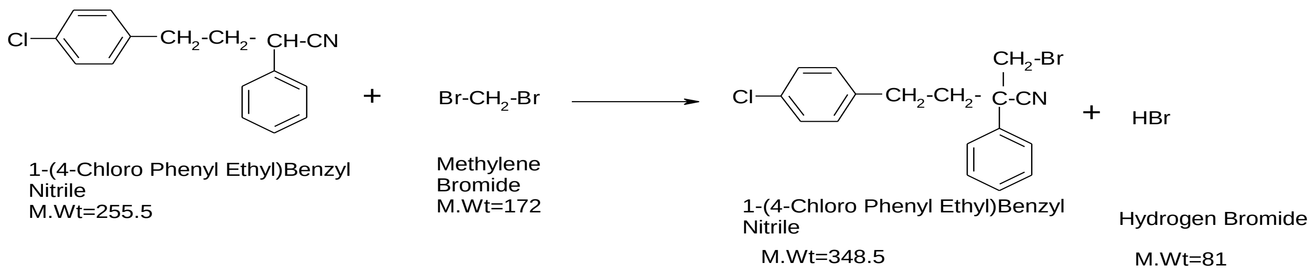
Step 2: -1-(4-Chlorophenyl) Ethyl Benzyl Nitrile reacts with Methyl Bromide to give 1-(4-Chlorophenyl) Ethyl Benzyl Nitrile.
Step 3: - 1-(4-Chlorophenyl) Ethyl Benzyl Nitrile reacts with 1,2,4-Triazole in presence of solvent and Catalyst to form the final product Fenbuconazole.

Chemical Reactions: -

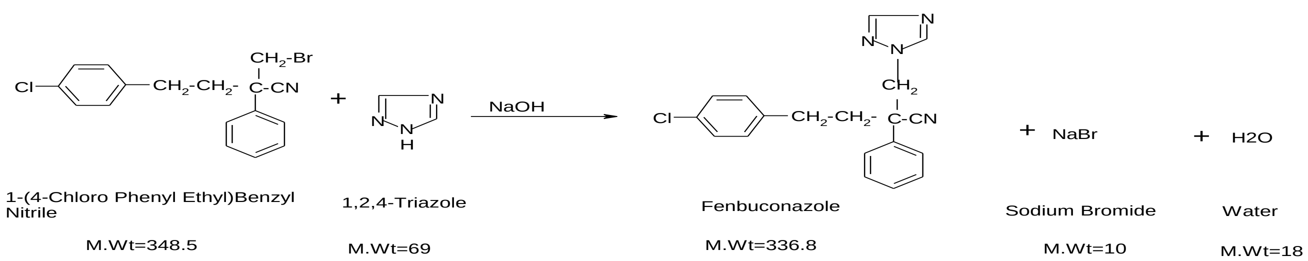
Step 1: -



Step 2: -



Step 3: -



Mass Balance:

83	Material / Mass Balance of Febuconazole Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Benzyl Cynamide	380		Febuconazole	**1000**

2	1-Chloro-2-(4-Chlorophenyl) Ethane	570		HBr Solution	870
3	Methylene Bromide	550		NaBr Salt	300
4	Sodium Hydroxide	200		Recovered Solvent(Xylene)	2430
6	1,2,4 - Triazole	130		Xylene Loss	70
7	Solvent-Xylene	2500		Aqueous Layer to ETP	375
8	Catalyst	12		30% Hydrochloric Acid Solution	647
9	Water	1350			
	TOTAL	**5692**		**TOTAL**	**5692**

84) Ipconazole

Brief Manufacturing Process: -

Step 1: -3-Methyl Ethyl-2-Oxo-Cyclopentane Carboxylate reacts with 4-Chloro-Benzyl Chloride in presence of solvent and catalyst to give 1-(4-Chloro Benzyl)-3-Methyl Ethyl Cyclopentane Carboxylate.

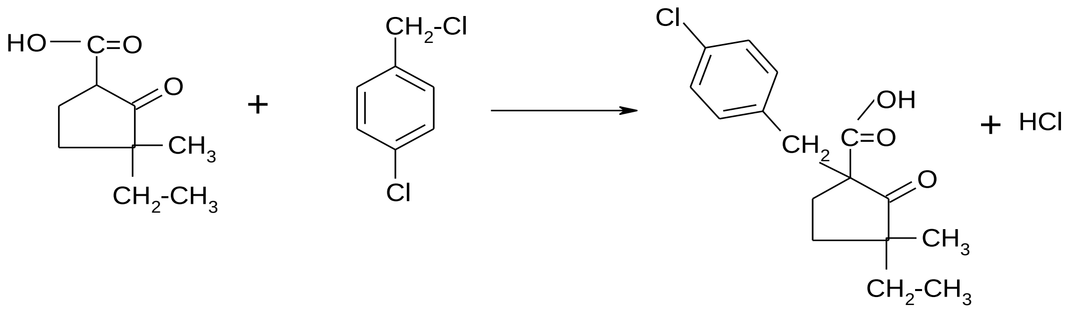
Step 2: -1-(4-Chloro Benzyl)-3-Methyl Ethyl Cyclopentane Carboxylate undergoes rearrangement reaction by means of catalyst in presence of solvent to give 1-(4-Chlorobenzyl)-3-Methyl Ethyl Carboxylate.

Step 3: -1-(4-Chlorobenzyl)-3-Methyl Ethyl Carboxylate undergoes cyclization reaction to form Intermediate-1 as 7-(4- Chlorobenzyl) 4, Methyl Ethyl (-1- Oxaspiro) [2,4] Heptane.

Step 4: -Intermediate- 1 finally reacts with 1,2,4-Triazole in presence of solvent and catalyst to give final product Ipconazole.

Chemical Reactions: -

Step 1: -



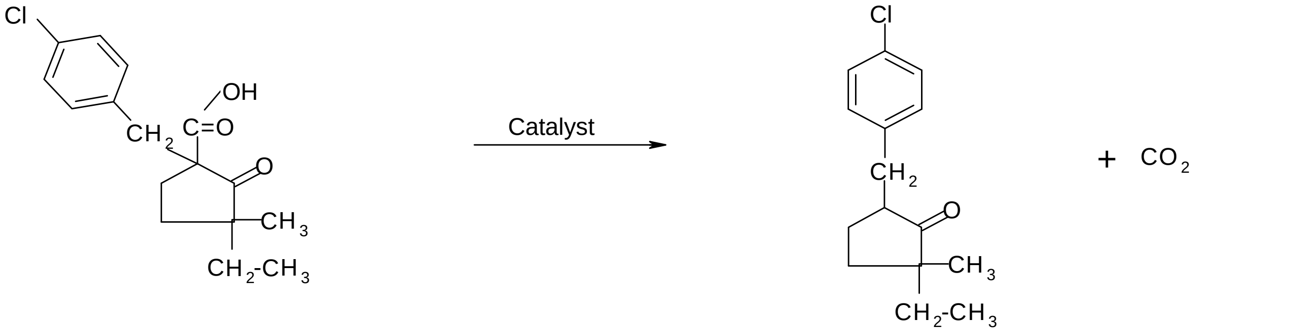
3-Methyl Ethyl-2-Oxo Cyclopentane Carboxilate M.Wt=170

4-Chloro Benzyl Chloride M.Wt=161

1-(4-Chloro Benzyl)3-Methyl Ethyl Cyclopentane Carboxylate M.Wt=294

Hydrochloric Acid M.Wt=36.5

Step 2: -

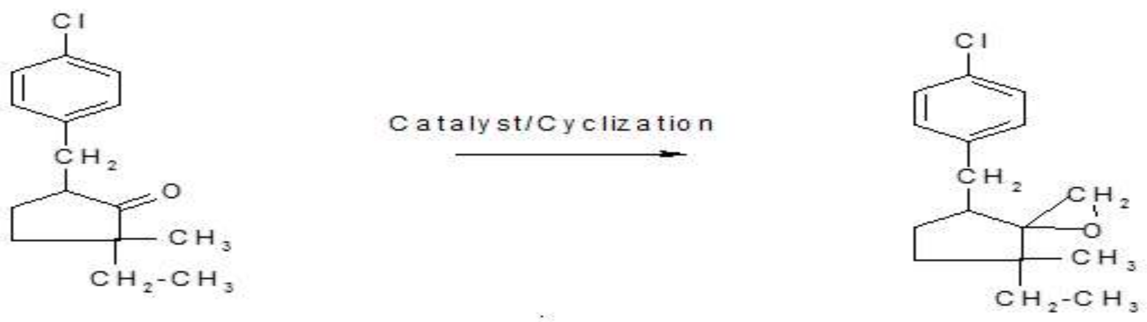


1-(4-Chloro Benzyl)3-Methyl Ethyl Cyclopentane Carboxylate
M.W.294

1-(4-Chloro Benzyl)3-Methyl Ethyl Cyclopentane
M.W.250.5

Carbon Dioxide
M.W.48

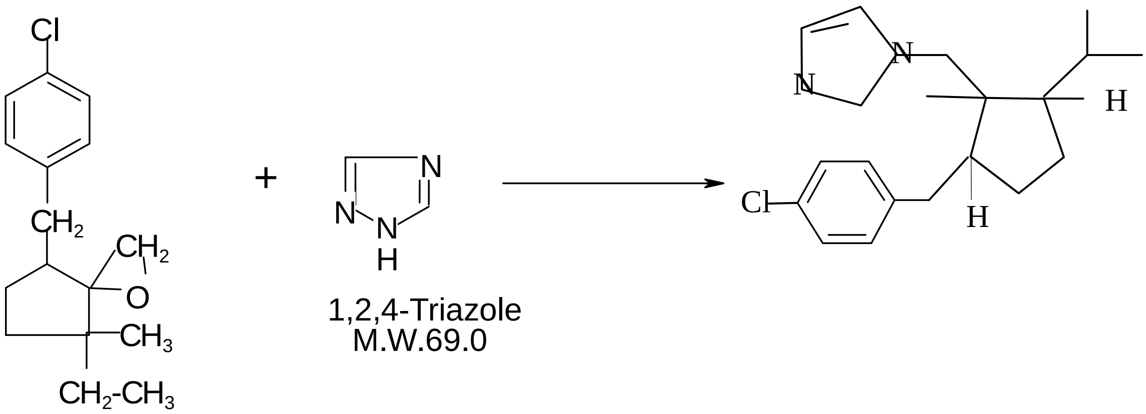
Step 3: -



1-(4-Chloro Benzyl)3-Methyl Ethyl Cyclopentane
M.Wt=250.5

Intermediate-1
1-(4-Chloro Benzyl)3-Methyl Ethyl-2-Oxaspiro [2,3] Butane
(M.W.264.5)

Step 4: -



Intermediate 1
1-(4-chloro Benzyl) 3-methyl ethyl -2-Oxaspiro [2,3] Butane
(M.W.264.5)

1,2,4-Triazole
M.W.69.0

Ipconazole
M.W.333.9

Mass Balance:

84	Material / Mass Balance of Ipconazole All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	3-Methyl Ethyl-2-Oxo Cyclopentane Carboxylate	540		Ipconazole	**1000**
2	Solvent Xylene	2500		Recovered. Solvent (Xylene)	2430
3	4-Chloro Benzyl Chloride	510		Solvent Loss	70
4	Catalyst-1	20		Catalyst Recovered	18
6	Catalyst-2	15		30% Hydrochloric Acid solution	365
7	1,2,4 - Triazole	210		Carbon Dioxide	130
8	Water for Washings	1775		Aqueous Layer to ETP	1557
	TOTAL	**5570**		**TOTAL**	**5570**

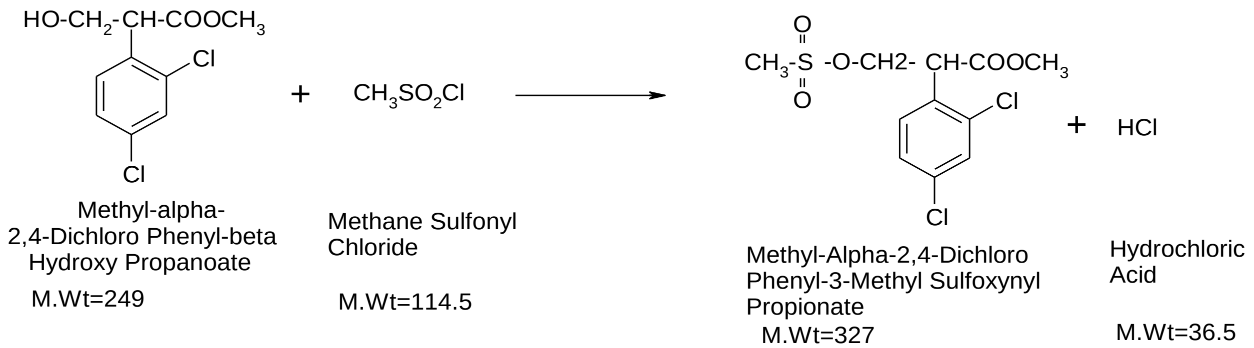
85) Tetraconazole

Brief Manufacturing Process: -

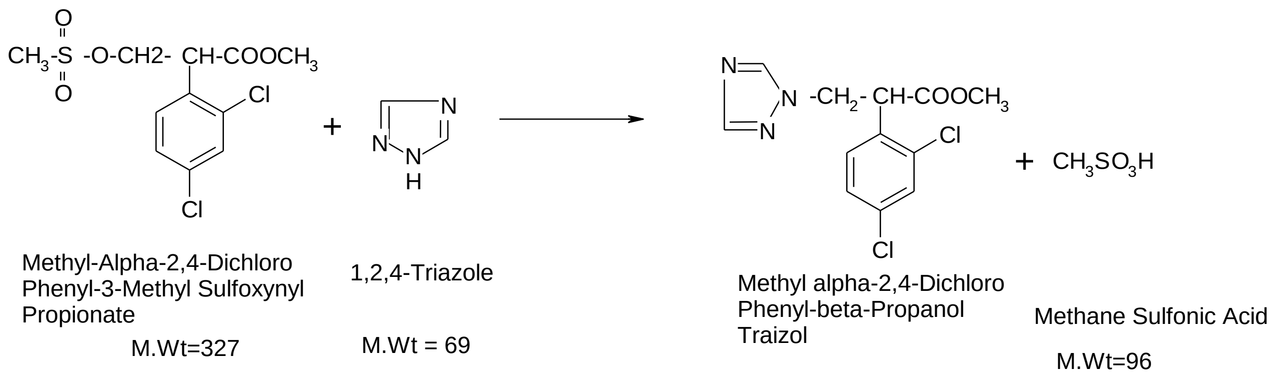
Step 1: -Methane-alpha-2,4-Dichloro Phenyl –beta-Hydroxy Propanoate reacts with methane sulfonyl chloride in presence of solvent as well as catalyst to give methyl-alpha-2,4-Dichloro Phenyl-3-Methyl Sulfoxonyl Propionate (A).
Step 2: -A reacts with 1,2,4-Triazole to give the intermediate methyl-alpha-2,4-Dichloro Phenyl-beta propanol Propionate (B).
Step 3: -B -further undergoes reduction by means of hydrogen as well as catalyst in presence of solvent to give the product 2,4-Dichloro Phenyl Propanol-2-Triazole (C)
Step 4: -C-finally reacts with Tetra Fluoro Ethylene in presence of solvent and catalyst to gives the final product Tetraconazole.

Chemical Reactions: -

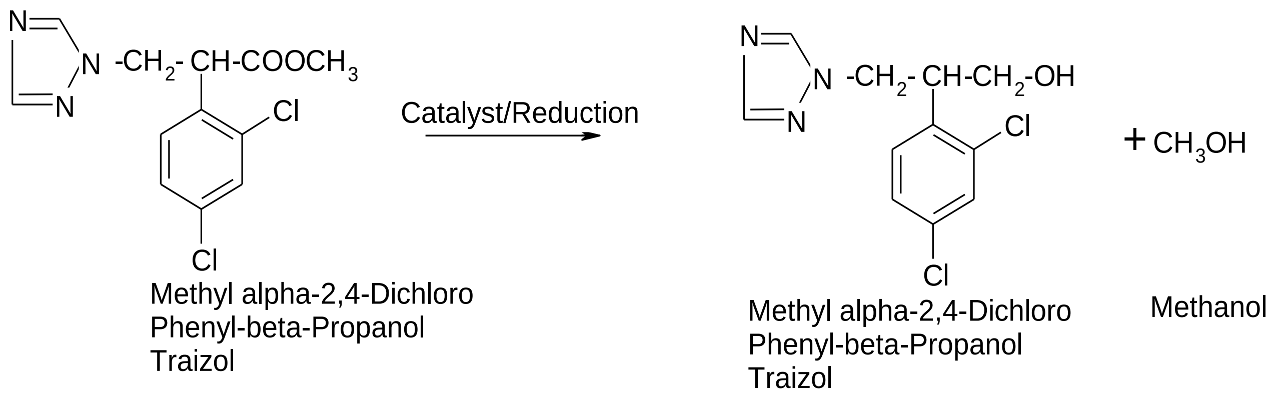
Step 1: -



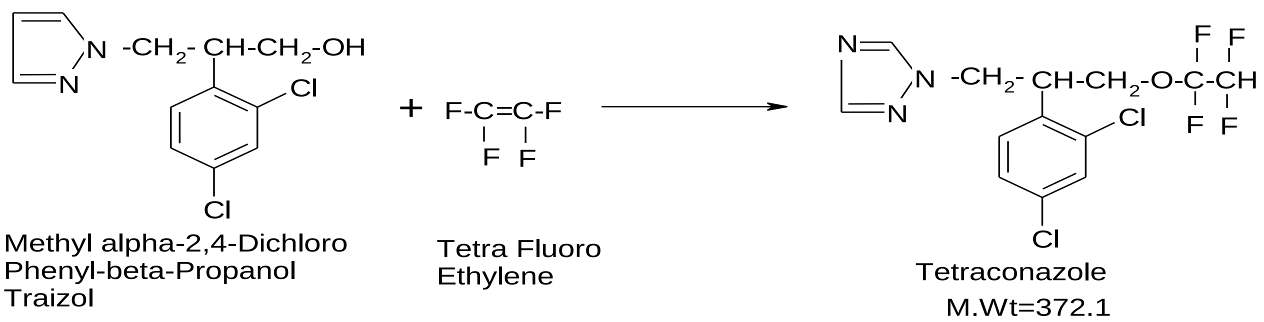
Step 2: -



Step 3: -



Step 4: -



Mass Balance:

85	Material / Mass Balance of Tetraconazole All Quantities are in kg)					
	IN – PUT			OUT – PUT		
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch	
1	Methyl Alpha-2,4, Dichloro Phenyl Beta Hydroxy Propanoate	740		Tetraconazole	**1000**	
2	Methane Sulphonyl Chloride	325		Rec. Solvent(Toluene)	2940	

3	Solvent Toluene	3000		Solvent Loss	60
4	Catalyst	20		30% Hydrochloric Acid Soln.	330
5	Tetrafluoro Ethane	275		Methane Soln.	260
6	Water for Reaction and washing	1750		Methane Distillate	80
7				Aqueous Layer to ETP	1440
	TOTAL	**6110**		**TOTAL**	**6110**

86) Prothioconazole

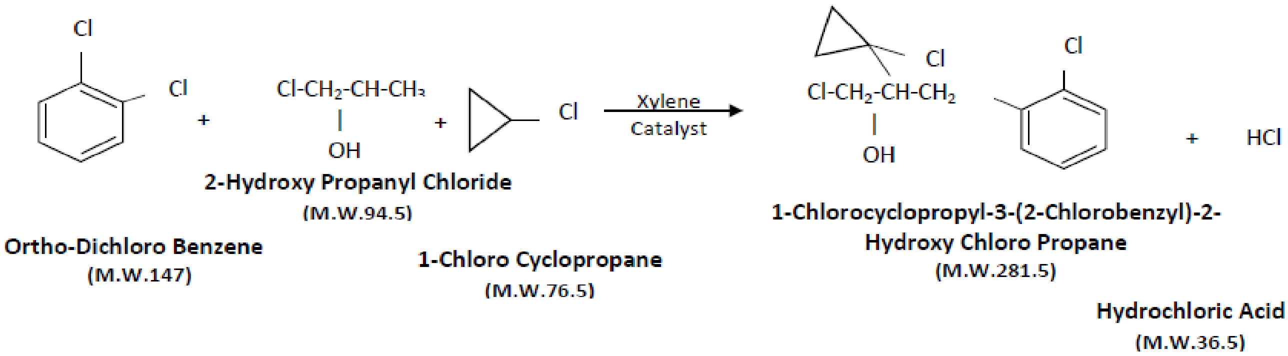
Brief Manufacturing Process: -

Step 1: -Ortho-Dichlorobenzene reacted with 1-Chloro Cyclo Propane & 2-Hydroxy Propanyl Chloride in presence of solvent Xylene and catalyst to get Intermediate (A) 1-Chlorocyclopropyl-3-(2-Chlorobenzyl)-2-Hydroxy Chloro Propane.

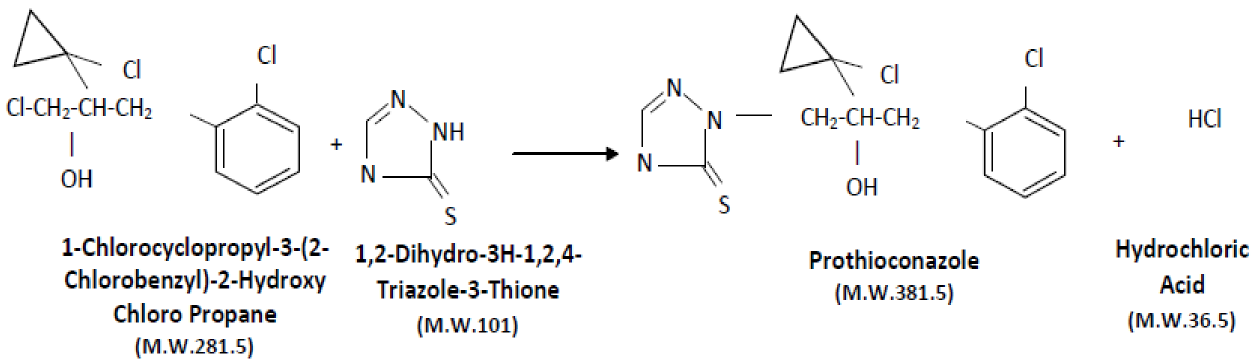
Step 2: -1-Chlorocyclopropyl-3-(2-Chlorobenzyl)-2-Hydroxy Chloro Propane reacted with 1,2-Dihydro-3H-1,2,4-Triazole-3-Thione in presence of solvent and catalyst to get final product Prothioconazole.

Chemical Reactions: -

Step 1: -



Step 2: -



Mass Balance:

86	Material / Mass Balance of Prothioconazole All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Ortho-Dichlorobenzene	460		**Prothioconazole**	1000
2	Chloro Cyclo Propane	240		Recovered Xylene	2430
3	2-Hydroxy Propanyl Chloride	320		Xylene Loss	70
4	Xylene	2500		30% Hydrochloric Acid	750
5	Catalyst	15		Aqueous Layer to ETP	1310
6	2,4 Dihydro 1,2,4 Triazole 5 Thione	325		Tarry Waste	50
7	Water	1750			
	TOTAL	**5610**		**TOTAL**	**5610**

87) Fluquinconazole

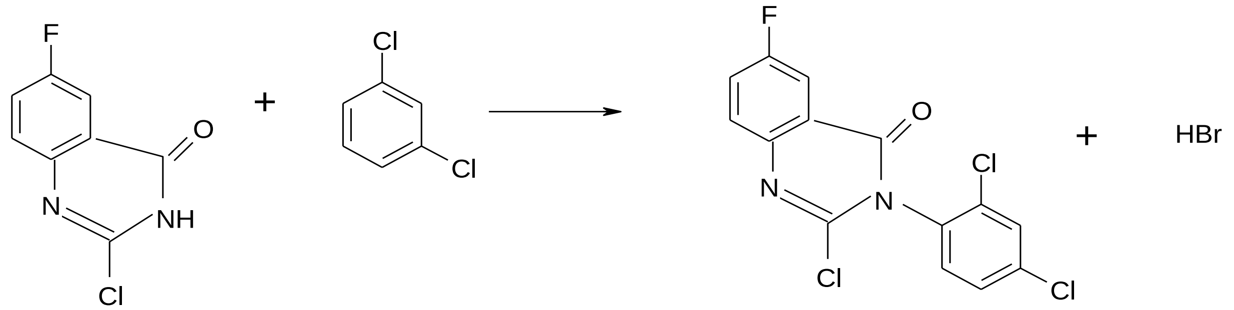
Brief Manufacturing Process: -

Step 1: -2-Chloro 6-Fluoro 4(3H) Quinazolinone reacts with 2, 4 Dichloro Bromo Benzene in presence of solvent Toluene & Catalyst to give 2-Chloro 6-Fluoro 3-(2, 4 Trichloro Phenyl) Quinazolin.

Step 2: - 2-Chloro 6-Fluoro 3-(2, 4 Trichloro Phenyl) Quinazolin on reaction with 1, 2, 4 Triazole in presence of solvent Toluene & Catalyst to give final product Fluquin Conazole.

Chemical Reactions: -

Step 1: -



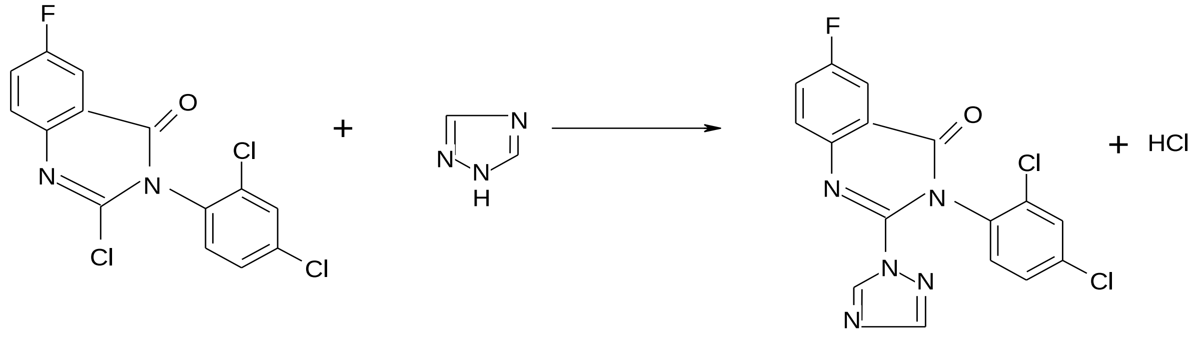
2-Chloro 6-Chloro 4(3H) Quinazoline M.Wt=198.5

2,4-Dichloro Bromo Benzene M.Wt=226

2-Chloro-6-Flouro-3-(2,4-Dichloro Phenyl) Quinazoline M.Wt=423.5

Hydrobromic Acid M.Wt=81

Step 2: -



2-Chloro-6-Flouro-3-(2,4-Dichloro Phenyl) Quinazoline

1,2,4-triazole M.Wt=69

Fluquinconazole M.Wt=376

Hydrochloric Acid M.Wt=36.5

Mass Balance:

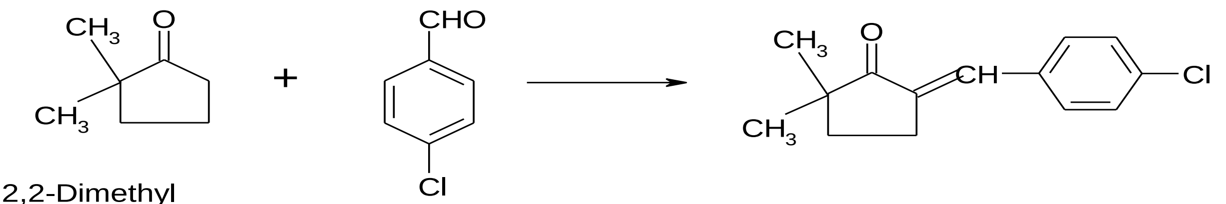
87	**Material / Mass Balance of Fluquinconazole All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2-Chloro-6-Fluoro-4(3H)-Quinazolinone	578		Fluquinconazole	**1000**
2	2,4-Dichloro Bromo Benzene	555		Recovered Toluene	1960
3	Solvent Toluene	2000		Toluene Loss	40
4	Catalyst	10		30% Hydrochloric Acid Soln.	314
5	1,2,4-Triazole	175		28% Hydrobromic Soln.	775
6	Water	1750		Aqueous Layer to ETP	979
	TOTAL	**5068**		**TOTAL**	**5068**

88) Triticonazole

Brief Manufacturing Process: -

Step 1: -2,2 Methyl Cyclopentane reacts with 4-Chloro Benzaldehyde in presence of solvent as well as catalyst to form 5-(4-chlorobenzyl) 2,2 Dimethyl Cyclopentanone.
Step 2: - 5-(4-chlorobenzyl) 2,2 Dimethyl Cyclopentanone undergoes cyclization reaction in presence of solvent as well as catalyst to give Intermediate as Cyclo Intermediate.
Step 3: -This Intermediate finally reacts with 1,2,4 Triazole in presence of solvent and catalyst to give final product Triticonazole.
Chemical Reactions: -

Step 1: -



2,2-Dimethyl Cyclopentanone
M.Wt=112

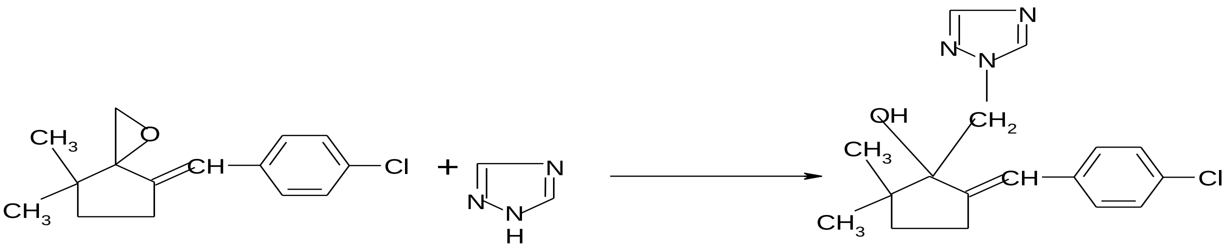
4-Chloro Benzaldehyde
M.Wt=140.5

5-(4-Chloro Benzyl)-2,2-Dimethyl Cyclopentanone
M.Wt=234.5

Step 2: -

5-(4-Chloro Benzyl)-2,2-Dimethyl Cyclopentanone
M.Wt=234.5

Step 3: -



1,2,4-Triazole
M.Wt = 69

Triticonazole
M.Wt=317.5

Mass Balance:

88	Material / Mass Balance of Triticonazole All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2,2-Dimethyl Cyclopentane	380		Triticonazole	**1000**
2	4-Chloro Benzaldehyde	480		Water Distillate	50
3	Catalyst-1	20		Recovered Solvent(DMF)	2930
4	Catalyst-2	15		Solvent Loss	70
5	Solvent DMF	3000		Aqueous Layer to ETP	815
6	1,2,4-Triazole	220			
7	Water for Reaction and Washing	750			
	TOTAL	**4865**		**TOTAL**	**4865**

89) Azaconazole

Brief Manufacturing Process: -

Step - 1

1,3-Dichloro Benzene is reacted with Acetyl Chloride in presence of Aluminum Chloride and Solvent - Ethylene Di Chloride (EDC) to get 2,4-Dichloro Acetophenone.

On completion of reaction mass is drowned to water where by Aluminum Chloride is isolated as 20 % Solution and separated as Aqueous layer from Organic mass on Phase separation.

Step - 2

2,4-Dichloro Acetophenone further undergoes Bromination reaction by liquid Bromine in presence of Solvent - Ethylene Di Chloride (EDC) to get 2,4-Dichloro Phenacyl Bromide. Hydrobromic Acid gas which generates during reaction is scrubbed to Water to result to 28 % Hydrobromic Acid solution.

Step - 3

2,4-Dichloro Phenacyl Bromide reacted with Ethylene Glycol in presence of Solvent - Toluene to get 4-(2-Bromomethyl-1,3-Dioxolane-2-yl)-1,3-Dichlorobenzene.

Step - 4

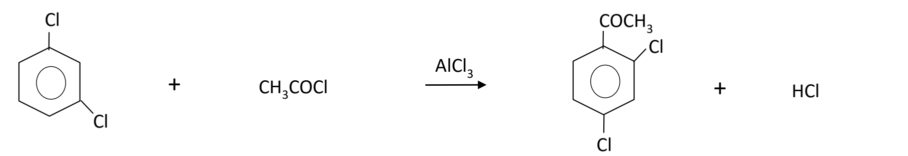
4-(2-Bromomethyl-1,3-Dioxolane-2-yl)-1,3-Dichlorobenzene finally reacted with 1,2,4-Triazole in presence of Potassium hydroxide and Solvent DMF to get crude Azaconazole.

Potassium Bromide Salt which forms during the reaction is isolated from mass by filtration and solvent is recovered by distillation.

Concentrated mass is finally subjected to crystallization using Solvent – Toluene to get Pure product as Azaconazole.

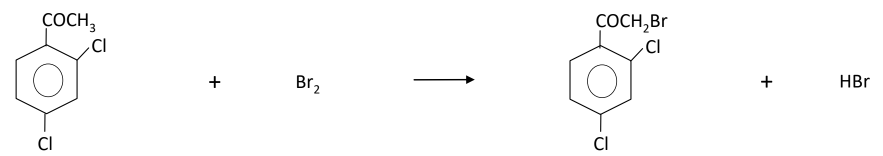
Chemical Reaction:

STEP:1



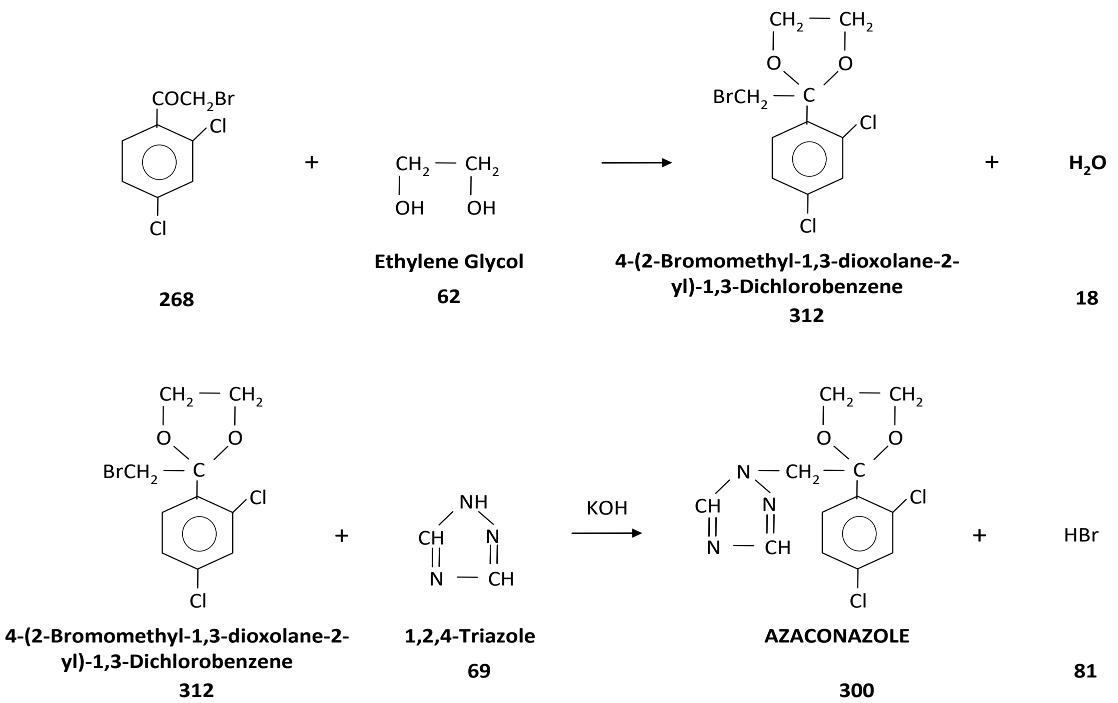
1,3 – Dichloro Benzene	**Acetyl chloride**	**2,4 – Dichloro Acetophenone**	**Hydrochloride Acid**
147	**78.5**	**189**	**36.5**

STEP:2



2,4 – Dichloro Acetophenone	**Bromine**	**2,4 – Dichloro Phenocyl Bromide**	**Hydrobromic Acid**
189	**2 x 80**	**268**	**81**

STEP:3 & 4



Material Balance

89	Material / Mass Balance of Azaconazole All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr No	Raw Materials / Items	Kg/Batch		Product / Bi Product	Kg/Batch
1	1,3 - Di Chloro Benzene	515		Azaconazole	1000
3	Aluminum Chloride	565		Solvent Loss EDC	60
4	Solvent - EDC	1400		20 % Aluminium Chloride	2830
5	Potassium Hydroxide	195		30 % Hydrochloride Solution	430
6	Solvent–Di-Methyl Formamide	1200		Recovered Solvent - DMF	1155
7	Bromine	560		Solvent loss - DMF	45
8	Ethylene Glycol	217		Water Distillate	68
9	1,2,4 - Triazole	240		28 % Hydrobromic Acid	1010
10	Solvent - Toluene	1250		Recovered Solvent - Toluene	1210
11	Water	3852		Solvent loss (Toluene)	40
12				Potassium Bromide	420
13				Aqueous Layer to ETP	1708
14				Distillation Residue	18
	Total	**9994**			**9994**

90) Bromuconazole
Brief Manufacturing Process: -
Step -1

Allyl Bromide reacts with Magnesium in presence of Solvent - Tetra Hydro Furan (THF) to get Allyl Magnesium Bromide.

Step -2

1,3 – Dichlorobenzene is reacted with Chloro Acetyl Chloride in presence of Aluminum Chloride and Solvent –EDC to form 2,4 – Di Chloro Phenacyl Chloride.

Step -3

2,4-Dichloro Phenacyl Chloride – A reacted with Allyl Magnesium Bromide - in presence of THF to give 1- Chloro -2- (2,4 Di Chlorophenyl) -4- Pentene 2- ol.

Step -4

1- Chloro -2- (2,4 Di Chlorophenyl) -4- Pentene 2- ol, reacted with 1,2,4-Triazole in presence of Potassium Hydroxide and Solvent DMF to give 1- [2-(2,4 Dichlorophenyl) -2- Hydroxy -4- Pentenyl] 1 H 1,2,4 Triazole.

Step -5

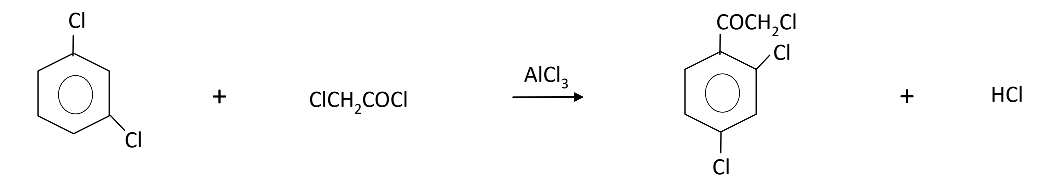
1- [2-(2,4 Di Chlorophenyl) -2- Hydroxy -4- Pentenyl] 1 H 1,2,4 Triazole reacted with Bromine in presence of Solvent EDC as well as catalyst to get 1- [2-(2,4 Di Chlorophenyl) -2- Hydroxy 4,5 Di Bromo, Pentenyl] 1 H 1,2,4 Triazole.

Step -6

1- [2-(2,4 Di Chlorophenyl) -2- Hydroxy 4,5 Di Bromo, Pentenyl] 1 H 1,2,4 Triazole undergoes Cyclization reaction in presence of Potassium carbonate as well as solvent - Toluene to give the final product Bromuconazole.

Chemical Reaction

STEP:1



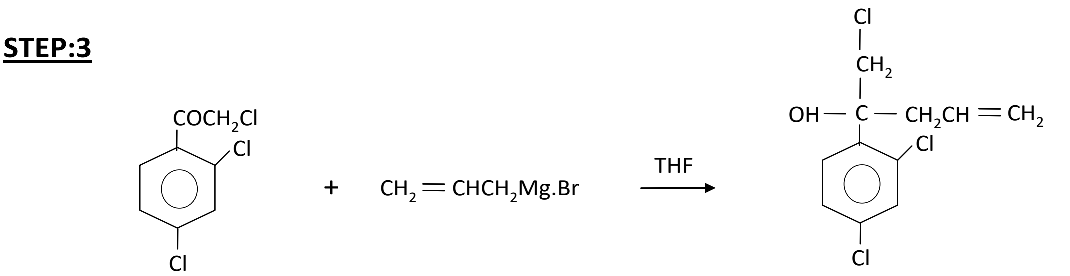
1,3 – Dichloro Benzene	Chloro Acetyl chloride	2,4 – Dichloro Phenacyl Chloride	
147	113	223.5	36.5

STEP:2

$$CH_2=CHCH_2Br + Mg \xrightarrow{THF} CH_2=CHCH_2Mg.Br$$

Allyl Bromide	Magnesium	Allyl Magnesium Bromide
121	24	145

STEP:3

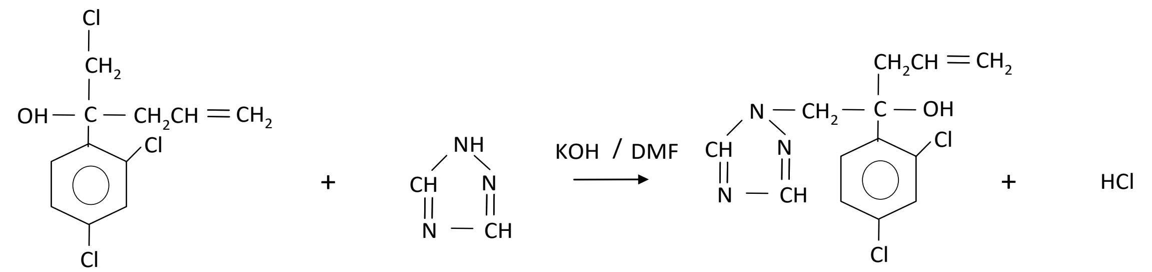


2,4 – Dichloro Phenacyl Chloride — 223.5

Allyl Magnesium Bromide — 145

1- Chloro -2- (2,4 Dichlorophenyl) -4- Pentene -2-Ol — 265.5

STEP:4



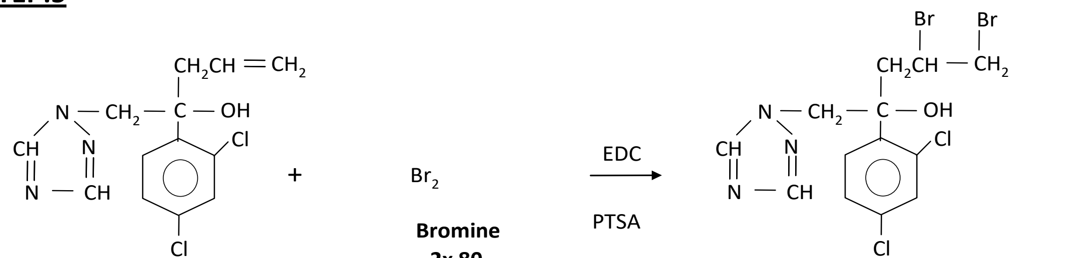
1- Chloro -2- (2,4 Dichlorophenyl) -4- Pentene -2-Ol — 265.5

1,2,4-Triazole — 69

1- [2- (2,4 Dichlorophenyl) -2- Hydroxy -4- Pentenyl 1H 1,2,4 Triazole — 298

36.5

STEP:5

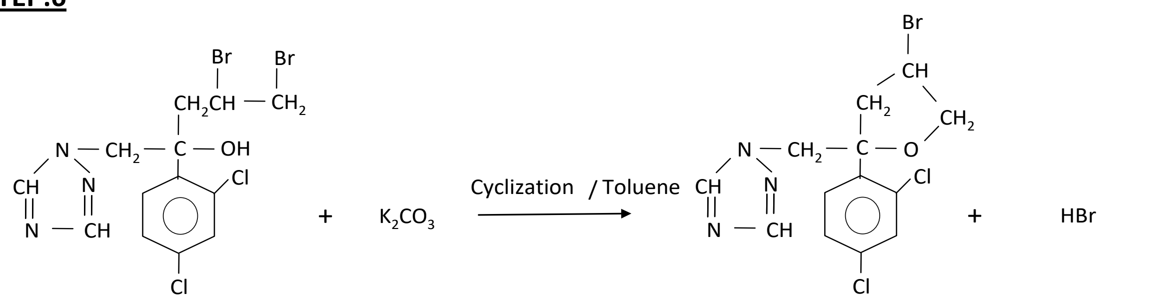


1- [2- (2,4 Dichlorophenyl) -2- Hydroxy 4,5 Di Bromopentenyl] 1H 1,2,4 Triazole — 298

Bromine 2x 80

1- [2- (2,4 Dichlorophenyl) -2- Hydroxy 4,5 Di Bromopentenyl] 1H 1,2,4 Triazole — 458

STEP:6



1- [2- (2,4 Dichlorophenyl) -2- Hydroxy 4,5 Di Bromopentenyl] 1H 1,2,4 Triazole — 458

BROMUCONAZOLE — 377

Hydrobromic Acid — 81

Material Balance:

90	Material / Mass Balance of Bromuconazole All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	1,3 - Di Chloro Benzene	413		Bromuconazole	1000
2	Acetyl Chloride	318		Recovered Solvent - EDC	1940
3	Aluminum Chloride	516		Solvent Loss EDC	60
4	Solvent - EDC	2000		20 % Aluminum Chloride	2580
5	Potassium Hydroxide	157		30 % Hydrochloride Soln	348
6	Magnesium Metal	67		Recovered Solvent - THF	2060
7	Solvent-Dimethyl Formamide	1200		Solvent loss - DMF	40
8	Bromine	898		Magnesium Bromide	298
9	Allyl Bromide	339		28 % Hydrobromic Acid	1794
10	Solvent - THF	2100		Recovered Catalyst	18
11	1,2,4 - Triazole	194		Solvent Recovered – DMF	1160
12	Catalyst	18		Solvent Loss - DMF	40
13	Potassium Carbonate	388		Potassium Chloride	210
14	Solvent - Toluene	1000		Potassium B I Carbonate	280
15	Water	4245		Recovered Solvent - Toluene	965
16				Solvent loss(Toluene)	35
17				Potassium Bromide	334
18				Aqueous Layer to ETP	674
19				Distillation Residue	17
	Total	**13853**			**13853**

91) Etaconazole

Brief Manufacturing Process: -

Step -1

1,3-Dichloro Benzene is reacted with Acetyl chloride in presence of Aluminum chloride and Solvent - Ethylene Di Chloride to get 2,4-Dichloro Acetophenone.

Step -2

2,4-Dichloro Acetophenone further reacted with bromine in presence of Solvent - Ethylene Di Chloride to get 2,4-Dichloro Phenacyl bromide.

Step -3

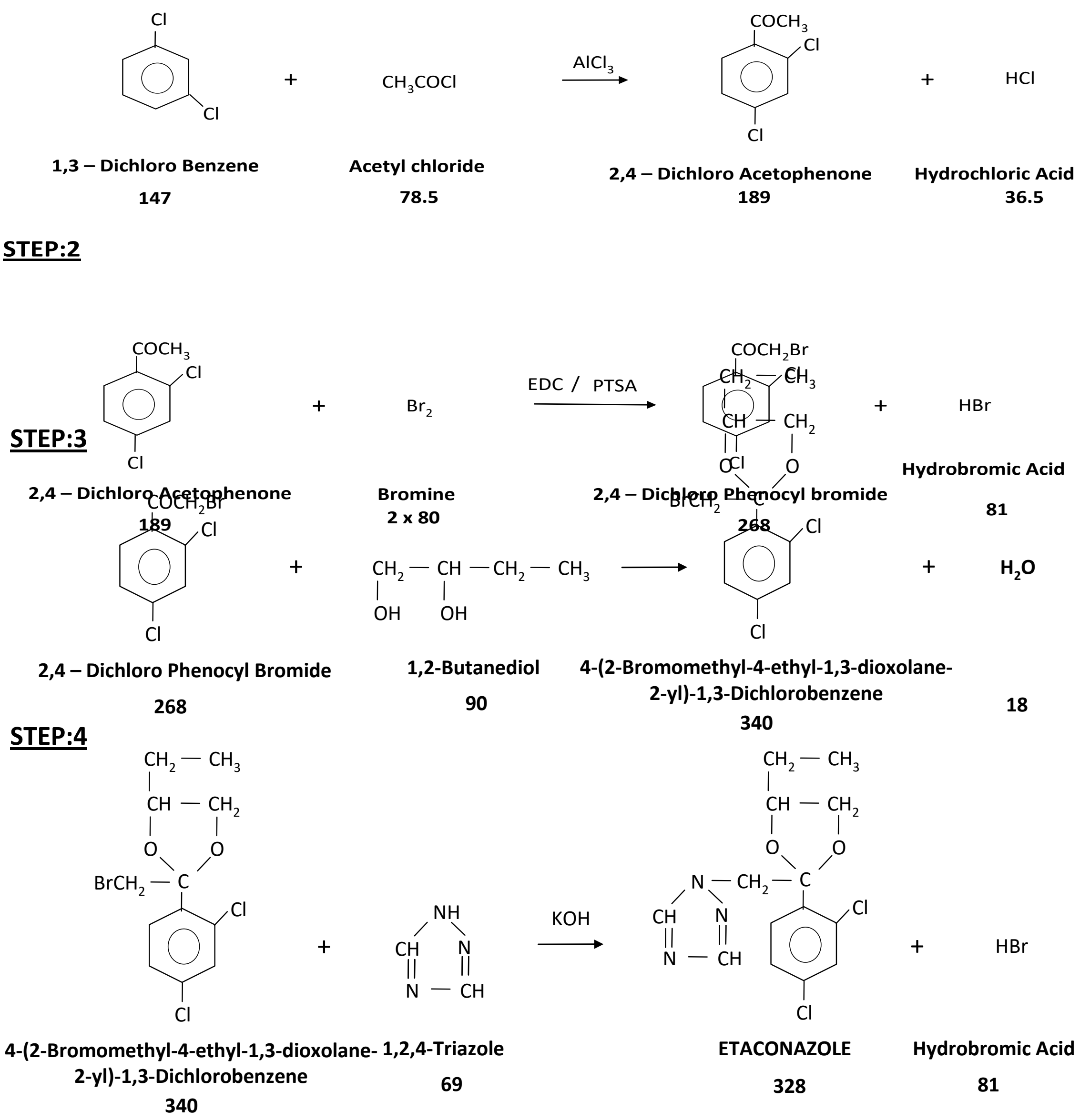
2,4-Dichloro Phenacyl bromide reacted with 1,2-Butanediol in presence of Toluene to get 4-(2-Bromomethyl-4-Ethyl-1,3-Dioxolane-2-yl)-1,3-Dichlorobenzene.

Step -4

4-(2-Bromomethyl-4-Ethyl-1,3-Dioxolane-2-yl)-1,3-Dichlorobenzene further reacted with 1,2,4-Triazole in presence of Potassium hydroxide and Solvent DMF to get final product Etaconazole.

Chemical Reaction

STEP:1



Material Balance:

91	Material / Mass Balance of Etazonazole All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr No	Raw Materials / Items	Kg/Batch		Product / Bi Product	Kg/Batch
1	1,3 Di Chloro Benzene	476		Etazonazole	1000
2	Acetyl Chloride	254		Recovered Solvent - EDC	1765
3	Aluminum Chloride	595		Solvent Loss EDC	35
4	Solvent - EDC	1800		20 % Aluminum Chloride	2964
5	Bromine	516		30 % Hydrochloride Soln	398

6	Catalyst	12		Recovered Solvent - DMF	970
7	1,2 - Butanediol	290		Solvent loss - DMF	30
8	Solvent - Toluene	1300		Potassium Bromide	388
9	Potassium Hydroxide	178		Recovered Catalyst	12
10	1,2,4 - Triazole	222		Recovered Solvent - Toluene	1260
11	Solvent–Dimethyl Formamide	1000		Solvent Loss - Toluene	40
12	Water	4016		28 % Hydrobromic Acid	935
13				Aqueous Layer to ETP	843
14				Distillation Residue	19
	Total	**10659**			**10659**

92) Penconazole

Brief Process Description:

Step -1

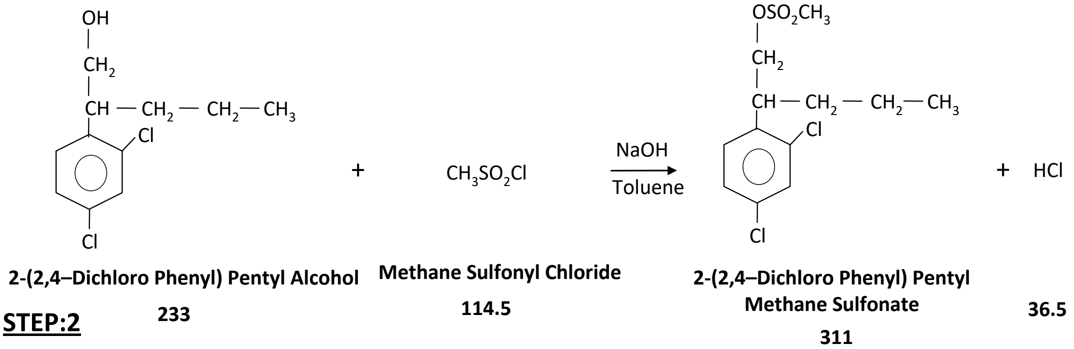
2-(2,4-Dichlorophenyl) Pentyl Alcohol reacted with Methane Sulfonyl Chloride in presence of Sodium hydroxide and solvent- Toluene to give 2-(2,4-Dichloro Phenyl) Pentyl Methane Sulfonate.

Step -2

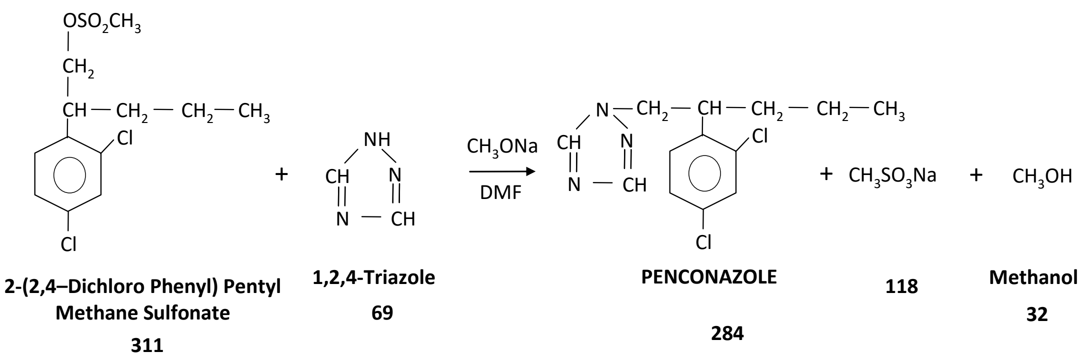
2-(2,4-Dichloro Phenyl) Pentyl Methane Sulfonate further reacted with 1,2,4-Triazole in presence of Sodium Methoxide and Solvent DMF to give final product Penconazole.

Chemical Reaction:

STEP:1



STEP:2



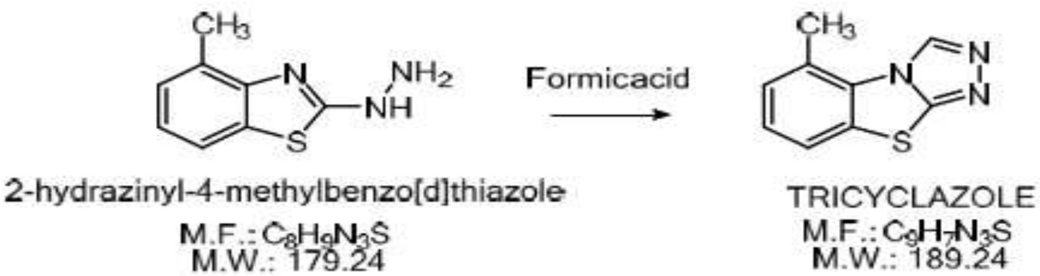
92	Material / Mass Balance of Penconazole All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr No	Raw Materials / Items	Kg/Batch		Product / Bi Product	Kg/Batch
1	2-(2,4–Dichlorophenyl) Pentyl Alcohol	905		Penconazole	1000
2	Methane Sulfonyl Chloride	445		Recovered Solvent-Toluene	1160
3	Sodium Hydroxide	155		Solvent Loss - Toluene	40
4	Solvent - Toluene	1200		Methane Sulfonic Acid Sodium Salt	466
5	1,2,4 - Triazole	264		30 % Hydrochloride Solution	478
6	Sodium Methoxide	208		Recovered Solvent - DMF	1175
7	Solvent - DMF	1200		Solvent loss - DMF	25
8	Water	858		Methanol	124
9				Aqueous Layer to ETP	750
10				Distillation Residue	17
	Total	**5235**			**5235**

93) Tricyclazole

Brief Manufacturing Process: -

2- Hydroxy -4- Methyl Benzothiazole (HMBT) when reacted with Formic Acid in presence of Solvent Ortho Xylene cyclization reaction takes place. Resulted reaction mass is drowned to chilled water. Subsequently it is filtered in a Nutsch. The mass is centrifuged and dried to get in a tray drier for Tricyclazole.

Chemical Reactions: -



Mass Balance:

93	Material / Mass Balance of Tricyclazole All Quantities are in kg)		
	IN – PUT		OUT – PUT

Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2- Hydroxy -4- Methyl Benzothiazole (HMBT)	1000		Tricyclazole	**1000**
2	Formic Acid	2000		Recovered Ortho Xylene	4800
3	Solvent-1 Ortho Xylene	5000		Ortho Xylene Loss	200
4	Water for Washing	1500		Recovered Formic Acid	1900
5				Drying Loss	600
6				Aq. Effluent	1000
	TOTAL	**9500**		**TOTAL**	**9500**

94) Bupirimate:

Brief Manufacturing Process: -

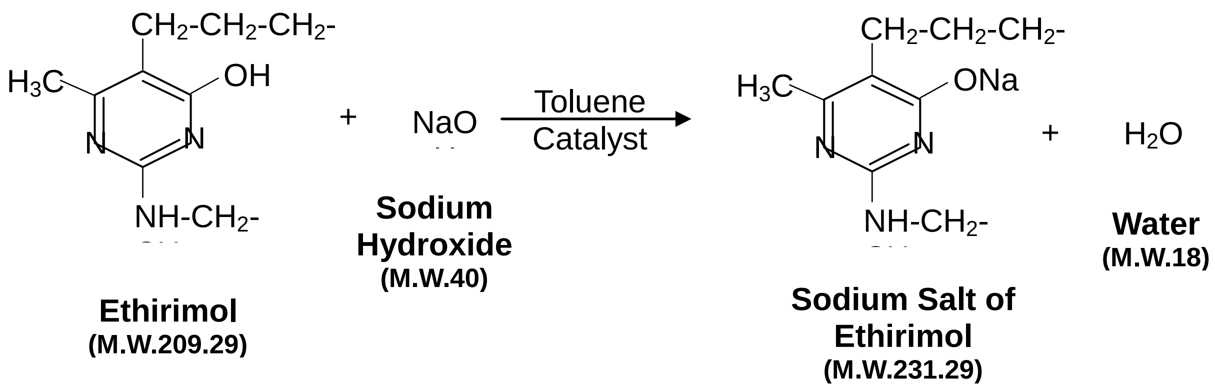
Step 1: - Ethirimol reacted with Sodium Hydroxide in presence of Solvent Toluene as well as Catalyst. This reaction gives out Sodium Salt of Ethirimol. After Completion of reaction Solvent Toluene is recovered which is used for next step of reaction.

Step 2: -

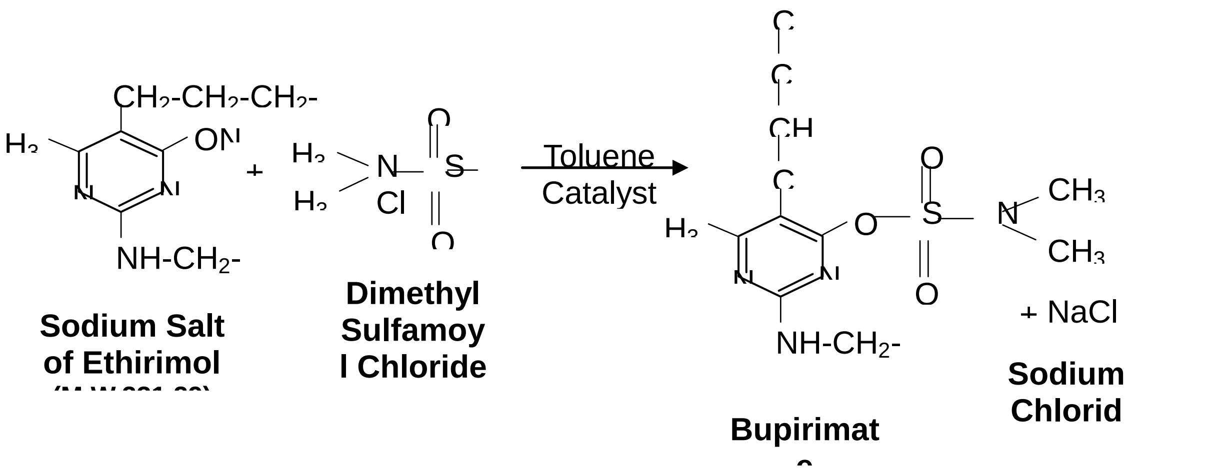
Sodium Salt of Ethirimol further reacted with Dimethyl Sulfamoyl Chloride in presence of Solvent Toluene as well as Catalyst. This reaction gives out Bupirimate as a final product and Solvent Toluene is loss at the end of reaction.

Chemical Reactions: -

Step 1: -



Step 2: -



Mass Balance:

94	Material / Mass Balance of Bupirimate All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Ethirimole	694		Bupirimate	**1000**
2	Solvent - Toluene	2200		NaCl Salt	127
3	Catalyst	12		Recovered Solvent	2130
4	Dimethyl Sulfomyl Chloride	476		Loss Solvent	70
5				Waste Water	55
	TOTAL	**3382**		**TOTAL**	**3382**

95) Imazalil

Brief Manufacturing Process: -

Step-1

2,4-Dichloro Phenacyl bromide reacts with Imidazole in presence of solvent and catalyst to give an intermediate 2,4-Dichloro Phenacyl Imidazole.

Step-2

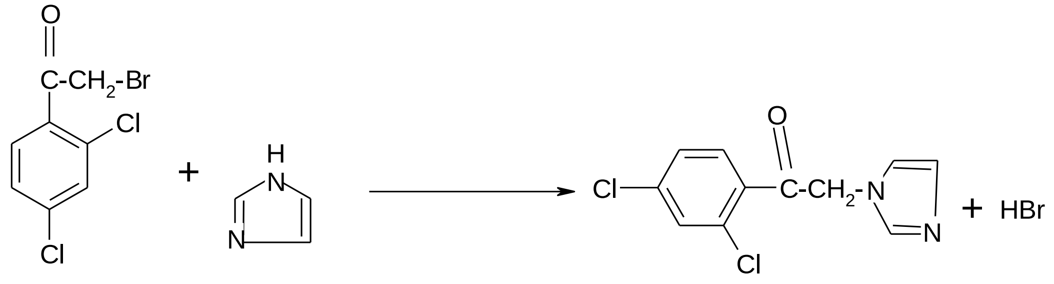
2,4-Dichloro Phenacyl Imidazole undergoes reduction by hydrogenation in presence of catalyst to give 2,4-Dichloro Benzyl Imidazole.

Step-3

2,4-Dichloro Benzyl Imidazole finally reacts with Allyl Chloride in presence of solvent and Catalyst to give the final product Imazalil.

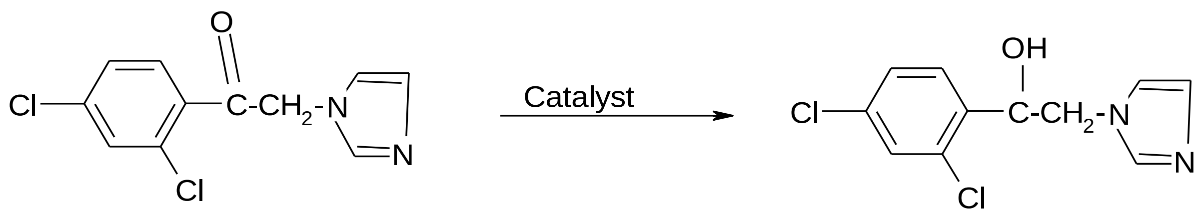
Chemical Reaction:

Step-1



2,4-Dichloro Phenacyl Bromide M.Wt=268 | Imidazole M.Wt=67 | 2,4-Dichloro Phenacyl Immidazole M.Wt=254 | Hydrobromic Acid M.Wt=81

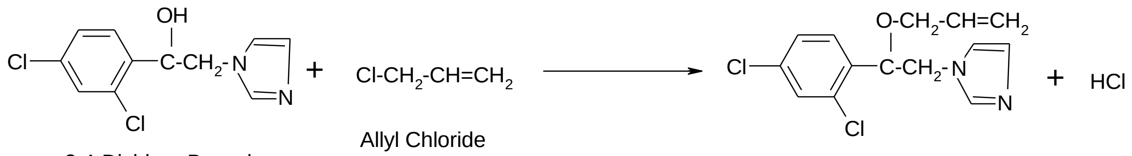
Step-2



2,4-Dichloro Phenacyl Immidazole
M.Wt=254

2,4-Dichloro Benzyl Immidazole
M.Wt=256

Step-3



2,4-Dichloro Benzyl Immidazole
M.Wt=256

Allyl Chloride
M.Wt=76.5

Imazalil
M.Wt=297.2

Hydrochloric acid
M.Wt=36.5

Material Balance:

95	Material / Mass Balance of Imazalil All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	2,4 Dichloro Phenacyl Bromide	950		Imazalil	1000
2	Imidazole	240		Rec. Solvent toluene	2900
3	Catalyst	20		Solvent Loss	100
4	Allyl Chloride	263		28% HBr Solution	990
5	Solvent Toluene	3000		30% Hydrochloric Acid Solution	410
6	Water for Reaction	1500		Aqueous Layer to ETP	573
	Total	**5973**		**Total**	**5973**

96) Triadimenol
Brief Manufacturing Process: -
Step – 1
Triadimefon finally undergoes reduction reaction in presence of solvent and catalyst to give final product Triadimenol.
Chemical Reaction:
Step-1

Triadimefon
M.Wt=293.8

Triadimenol
M.Wt=295.8

Material Balance:

96	Material / Mass Balance of Triadimenol All Quantities are in kg)				
	INPUT			OUTPUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**kg/Batch**
1	Triadimefon	1020		Triadimenol	1000
2	Solvent Toluene	2000		Recovered Solvent toluene	1950
3	Catalyst	20		Solvent Loss	50
4	Water for Washing	500		Aqueous Layer to ETP	540
	Total	**3540**		**Total**	**3540**

97) Triadimefol

Brief Manufacturing Process: -

Step-1

Pinacolne undergoes Bromination reaction by liquid bromine in presence of solvent and catalyst to give Bromo Pinacolone.

Step-2

Bromo Pinacolone reacts with sodium salt of p-chloro phenol to get 1-(4-Chlorophenoxy) Pinacolone as intermediate.

Step-3

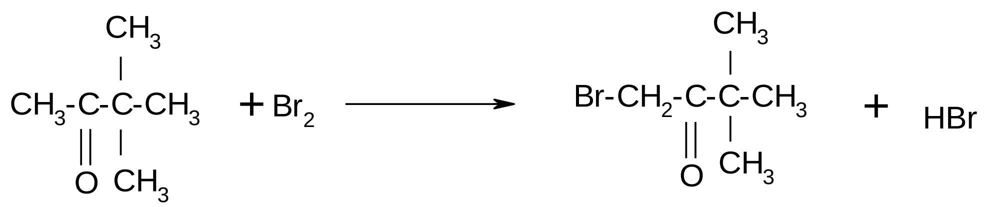
1-(4-Chlorophenoxy) Pinacolone undergoes Bromination reaction by liquid Bromine it gives 1-Bromo-1-(4-Chlorophenoxy) Pinacolone.

Step-4

1-Bromo-1-(4-Chlorophenoxy) Pinacolone finally reacts with 1,2,4-Triazole in presence of solvent as well as catalyst to get final product Triadimefon.

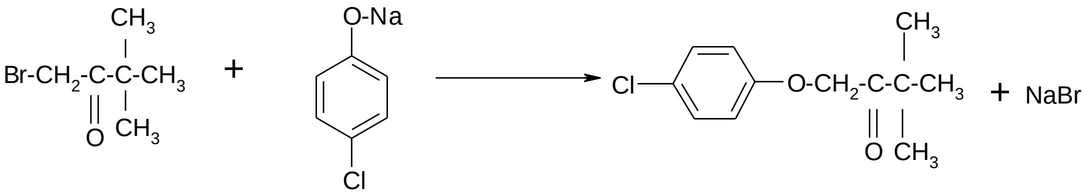
Chemical Reaction:

Step-1



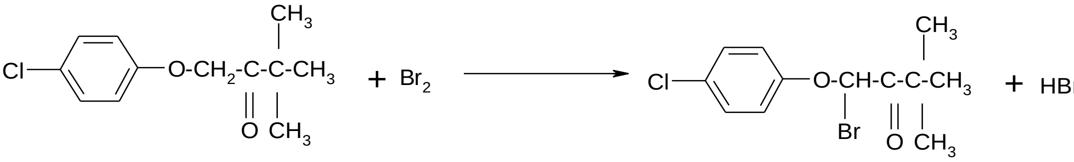
Pinacolone M.Wt=100 | Bromine M.Wt=160 | Bromo-Pinacolone M.Wt=179 | Hydrobromic Acid M.Wt=81

Step-2



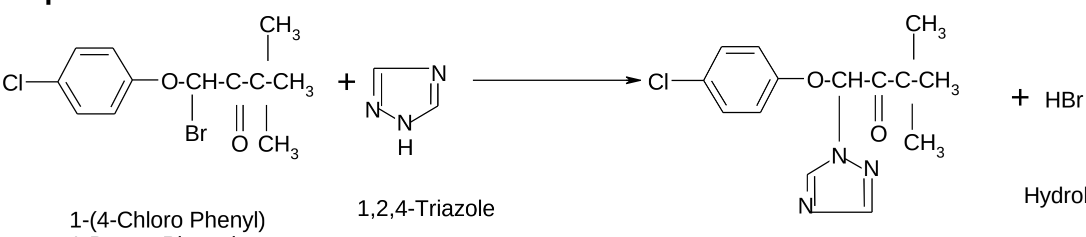
Bromo-Pinacolone M.Wt=179 | 1-(4-Chloro Phenyl) Pinacolone M.Wt=226.5 | Sodium Bromide M.Wt=103

Step-3



1-(4-Chloro Phenyl) Pinacolone M.Wt=226.5 | Bromine M.Wt=160 | 1-(4-Chloro Phenyl) 1-Bromo Pinacolone M.Wt=305.5 | Hydrobromic Acid

Step-4



1-(4-Chloro Phenyl) 1-Bromo Pinacolone M.Wt=305.5 | 1,2,4-Triazole M.Wt=69 | Triadimefon M.Wt=293.8 | Hydrobromic Acid M.Wt=81

Material Balance:

97	Material / Mass Balance of Triadimefol All Quantities are in kg)				
INPUT				OUTPUT	
Sr No	Raw Materials / Items	Kg/Batch		Product / Bi Product	Qty/Batch
1	Pinacolone	365		Triadimefol	1000
2	P-chloro phenol sodium salt	550		Sodium Bromide	360
3	Bromine	1111		20% Hydrobromic Acid Solution	2008
4	1,2,4 Triazole	245		Toluene Solvent Recovered	1940

5	Solvent Toluene	2000		Solvent Loss	60
6	Water for Reaction and washing	1950		Aqueous Layer to ETP	853
	Total	**6221**		**Total**	**6221**

98) Metrafenone

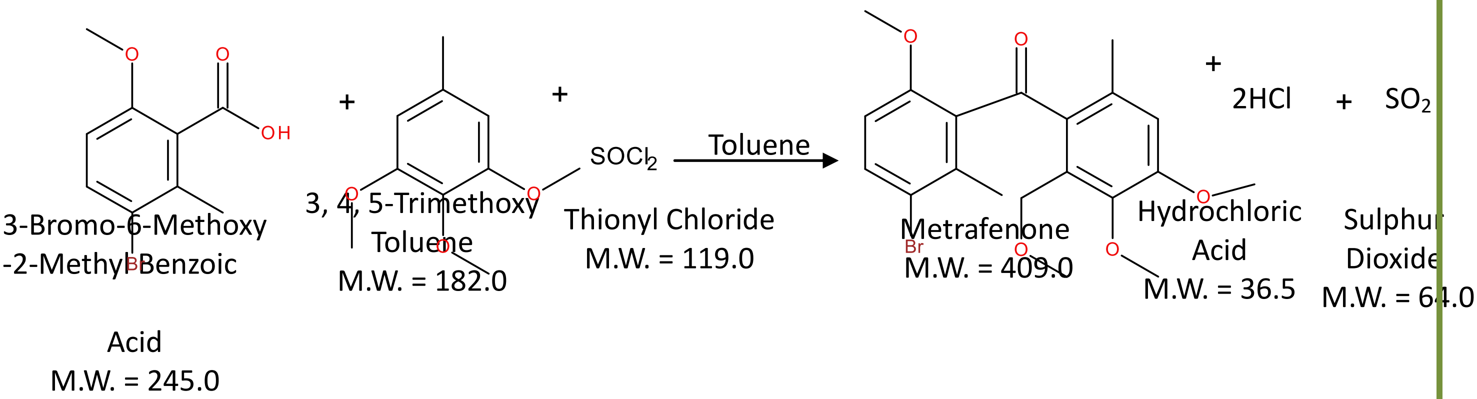
Brief Manufacturing Process:

3-Bromo-6-Methoxy-2-Methyl-Benzoic Acid and 3, 4, 5-Trimethoxy Toluene in Toluene at desired Temperature in presence of Thionyl Chloride is added to a mixture of.

During the reaction Hydrochloric Acid as well as Sulphur Dioxide gases are liberated which are scrubbed to water as well as Dilute Caustic Solution to covert to sealable bi Products as 30 %Hydrochloric Acid Solution as well as 20 % Sodium Sulphite solution.

On completion of reaction mass is cooled to room temperature first and then to further lower temp for crystallization of Product which on filtration and drying we get final product Metrafenone.

Chemical Reactions:



98	**Material / Mass Balance of Metrafenone All Quantities are in kg)**				
	INPUT			**OUTPUT**	
Sr. No.	**Raw Material/Item**	**Kg/Batch**		**Product/Bi Product**	**Kg/Batch**
1	3-Bromo-6-Methoxy-2-Methyl Benzoic Acid	610		Metrafenone	1000
2	3,4,5-Trimethoxy Toluene	450		Recovered Solvent - Toluene	4850
3	Thionyl Chloride	350		Toluene Loss	150
4	Solvent - Toluene	5000		20 % Sodium Sulphite Soln	1580
5	Dilute NaOH Soln for Scrubbing SO2	1420		30 % Hydrochloric Acid Solution	310
6	Water for Hydrochloric Acid solution formation	210		Mother Liquor (ML) recycled	122
7				Distillation Residue	28
	Total	**8040**		**Total**	**8040**

99) Flusilazole

Brief Manufacturing Process: -

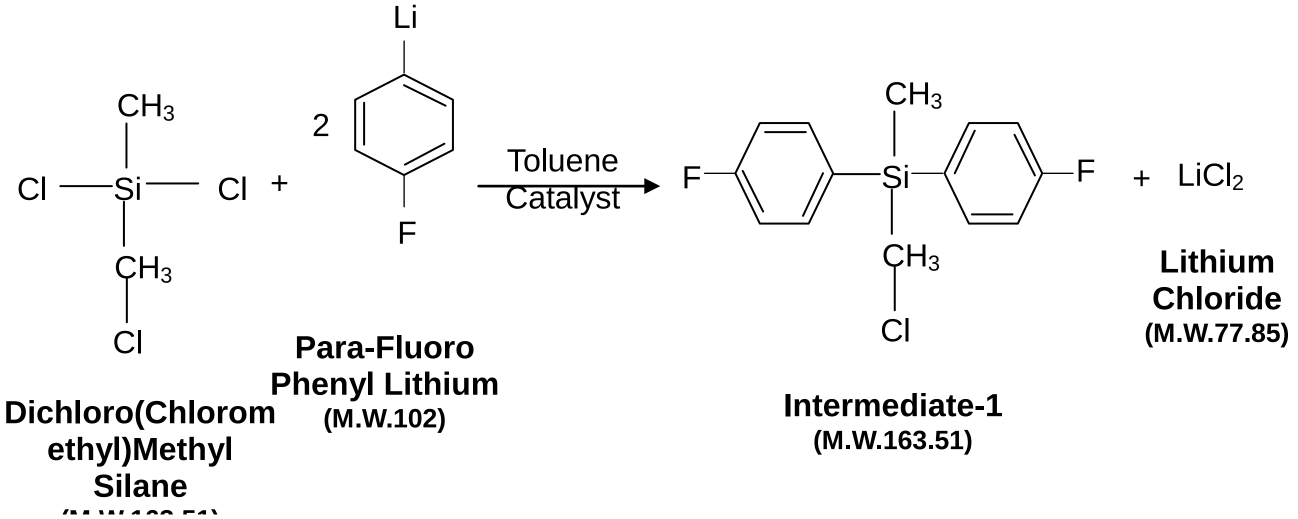
Step 1: - Dichloro (Chloromethyl)Methyl Silane reacted with Para-Fluorophenyl Lithium in presence of Solvent Toluene as well as Catalyst. This reaction gives out Intermediate-1.

After completion of reaction Solvent Toluene is recovered from the reaction mass.

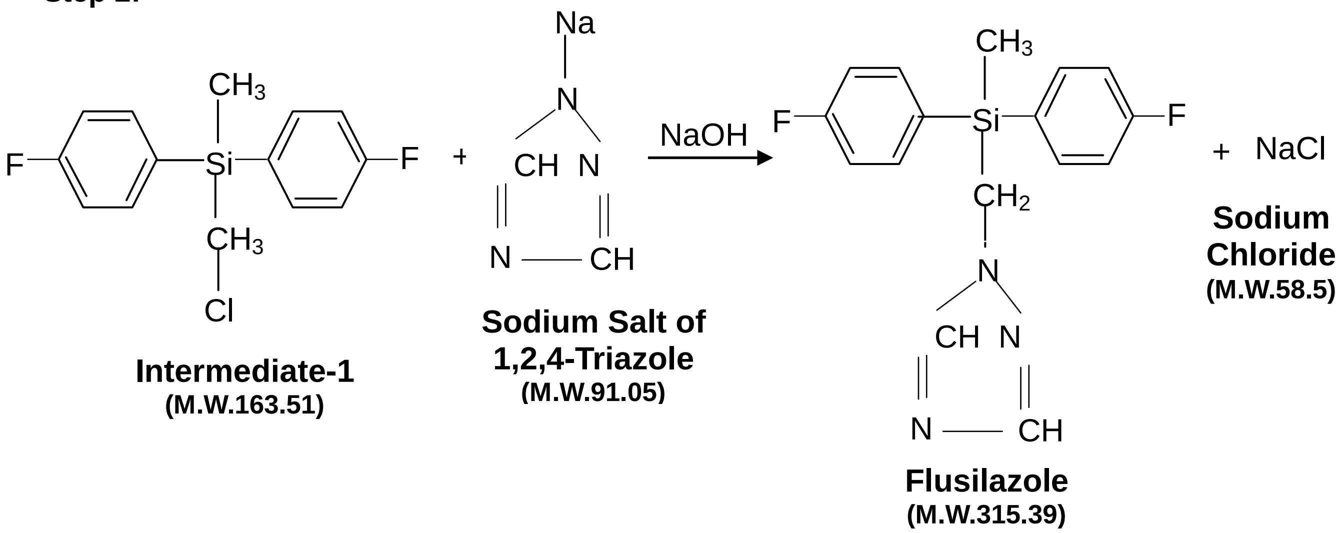
Step 2: - Intermediate-1 reacted with Sodium Salt of 1,2,4-Triazole as well as Sodium Hydroxide. This reaction gives out Flusilazole as a final product.

Chemical Reactions: -

Step 1: -



Step 2:



99	Material / Mass Balance of Flusilazole All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Dichloro (Chloromethyl) Methyl Silane	564		Flusilazole	**1000**
2	Solvent - Toluene	2000		Recovered Toluene	1930
3	Catalyst	15		Loss Toluene	70
4	Para-Fluorophenyllithium	350		Waste Water	1704

5	48% NaOH Solution	345			
6	1,2,4 Triazole	230			
7	Water for Reaction	1200			
	TOTAL	**4704**		**TOTAL**	**4704**

100) Prochloraz:

Brief Manufacturing Process:

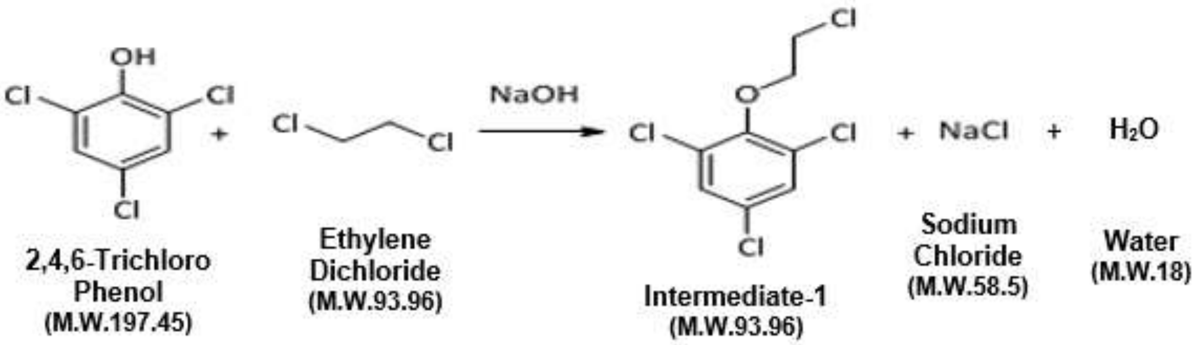
Step 1: - Sodium Salt of 2,4,6-Trichlorophenol is reacted with Ethylene Dichloride in presence of NaOH. This reaction gives out Intermediate-1.

Step 2: - Intermediate-1 further react with N-Propyl Amine to give Intermediate-2.

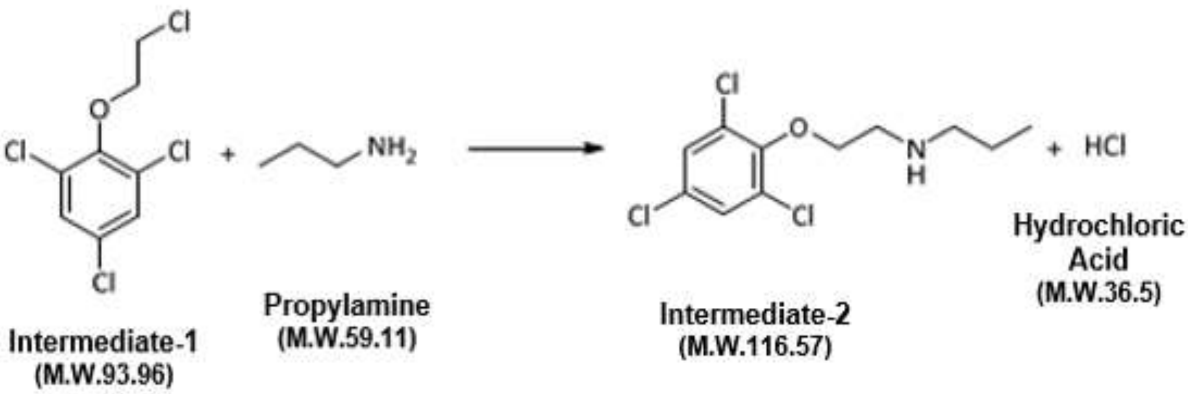
Step 3: - Intermediate-2 is further react with 1,1'-Carbonyldiimidazole (CDI) in presence of Toluene. This reaction gives out Prochloraz as a final product.

Chemical Reactions: -

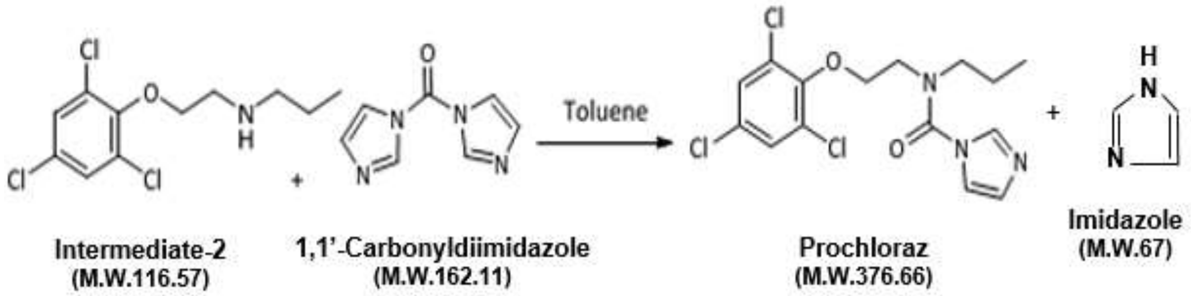
Step 1: -



Step 2: -



Step 3: -



100	Material / Mass Balance of Prochloraz All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2,4,6-Trichloro Phenol	750		Prochloraz	**1000**
2	NaOH	180		Aqueous Layer to ETP	3525
3	Water	3250		Recovered EDC	2077
4	EDC	2820		Loss EDC	743
5	N-Propyl amine	1310		Recovered n-Propylamine	891
6	CDI	525		Loss n-Propylamine	419
7	Toluene	2500		Recovered Toluene	1842
8				Loss Toluene	658
9				Imidazole	180
	TOTAL	**11335**		**TOTAL**	**11335**

101) Mycobutanil

Brief Manufacturing Process: -

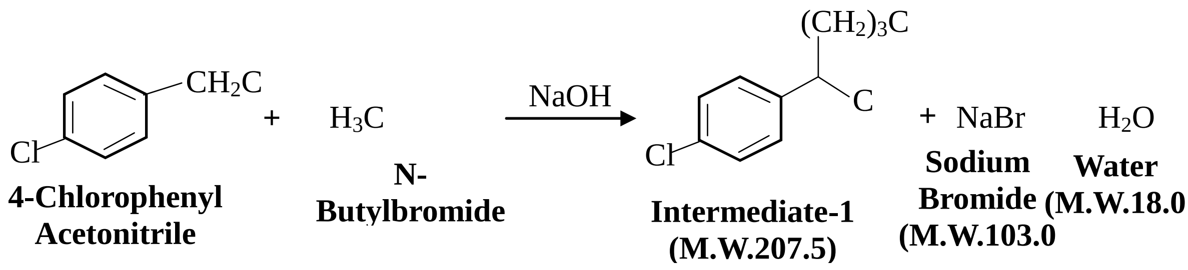
Step 1: - 4-Chlorophenyl Acetonitrile is reacted with n-Butyl Bromide in presence of a Phase transfer Catalyst and Caustic Soda Lye at 50- 58°C. After the completion of reaction Intermediate product is isolated by Vacuumdistillation.

Step 2: - The Intermediate from step 1 is reacted with Dibromomethane and C.S. Lye at 55 – 65°C. Maintain the reaction for 3- 4 hrs at the above temperature until the reaction is completed. Separate the Organic layer and send the aqueous layer of NaBr solution for bromine recovery. Organic layer is distilled to get pure Bromo Intermediate.

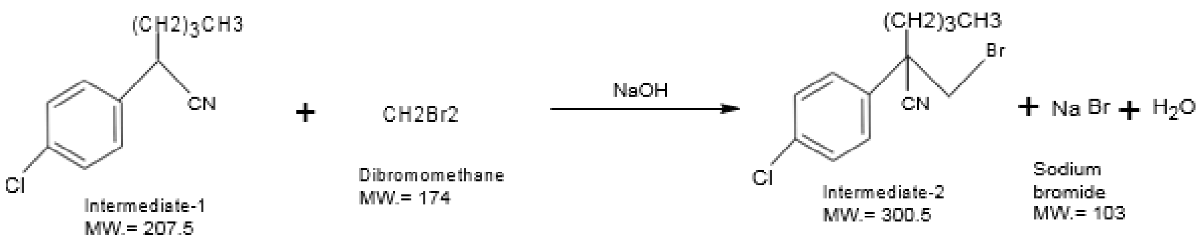
Step 3: - Charge Bromo Intermediate, Dimethyl Formamide, 1,2,4-Trizole and C.S. Lye in the reactor and maintain the mass under stirring at 75- 85°C temperature until the reaction is completed. Recover DMF under vacuum and take the mass in Toluene.

The slurry is crystallized, centrifuged and the cake is dried to get Myclobutanil Technical. The Toluene solvent is recovered from the ML by distillation and recycled.

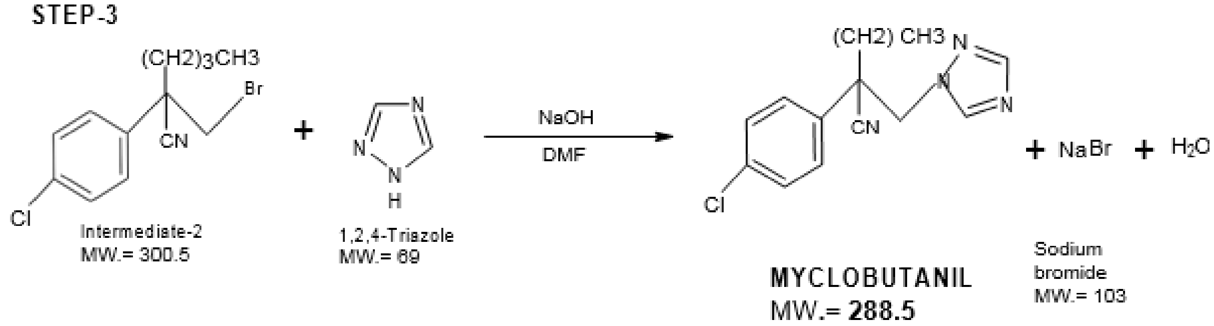
Chemical Reactions: -
Step :1-



STEP-2



STEP-3



Mass Balance:

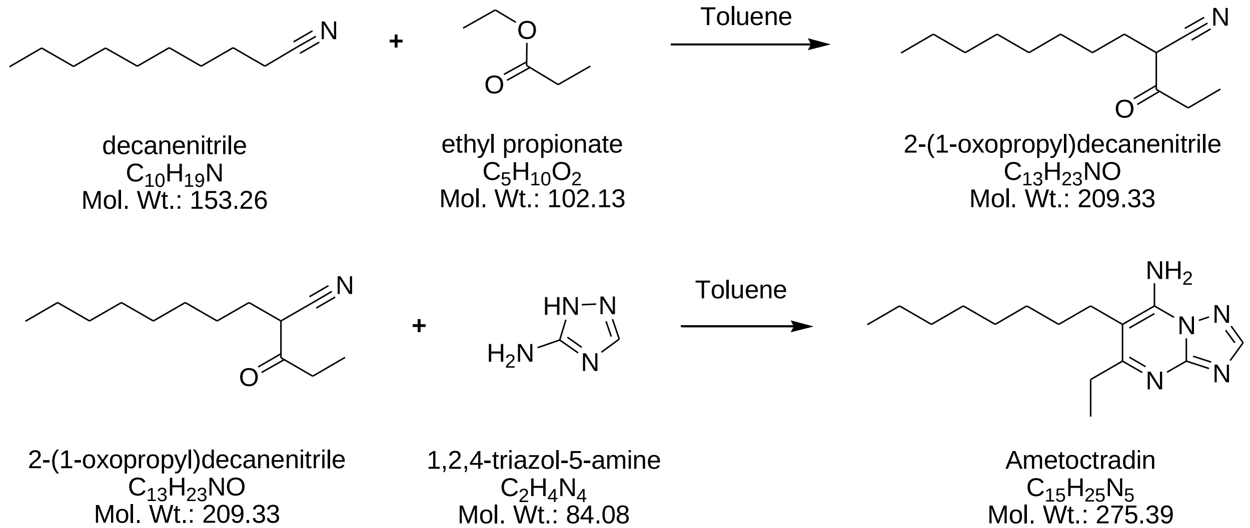
101	**Material / Mass Balance of Mycobutanil All Quantities are in kg)**			
	IN – PUT		**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**	**Product / By product**	**Kg/Batch**
1	4-Chlorophenyl Acetonitrile	600	Mycobutanil	**1000**
2	n-Butyl Bromide	525	Recovered DMF	1450
3	TBAB	15	DMF Loss	50
4	C S Lye	675	Recovered Toluene	1950
5	Dibromomethane	675	Toluene Loss	50
6	DMF	1500	20 % NaBr Soln for Bromine recovery	7125
7	Toluene	2000	Aqueous Layer to ETP	1290
8	1,2,4-Triazole	260	Distillation Residue	35
9	Water for NaBr Solution	5700		
10	Water for washings	1000		

	TOTAL	12950		TOTAL	12950

102) Ametoctradin
Manufacturing Process

The Solvent Toluene and Sodium Ethoxide are charged. Decanenitrile and Ethyl Propionate are added. The temperature is raised to 80°C and the reaction is maintained for 6 hours to complete. After completion of the reaction, the mass is cooled to 30°C and water is added. 30% Hydrochloric Acid is added to neutralize the mass and aqueous phase is separated. 1,2,4-Triazole-5-Amine is added to the organic phase along with Catalyst. The temperature is raised to reflux and reaction water is collected azeotropically. After complete removal of water, the mass is cooled to 70°C and water is added. The aqueous phase is separated and organic phase is cooled to 0°C to crystallize the product. The slurry is filtered and dried to obtain Ametoctradin.

Chemical reactions



102	Material / Mass Balance of Ametoctradin All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Ethyl propionate	460		**Ametoctradin**	**1000**
2	Decanenitrile	690		Recovered Solvent Toluene	2900
3	Sodium methoxide	250		Toluene Loss	100
4	Toluene	3000		Water from Reaction	70
5	30% Hydrochloric Acid	550		Aqueous Layer to ETP	5175
6	1,2,4-Triazole-5-Amine	340		Drying Loss	50
7	Catalyst	5			
8	Water	4000			
	TOTAL	**9295**		**TOTAL**	**9295**

Group-6Strobilurins/ Methoxyacrylate/Carbanilate Fungicides/Mono Carboxylic Acid Amide/Hydroxy Aniline G-1

103) Pyraclostrobin

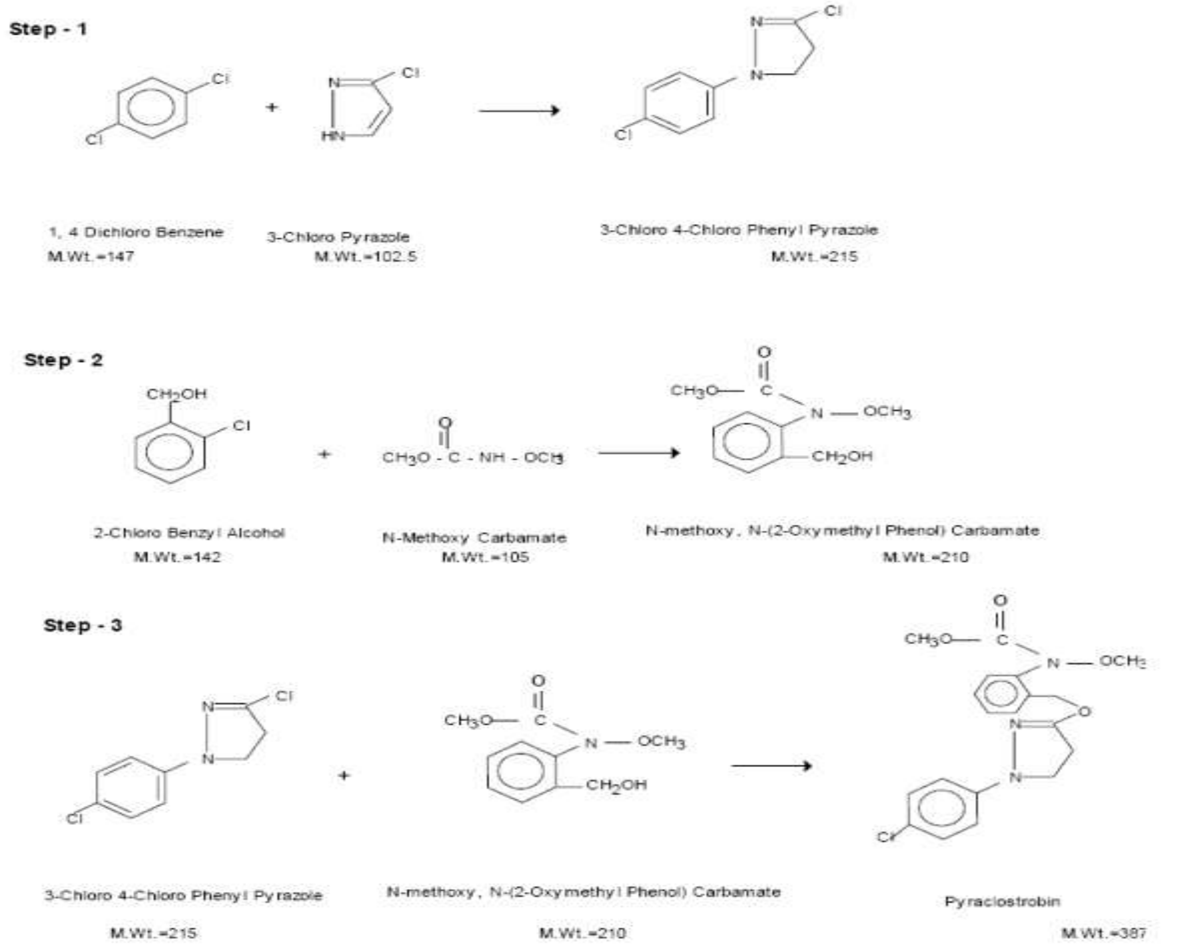
Brief Manufacturing Process: -

Step 1: -1, 4 Dichloro Benzene reacts with 3-Chloro Pyrazole in presence of catalyst & solvent Xylene to form Intermediate (A) as 3-Chloro 4-Chloro Phenyl Pyrazole.

Step 2: -2-Chloro Benzyl Alcohol reacts with N-Methoxy Carbamate to form 2nd Intermediate (B) N-Methoxy, N-(2-Oxymethyl Phenol) Carbamate.

Step 3: - (A) & (B) then undergoes Condensation reaction in presence of Catalyst & Solvent Xylene gives the final product Pyraclo Strobin.

Chemical Reactions:



Mass Balance:

103	Material / Mass Balance of Pyraclostrobin All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch

1	1,4 Dichloro Benzene	422		Pyraclostrobin	**1000**
2	3 – Chloro Pyrazole	275		Recovered Solvent – Xylene	3920
3	Solvent – Xylene	4000		Solvent Loss Xylene	80
4	Catalyst	10		30% Hydrochloric Acid Solution	950
5	2 – Chloro Benzyl Alcohol	350		Aqueous Effluent to ETP	905
6	N – Methoxy Carbamate	270		Distillation Residue	22
7	Water	1550			
	TOTAL	**6877**		**TOTAL**	**6877**

104)Azoxystrobin

Brief Manufacturing Process: -

Step 1: -2-Caumaranone is reacted with methyl format in presence of Di methyl Carbonate and Sodium Hydride as well as Solvent -Toluene to form 3- Methoxy Methylene -1- Benzo furan -2-(3-H) – One

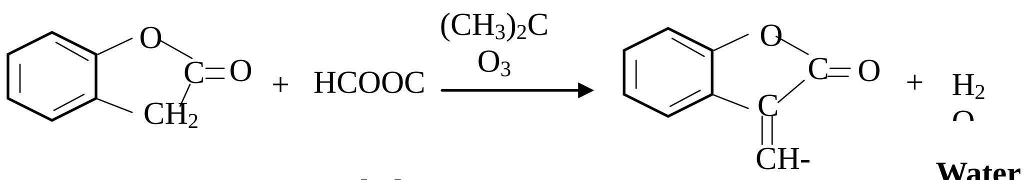
Step 2: -3- Methoxy Methylene -1- Benzofuran -2-(3-H) – One reacted with Sodium Methoxide in presence of Solvent – EDC to form Sodium -2- [1,3 Dimethoxy -3- Oxoprop -1- en -2- yl] Phenolate.

Step 3: -Sodium -2- [1,3 Dimethoxy -3- Oxoprop -1- en -2- yl] Phenolate is reacted with 4,6 – Dichloro Pyrimidine in presence of Solvent – Toluene to give Methyl -2- [2- {(6- Chloro Pyrimidine -4 –yl)} Oxy Phenyl] -3- Methoxyprop -2- Ethanoate.

Step 4: - Methyl -2- [2- {(6- Chloro Pyrimidine -4 –yl)} Oxy Phenyl] -3- Methoxyprop -2- Ethanoate O- Cyano Phenol in presence of Potassium Hydroxide and Solvent – Di Methyl Formamide to give the Final product as Azoxystrobin.

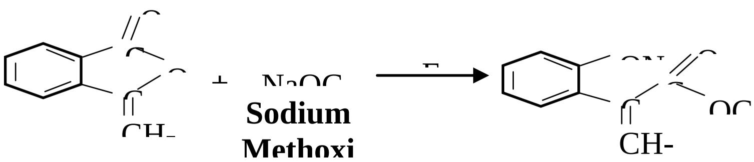
Chemical Reactions: -

Step 1: -



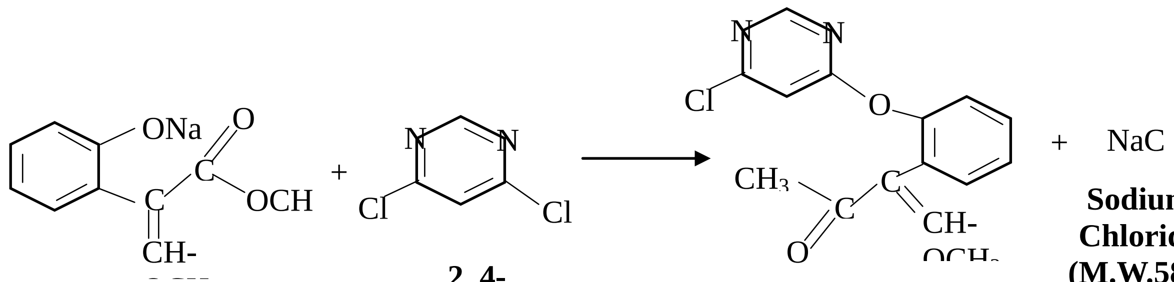
2- Caumaranone **Methyl Formate** **3- Methylmethylidene-1-Benzofuran-2-One** **Water (M.W.18.0)**

Step 2: -



3- Methylmethyliden **Sodium-2- [1, 3- Dimethoxy-3-**

Step 3: -



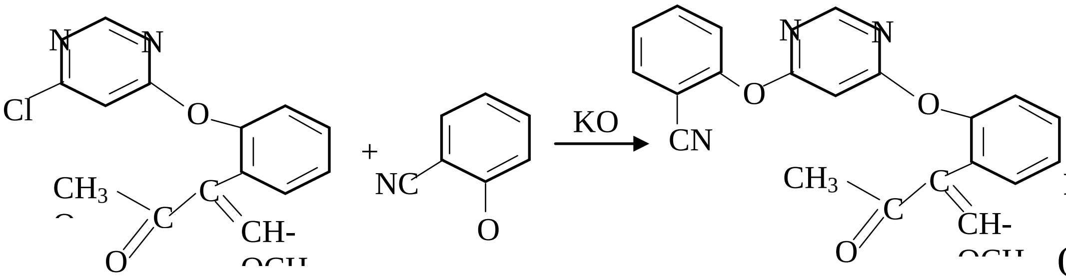
Sodium-2-[1, 3-Dimethoxy-3-Oxoprop-1-en-2-yl]-Phenolate

2, 4-Dichloro Pyrimidine

Methyl-2- [2-(6-Chloro Pyrimidine-4-yl) Oxyphenyl-3-Methoxyprop-2-Enoate

Sodium Chloride (M.W.58.5

Step 4: -



\+ KC + H_2O

Potassium Chloride (M.W.74.5)

Water (M.W.18.0

ONa

Methyl-2- [2-(6-Chloro Pyrimidine-4-yl) Oxyphenyl-3-Methoxyprop-2-Enoate

O-Cyano Phenol

Azoxystrobin

Mass Balance:

104	Material / Mass Balance of Azoxystrobin All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By Product	Kg/Batch
1	2-Caumaranone	350		Azoxystrobin	**1000**
2	Methyl Formate	142		Recovered Solvent – Toluene	1370
3	Di Methyl Carbonate	216		Solvent Loss (Toluene)	30
4	Sodium Hydride	58		Sodium Chloride	150
5	Solvent – Toluene	1400		Recovered Solvent – EDC	1160
6	Sodium Methoxide	128		Solvent Loss (EDC)	40
7	Solvent – EDC	1200		Potassium Chloride	190
8	4,6 - Di Chloro Pyrimidine	352		Solvent Recovered – DMF	1160
9	Ortho Cyano Phenol	283		Solvent Loss (DMF)	40
10	Potassium Hydroxide	133		Aqueous Layer to ETP	1183
11	Solvent – DMF	1200		Distillation Residue	19

12	Water	880			
	TOTAL	**6342**		**TOTAL**	**6342**

105) Pyroxystrobin

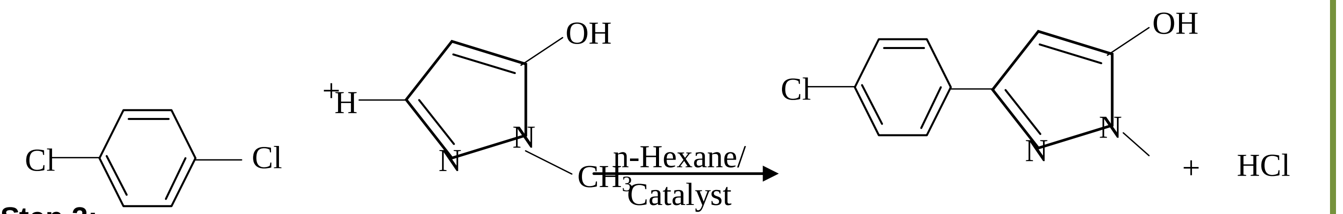
Brief Manufacturing Process: -

Step 1: - 1,4-Dichloro Benzene reacted with 2-Methyl-3-Hydroxy-5H-Pyrazole in presence of Solvent n-Hexane and Catalyst to gives the Intermediate as 2-Methyl-3-Hydroxy-5-(4-Chlorophenyl) Pyrazole (Cpd-1).

Step 2: - When Intermediate Cpd-1 undergoes Condensation Reaction with 2-Methyl (Oxy Methyl-3-Methoxy Propionate) Phenyl Chloride in presence of Solvent and Caustic Lye. It gives the final product Pyroxystrobin.

Chemical Reactions: -

Step 1: -



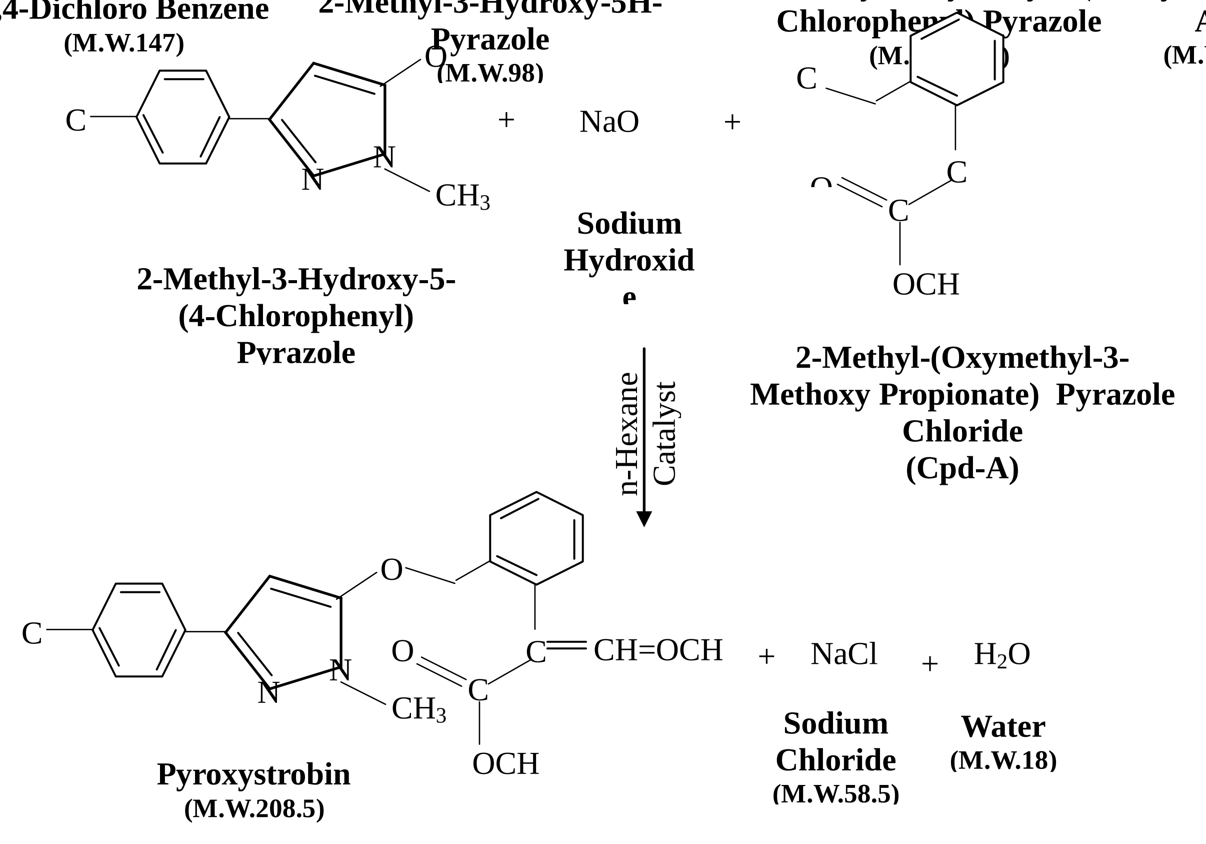
1,4-Dichloro Benzene
(M.W.147)

2-Methyl-3-Hydroxy-5H-Pyrazole
(M.W.98)

2-Methyl-3-Hydroxy-5-(4-Chlorophenyl) Pyrazole
(M.[illegible])

Hydrochloric Acid
(M.W.36.5)

Step 2: -



Mass Balance:

105	Material / Mass Balance of Pyroxystrobin All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	1,4-Dichloro Benzene	396		Pyroxystrobin	**1000**
2	Solvent n-Hexane	2400		Recovered Solvent n-Hexane	2320
3	Catalyst-1	12		n-Hexane Loss	80
4	2-Methyl-3-Hydroxy-5H-Pyrazole	250		30% Hydrochloric Acid Soln	327
5	Caustic Lye 48%	222		Aqueous Layer to ETP	345
6	Water for 30% Hydrochloric Acid Soln	230		Distillation Residue	38
7	Cpd-A	600			
	TOTAL	**4110**		**TOTAL**	**4110**

106)Picoxystrobin

Brief Manufacturing Process: -

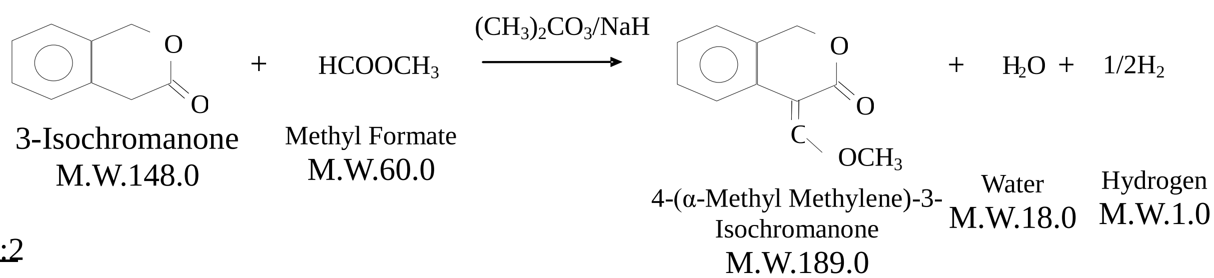
Step 1: -3-Isochromanone is reacted with Methyl Formate in presence of Di methyl Carbonate and Sodium Hydride to give 4-(α-Methyl Methylene)-3-Isochromanone.

Step 2: -4-(α-methyl Methylene)-3-Isochromanone further reacted with Hydrochloric acid in presence of Solvent – EDC to give Methyl-2-(Chloromethyl)-α-Methoxy Methylene-Benzene acetate.

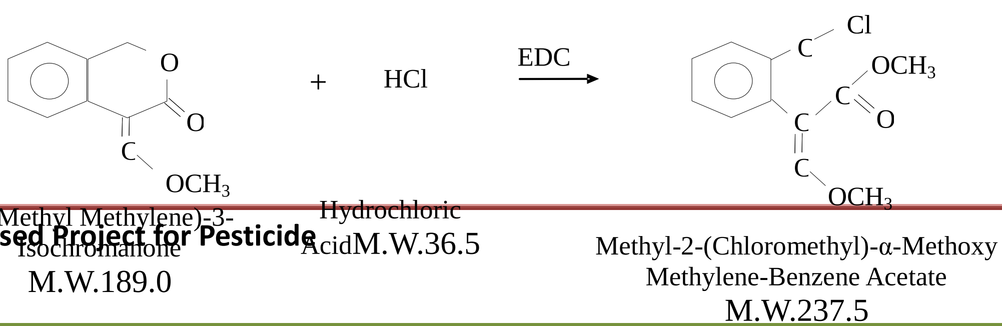
Step 3: -Methyl-2-(Chloromethyl)-α-Methoxy Methylene-Benzene acetate reacted with 2-Hydroxy-6-Trifluoromethyl pyridine to give final product Picoxystrobin.

Chemical Reaction: -

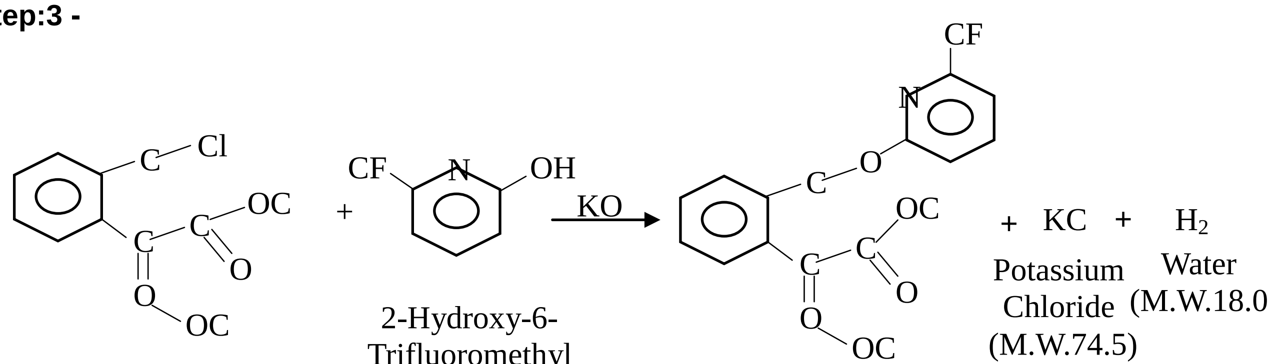
STEP:1



STEP:2



Step:3 -



Methyl-2-(Chloromethyl)-α-Methoxy Methylene-Benzene acetate

2-Hydroxy-6-Trifluoromethyl Pyridine (M.W.163.0)

Picoxystrobin (M.W.364.0)

Potassium Chloride (M.W.74.5)

Water (M.W.18.0)

Mass Balance:

106	Material / Mass Balance of Picoxystrobin All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By Product	Kg/Batch
1	3 – Iso Chromanone	445		**Picoxystrobin**	**1000**
2	Methyl Formate	180		Recovered Solvent - Toluene	1260
3	Di Methyl Carbonate	270		Solvent loss (Toluene)	40
4	Sodium Hydride	287		Sodium Carbonate	650
5	Solvent - Toluene	1300		Potassium Chloride	223
6	Hydrochloric Acid Gas	110		Recovered Solvent - EDC	1360
7	Solvent – EDC	1400		Solvent Loss EDC	40
8	2- Chloro -6-Trifluoro Methyl Pyridine	483		Solvent Recovered - Xylene	970
9	Potassium Hydroxide	168		Solvent Loss - Xylene	30
10	Solvent - Xylene	1000		Aqueous Layer to ETP	724
11	Water	666		Distillation Residue	12
12					
	TOTAL	**6309**		**TOTAL**	**6309**

107) Flufenoxystrobin

Brief Manufacturing Process: -

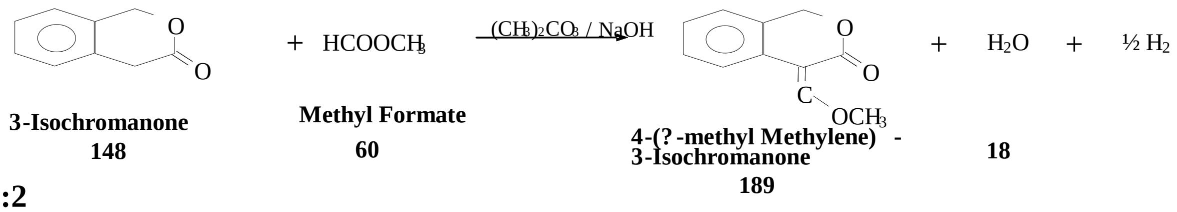
Step 1: - 3-Isochromanone is reacted with Methyl Formate in presence of Dimethyl Carbonate and Sodium Hydride as well as Solvent Toluene to give 4-(α-Methyl Methylene)-3-Isochromanone.

Step 2: - 4-(α-Methyl Methylene)-3-Isochromanone further reacted with Hydrochloric Acid gas in presence of Solvent EDC to give Methyl-2-(Chloromethyl)-α-Methoxy Methylene-Benzene Acetate.

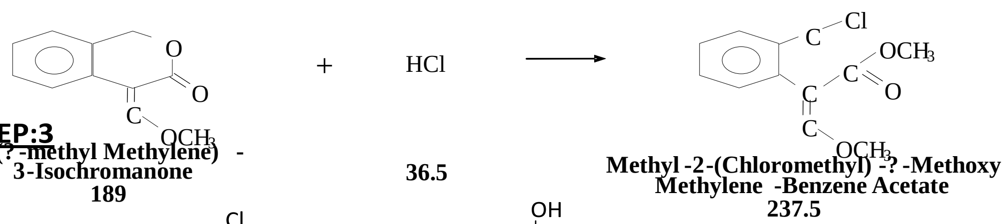
Step 3: - Methyl-2-(Chloromethyl)-α-Methoxy Methylene-Benzene Acetate is reacted with 2-Chloro-4-Trifluoromethyl Phenol in presence of Pottasium Hydroxide as well as Solvent Xylene to give final product Flufenoxystrobin.

Chemical Reactions: -

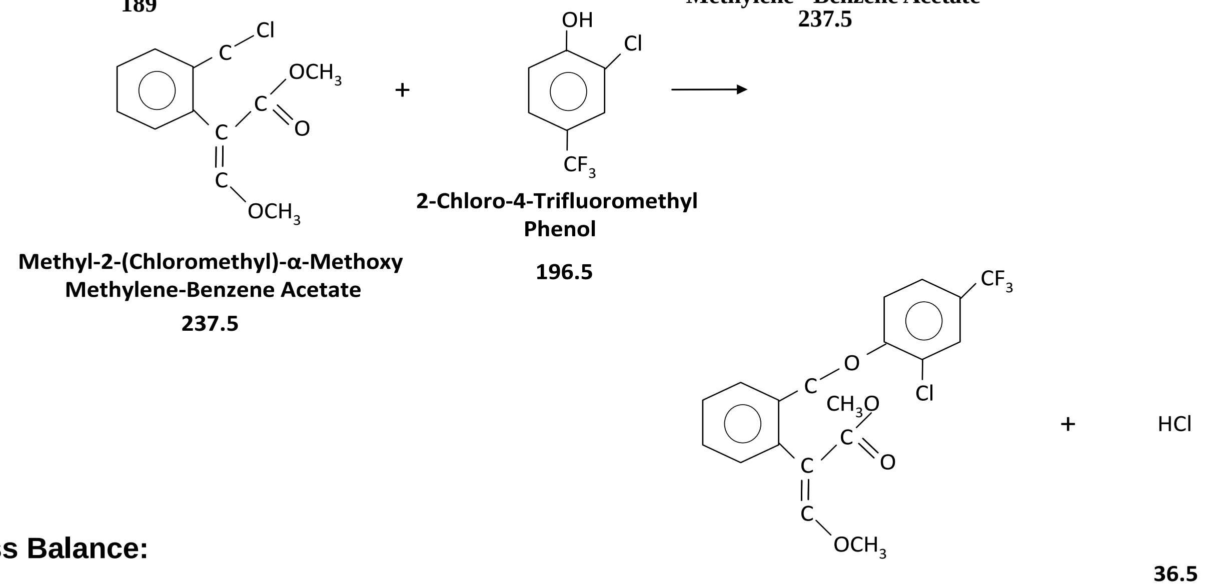
STEP:1



STEP:2



STEP:3



Mass Balance:

107	Material / Mass Balance of Flufenoxystrobin All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By Product	Kg/Batch
1	3-Iso Chromanone	390		Flufenoxystrobin	**1000**
2	Methyl Formate	158		Recovered Solvent - Toluene	1165
3	Dimethyl Carbonate	230		Solvent loss Toluene	35
4	Sodium Hydride	252		Sodium Carbonate	576
5	Solvent Toluene	1200		Methanol	85
6	Hydrogen Chloride Gas	105		Potassium Chloride	198
7	Solvent EDC	1400		Recovered Solvent EDC	1365

8	2-Chloro-4-Trifluoro Methyl Phenol	514		Solvent Loss EDC	35
9	Potassium Hydroxide	160		Recovered Solvent Xylene	970
10	Solvent Xylene	1000		Solvent Loss Xylene	30
11	Water	655		Aqueous Layer to ETP	605
	TOTAL	**6064**		**TOTAL**	**6064**

108) Metominostrobin

Brief Manufacturing Process: -

Step -1

Di Phenyl Oxide is reacted with Di methyl Oxalate in presence of Solvent – Toluene as well as Catalyst to form Methyl -oxo – (2- Methyl Phenyl) Acetate.

Step -2

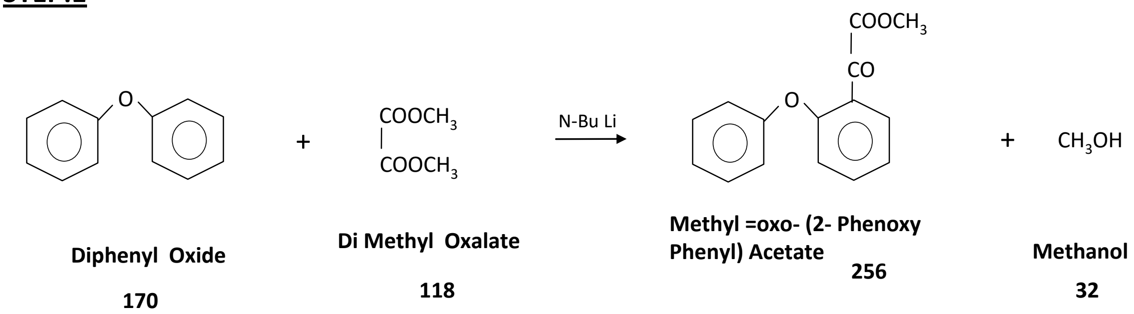
Methyl -oxo - (2- Methyl Phenyl) Acetate is further reacted with Methyl Amine to give 2-(Phenoxy) Phenyl Glyoxylate -o- methyl Oxime.

Step -3

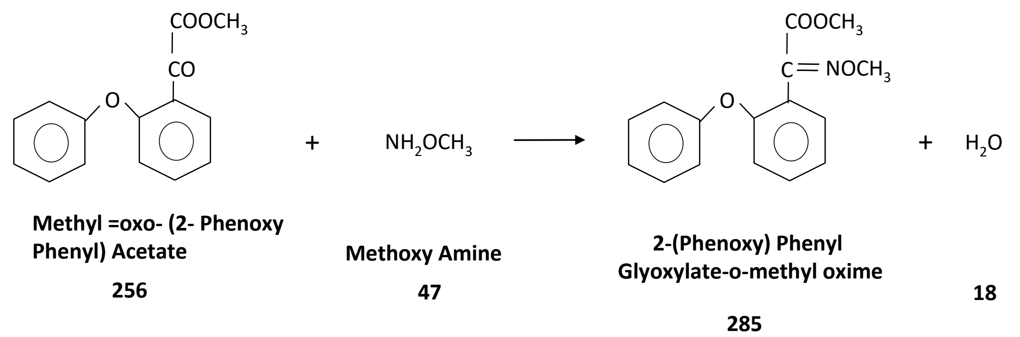
(Phenoxy) Phenyl Glyoxylate -o- methyl Oxime is finally reacted with Methyl Amine in presence of Solvent –Toluene to form the final product as Metomino Strobin.

Chemical Reaction:

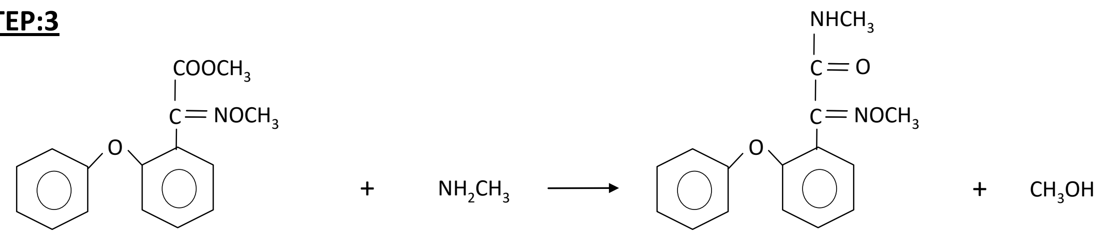
STEP:1



STEP:2



STEP:3



2-(Phenoxy) Phenyl Glyoxylate-o-methyl oxime 285 | Methyl amine 31 | METOMINOSTORBIN 284 | Methanol 32

Material Balance / Mass Balance (All Quantities are in Kg)

108	Material / Mass Balance of Metominostrobin All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	Di methyl Oxide	584		Metominostrobin	1000
2	Di Methyl Oxalate	405		Recovered Solvent - Toluene	1060
3	Catalyst	18		Solvent Loss - Toluene	40
4	Solvent - Toluene	1100		Methanol	220
5	Methyl Amine	106		Recovered catalyst	18
6	Methoxy Amine	162		Solvent Recovered- Xylene	1560
7	Solvent - Xylene	1600		Solvent Loss - Xylene	40
8	Water	625		Aqueous Layer to ETP	645
9				Distillation Residue	17
	Total	**4600**			**4600**

109) Orysastrobin

Brief Manufacturing Process: -

Step-1

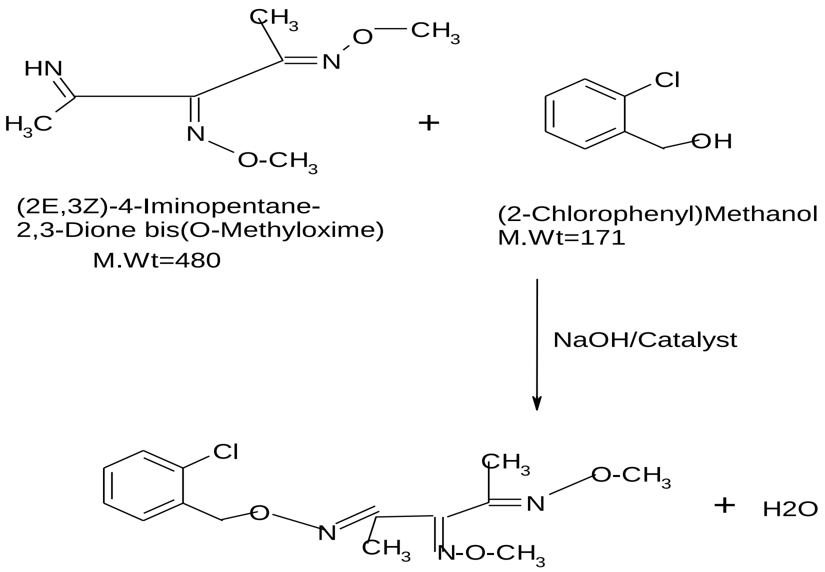
(2E,3Z)-4-Iminopentane-2,3-Dione bis(O-Methyloxime) reacts with 2-Chlorophenyl) methanol to give intermediate A

Step-2

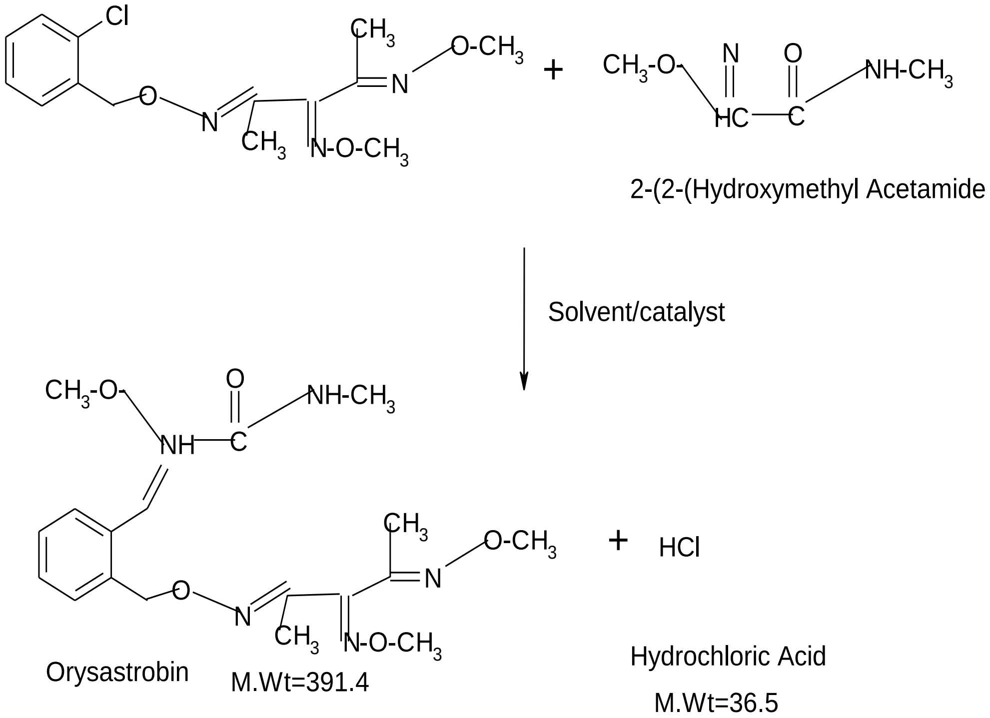
Intermediate A reacts with 2-Methoxyimine)-N-Methyl Acetamide to give final product Orysastrobin.

Chemical Reaction:

Step-1



Step-2



Material Balance:

109	Material / Mass Balance of Orysastrobin All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / Bi Product	Kg/Batch
1	(2E,3Z)-4-Iminpentane-2,3-Dione Bis (O-Methyloxime)	480		Orysastrobin	1000
2	2-(Mehoxyimino)-N-Methylacetamide	325		Recovered Xylene	2940
3	Solvent - Xylene	3000		Xylene Loss	60

4	Catalyst	15	30% Hydrochloric AcidSolution	310
5	Sodium Hydroxide	120	Rec. Catalyst	10
6	(2-Chlorophenyl)Methanol	382	Sodium Chloride	150
7	2-[2-(Hydroxymethyl)Phenyl]-2-(Methoxyimino)-N-Methylacetamide	595	Aqueous Layer to ETP	1447
8	Water	1000		
	Total	**5917**		**5917**

110)Kresoxim Methyl

Brief Manufacturing Process: -

Step 1: -Phthalide is reacted with O-Cresol in presence of Potassium Hydroxide and Solvent – Xylene to give 2-(2-Methyl Phenoxy Methyl) Benzoic Acid.

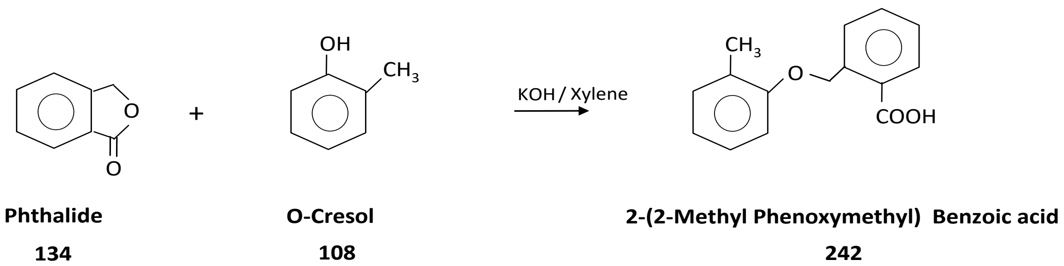
Step 2: -2-(2-Methyl Phenoxy Methyl) Benzoic acid reacted with Thionyl Chloride in presence of Solvent - Xylene to give 2-(2-Methyl Phenoxy Methyl) Benzoyl chloride.

Step 3: -2-(2-Methyl Phenoxy Methyl) Benzoyl Chloride reacted with Sodium cyanide to give 2-(2-Methyl Phenoxy Methyl) Benzoyl Cyanide.

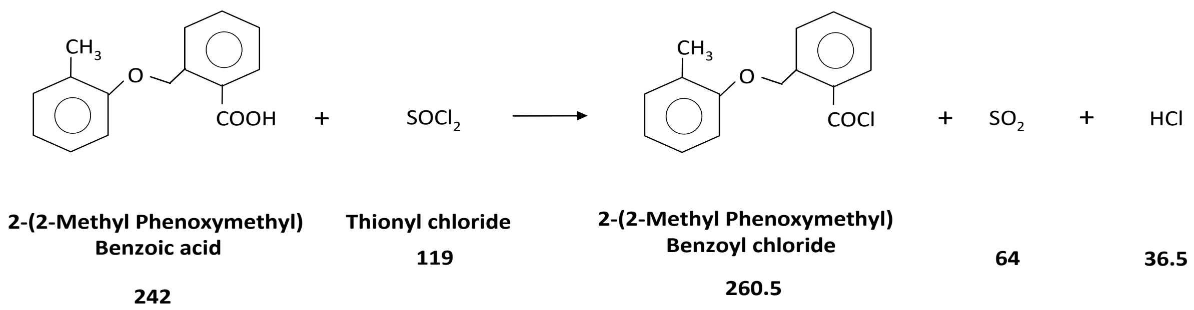
Step 4: -2-(2-Methyl Phenoxy methyl) Benzoyl Cyanide (Nitrile) further reacted with Methoxy Amine in presence of Hydrochloric Acid and Solvent - Methanol to give final product Kresoxim Methyl.

Chemical Reactions: -

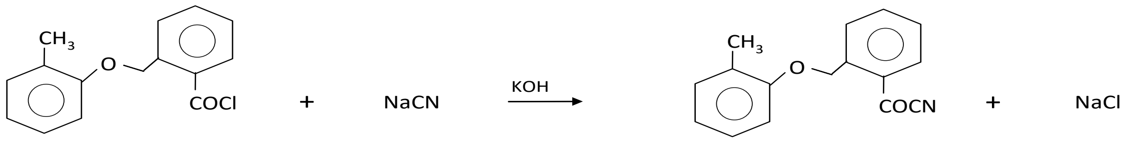
STEP:1



STEP:2

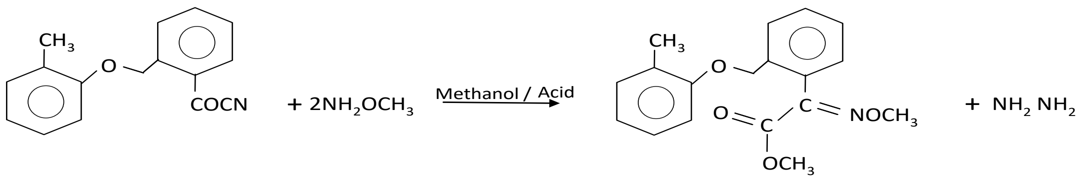


STEP:3



2-(2-Methyl Phenoxymethyl) Benzoyl chloride 260.5 | Sodium cyanide 49 | 2-(2-Methyl Phenoxymethyl) Benzoyl Nitrile 251 | Sodium chloride 58.5

STEP:4



2-(2-Methyl Phenoxymethyl) Benzoyl Nitrile 251 | Methoxy amine 94 | KRESOXIM-METHYL 313 | Hydrazine 32

Mass Balance:

110	Material / Mass Balance of Kresoxim Methyl All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Ortho Cresol	360		Kresoxim Methyl	**1000**
2	Phthalide	447		Recovered Solvent - Xylene	1760
3	Potassium Hydroxide	187		Solvent Loss - Xylene	40
4	Solvent - Xylene	1800		Sodium Bi Sulphate	413
5	Thionyl Chloride	398		28 % Hydrochloric Acid	350
6	Sodium Hydroxide	163		Sodium Chloride	195
7	Sodium Cyanide	172		Recovered-Methanol	960
8	30 % Hydrochloric Acid	131		Solvent Loss - Methanol	40
9	Solvent - Methanol	1000		Ammonium Chloride	77
10	Methoxy Amine	156		Hydrazine	110
11	Water	1060		Aqueous Layer to ETP	912
12				Distillation Residue	17
	TOTAL	**5874**		**TOTAL**	**5874**

111) Triclopyricarb

Brief Manufacturing Process: -

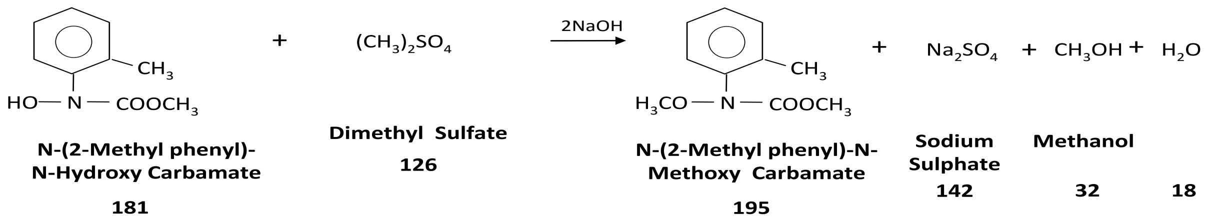
Step 1: -N-(2- Methyl Phenyl)–N-Hydroxy Carbonate is reacted with Di Methyl Sulphate in presence of Sodium Hydroxide to give N-(2-Methyl Phenyl -N- Methoxy Carbonate.

Step 2: -N-(2- Methyl Phenyl -N- Methoxy Carbonate further reacted with N- methyl Succinamide in presence of Solvent EDC to give N-(2-Bromomethyl Phenyl)–N- Methoxy Carbonate.

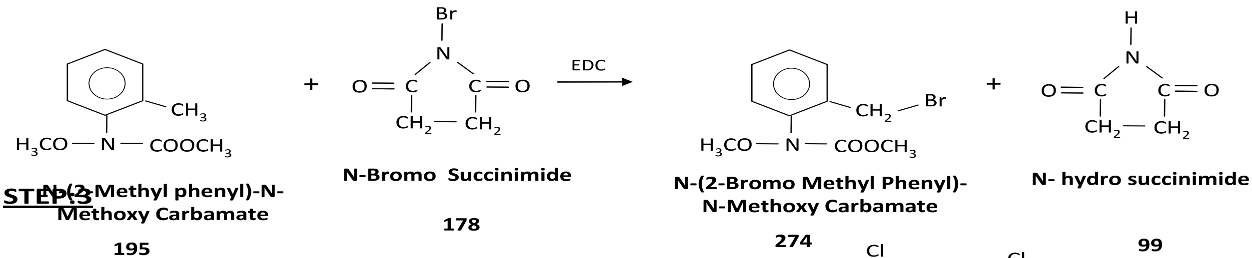
Step 3: -N -(2-Bromomethyl Phenyl)-N-Methoxy Carbonate is reacted with 3,5,6-Trichloro Pyridinol to form Triclopyricarb.

Chemical Reactions: -

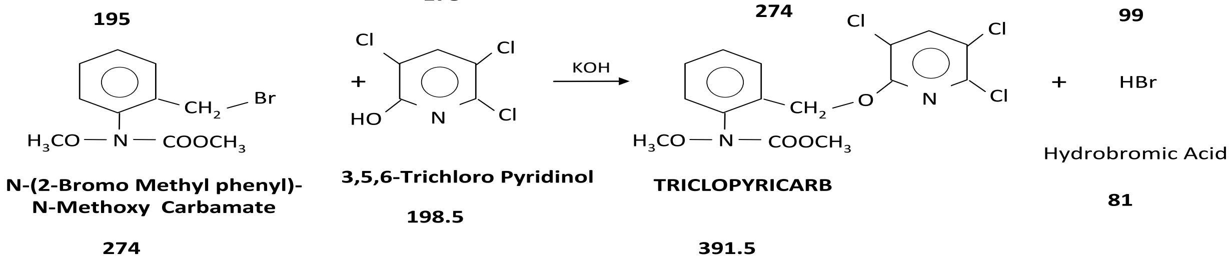
STEP:1



STEP:2



STEP:3



Mass Balance:

111	Material / Mass Balance of Triclopyricarb All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr. No.	Raw Materials / Items	Kg/ Batch		Product / By product	Kg/ Batch
1	N-(2-Methylphenyl) N-Hydroxy Carbamate	502		Triclopyricarb	1000
2	Di Methyl Sulphate	177		Recovered Solvent - EDC	1370
3	Sodium Hydroxide	112		Solvent Loss - EDC	30
4	N- Bromo Succinamide	488		Sodium Sulphate	400

5	Solvent - EDC	1400		Succinamide	280
6	3,5,6 Trichloro Pyridinol	545		Solvent Recovered-Toluene	1160
7	Potassium Hydroxide	155		Solvent Loss - Toluene	40
8	Solvent - Toluene	1200		Potassium Bromide	330
9	Water	650		Aqueous Layer to ETP	605
10				Distillation Residue	14
	Total	**5229**		**Total**	**5229**

112) Fenoxanil

Brief manufacturing Process:

Step – 1

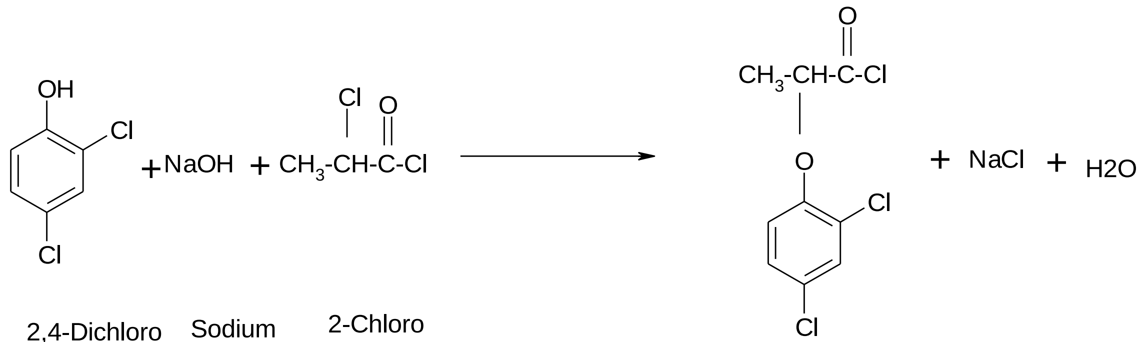
2, 4 Dichloro Phenol reacts with 2-Chloro Propionic Chloride in presence of Sodium Hydroxide give 2, 4 Dichloro Phenoxy Propionic Chloride.

Step – 2

2, 4 Dichloro Phenoxy Propionic Chloride reacts with Cyano 1, 2 Dimethyl Propanamide gives final product Fenoxanil.

Chemical Reaction:

Step-1



2,4-Dichloro Phenol M.Wt=163

Sodium Hydroxide M.Wt=40

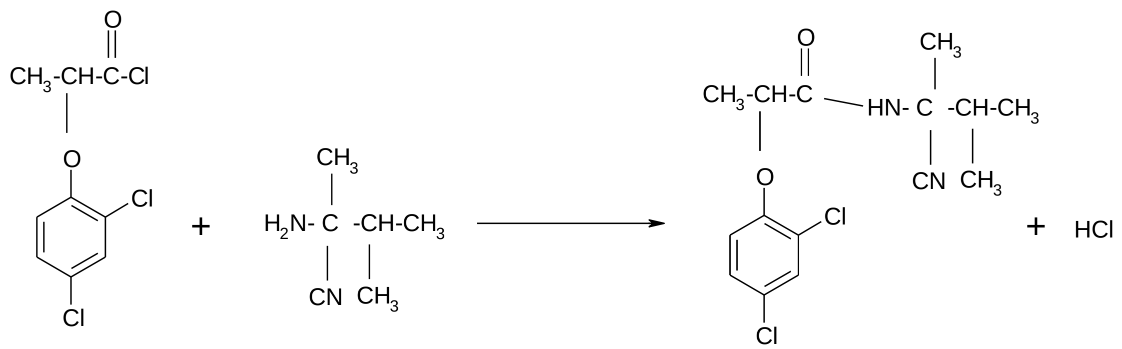
2-Chloro Propionic Chloride M.Wt=127

2,4-Dichloro Phenoxy Propionic Chloride M.Wt=253.5

Sodium Chloride M.Wt=58.5

Water M.Wt=18

Step-2



2,4-Dichloro Phenoxy Propionic Chloride M.Wt=253.5

Cyano-1,2-Dimethyl Propamide M.Wt=112

Fenoxanil M.Wt=329

Hydrochloric Acid M.W=36.5

Material Balance:

112	Material / Mass Balance of Fenoxanil All Quantities are in kg)				
INPUT				OUTPUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	2,4 Dichloro Phenol	550		Fenoxanil	1000
2	Propionic Chloride	425		Recovered -Toluene	1960
3	Cyano 1,2 Dimethyl Propanamide	360		Toluene Loss	40
4	Solvent Toluene	2000		Distillate	55
5	Catalyst	10		Sodium Chloride	190
6	Sodium Hydroxide	135		Aqueous Layer to ETP	785
7	Water	550			
	Total	**4030**		**Total**	**4030**

113) Cymoxanil

Brief Manufacturing Process: -

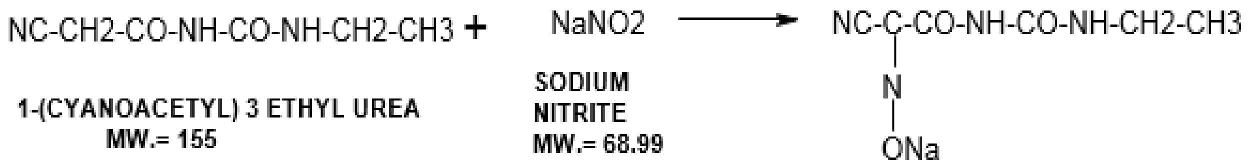
Step 1: - 1-Cyanoacetyl-3-Ethyl Urea and Sodium Nitrite solution (40%) are added sequentially into the reactor containing water. The reaction is allowed to take place at controlled temperature of 40 – 45°C and the reaction mass is held at this temperature till completion of thereaction. The reaction mass is then cooled to room temperature.

Step 2: - After the reaction mass of 1st step is cooled to room temperature Dimethyl Sulfate is added to it. The reaction mass is held at 50 – 55°C till completion of the reaction.

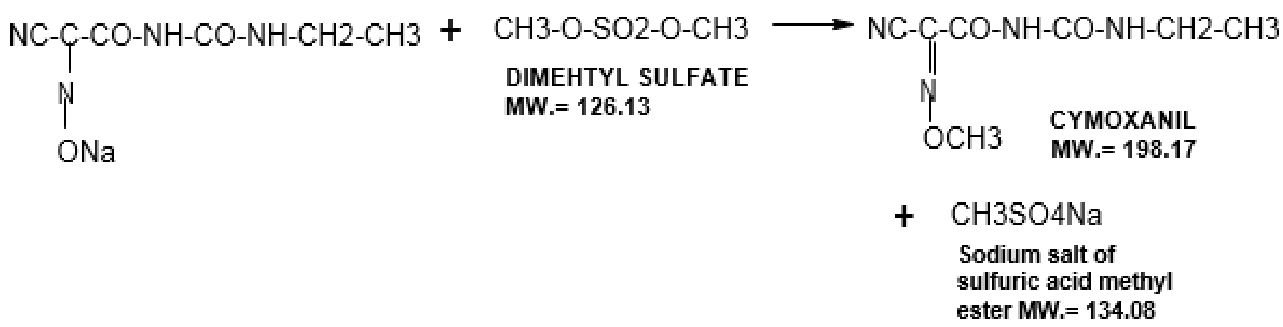
The reaction mass is then cooled to room temperature and centrifuged. The cake obtained is washed with water and dried to give Cymoxanil technical.

Chemical Reactions: -

Step 1: -



Step 2: -



Mass Balance:

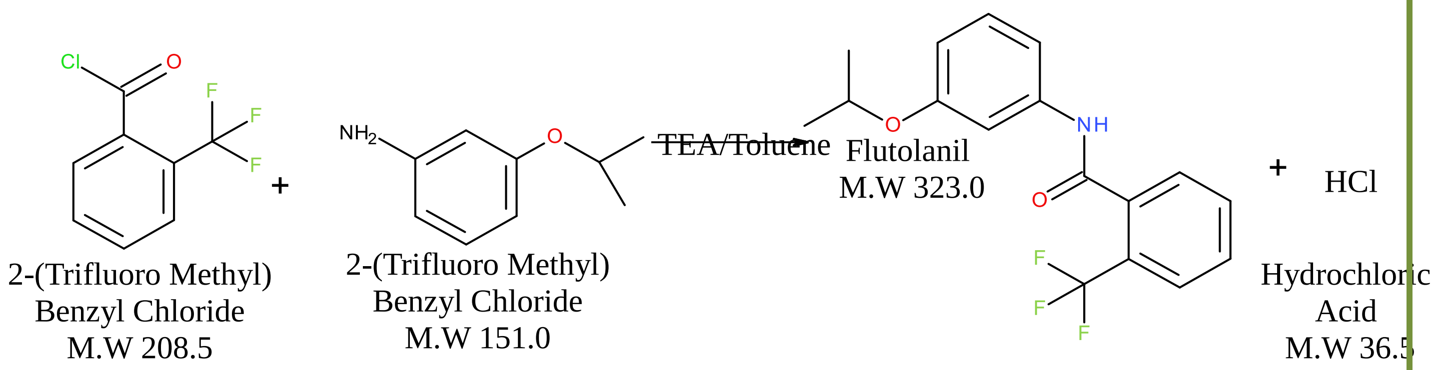
113	Material / Mass Balance of Cymoxanil All Quantities are in kg)				
INPUT				OUTPUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	1-Cyano Acetyl-3-Ethyl Urea	834		**Cymoxanil**	1000
2	Sodium Nitrite	353		Aqueous Layer to ETP	2713
3	DMSO4	626			
4	Water	1900			
	Total	**3713**		**Total**	**3713**

114) Flutolanil

Brief Manufacturing Process:

2-(Trifluoro Methyl) Benzyl Chloride reacts with 3-(1-Methyl Ethoxy) Benzene amine in presence of triethyl amine and Toluene as a Solvent to get Flutolanil.

Chemical Reaction:



Material Balance:

114	Material / Mass Balance of Flutolanil All Quantities are in kg)				
INPUT				OUTPUT	
Sr. No.	Raw Material/item	Kg/Batch		Product/Bi Product	kg/Batch

1	2- (Trifluoro Methyl) Benzyl Chloride	710	Flutolanil	1000
2	3-(1-Methayl Ethoxy) Benzene Amine	505	Recovered - TEA	340
3	Triethyl Ethyl Amine	360	TEA Loss	20
4	Solvent- Toluene	1500	Recovered Toluene	1440
5	10% Caustic Solution	1425	Toluene Loss	60
			Aqueous Layer to ETP	1612
			Distillation Residue	28
	Total	**4500**	**Total**	**4500**

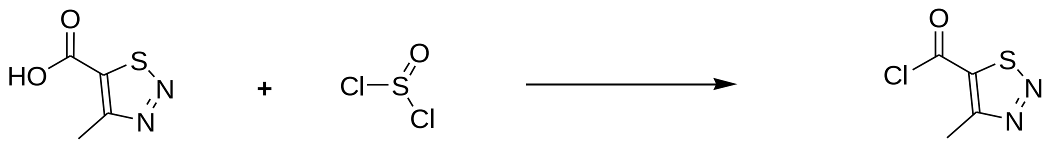
115) Tiadinil:

Brief Manufacturing Process:

The Solvent Toluene and 4-Methyl-1,2,3-Thiadiazole-5-Carboxylic Acid (4-MTCA) are charged. The Catalyst is added and the temperature is raised to 65^{o}C and Thionyl Chloride is added for 4 hours and the by-product Hydrogen Chloride gas is scrubbed in water and Sulphur Dioxide is scrubbed in Caustic Lye Solution. The reaction is maintained at 65^{o}C for 4 hours to complete. The reaction mass of 4-Methyl-1,2,3-Thiadiazole-5-Carbonyl Chloride in Toluene is cooled to 40^{o}C.

3-Chloro-4-Methylbenzenamine (3-CMBA) is added to the above reaction mass of 4-Methyl-1,2,3-Thiadiazole-5-Carbonyl Chloride in Toluene for 2 hours at 40^{o}C. The temperature is raised to 75^{o}C and maintained for 4 hours. After completion of the reaction, water is added and neutralized with 5% Caustic Soda Lye Solution. The aqueous phase is separated and the organic phase is cooled to 0^{o}C. The slurry is filtered and dried to obtain Tiadinil TC.

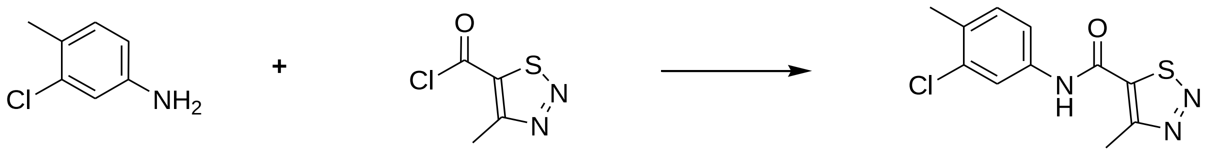
Chemical reactions:



4-methyl-1,2,3-thiadiazole-5-carboxylic acid
$C_4H_4N_2O_2S$
Mol. Wt.: 144.15

thionyl chloride
Cl_2OS
Mol. Wt.: 118.97

4-methyl-1,2,3-thiadiazole-5-carbonyl chloride
$C_4H_3ClN_2OS$
Mol. Wt.: 162.6



3-chloro-4-methyl benzenamine
C_7H_8ClN
Mol. Wt.: 141.60

4-methyl-1,2,3-thiadiazole-5-carbonyl chloride
$C_4H_3ClN_2OS$
Mol. Wt.: 162.6

TIADINIL
$C_{11}H_{10}ClN_3OS$
Mol. Wt.: 267.73

Mass Balance:

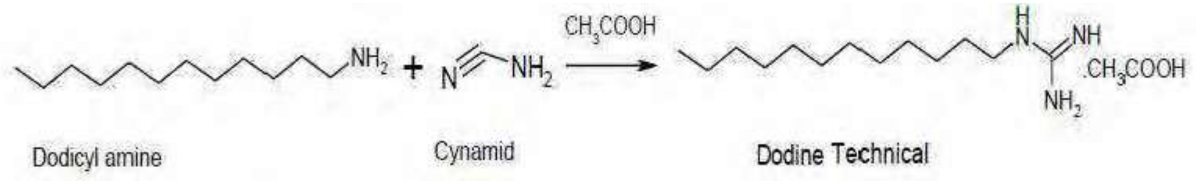
115	**Material / Mass Balance of Tiadinil (All Quantities are in kg)**			
	IN – PUT		**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**	**Product/ Byproduct**	**Kg/Batch**

1	4-Methyl-1,2,3-Thiadiazole-5-Carboxylic Acid	675		**Tiadinil**	**1000**
2	3-Chloro-4-Methylbenzenamine	620		Recovered Toluene	2400
3	Toluene	2500		Toluene Loss	100
4	Thionyl chloride	550		30% Hydrochloric Acid	1050
5	Catalyst	5		Sodium Sulfite Solution	790
6	5% CS lye solution	550		Drying Loss	50
7	Water for Hydrochloric Acid	735		Aqueous Layer to ETP	1145
8	Water	1000		Organic Residue	100
	Total	**6635**		**Total**	**6635**

116) Dodine

Brief Manufacturing Process:
Dodine technical is manufactured in a single step. In this single step molten Dodecilamine isreacted with Cynamide in presence of acetic acid at high range of temperature which givesDodinetechnical.

Chemical Reaction:



116	**Material / Mass Balance of Dodine (All Quantities are in kg)**				
	IN PUT			**OUT PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Dodecyl Amine	680		**Dodine**	1000
2	Cyanamide	155		Recovered Mother Liquor-Recycle	390
3	Acetic Acid	220		Effluent	65
5	Mother Liquor	400			
	TOTAL	**1455**		**TOTAL**	**1455**

117) Captan: -

BriefManufacturingProcess: -

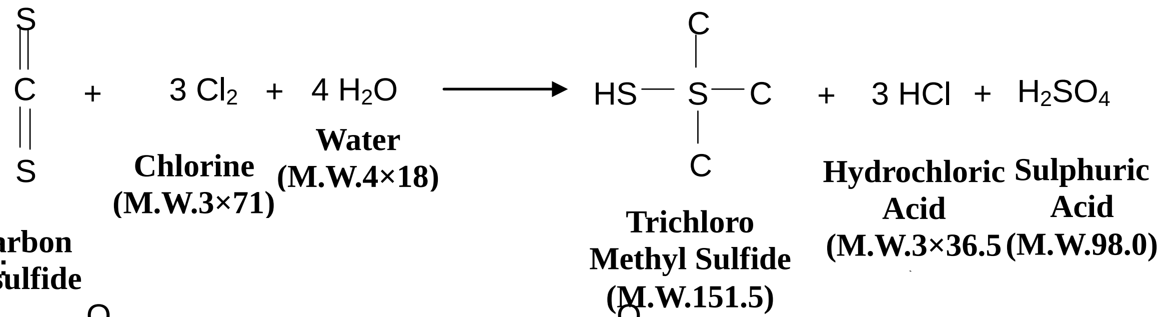
Step1: -
CarbonDisulfideisreactedwithChlorineGastogivesoutTrichloroMethylSulfide.SpentHydrochloricAcid andSpentSulphuricAcidareseparated duringthereaction.

Step2: -TetrahydrophthalicAnhydridereactedwithAmmoniatogetTetrahydrophthalicImine.

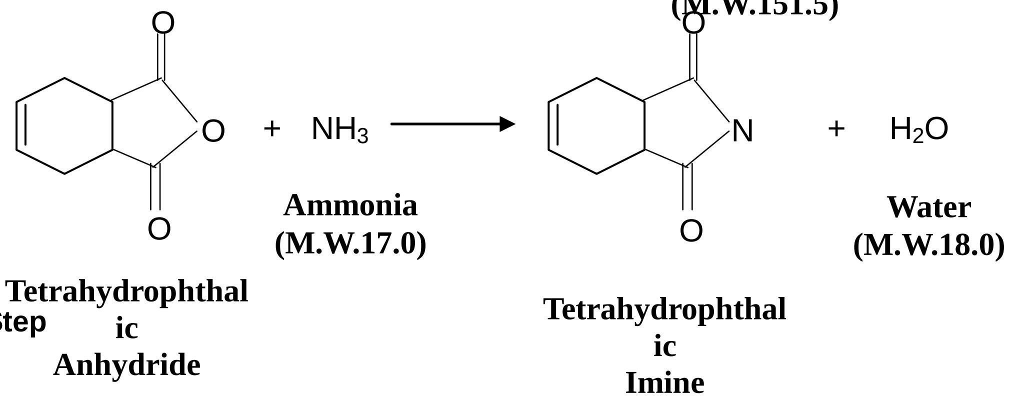
Step 3: - Tetrahydrophthalic Imine (THPI) is further reacted with Trichloro Methyl Sulfide in presence of Sodium Hydroxide to gives out Captan as a crude product. After completion of reaction Crude product is filtered and washed to get pure product.

Chemical Reaction:

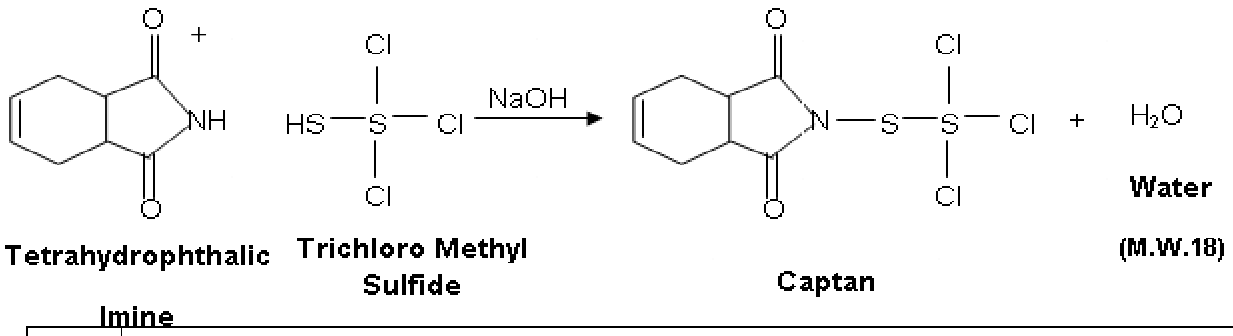
Step1:



Step2:



Step



117	Material/MassBalanceofCaptanAllQuantitiesareinkg)				
	IN– PUT			OUT– PUT	
Sr. No.	Raw Materials/Items	Kg/Batch		Product/Byproduct	Kg/Batch
1	CS_2–CarbonDisulphide	390		**Captan**	1000
2	Chlorine Gas	2300		Chlorine GastoScrubber	25
3	SpentSulphuric acid	5300		Spent Acid to Recycle	5300
4	WaterforAcidDilution	3000		SpentSulphuricacid toSale	4835
5	Tetrahydrophthalic	601		AmmoniaGasforScrubber	81
6	Ammonia	70		AqLayer toETP	2290

7	WaterforCaptanReaction	1000		DryingLoss	549
8	CausticLye	419			
9	WaterforWashing	1000			
	Total	**14080**		**Total**	**14080**

GROUP-7: Strobilurins/ Methoxyacrylate/Carbanilate Fungicides/Mono Carboxylic Acid Amide/Hydroxy Aniline(G-2)

118) Dimoxystrobin

Brief Manufacturing Process: -

Step -1

Phthalide is reacted with 2,5-Xylenol in presence of Potassium Hydroxide and Solvent – Xylene to give 2-(2,5-Dimethyl Phenoxy methyl) Benzoic acid.

Step- 2

2-(2,5-Dimethyl Phenoxy methyl) Benzoic Acid is reacted with Thionyl chloride to give 2-(2,5-Dimethyl Phenoxy methyl) Benzoyl Chloride.

Step - 3

2-(2,5-Dimethyl Phenoxy methyl) Benzoyl Chloride reacted with Sodium Cyanide to give 2-(2,5-Dimethyl Phenoxy methyl) Benzoyl Cyanide.

Step -4

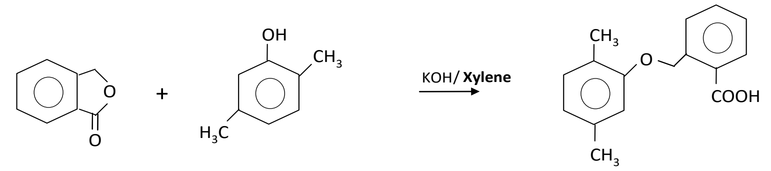
2-(2,5-Dimethyl Phenoxy methyl) Benzoyl cyanide further reacted with Methoxy amine in presence of Hydrochloric Acid and solvent –Ethanol to give 2-(2,5-Dimethyl Phenoxy methyl) Phenyl Glyoxylate-O-methyl Oxime.

Step - 5

2-(2,5-Dimethyl Phenoxy methyl) Phenyl Glyoxylate-O-methyl Oxime reacted with Methyl amine in presence of Solvent - toluene to give final product DIMOXYSTORBIN.

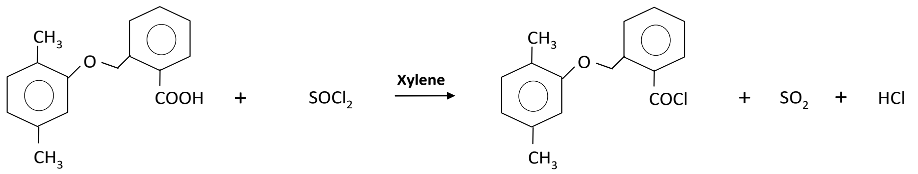
Chemical Reaction:

STEP:1



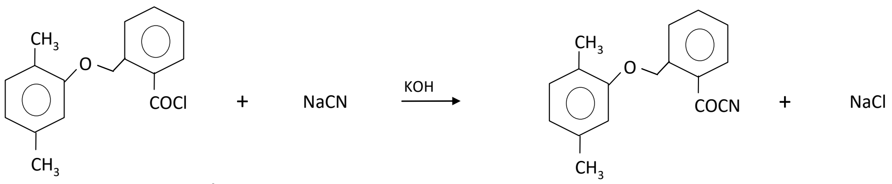
Phthalide	2,5-Xylenol	2-(2,5-Dimethyl Phenoxymethyl) Benzoic acid
134	122	256

STEP:2



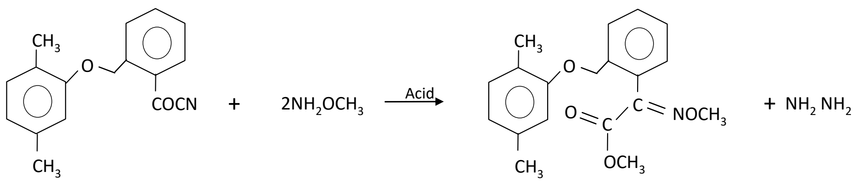
2-(2,5-Dimethyl Phenoxymethyl) Benzoic acid	Thionyl chloride	2-(2,5-Dimethyl Phenoxymethyl) Benzoyl chloride		
256	119	274.5	64	36.5

STEP:3



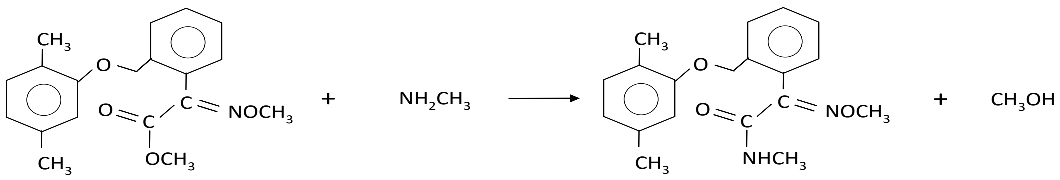
2-(2,5-Dimethyl Phenoxymethyl) Benzoyl Chloride	Sodium cyanide	2-(2,5-Dimethyl Phenoxymethyl) Benzoyl Nitrile	Sodium chloride
274.5	49.1	265	58.5

STEP:4



2-(2,5-Dimethyl Phenoxymethyl) Benzoyl Nitrile	Methoxy Amine	2-(2,5-Dimethyl Phenoxymethyl) Phenyl Glyoxylate-O-Methyl oxime	Hydrazine
265	94	327	32

STEP:5



2-(2,5-Dimethyl Phenoxymethyl) Phenyl Glyoxylate-O-methyl oxime	Methyl Amine	DIMETHOXYSTORBIN	Methanol
327	31	326	32

Material Balance:

118	Material / Mass Balance of Dimoxystrobin All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr No	Raw Materials / Items	Kg/Batch		Product / Bi Product	Kg/Batch
1	2,5 - Xylenol	380		Dimoxystrobin	1000
2	Phthalate	415		Recovered Solvent - Xylene	1760
3	Potassium Hydroxide	174		Solvent Loss - Xylene	40
4	Solvent - Xylene	1800		Potassium Chloride	232
5	Thionyl Chloride	370		Sodium Bi Sulphate	323
6	Sodium Hydroxide	128		28 % Hydrochloric Acid	381
7	Sodium Cyanide	150		Sodium Chloride	182
8	30 % Hydrochloric Acid	755		Solvent Recovered – Ethanol	1150
9	Solvent - Ethanol	1200		Solvent Loss - Ethanol	50
10	Methoxy Amine	146		Ammonium Chloride	166
11	Solvent - Toluene	1100		Methanol	100
12	Methyl Amine	96		Recovered Solvent - Toluene	1075
13	Water	3688		Solvent loss (Toluene)	25
14				Aqueous Layer to ETP	3900
15				Distillation Residue	18
	Total	**10402**			**10402**

119) Trifloxystrobin

Brief Manufacturing Process: -

Step 1: -2-Methyl Aniline is reacted with Sodium Nitrite and Sulphuric Acid to give 2-Methyl benzene Diazonium salt by diazotization.

Step 2: -2-Methyl Benzene Diazonium salt further reacted with Glyoxylic Acid methyl ester Oxime to give 2-Methyl phenyl glyoxalin acid methyl ester Oxime.

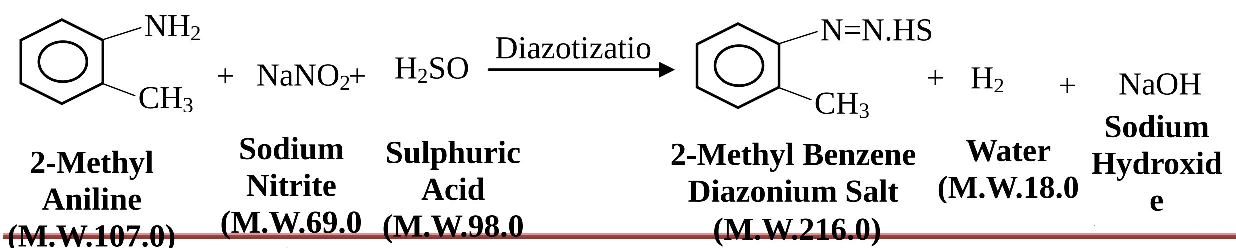
Step 3: -2-Methyl Phenyl Glyoxylic Acid methyl ester Oxime reacted with Dimethyl sulfate in presence of Sodium Hydroxide to give 2-Methyl Phenyl Glyoxylate-o-methyl Oxime.

Step 4: -2-Methyl Phenyl Glyoxylate-o-methyl Oxime further on chlorination with chlorine gas in presence of Solvent – EDC gives 2-Methyl phenyl Glyoxylate-o-methyl Oxime.

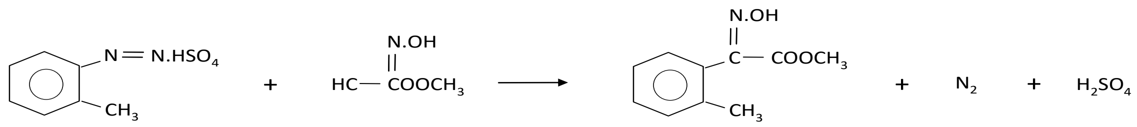
Step 5: -2-Methyl Phenyl Glyoxylate-o-methyl Oxime reacted with Sodium [-1- [3- (Trifluoromethyl) Phenyl] Ethylene] Amine] Oxidanide in presence of Solvent – DMF to give final product Trifloxystrobin.

Chemical Reactions: -

Step:1

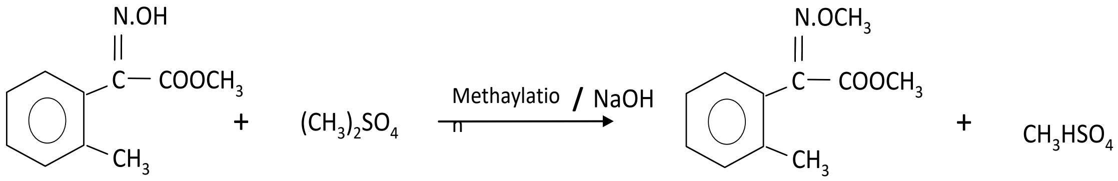


STEP:2



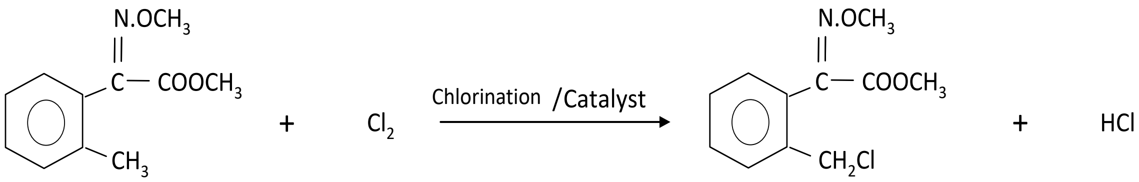
	Glyoxylic Acid Methyl Ester Oxime	**2-Methyl Phenyl Glyoxylic Acid Methyl Ester Oxime**		
216	**103**	**193**	**28**	**98**

STEP:3



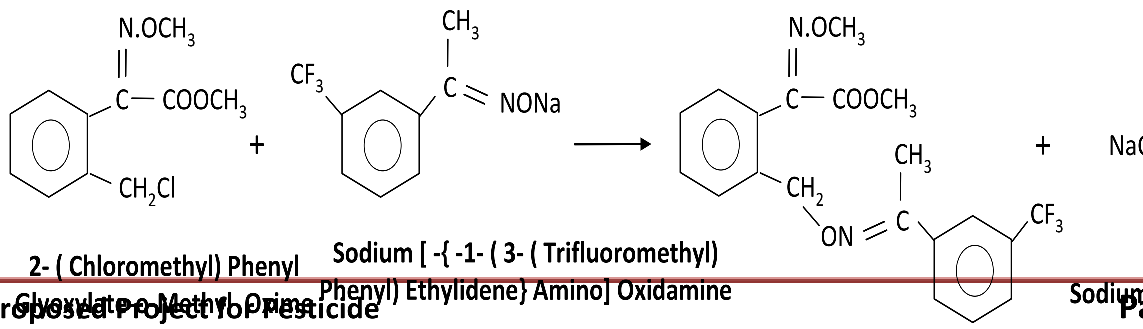
2-Methyl Phenyl Glyoxylic Acid Methyl Ester Oxime	**Dimethyl Sulfate**	**2-Methyl Phenyl Glyoxylate-O-Methyl Oxime**	**Methyl Bisulfate**
193	**126**	**207**	**112**

STEP:4



2-Methyl Phenyl Glyoxylate-O-Methyl Oxime	**Chlorine gas**	**2- (Chloromethyl) Phenyl Glyoxylate-o-Methyl Oxime**	
207	**71**	**241.5**	**36.5**

STEP:5



2- (Chloromethyl) Phenyl Glyoxylate-o-Methyl Oxime	**Sodium [-{ -1- (3- (Trifluoromethyl) Phenyl) Ethylidene} Amino] Oxidamine**	**TRIFLOXYSTORBIN**	**Sodium Chloride**
241.5	**225**	**408**	**58.5**

Mass Balance:

119	Material / Mass Balance of Trifloxystrobin All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2- Methyl Aniline	288		Trifloxystrobin	**1000**
2	Sodium Nitrite	185		Methyl Bisulfate	300
3	Sulfuric Acid	272		Nitrogen Gas	71
4	Glyoxylic Acid methyl Ester Oxime	270		Sodium Sulphate	366
5	Sodium Hydroxide	306		Sodium Hydroxide	100
6	Di Methyl Sulphate	160		Recovered Solvent - EDC	1160
7	Chlorine Gas	190		Solvent Loss EDC	40
8	Solvent - EDC	1200		30 % Hydrochloride Solution	310
9	Sodium [1- {(3- Trifluoro Methyl) Phenyl} Ethylidene Amino] Oxidanide	518		Solvent Recovered – DMF	1360
10	Solvent - DMF	1400		Solvent Loss - DMF	40
11	Water	3692		Sodium Chloride	450
12				Aqueous Layer to ETP	3266
				Distillation Residue	18
	TOTAL	**8481**		**TOTAL**	**8481**

120) Fluoxastrobin

Brief Manufacturing Process: -

Step 1: -2- Hydroxy Phenacyl Bromide is reacted with Methoxy Amine in presence of Catalyst as well as Solvent -Toluene to form 2- [(1E) -2- Bromo –N- Methoxy Ethanimidoyl] Phenol

Step 2: -2- [(1E) -2- Bromo –N- Methoxy Ethanimidoyl] Phenolreacted with potassium Tertiary Butoxide and Tertiary Butyl Nitrate in presence of Solvent – Butyl Alcohol to form N- Hydroxy –N- Methoxy -1- Benzofuran -2,3- Diimine.

Step 3: -N- Hydroxy –N- Methoxy -1- Benzofuran -2,3- Diimine is reacted with Ethylene Oxide in presence of Potassium Hydroxide to give 2- [{(3E) -3 - Methoxyimino -1- Benzofuran -2-(3H) – ylidene} amino} oxy] Ethanol.

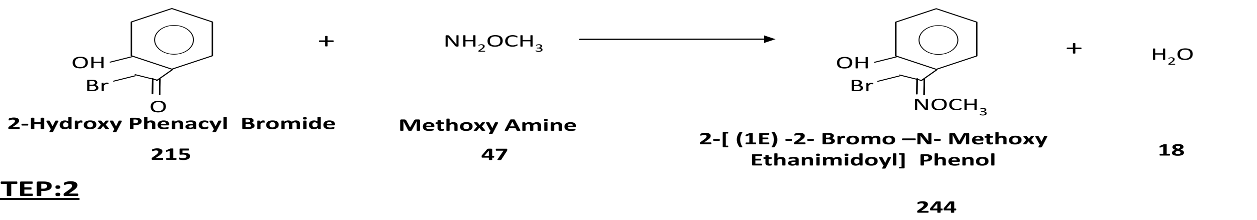
Step 4: -2- [{(3E) -3- Methoxyimino -1- Benzofuran -2-(3H) – ylidene} amino} oxy] Ethanol undergoes Cyclization in presence of Potassium Hydroxide to form 2- [{(E) 5,6 –Di hydro 1,4,2 Dioxazin -3- yl (methoxyimino) methyl) Phenol.

Step 5 :-2- [{(E) 5,6 –Di hydro 1,4,2 Dioxazin -3- yl (methoxyimino) methyl) Phenol is reacted with 4,6 – Dichloro -5- Fluoro Pyrimidine in presence of Potassium Hydroxide as well as Solvent – Dimethyl Formamide to form (E) -1- [2- { 6- Chloro -5- Fluoro Pyrimidine -4- yl) oxy }Phenyl]-1-(5,6 Dihydro -1,4,2 -Dioxazin -3- yl) –N – Methoxymethanimine.

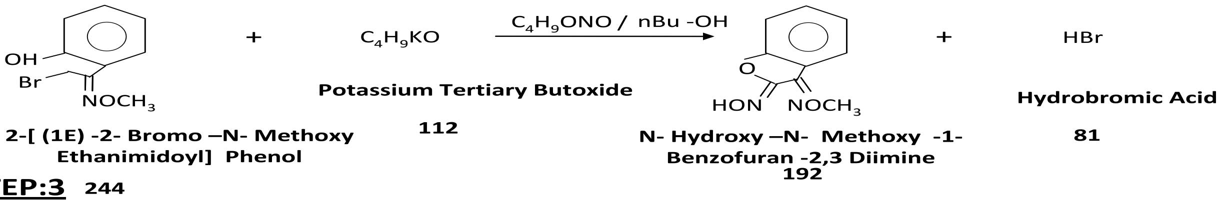
Step 6 :-(E) -1- [2- { 6- Chloro -5- Fluoro Pyrimidine -4- yl) oxy }Phenyl]-1-(5,6 Dihydro -1,4,2 -Dioxazin -3- yl) –N – Methoxymethanimine is reacted with O – Chloro Phenol in presence of Potassium Hydroxide and Solvent – DMF to form final product as Fluoxastrobin.

Chemical Reactions: -

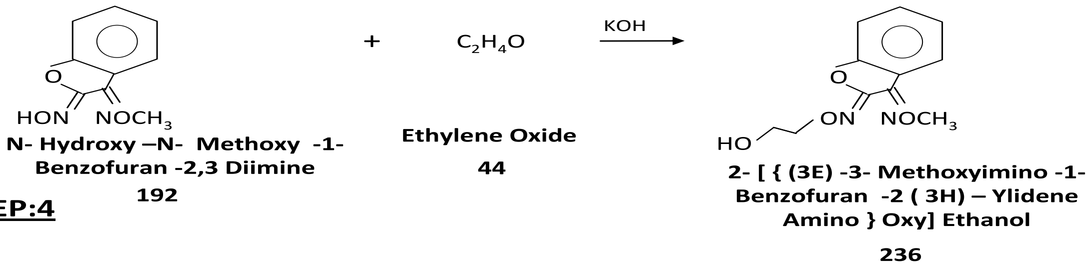
\ **STEP:1**



STEP:2

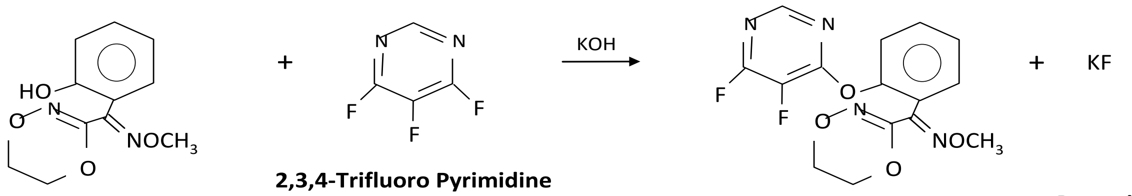


STEP:3



STEP:4

STEP:5



2,3,4-Trifluoro Pyrimidine

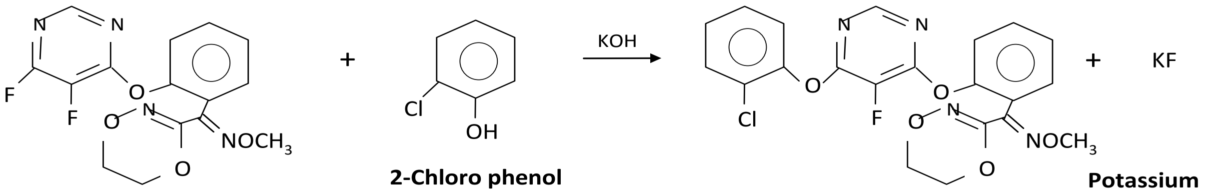
2- [(E) 5,6 – Dihydro -1,4,2 Dioxazin - 3- Yl (Methoxyimino) Methyl]Phenol — 236

2,3,4-Trifluoro Pyrimidine — 134

(E) -1- [2-{ 6- Chloro – 5-fluoro Pyrimidine -4- Yl) N- methoxy methanimide — 350

Potassium Fluoride — 58

STEP:6



(E) -1- [2-{ 6- Chloro – 5-fluoro Pyrimidine -4- Yl) N- methoxy methanimide — 350

2-Chloro phenol — 128.5

FLUOXASTORBIN — 458.5

Potassium Fluoride — 58

Mass Balance:

120	Material / Mass Balance of Fluoxastrobin All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By Product	Kg/Batch
1	2-Hydroxy Phenacyl Bromide	450		Fluoxastrobin	**1000**
2	Methyl Amine	100		Recovered Solvent - Toluene	1410
3	Solvent Toluene	1450		Solvent loss Toluene	40
4	Potassium Tertiary Butoxide	232		Potassium Bromide	250
5	Tertiary Butyl Nitrate	215		Solvent Recovered Butyl Alcohol	1550
6	Solvent Butyl Alcohol	1600		Solvent Loss Butyl Alcohol	50
7	Ethyl Oxide	92		Potassium Chloride	311
8	Potassium Hydroxide	350		Recovered Solvent - DMF	1165
9	4,6-Dichloro-5-Fluoro Pyrimidine	345		Solvent Loss DMF	35
10	Solvent DMF	1200		Aqueous Layer to ETP	4171
11	Ortho Chloro Phenol	265		Distillation Residue	17

12	Water	3700			
	TOTAL	**9999**		**TOTAL**	**9999**

121) Fenhexamide:

BriefManufacturingProcess:

Step 1: -Aniline reacted with Sodium Nitrite and Hydrochloric Acid in presence of Ethyl Acetate. Thisreactiongivesout Intermediate-1and SodiumHydroxideasaby-product.

Step 2: -2,3-Dichloro Phenol reacted with Sodium Hydroxide. This reaction gives out Sodium Salt of2,3-DichloroPhenol.

Step 3: -Intermediate-1 further reacted with Sodium Salt of 2,3-Dichloro Phenol. This reaction gives outIntermediate-2.

Step4: -ThisIntermediate-2furtherreactedwithHydrochloricAcid.ThisreactiongivesoutIntermediate-3.

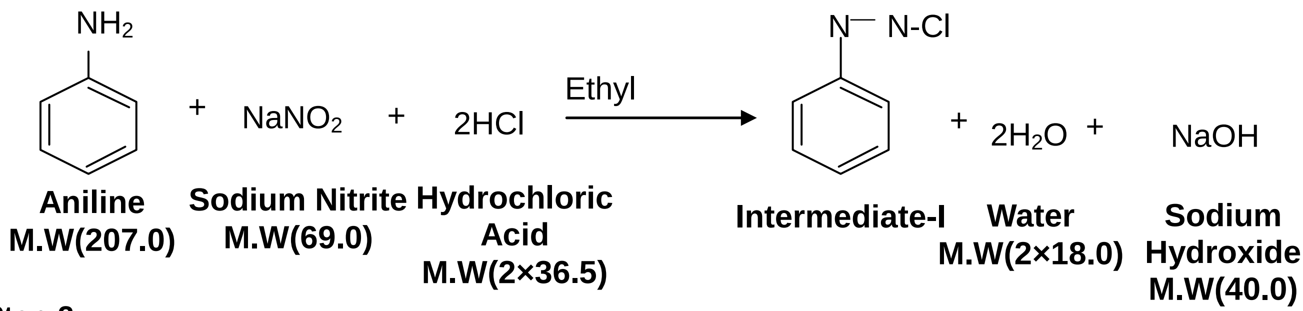
Step 5: -This Intermediate-3 further reacted with Ethyl Acetate and Hydrogen in presence of Methanol.This reactiongivesoutAniline,2,3-DichloroPhenylAnilineandsome sideproduct.

Step 6: -Aniline,2,3-Dichloro Phenyl Aniline further reacted with 1MCH-Chlorochloride in presence ofTEA (Triethyl Amine). This reaction gives out Fenhexamid as a crude product and Aniline Hydrochloride(THF)as a by-product.

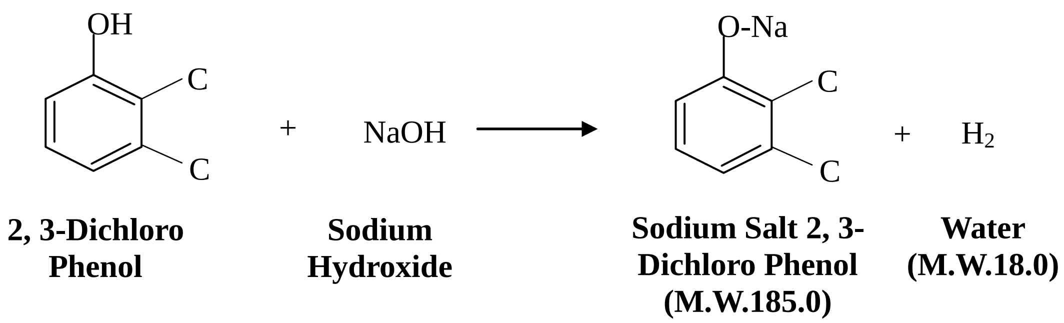
After the reaction gets completed Ethyl Acetate in reaction mass is recovered by distillation, Methanoland Aniline Hydrochloride (THF) are loss at the end of reaction and crude product is distilled out to getpureproduct.

Chemical Reactions: -

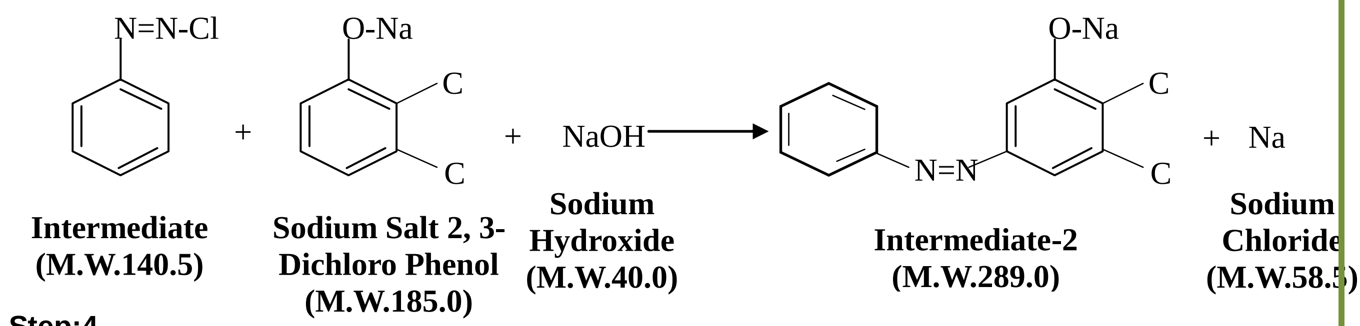
Step:1-



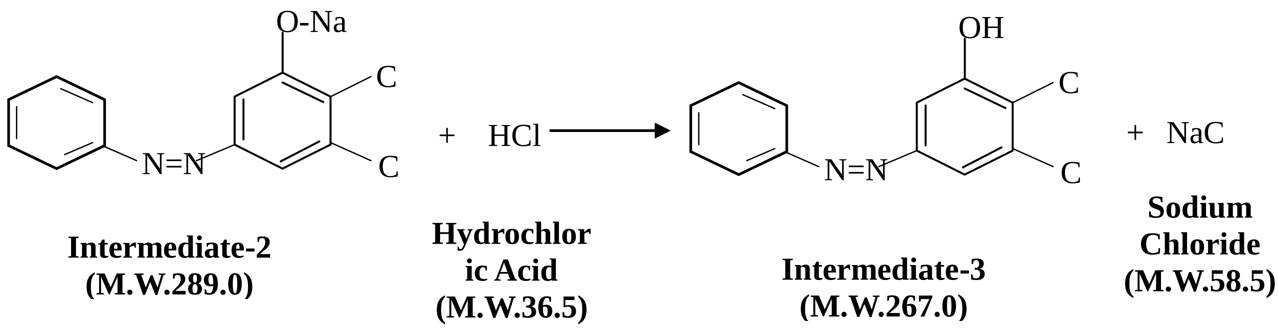
Step:2-



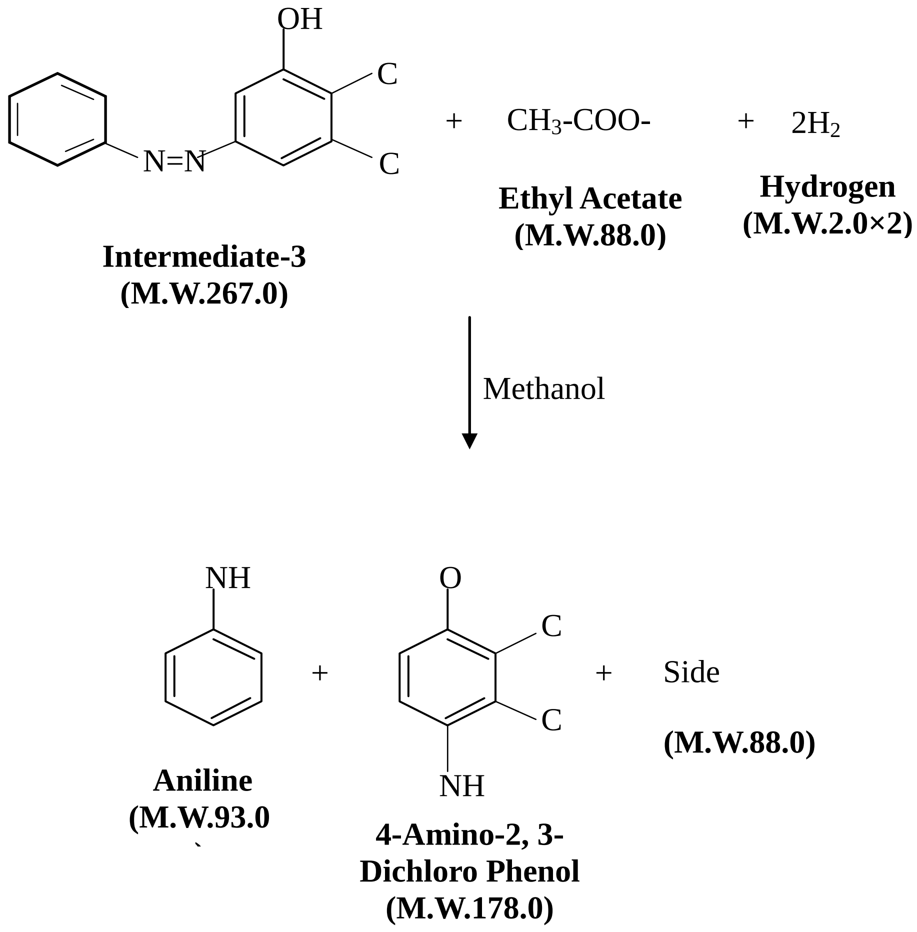
Step:3-



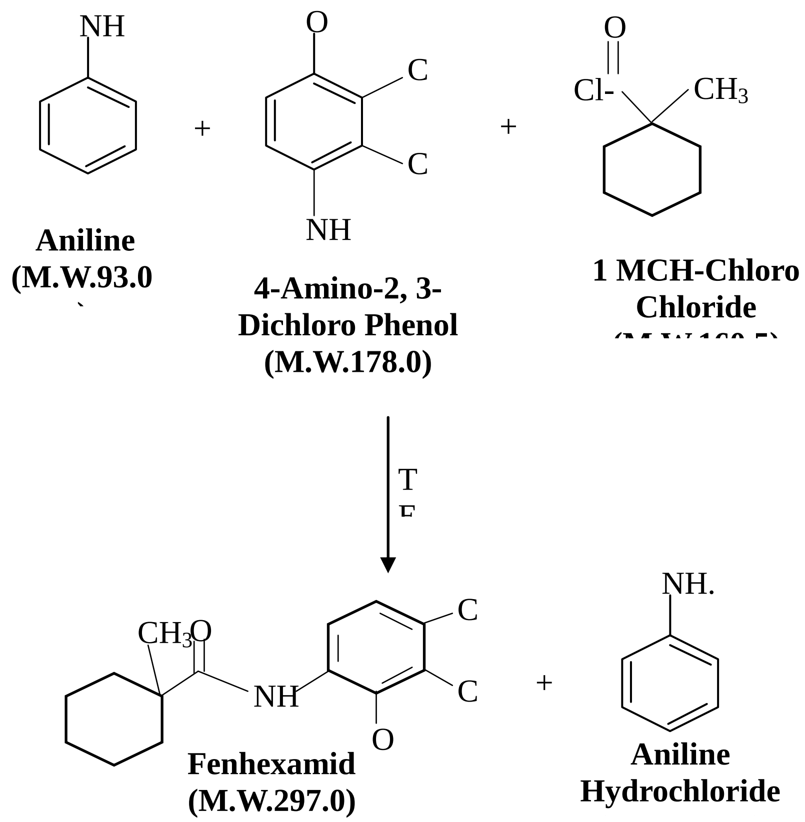
Step:4-



Step:5-



Step:6-



121	Material/MassBalanceofFenhexamideAllQuantitiesareinkg)				
	IN–PUT			OUT– PUT	
Sr.No.	Raw Materials/Items	Kg/Batch		Product/Byproduct	Kg/Batch
1	Aniline	2167		**Fenhexamide**	1000
2	15%Hydrochloric Acid Solution	396		RecoveredEthylAcetate	10550
3	ProcessWaterforHydrochloric Acid Soln	6000		EthylAcetateLoss	350
4	38.7% Sodium Nitrite	794		Recovered Methanol	11000
5	Sodium Hydroxide (100%)	810		Methanol Loss	200
6	2,3DCP	660		RecoveredAniline	400
7	30%Hydrochloric AcidSolution	1971		AqueousLayerToETP	12278
8	EthylAcetate	10900		RecoveredTHF	5828
9	Methanol	11200		THFLoss	140
10	NI	202		RecoveredTEA	500
11	Hydrogen Gas	16		TEALoss	65
12	THF	5977		Catalyst	202

13	TEA	565		Tarrywaste	37
14	1MCH Chloro Chloride	892			
	TOTAL	**42550**			**42550**

GROUP-8: Multicite / SBI-Other Dmis / Phenyl Amides / Sulfonyl Ureas/ Ethyl Mercaptan/Pyrazole Fungicides/ SDHIs / Others-Cont Fungicides

122) Thiophenate Methyl:

Brief Manufacturing Process: -

Step-1

Ethylene Dichloride is taken into a reactor provided with gear – motor agitator and distillation column – condenser assembly. Sodium Thiocyanate is added in Ethylene Dichloride. Then is reacted with Methyl Chloro Formate in the ratio of 1 mole: 1 mole at temp. < 5 0C and Methyl Isothiocyanate format is formed.

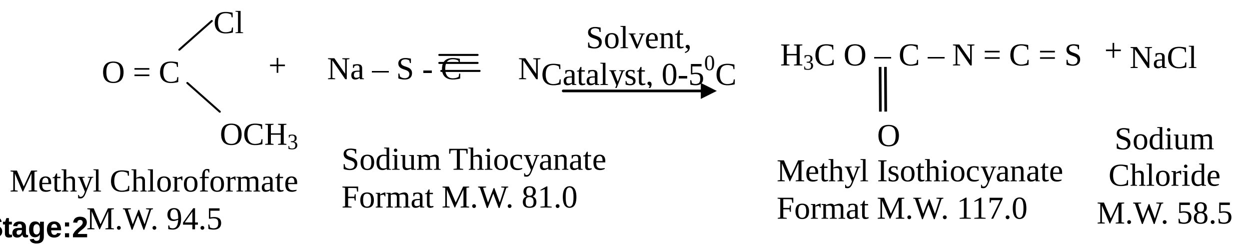
Step-2

In above ethylene dichloride layer, solution of O-Phenylene Diamine prepared in EDC is added and after addition the reaction mass is heated to reflux for 3.0 hrs and then Reaction product is filtered off, washed with water and then dried and pulverized and packed as Thiophenate Methyl Technical.

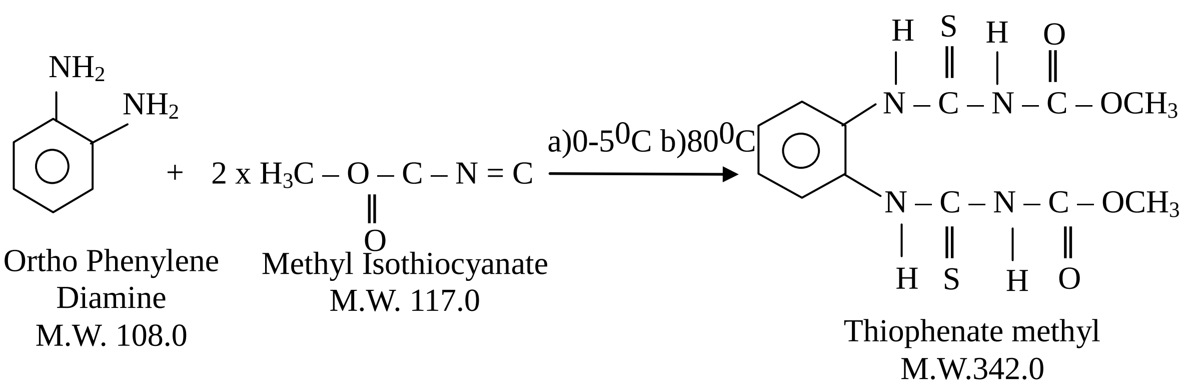
Filtrate and washes are collected and distilled to recover EDC. Final aqueous layer is then sent to ETP.

Chemical Reaction:

Stage:1



Stage:2

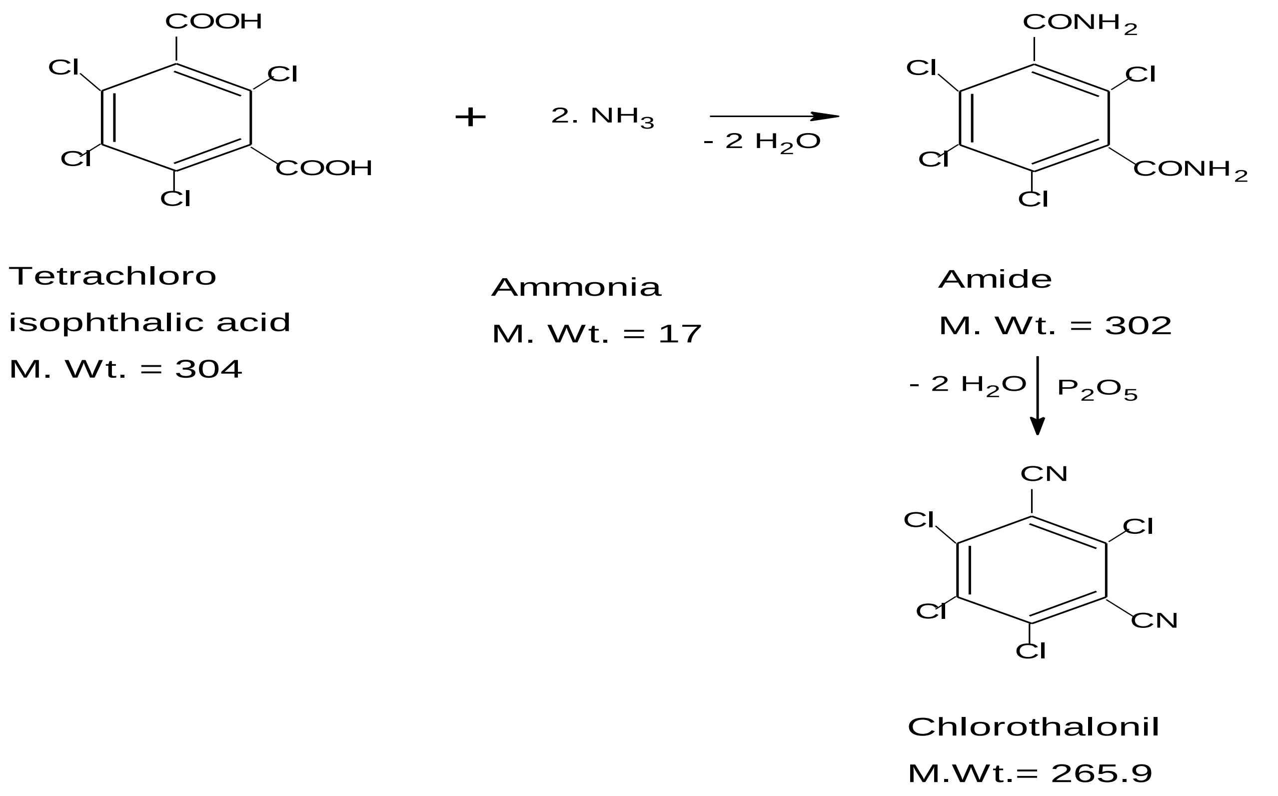


Mass Balance:

122	Material/MassBalanceofThiophenate MethylAllQuantitiesarein kg)				
	In-Put			Out-Put	
Sr. No	**Raw Materials / Items**	**Kg/Batch**		**Product / By Product**	**Kg/Batch**
1	Methyl Chloroformate	600		Thiophenate Methyl	1000
2	Sodium Thiocyanate	526		Recovered EDC	1950
3	Ortho Phenylene Diamine	350		EDC Loss	50
4	Solvent- EDC	2000		Aqueous Layer for ETP	2810
5	Water	3100		Sodium Chloride Salt	390
6				Solid Waste to Incineration	376
	TOTAL	**6576**		**TOTAL**	**6576**

123) Chlorothalonil
Brief Manufacturing Process: -
Tetrachloroisophtalic Acid on Ammonylsis forms its Ammonium Salt, which on further reaction with Phosphorous Pentoxide forms the product Chlorothalonil.

Chemical Reactions: -



Mass Balance:

123	Material / Mass Balance of Chlorothalonil All Quantities are in kg)				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Tetrachloro Isophthalate	1055		Chlorothalonil	**1000**
2	Solvent - Toluene	2000		Water Distillate	120
3	Ammonia Soln.	125		Rec. Toluene	1950
4	Catalyst	20		Toluene Loss	50
5	Water for Washing	850		Aqueous Layer to ETP	930
	Total	**4050**		**Total**	**4050**

124) Isoprothiolane

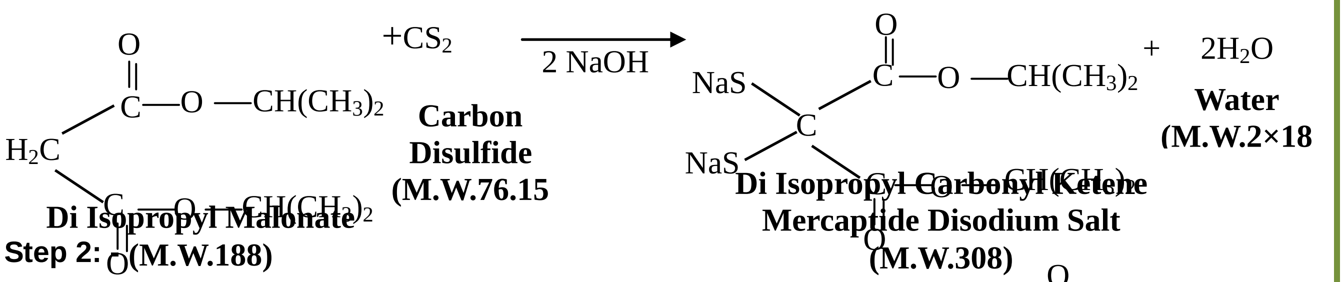
Brief Manufacturing Process: -

Step 1: - Di Isopropyl Malonate is reacted with Carbon Disulphide in alkaline medium, it gives an Intermediate Di Iso Propoxy Carbonyl Ketene Mercaptide Disodium Salt.

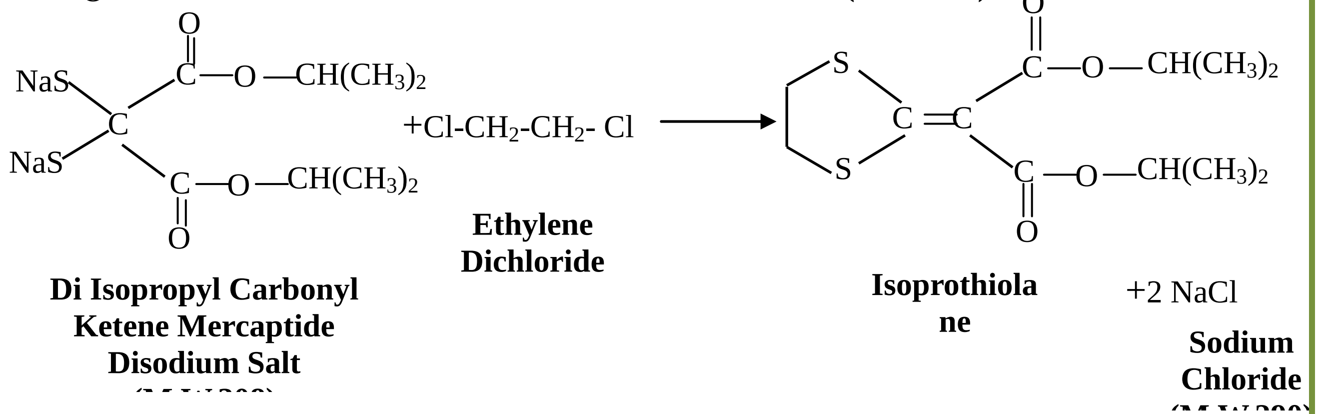
Step 2: - Di Iso Propoxy Carbonyl Ketene Mercaptide Disodium Salt further reacted with Ethylene Dichloride to get crude product as Isoprothiolane. This crude Isoprothiolane is purified by crystallization with Solvent n-Heptane to get Isoprothiolane.

Chemical Reactions: -

Step 1: -



Step 2:



Mass Balance:

124	Material / Mass Balance of Isoprothiolane All Quantities are in kg)				
Step-1	**IN – PUT**			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**

1	Di Isopropyl Malonate	715		Di Iso Propoxy Carbonyl Ketone Mercaptide Disodium Salt	1120
2	Carbon Disulphide	290		Aqueous Layer to ETP	2595
3	Caustic Soda Solution (47%)	710			
4	Water for reaction	2000			
5	**Total**	**3715**		**Total**	**3715**

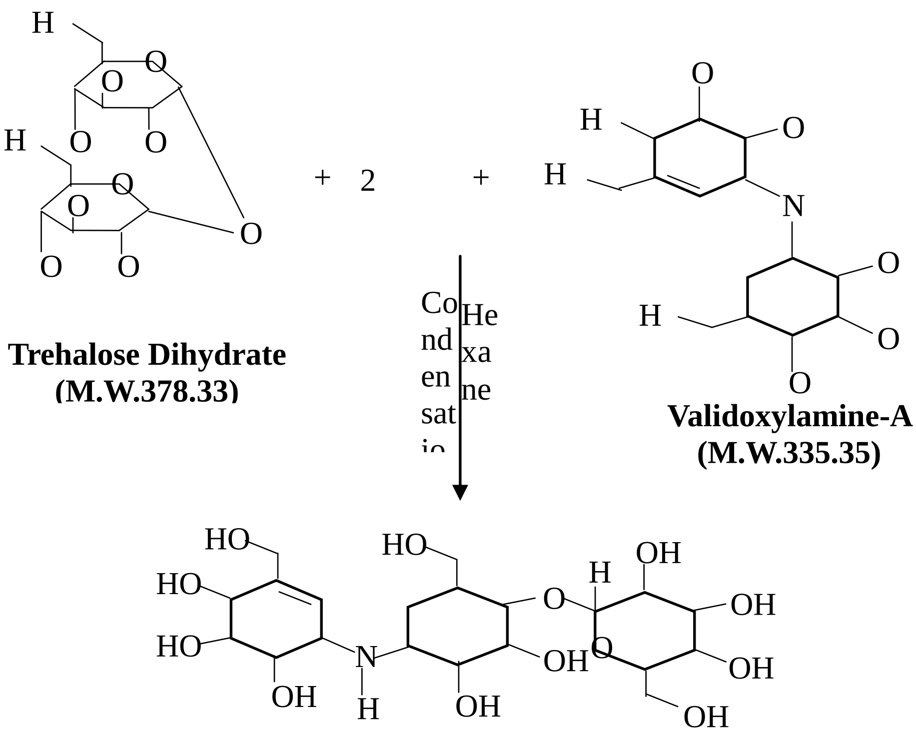
124	**Material / Mass Balance of Isoprothiolane All Quantities are in kg)**				
Step-2	**IN – PUT**			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Di Iso Propoxy Carbonyl Ketone Mercaptide Disodium Salt	1120		**Isoprothiolane**	**1000**
2	Ethylene Dichloride	1440		Recovered EDC	1080
3	Solvent – n-Heptane	2500		Recovered Heptane	2375
4				Sodium Chloride Salt Wet Cake	445
5				Distillation Residue	35
6				Heptane Loss	125
	Total	**5060**		**Total**	**5060**

125) Validamycin

Brief Manufacturing Process: -

Trehalose Dihydrate undergoes Condensation Reaction with Validoxylamine-A. This reaction gives out Validamycine. During this reaction water is also separated out.

Chemical Reactions: -



Validamycin
(M.W.335.35)

Mass Balance:

125	Material / Mass Balance of Validamycin All Quantities are in kg)				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Trehalose Dihydrate	435		**Validamycin**	**1000**
2	Validoxylamine-A	804		Recovered Hexane	1960
3	Hexane	2000		Hexane Loss	40
4	Water for Washing	1000		Aq. Layer to ETP	1239
	Total	**4239**		**Total**	**4239**

126) Quinoxyfen

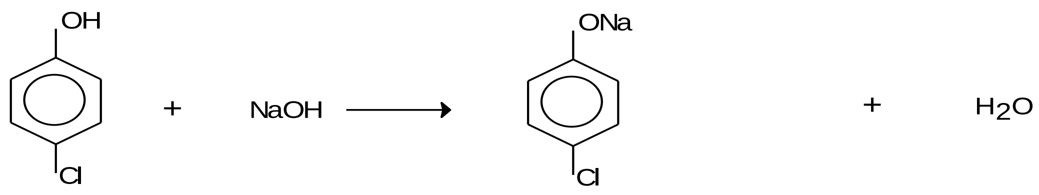
Brief Manufacturing Process: -

Step 1: -4-Chloro Phenol reacts with Sodium Hydroxide to form P-Chloro Sodium Phenate in presence of solvent Toluene.

Step 2: -P-Chloro Sodium Phenate undergoes condensation reaction with 4, 5, 7 Tri Chloro Quinoline in presence of catalyst to give final product Quinoxyfen.

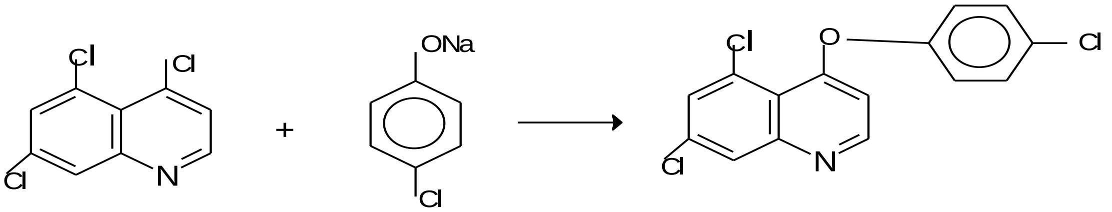
Chemical Reactions: -

Step-1



4 Chloro Phenol M.Wt = 128.5 | Sodium Hydroxide M.Wt = 40 | P-Chloro Sodium Phenate M.Wt = 150.5 | Water M.Wt = 18

Step-2



4,5,7 Trichloro Quinoline M.Wt = 232.5 | P-Chloro Sodium Phenate M.Wt = 150.5 | Quinoxyfen M.Wt = 308

Mass Balance:

126	Material / Mass Balance of Quinoxyfen All Quantities are in kg)					
	IN – PUT			OUT – PUT		
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Para-Chloro Phenol	450		Quinoxyfen	**1000**
2	Sodium Hydroxide	150		Rec. Solvent Toluene	2900
3	Solvent Toluene	3000		Solvent Loss	100
4	4,5,7 Trichloro Quinoline	800		Waste Distilled	60
5	Catalyst	10		Sodium Chloride	200
6	water	850		Aqueous Layer to ETP	1000
	TOTAL	**5260**		**TOTAL**	**5260**

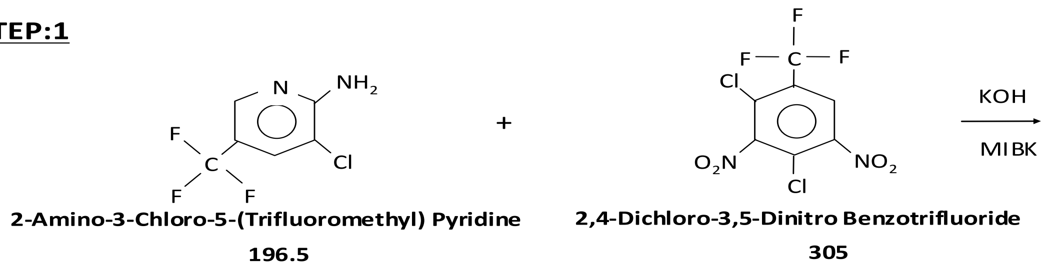
127) Fluazinam

Brief Manufacturing Process: -

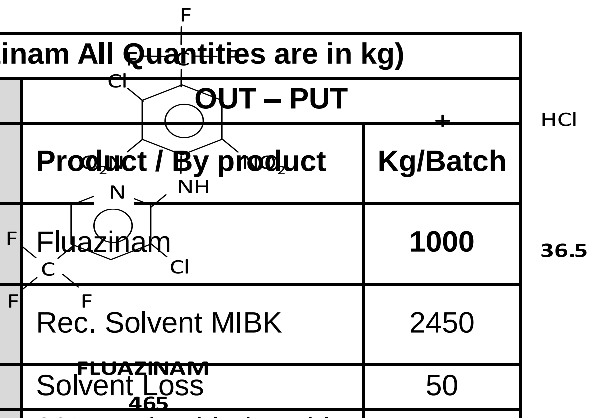
2-Amino-3-Chloro-5-(Trifluoromethyl) Pyridine reacted with 2,4-Dichloro-3,5-Dinitro Benzotrifluoride in presence of Potassium hydroxide and solvent MIBK to give final product Fluazinam.

Chemical Reactions: -

STEP:1



Mass Balance:



127	Material / Mass Balance of Fluazinam All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2-Amino-3-Chloro-5-(Trifluoromethyl) Pyridine	430		Fluazinam	**1000**
2	2,4-Dichloro-3,5-Dinitro Benzotrifluoride	700		Rec. Solvent MIBK	2450
3	MIBK-Solvent	2500		Solvent Loss	50
4	Potassium Hydroxide	130		30% Hydrochloric Acid Solution	260
5	Catalyst	15		Aqueous Layer to ETP	765
6	Water for Washing	750			
	TOTAL	**4525**		**TOTAL**	**4525**

128) Famoxadone

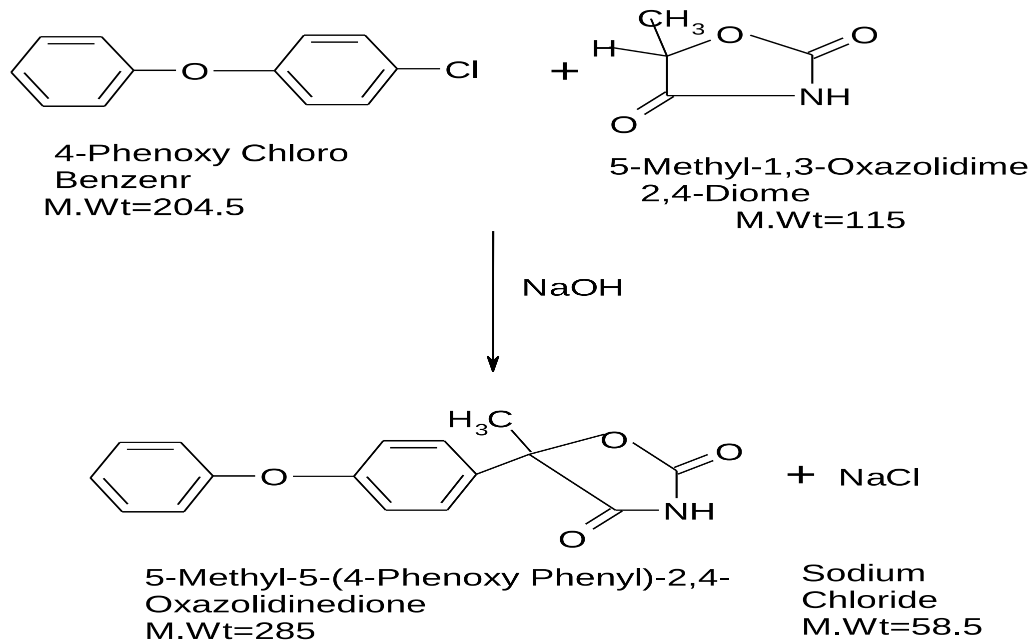
Brief Manufacturing Process: -

Step 1: -4-Phenoxy Chloro Benzene is reacted with 5-methyl 1,3 Oxazolidine 2,4 Dione in presence of Solvent & Sodium Hydroxide to give 5-Methyl 5-(4-Phenoxy Phenyl) 2,4 Oxazolidinedione.

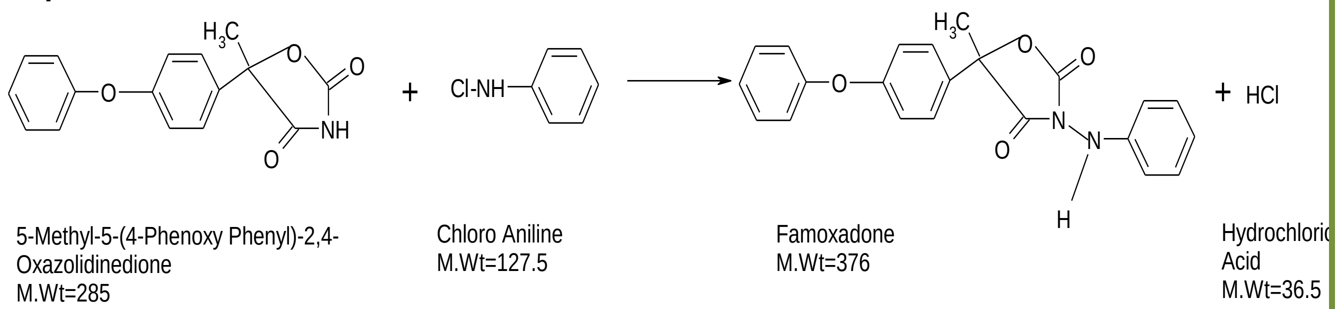
Step 2: -5-Methyl 5-(4-Phenoxy Phenyl) 2,4 Oxazolidinedione when reacts with Chloraniline in presence of Solvent & Catalyst to give the final product Famoxadone.

Chemical Reactions: -

Step 1: -



Step 2: -



Mass Balance:

128	**Material / Mass Balance of Famoxadone All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	4-Phenoxychloro Benzene	860		Famoxadone	**1000**
2	5-Methyl-1,3-Oxazolidine-2,4-Dione	484		Rec. Solvent toluene	1960
3	Solvent-Toluene	2000		Solvent Loss	40
4	Catalyst	15		30% Hydrochloric Acid Solution	490
5	Aniline	535		Sodium Chloride	230
6	Water	1250		Aqueous Layer to ETP	1424
	TOTAL	**5144**		**TOTAL**	**5144**

129) Benalaxyl

Brief Manufacturing Process: -

Step 1: -2- Chloro Propionic Acid is reacted with Methanol in presence of catalyst to get the Methyl Ester of 2- Chloro Propionic Acid.

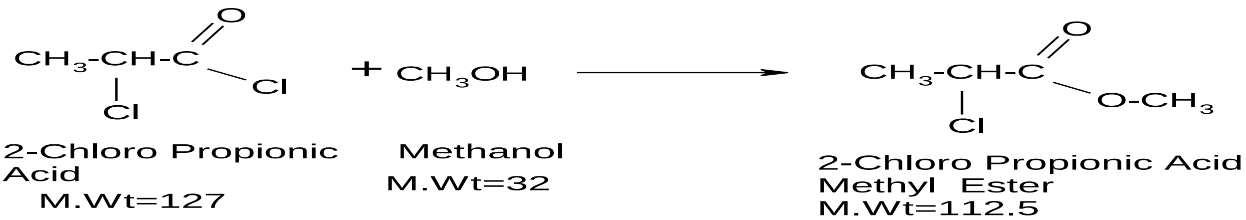
Step 2: -Methyl Ester of 2- Chloro Propionic Acid further reacted with 2,6 Dimethyl Aniline in presence of Solvent toluene and catalyst to form N-(2,6–Dimethyl Phenyl) Alanine – Methyl Ester.

Step 3: -N-(2,6 – Dimethyl Phenyl) Alanine – Methyl Ester finally reacts with Phenyl Acetyl Chloride in presence of catalyst and solvent to get Benalaxyl solution. This solution is then washed with water & solvent is distilled out to get Benalaxyl (Tech.)

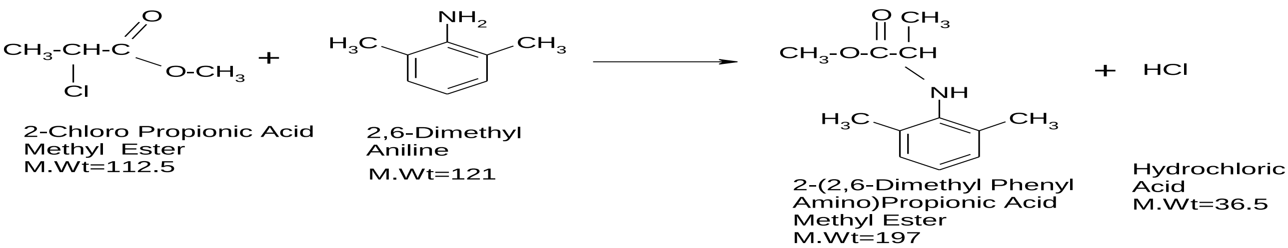
Finally, Toxic Effluent Which contains traces of Pesticides is taken to Hydrolysis stage for detoxification. Where Aq. Mass is treated at high temp. by Alkali for the rapid hydrolysis of pesticides to simpler non-toxic compounds.

Chemical Reactions: -

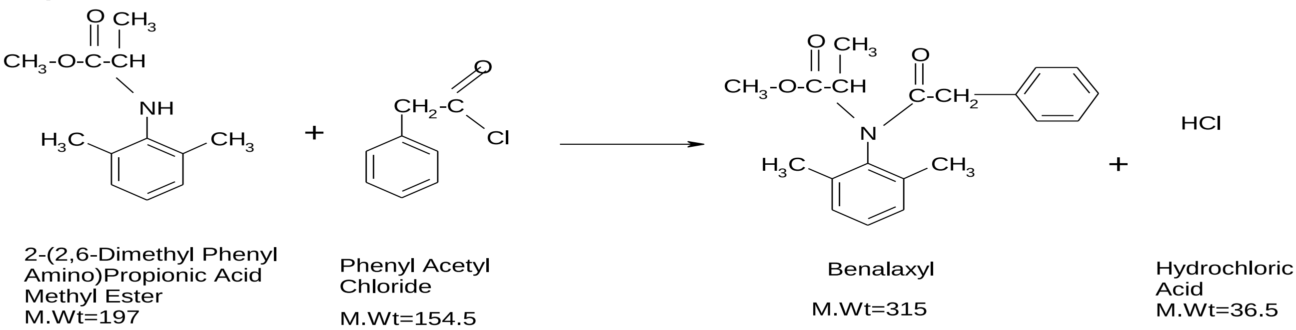
Step 1: -



Step 2: -



Step 3: -



Mass Balance:

129	Material / Mass Balance of Benalaxyl All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	4-Phenoxychloro Benzene	435		**Benalaxyl**	**1000**
2	Methanol	510		Recovered Methanol	370
3	2,6 Dimethyl Aniline	405		Methanol Loss	38
4	Phenyl Acetyl Chloride	490		30% Hydrochloric Acid Solution	1120
5	Solvent Toluene	2500		Rec. Toluene	2450
6	Water for Reaction	785		Toluene Loss	50
7	Water for washing	750		Aqueous Layer to ETP	847
	TOTAL	**5875**		**TOTAL**	**5875**

130) Carboxin

Brief Manufacturing Process: -

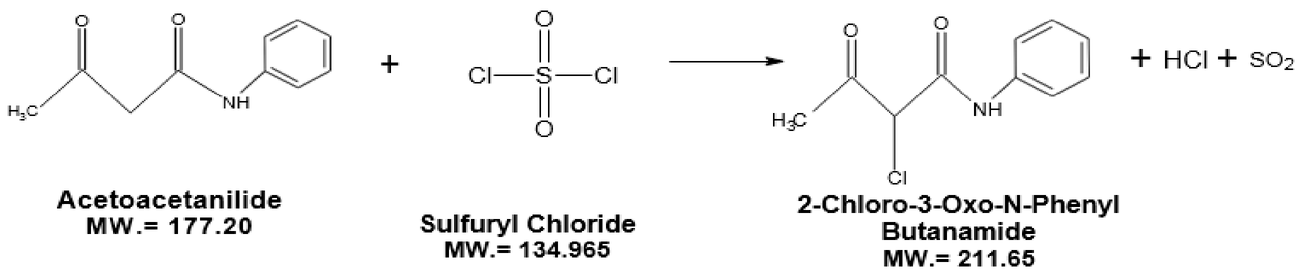
Step 1: - Acetoacetanilide with Sulfuryl Chloride (SO_2Cl_2) in presence of Toluene at 20 – 25°C to give 2-Chloro-3-Oxo-N-Phenylbutanamide.

Step 2: - 2-Chloro-3-Oxo-N-Phenylbutanamide is further reacted with 2-Mercaptoethanol in presence of Triethyl Amine at 30 – 35°C to give 2-(2-Hydroxyethylthio) -3-Oxo-N-Phenylbutanamide.

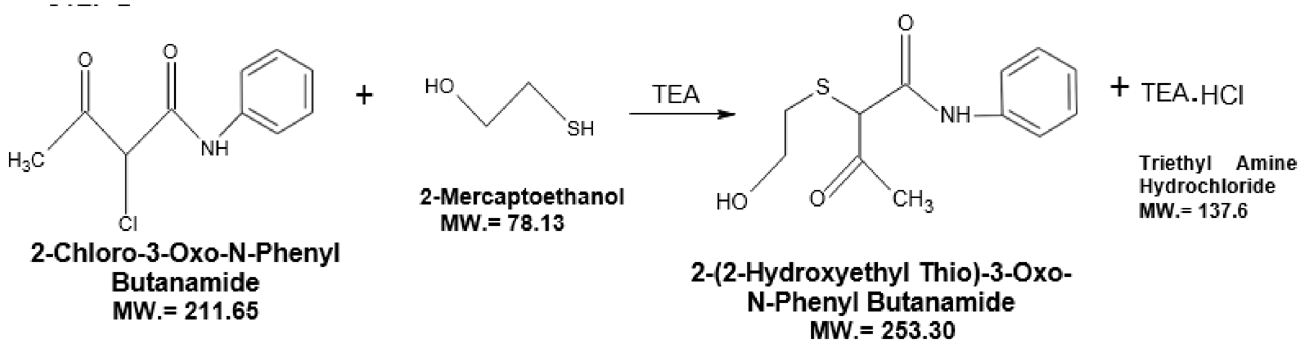
Step 3: - Finally it is cyclized using PTSA at 60 – 65°C to give Carboxin crude. Toluene is distilled off from the reaction mass, suspended in water and centrifuged. The cake is recrystallized from Acetone, centrifuged and dried to get Carboxin Technical.

Chemical Reactions: -

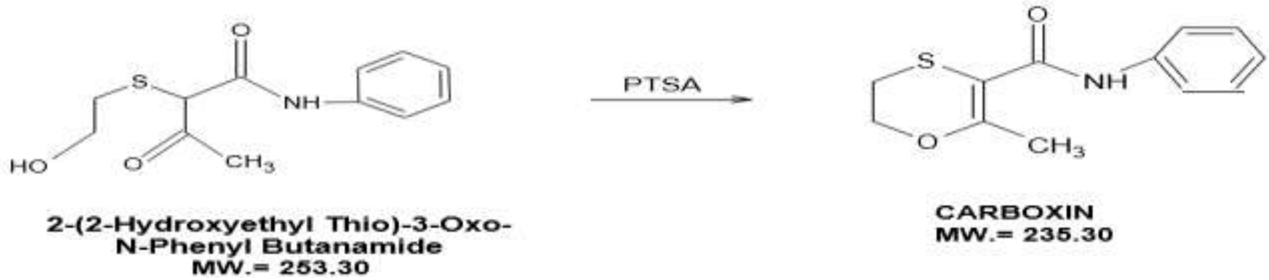
Step 1: -



Step 2: -



Step 3: -



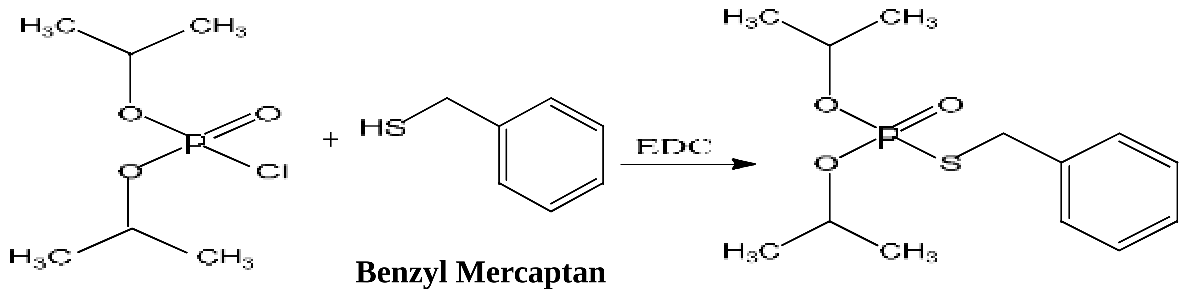
Mass Balance:

130	Material / Mass Balance of Carboxin All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Acetoacetanilide	1506		Carboxin	**1000**
2	Sulfuryl Chloride	1183		30% Hydrochloric Acid	1065
3	Toluene	8500		SO_2 Loss	560
4	2-Mercaptoethanol	610		Recovered Toluene	8100
5	TEA	790		Toluene Loss	400
6	PTSA	350		Recovered PTSA	350
7	Water for Washing	7255		Aqueous Layer	8393
8	Acetone	4000		Recovered Acetone	3820
9	Water for Hydrochloric Acid	746		Acetone Loss	180
10				TEA.HCl	1072
	Total	**24940**		**Total**	**24940**

131) Iprobenfos (Kitazin): -
Brief Manufacturing Process: -

Benzyl Mercaptan is taken in EDC to which Diisopropyl Phosphorochloridate is added along with Catalyst. The mixture is heated to reflux till completion of reaction. Hydrogen Chloride Gas formed during reaction is scrubbed in Caustic scrubber. At the end of reaction, the Organic layer is washed with water, given Charcoal treatment and solvent recovered under vacuum.

Chemical Reactions: -



Diisopropyl Phosphorochloridate (M.W.200.6) + **Benzyl Mercaptan** (M.W.124.2) → **Iprobenfos (Kitazin)** (M.W.288.3) + HCl **Hydrochloric Acid**(M.W.36.5)

Mass Balance:

131	Material / Mass Balance of Iprobenfos(Kitazin) All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Diisopropyl Phosphorochloride	718		Iprobenfos(Kitazin)	**1000**
2	Benzyl Mercaptan	444		30% Hydrochloric Acid	425
3	Dichloroethane (DCE)	3600		DCE Recovered	3506
4	Charcoal	107		DCE Loss	11
5	Water for Hydrochloric Acid	298		DCE in Residue	82
6				Diisopropyl Phosphorochloride	22
7				Benzyl mercaptan	14
8				Charcoal	107
	Total	**5167**		**Total**	**5167**

132) Bixafen

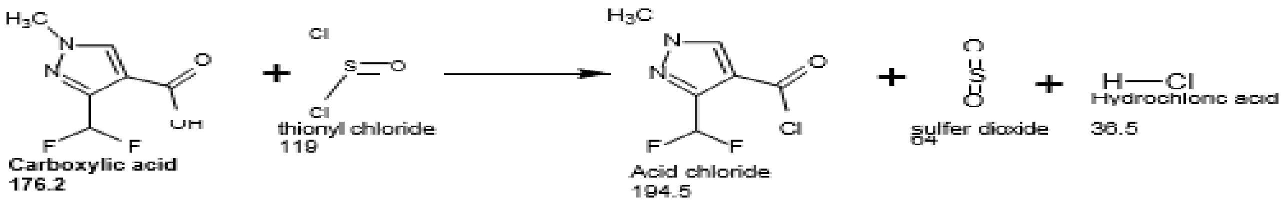
Brief Manufacturing Process: -

Step1:-3-(Difluoromethyl)-1-Methyl-1-H-Pyrazol-4-Carboxylic Acid, (3-(Difluoromethyl)-1-Methylpyrazole-4-Carboxylic Acid) undergoes chlorination by Thionyl Chloride to convert to Acid Chloride in Presence of Solvent – Toluene & Catalyst. During this chlorination gases such as Hydrogen Chloride&Sulfur Dioxide are generated which are scrubbed on Water & dilute Caustic respectively to get 30 % Hydrochloric Acid Solution& 20 % Sodium Sulphite Solution as Bye Products.

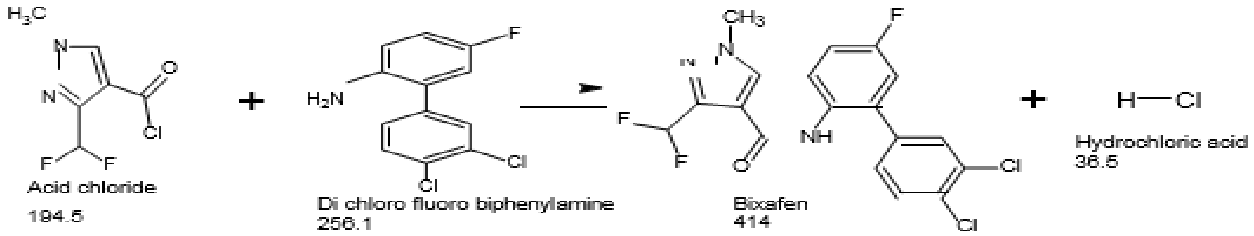
Step 2: - The Acid Chloride is coupled with 3,4-Dichloro-5-Fluoro-1,1-Biphenyl]-2-Amine (3',4'-Dichloro-5-Fluorobiphenyl-2-Amine) at room temperature and the product is filtered, washed and dried to get the desired product.

Chemical Reactions: -

Step 1: -



Step 2: -



Mass Balance:

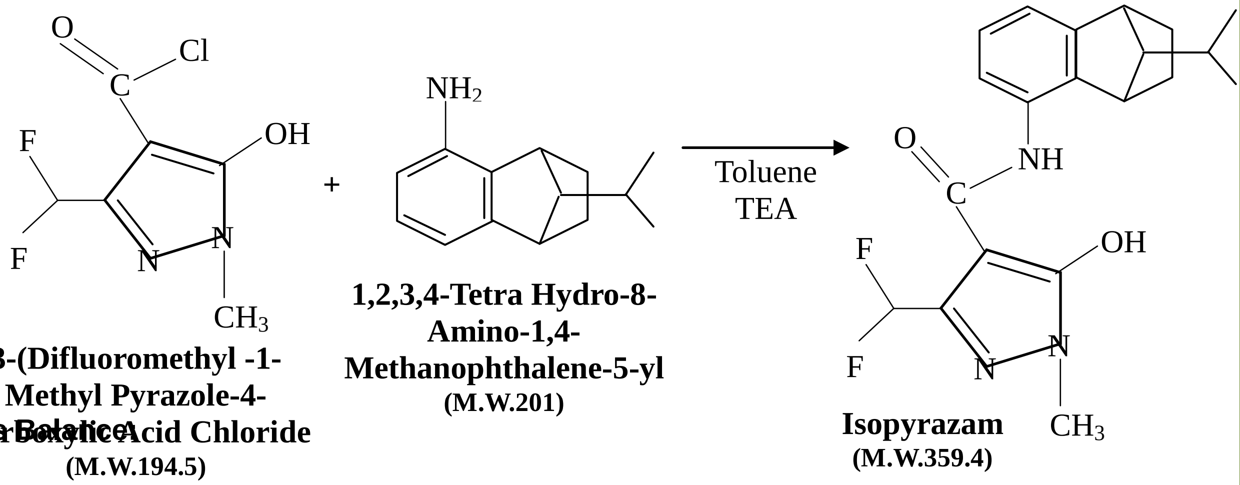
132	Material / Mass Balance of Bixafen All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Carboxylic acid	501		Bixafen	**1000**
2	Thionyl chloride	355		20% Sodium Sulphite Soln	1792
3	DMF	5		Recovered Toluene	1350
4	Toluene	1500		Toluene Loss	150
4	Dichlorofluoro Biphenyl Amine	742		30 % Hydrochloric Acid Soln	670
5	Potassium Carbonate	400		Organic Waste Loss	196
6	Water for 30 %Hydrochloric Acid solution	483		Aqueous Waste Loss	438
7	Dilute Caustic for 20 % Sodium Sulphite	1610			
	Total	**5596**		**Total**	**5596**

133) Isopyrazam

Brief Manufacturing Process: -

3-(Difluoromethyl-1-Methyl Pyrazole-4-Carboxylic Acid Chloride undergoes Condensation reaction with 1,2,3,4-Tetra Hydro-8-Amino-1,4-Methano phthalene-5-yl in presence of Solvent Toluene and Acid Scavenger Tri Ethyl Amine. It gives the final Product Isopyrazam.

Chemical Reactions: -



Mass Balance: -

133	Material / Mass Balance of Isopyrazam All Quantities are in kg)				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/ Batch**		**Product / By product**	**Kg/ Batch**
1	3-(Difluoromethyl-1-Methyl Pyrazole-4-Carboxylic Acid Chloride	584		Isopyrazam	**1000**
2	1,2,3,4-Tetra Hydro-8-Amino-1,4-Methano phthalene-5-yl	210		Recovered Toluene	1920
3	Solvent Toluene	2000		Toluene Loss	80
4	Catalyst	10		Recovered TEA	296
4	Triethyl Amine	303		TEA Loss	7
5	Caustic Lye 48%	275		Aq. Layer to ETP	557
6	Water	510		Residue	32
	Total	**3892**		**Total**	**3892**

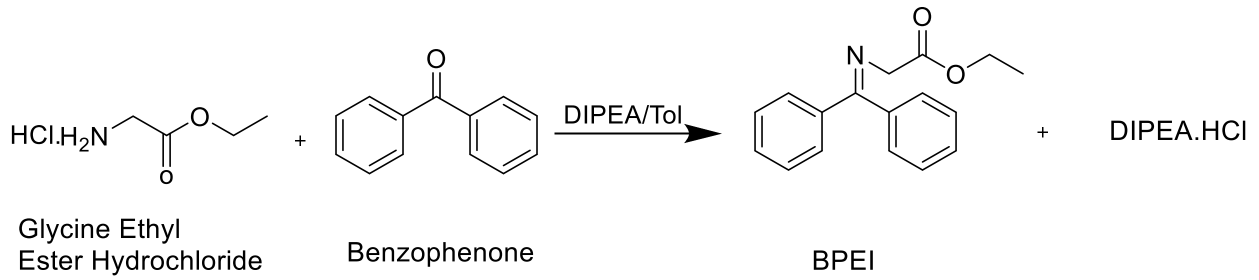
134)Fluopicolide

Manufacturingprocess

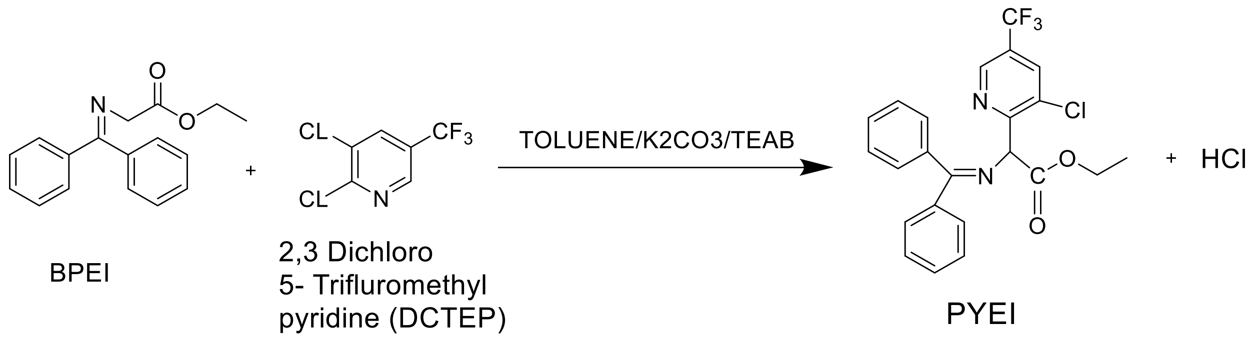
GlycineethylesterHydro Chloride Benzophenoneand DIEPA are mixed and reflux under pressure and moisture is removed. Toluene is added to the reaction mass. Water is added to remove the salt. Potassiumcarbonate and Tetraethyl ammonium bromide is added and water is removed by azetropic distillationand then Dichloro Trifluoromethyl pyridine is added to the reactor. Toluene is distilled out from the reaction mass.Water is added to remove the carbon at estlandaq.Phase is separated out, followed by addition of Disodiumtetraborate for decarboxylation and then extraction. Reaction mass is filtered andthen driedtogetdryFluopicolideproduct.

Chemical Reaction

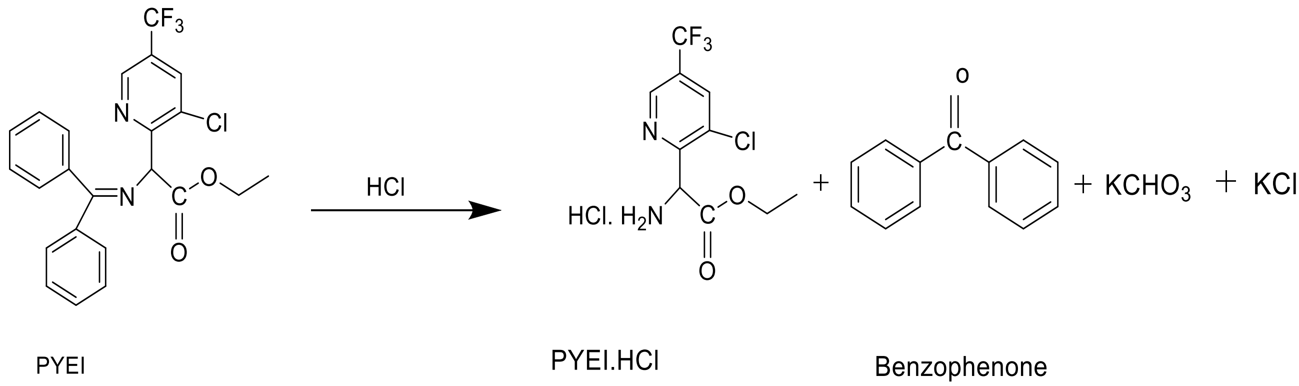
Step:1



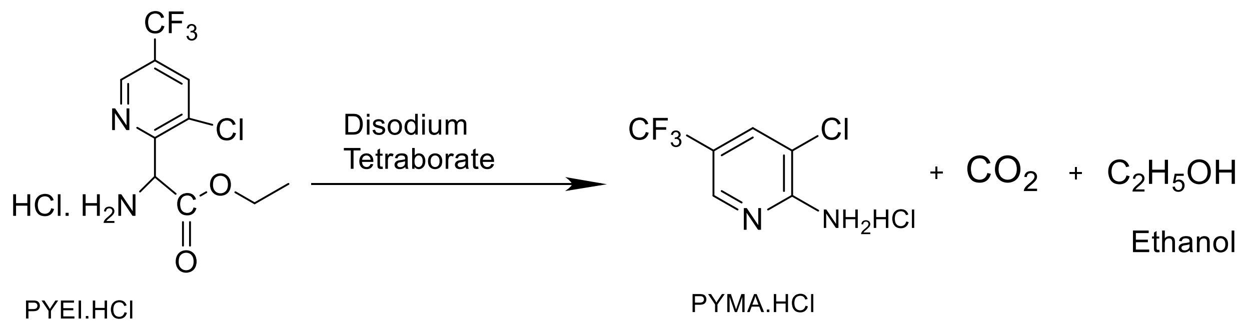
Step:2



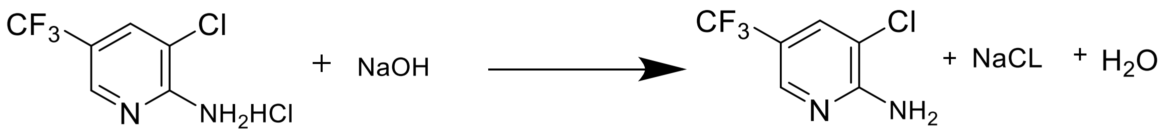
Step 3:



Step:4

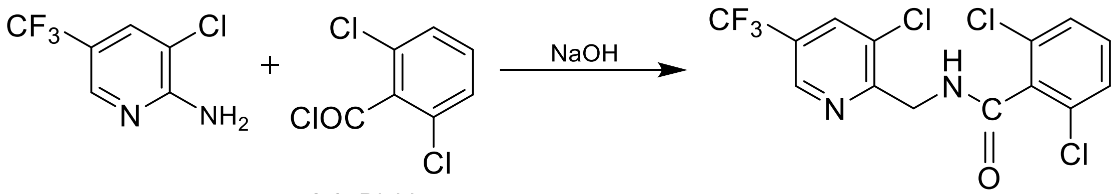


Step:5



PYMA.HCl PYMA

STEP:6



PYMA

2,6, Dichloro Benzoyle Chloride (DCBA)

Fluopicolide

Mass Balance:

134	**Material / Mass Balance of Fluopicolide All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
STEP-1	Slurry Preparation				
1	Toluene (Recycle+Fresh)	1224		Slurry Mixture	2832
2	Benzophenone (Recycle+Fresh)	1563			
3	PTSS	45			
	TOTAL	2832		**TOTAL**	2832

134	**Material / Mass Balance of Fluopicolide All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
STEP-2	BPGI Reaction				
1	Mixture from step -1	2832		Recovered Toluene	780
2	DIPEA(Recycle+Fresh)	697		Aq. DIPEA HCl recovery	530
3	Water for Extraction	535		BPGI solution in Tol.	2754
	TOTAL	4064		**TOTAL**	4064

134	**Material / Mass Balance of Fluopicolide All Quantities are in kg)**		
	IN – PUT		**OUT – PUT**
STEP-3	PYGI Reaction		

1	BPGI solution in Tol. From step-2	2754		Toluene Distillate (Recycle)	302
2	Pottasium Carbonate	1558		Reaction mixture	6807
3	TEBRO-Catalyst	48			
4	Toluene (Recycle+Fresh)	1936			
5	DCTFP	813			
	TOTAL	**7109**		**TOTAL**	**7109**

134	Material / Mass Balance of Fluopicolide All Quantities are in kg)				
	IN – PUT			OUT – PUT	
STEP-4	PYGE.HCl Salt preparation				
1	PYGI Reaction mixture from step-3	6807		Product in aq. (PYGE.HCl)	3909
2	Water	1698		Organic Phase for Benzophenone Recovery	5505
3	BXA	45		Aq. Phase	1002
4	HCl (30%)	959			
5	Toluene	907			
	TOTAL	**10416**		**TOTAL**	**10416**

134	Material / Mass Balance of Fluopicolide All Quantities are in kg)				
	IN – PUT			OUT – PUT	
STEP-5	PYMA Reaction				
1	Product in aq. (PYGE.HCl)	3909		PyMA in Toluene	4118
2	Toluene (Recycle+Fresh)	2226		Aq. Phase	3753
3	CSL (48% Solution)	512			
4	Water	1224			
	TOTAL	**7871**		**TOTAL**	**7871**

134	Material / Mass Balance of Fluopicolide All Quantities are in kg)				
	IN – PUT			OUT – PUT	
STEP-6	Fluopicolide Reaction				
1	PyMA in Toluene	4118		Fluopicolide in Toluene	3913
2	CSL (48% Solution)	139		Aq. Layer to ETP	542
3	DCBC	138			
4	Toluene	60			
	TOTAL	**4455**		**TOTAL**	**4455**

134	Material / Mass Balance of Fluopicolide All Quantities are in kg)				
	IN – PUT			OUT – PUT	

STEP-7	Fluopicolide Filtration				
1	Fluopicolide in Toluene	3913		Product wet cake	1662
2	Toluene (Recycle)- wash	1122		ML for Recovery	3373
	TOTAL	**5035**		**TOTAL**	**5035**

134	**Material / Mass Balance of Fluopicolide All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
STEP-8	Fluopicolide Drying				
1	Product wet cake	1662		Dry Fluopicolide	1000
2				Drying Loss	662
	TOTAL	**1662**		**TOTAL**	**1662**

135) Fluopyram:

Brief Manufacturing Process: -

Step 1: - 3-Chloro-5-(Triflouromethyl)-2-Pyridine Ethane Aminewith water under stirrer heat reaction mass at 40-45°C. Started addition of Hydrochloric Acid in two hours.

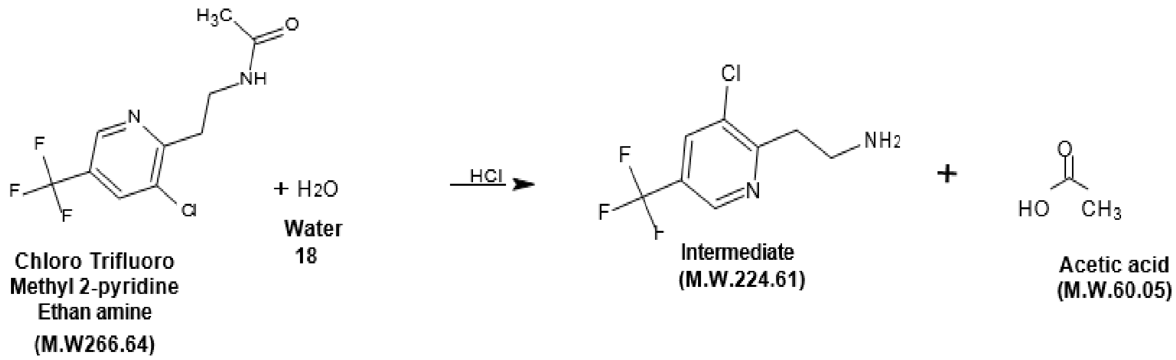
Reaction mass heat up to reflux for 3-4 hours. Cool to 30°C, added two times EDC in mass under stirrer for one hour, reaction mass taken for layer separation, organic layer concentrate under vacuum distillation. Obtained crude material taken for next step.

Step 2: - 2-(Triflouromethyl) Benzoic Acid (TFBC), is taken in Ethylene Dichloride and is reacted with Thionyl Chloride, evolved gases are removed by nitrogen purging.

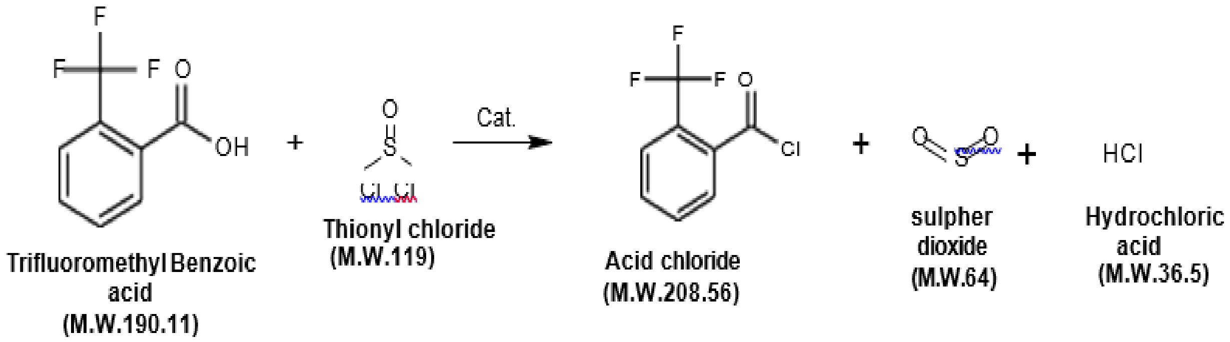
Step 3: - The Acid Chloride is coupled with Intermediate at room temperature and the product is filtered, washed and dried to get the desired product.

Chemical Reactions: -

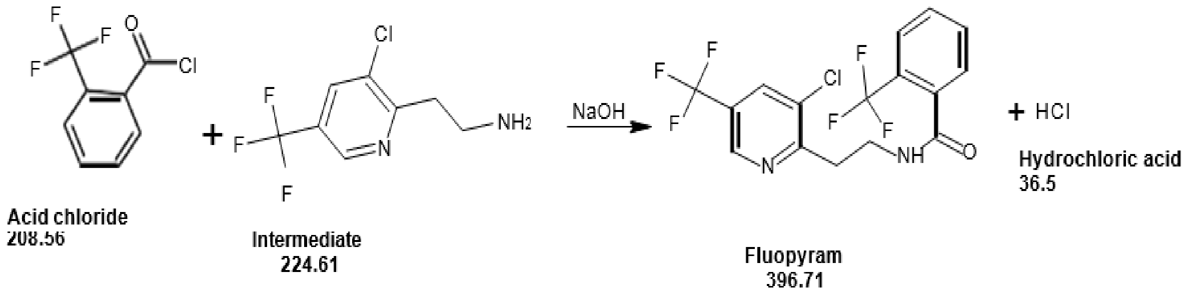
Step 1: -



Step 2: -



Step 3: -



135	Material / Mass Balance of Fluopyram All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	3-Chloro-5-(Triflouromethyl)-2-Pyridine Ethane Amine	849		Fluopyram	**1000**
2	2-(Triflouromethyl) Benzoic Acid	563		Recovered EDC	1555
3	EDC	1690		Loss EDC	135
4	DMF	5		Acetic Acid	191
5	Thionyl Chloride	370		30% Hydrochloric Acid	360
6	Hydrochloric Acid	387		20% Sodium Sulfite Soln	945
7	Water	1000		Aqueous Waste	1804
8	Sodium Hydroxide (Caustic)	874			
9	Water for Hydrochloric Acid	252			
	TOTAL	**5990**		**TOTAL**	**5990**

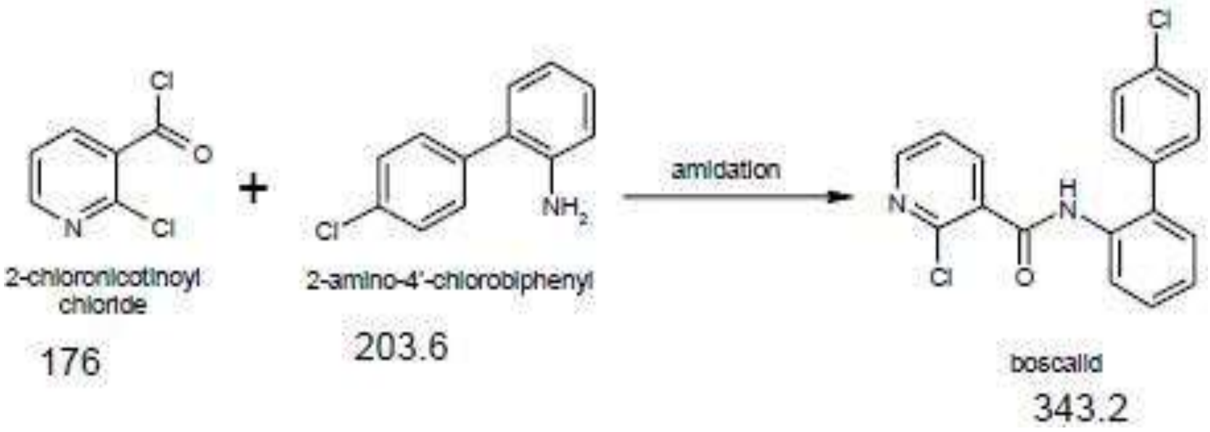
136)Boscalid:

Brief Manufacturing Process: -

Step 1: - 2-Chloro-3-Nicotinic Acid (CNA) is taken in toluene and is reacted with Thionyl chloride and the gases are removed by nitrogen purging.

Step 2: - The Acid Chloride is coupled with 2- Amino-4'-Chlorobiphenyl (ACBP) at room temperature and the product is filtered, washed and dried to get the product.

Chemical Reactions: -



136	Material / Mass Balance of Boscalid All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2-Chloronicotinoyl Chloride	537		Boscalid	**1000**
2	2-Amino-4'-Chlrobiphenyl	594		30% Hydrochloric Acid	355
3	Toluene	1500		Water	700
4	Water	1500		Recovered Toluene	1350
5	Water washing	500		Toluene losses	150
6	Water for Hydrochloric Acid	249		Aqueous ML	960
7				Water Washing	300
8				Organic Impurities	65
	TOTAL	**4880**		**TOTAL**	**4880**

137) Fluxapyroxad:

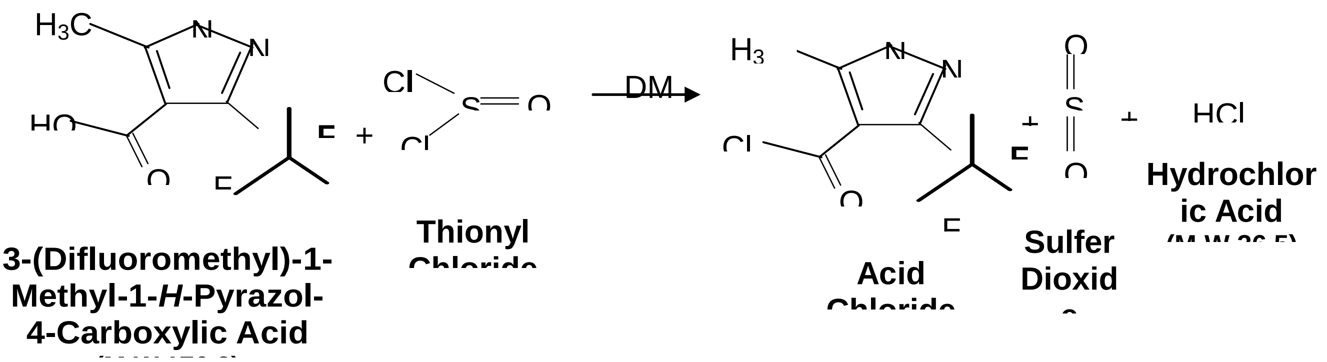
Brief Manufacturing Process: -

Step-1: 3-(Difluoromethyl)-1-methyl-1-*H*-pyrazol-4-carboxylic acid, is taken in toluene and is reacted with Thionyl chloride, evolved gases are removed by nitrogen purging.

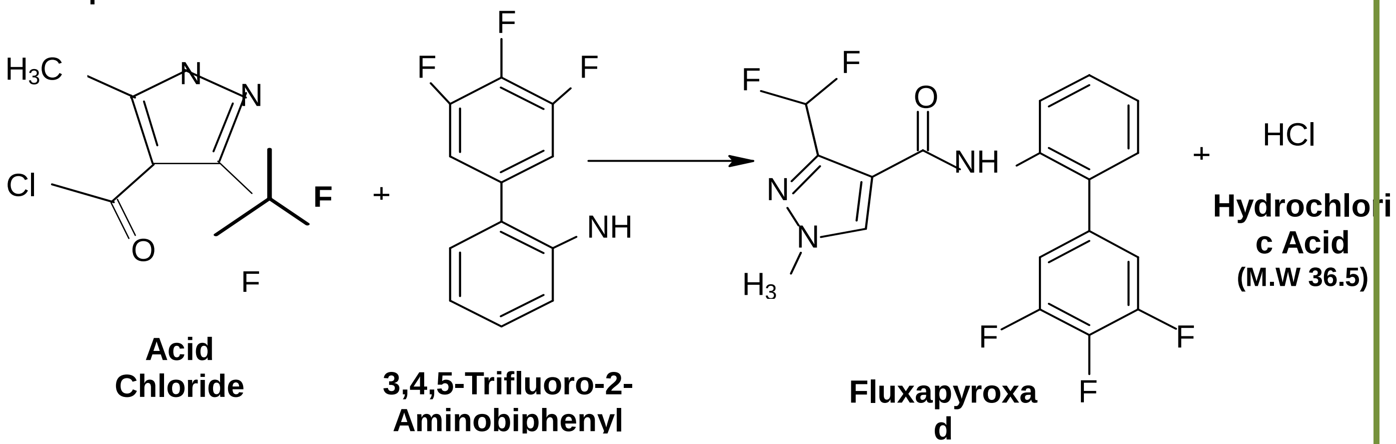
Step-2: The acid chloride is coupled with 3,4,5-trifluoro-2-aminobiphenyl at room temperature and the product is filtered, washed and dried to get the desired product.

Chemical Reactions: -

Step 1: -



Step 2: -

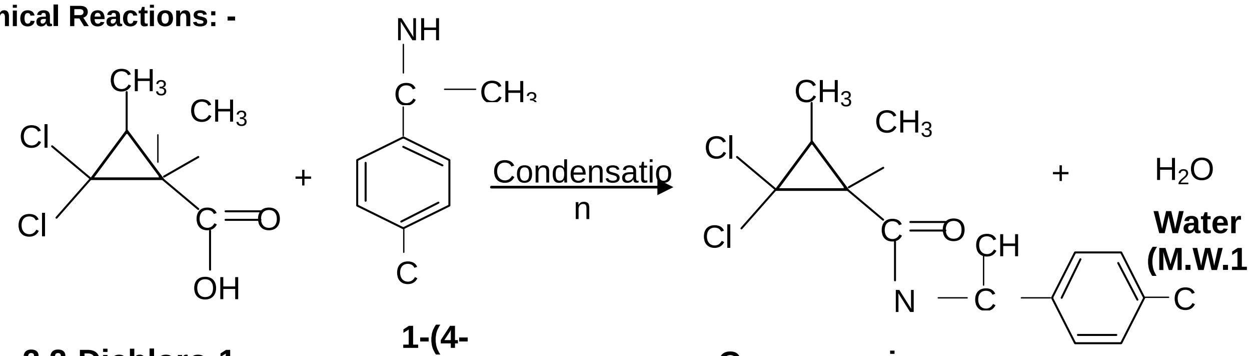


137	Material / Mass Balance of Fluxapyroxad All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	3-(Difluoromethyl)-1-Methyl-1-H-Pyrazol-4-Carboxylic Acid	554		Fluxapyroxad	**1000**
2	Thionyl Chloride	393		Recovery Toluene	1498
3	DMF	5		Loss Toluene	166
4	3,4,5-Trifluoro-2-Aminobiphenyl	702		Loss Thionyl Chloride	19
5	Potassium Carbonate	425		Recovery Thionyl Chloride	374
6	Toluene	1664		30% Hydrochloric Acid	425
7	Dilute Caustic Lye	850		20% Sodium Sulfite Soln	951
8	Water for Hydrochloric Acid	298		Organic Waste	190
9				Aqueous Waste	268
	TOTAL	**4891**		**TOTAL**	**4891**

138) Carpropamid:
Brief Manufacturing Process: -

2,2-Dichloro-1-Ethyl-3-Methylcyclopropane is undergoes formal Condensation reaction with 1-(4-Chlorophenyl) Ethylamine in presence of Solvent Toluene as well as Catalyst. It forms the final product Carpropamid. Solvent is recovered which is reused in process.

Chemical Reactions: -



2,2-Dichloro-1-Ethyl-3-Methylcyclopropan **1-(4-Chlorophenyl) Ethylamine** **Carpropamid**

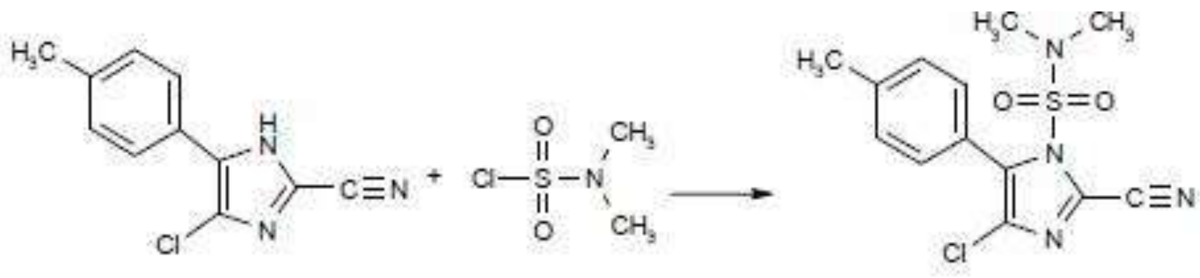
138	Material / Mass Balance of Carpropamid All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2,2-Dichloro 1-Ethyl 3-Methylcyclopropane Carboxylic Acid	616		Carpropamid	**1000**
2	1-(4-ChloroPhenyl) Ethyl Amine	490		Recovered Solvent	2130
3	Solvent - Toluene	2200		Loss Solvent	70
4	Catalyst - TBAB	18		Waste Water	1374
5	Water for Reaction	1250			
	TOTAL	**4574**		**TOTAL**	**4574**

139) Cyazofamid:

Brief Manufacturing Process: -

4-Chloro-2-cyano-5-p-tolylimidazole (CCDTI) is reacted with Dimethylsulfamoyl Chloride in presence of Solvent Toluene at elevated temperature. After completion of the reaction, the organic layer is washed with water and the aqueous layer is separated. The organic layer is taken for the recovery of solvent and the crude is sent through ATFE to remove the impurities.

Chemical Reactions: -



condensation dehydrochlorination sulfonamide formation
217.66

Dimethylsulfamoyl chloride
143.6

cyazofamid
324.8

139	Material / Mass Balance of Cyazofamid All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	4-Chloro-2-Cyano-5-p-Tolylimidazole (CCDTI)	656		Cyazofamid	**1000**
2	Dimethylsulfamoyl Chloride	441		Loss Acetonitrile	1530
3	K2CO3	430		Recovered Acetonitrile	170
4	Acetonitrile	1700		Water	1000
5	Toluene	2000		KCl	165
6	Water wash	1000		KHCO3	290
7				K2CO3	4
8				Toluene Recovered	1950
9				Organic Impurities	68
10				Toluene losses	50
	TOTAL	**6227**		**TOTAL**	**6227**

140) Mandipropamid:
Brief Manufacturing Process: -

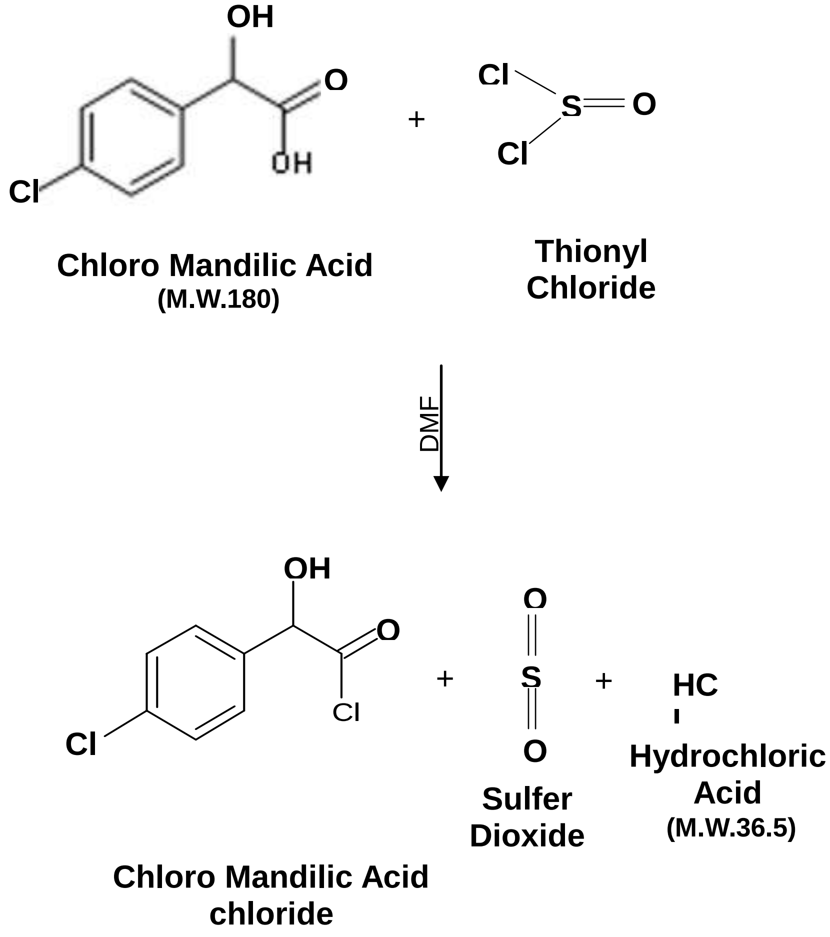
Step-1: - 4-Chloromandilic Acid, is reacted with Thionyl chloride, in presence of Solvent Toluene to convert to Acid Chloride. During this reaction gases such as Hydrochloric Acid as well Sulphur Dioxides are evolved which are scrubbed to Water & Dilute Caustic Soda Lye to get 30 % Hydrochloric Acid solution & 20 % Sodium Sulphite Solution respectively. Finally, remaining gases are removed by nitrogen purging.

Step-2: The Acid Chloride is coupled with 3,4-Dichloro-5-fluoro-1,1-Biphenyl]-2-amine at room temperature and the product is filtered, washed and dried to get the intermediate.

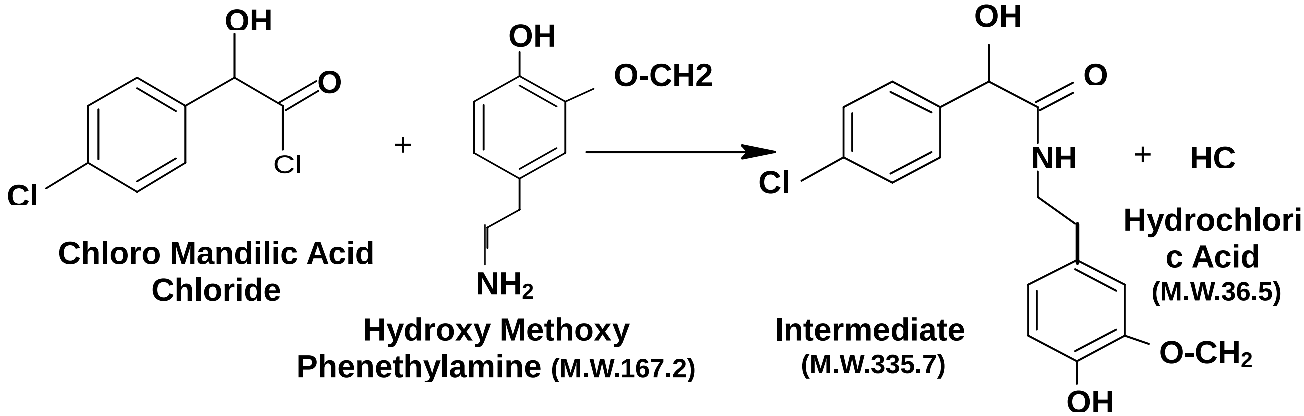
Step-3: The Intermediate substitution with 2-Propinyl methane Sulfonate at room temperature Filter and the product is filtered, washed and dried to get the desired product.

Chemical Reactions: -

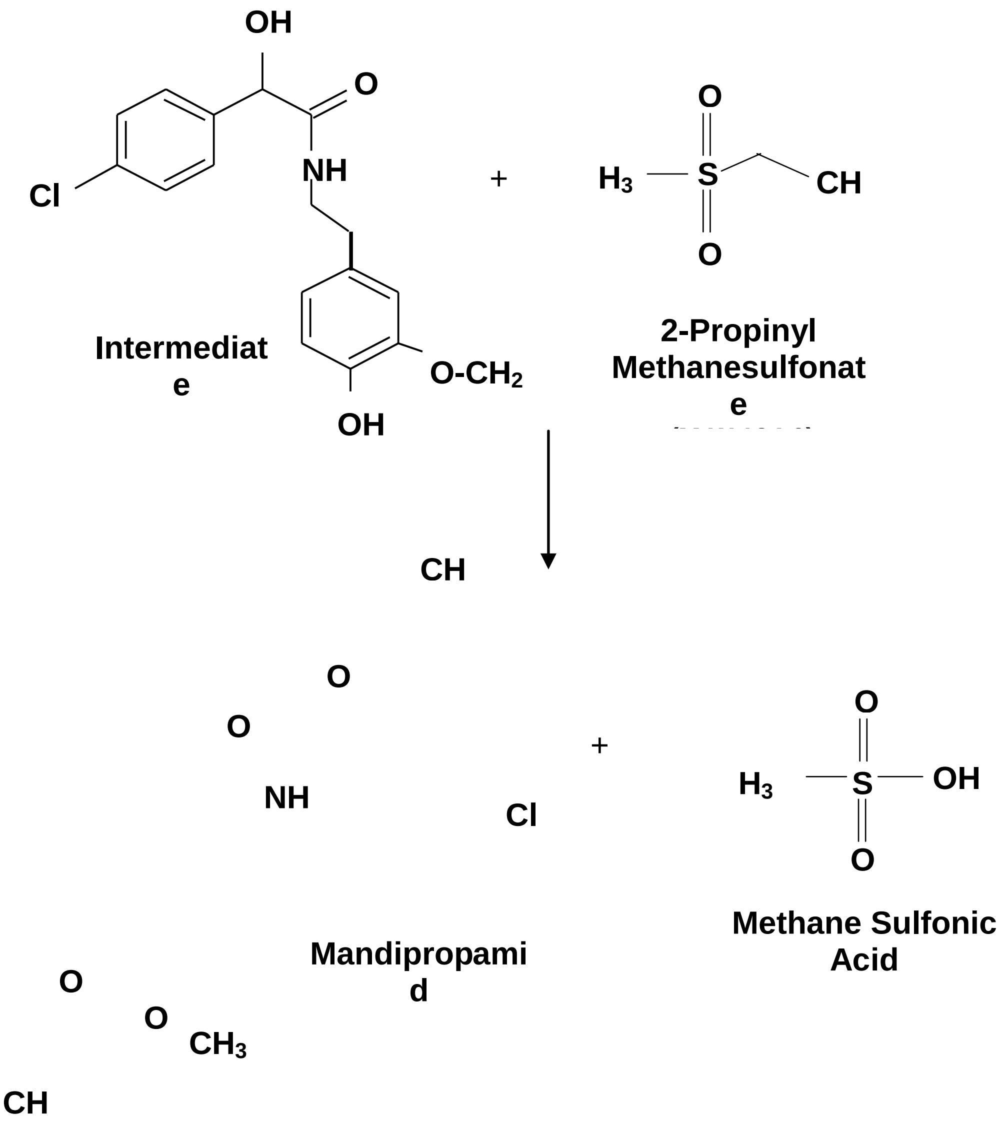
Step 1: -



Step 2: -



Step 3: -



Intermediat
e

2-Propinyl
Methanesulfonat
e

Mandipropami
d

Methane Sulfonic
Acid

140	Material / Mass Balance of Mandipropamid All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	4-Chloromandilic Acid	607		Mandipropamid	**1000**
2	Thionyl chloride	407		Recovery Toluene	1620
3	DMF	6		Loss Toluene	180
4	Toluene	1800		Recovery DMF	5
5	3-Methoxy Phenethylamine	544		Loss DMF	1
6	2-Propinyl Methanesulfonate	896		Methane Sulfonic Acid	583
7	Dilute Caustic lye	1500		30% Hydrochloric Acid	715
8	Water for Hydrochloric Acid	500		Organic Waste	416
9				20% Sodium Sulfite Soln	1708
10				Loss Thionyl Chloride	32
	TOTAL	**6260**		**TOTAL**	**6260**

141) Penflufen

Manufacturing Process

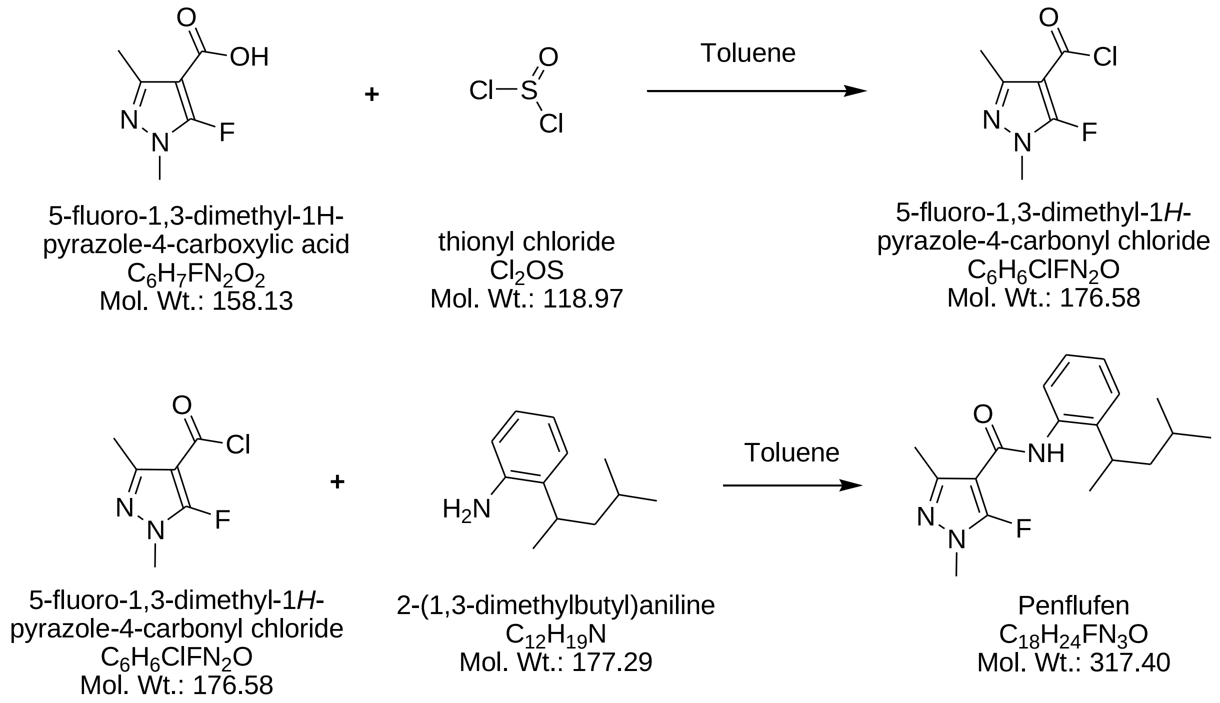
Step: 1-

The Solvent Toluene and 5-Fluoro-1,3-Dimethyl-1H-Pyrazole-4-Carboxylic Acid (5-FDMPCA) are charged. The Catalyst is added and the temperature is raised to 55^{o}C and Thionyl Chloride is added for 6 hours and the by-product Hydrogen Chloridegas is scrubbed in water and Sulphur Dioxide is scrubbed in caustic lye solution. The reaction is maintained at 70^{o}C for 6 hours to complete. The reaction mass of 5-Fluoro-1,3-Dimethyl-1H-Pyrazole-4-Carboxylic Acid Chloride in Toluene is cooled to 50^{o}C.

Step: 2-

2-(1,3-Dimethylbutyl)Aniline (2-DMBA) is added to the above reaction mass of 5-Fluoro-1H-Pyrazole-4-Carboxylic Acid Chloride in Toluene for 6 hours at 50^{o}C. The temperature is raised to 100^{o}C and maintained for 6 hours. After completion of the reaction, water is added and neutralized with 10% Caustic Soda lye Solution. The aqueous phase is separated and the organic phase is cooled to 10^{o}C. The slurry is filtered and dried to obtain Penflufen TC.

Chemical reactions



141	Material / Mass Balance of Penflufen All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	5-Fluoro-1,3-Dimethyl-1H-Pyrazole-4-Carboxylic Acid	625		**Penflufen**	**1000**
2	2-(1,3-Dimethylbutyl)Aniline	620		Recovered Solvent Toluene	2900
3	Thionyl chloride	475		Toluene Loss	100
4	Toluene	3000		30% Hydrochloric Acid	865
5	Dilute Caustic Lye	1500		Sodium Sulfite Soln	1702
6	Catalyst	7		Aqueous Layer to ETP	1215
7	Water	1000		Drying Loss	50
8	Water for Hydrochloric Acid	605			
	TOTAL	**7832**		**TOTAL**	**7832**

❖ **GROUP-9-Als-Imidazolinone/Ureas/Als-Sulfonylurea-Cont/Als-Others/AminoAcids/Ureas/Cyclohexandiones/DinitroAnilinees/Acetamides/Amide/NitroPhenyl Ether Herbicides/Monothiocarbamic Ester/ Triazinone Herbicides / Cyclohexane Oxime**

142) Imazamox

Brief Manufacturing Process: -

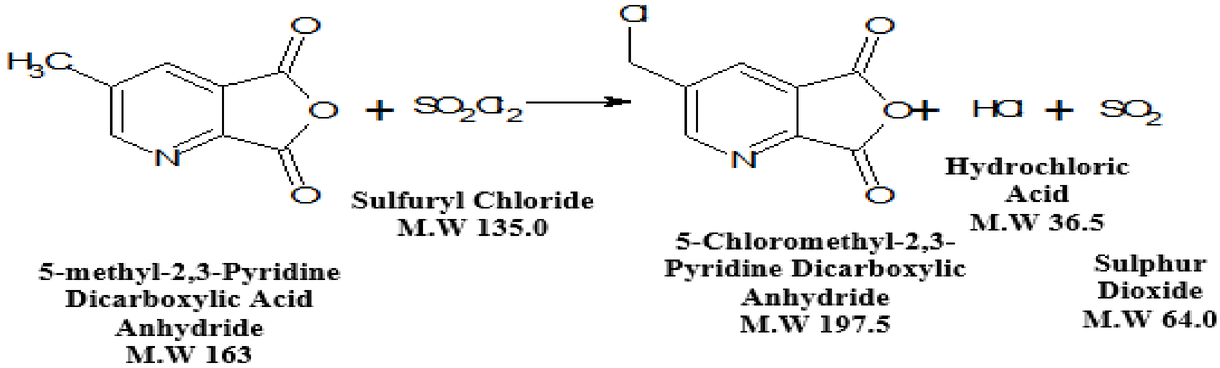
Step 1: -Chlorination of 5-methyl-2,3-Pyridine Dicarboxylic Acid Anhydride is carried out with Sulfuryl Chloride to 5-Chloromethyl-2,3-Pyridine Dicarboxylic Anhydride. During reaction Hydrogen Chloride gas and Sulphur dioxide gas scrub in scrubber. After reaction complete Chlorobenzene is distilled out then filter it to get 5-Chloromethyl-2,3-Pyridine Dicarboxylic Anhydride which is used in next step.

Step 2: -5-Chloromethyl-2,3-Pyridine Dicarboxylic Acid Anhydride reacts with α-amino-1,2-Dimethyl Butyronitrile form 5-(Chloromethyl)-2-[(2-Cyano-3-Methylbutan-2-yl) carbamoyl] pyridine-3-Carboxylic Acid which is used in third step.

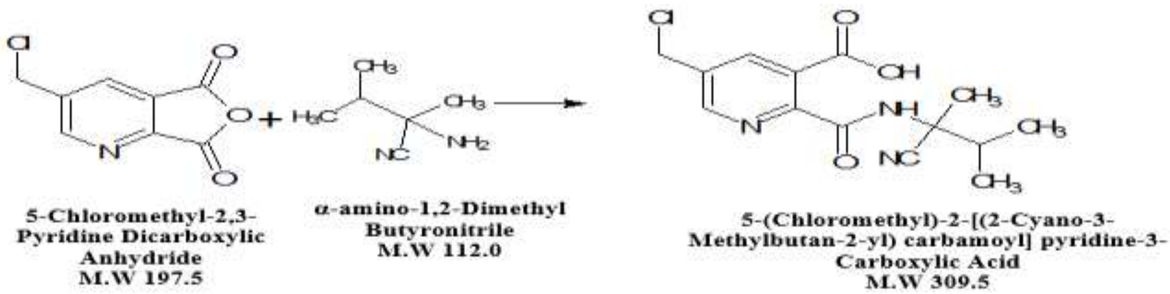
Step 3: -5-(Chloromethyl)-2-[(2-Cyano-3-Methylbutan-2-yl) Carbamoyl] pyridine-3-Carboxylic Acid react with Methanol in presence of Caustic Soda to form Imazamox.

Chemical Reactions: -

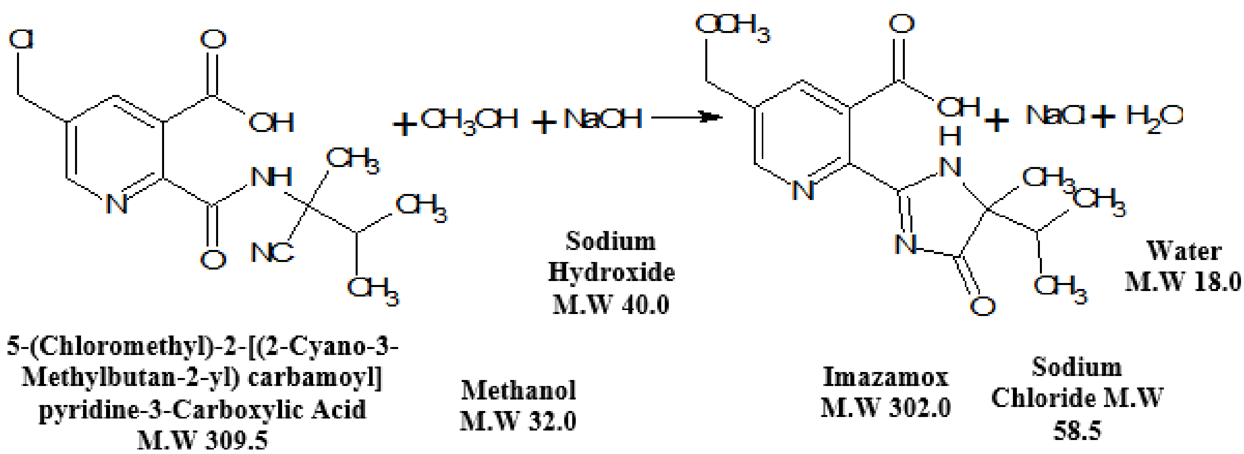
Step 1: -



Step 2: -



Step 3: -



Mass Balance:

142	Material / Mass Balance of Imazamox All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	5-Methyl-2,3-Pyridine Dicarboxylic Acid Anhydride	1040		Imazamox	**1000**
2	2-Amino-2,3-Dimethyl Butanenitrile	630		Recovered Chlorobenzene	3940
3	Methanol	196		Chlorobenzene Loss	60
4	Sulfonyl Chloride	990		20% Sodium Sulfite Solution	3315
5	Chlorobenzene	4000		Hydrochloric Acid (30%) Solution	777
6	Sulfuric acid	200		Aqueous Layer to ETP	1891
7	Water	3500			
8	Sodium Hydroxide	427			
	TOTAL	**10983**		**TOTAL**	**10983**

143) Imazamethabenz

Brief Manufacturing Process:

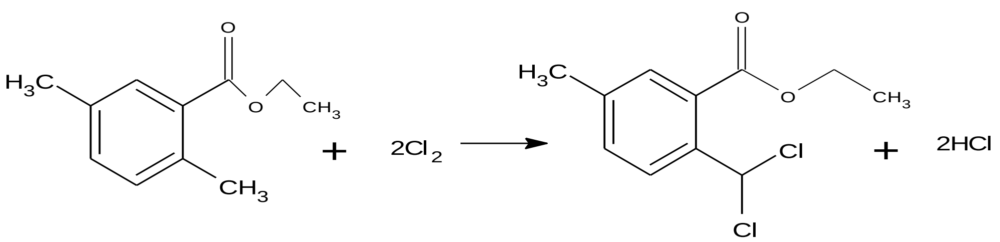
Step-I

Chlorination of 2,5-Dimethylbenzoic Acid Ethyl Ester carried out by Chlorination gas to get Ethyl 2-(Dichloromethyl)-5-Methylbenzoate in presence of solvent & catalyst. During reaction Hydrogen Chloridegas is generated which is scrubbed to water scrubbing system. After completion of reaction, Chlorobenzene is distilled out then filter it to get Ethyl 2-(Dichloromethyl)-5-methylbenzoate which is used in next step.

Step-II

Ethyl 2-(Dichloromethyl)-5-methylbenzoate reacts with 2-Amino-2,3-Dimethyl Butyramide in presence of NaOH to from Imazamethabenz. NaCl salt which is generated during reaction, is isolated by filtration, then distilled out MCB and filter it to get Imazamethabenz.

Chemical Reaction:

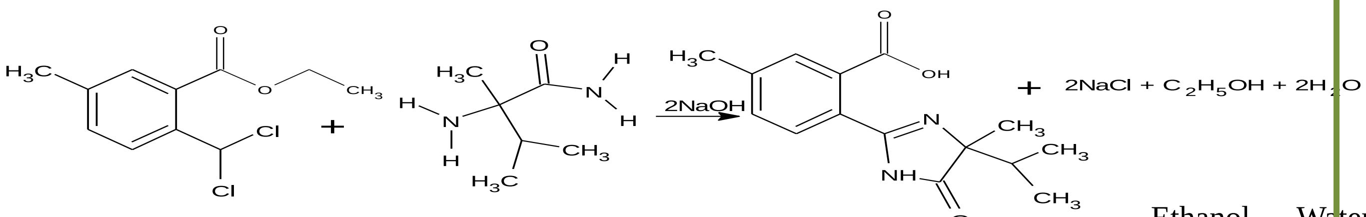


2,5-Dimethylbenzoic Acid Ethyl Ester M.W 178.0

Chlorine M.W.2×71.0

Ethyl 2-(Dichloromethyl)-5-Methylbenzoate M.W 247.0

Hydrochloric Acid M.W 2× 36.46=73.0



Ethyl 2-(Dichloromethyl)-5-Methylbenzoate
M.W 247.0

2-Amino-2,3-Dimethyl Butyramide
M.W 130.0

Imazamethabenz
M.W 274.0

Sodium Chloride
M.W.117.0

Ethanol
M.W 46.0

Water
M.W 36.0

Material Balance:

143	Material / Mass Balance of Imazamethabenz All Quantities are in kg)				
	IN – PUT			**OUT – PUT**	
Sr.No.	**Raw Material/item**	**Kg/Batch**		**Product/Bi Product**	**kg/Batch**
1	2,5-Dimethylbenzoic Acid Ethyl Ester	1014		Imazamethabenz	1000
2	Chlorine gas	890		Recovered Chlorobenzene	4430
3	2-Amino-2,3-Dimethyl Butyramide	540		Chlorobenzene Loss	90
4	Sodium Hydroxide	405		Hydrochloric Acid (30%) Solution	1390
5	Chlorobenzene -Solvent	4520		Sodium Chloride (Salt)	535
6	Water	2500		Aqueous Layer to ETP	2424
	Total	**9869**		**Total**	**9869**

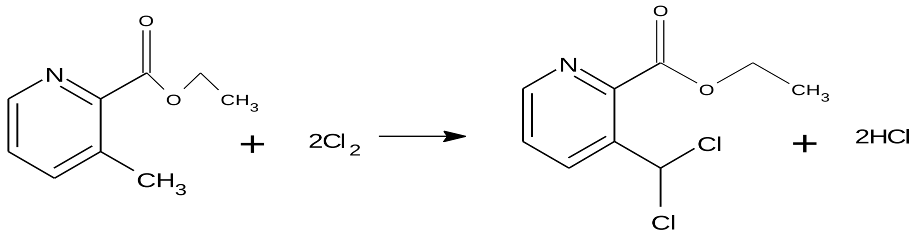
144) Imazapyr

Brief Manufacturing Process:

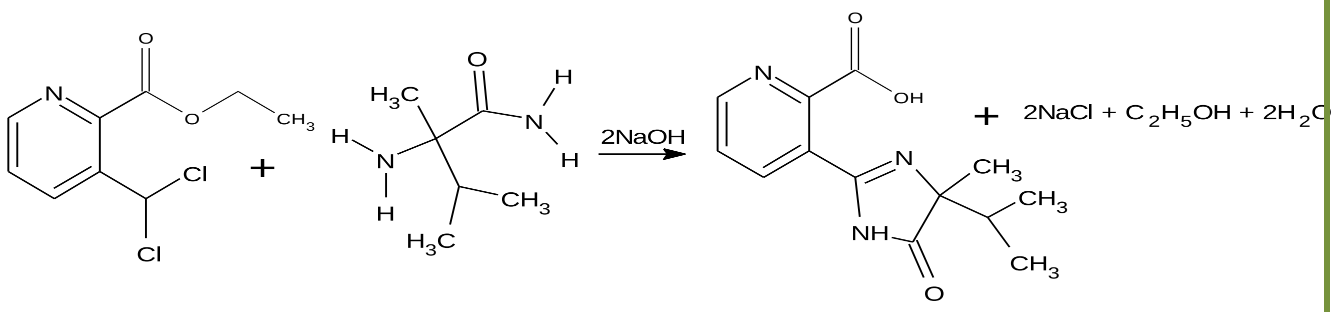
Chlorination of Ethyl 3-Methylpyridine-2-Carboxylate carried out by Chlorine gas in presence of solvent MCB & Catalyst to get Ethyl 3-(Dichloromethyl) pyridine-2-Carboxylate. During reaction Hydrogen Chloride gas is generated, which is scrubbed to water to form 28-30% Hydrochloric Acid solution as By-Product. Completion of reaction Chlorobenzene is distilled out then filter it to get ethyl 3-(Dichloromethyl) pyridine-2-carboxylate which is used in next step.

Ethyl 3-(Dichloromethyl) pyridine-2-carboxylate reacts with 2-Amino-2,3-Dimethyl Butyramide in presence of solvent & NaOH form Imazapyr. NaCl salt which is generated during reaction is isolated from mass by filtration solvent MCB is recovered by distillation & recycled by distillation & recycled by fresh batch.

Chemical Reaction:



Ethyl 3-Methylpyridine-2-Carboxylate M.W165.0 | Chlorine M.W.2×71.0 | Ethyl 3-(Dichloromethyl) pyridine-2-Carboxylate M.W 234.0 | Hydrochloric Acid M.W 2× 36.46=73.0



Ethyl 3-(Dichloromethyl) pyridine-2-CarboxylateM.W 234.0 | 2-Amino-2,3-Dimethyl Butyramide M.W 130.0 | Imazapyr M.W 261.0 | Sodium Chloride M.W 2×58.4=117 | Ethanol M.W 46.0 | Water M.W 36.0

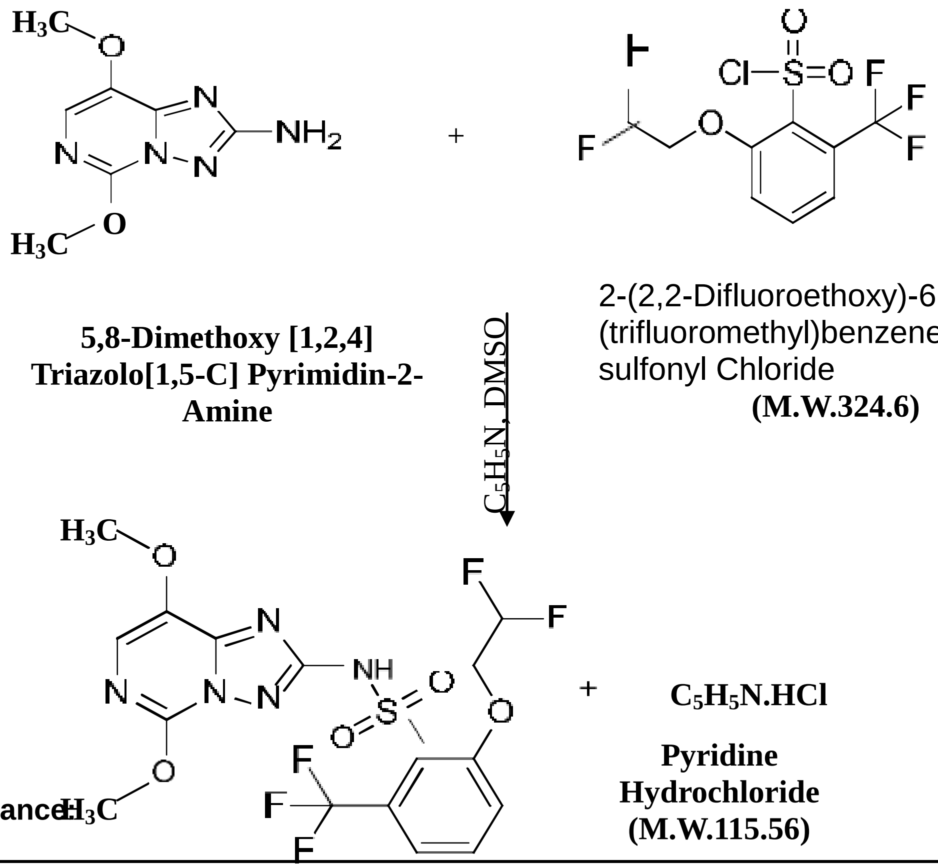
144	Material / Mass Balance of Imazapyr All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Material/item	Kg/Batch		Product/Bi Product	kg/Batch
1	Ethyl 3-methylpyridine-2-carboxylate	988		Imazapyr	1000
2	Chlorine gas	935		Recovered Chlorobenzene	3430
3	2-Amino-2,3-Dimethyl Butyramide	685		Chlorobenzene Loss	70
4	NaOH	440		Hydrochloric Acid(30%) Solution	1457
5	Chlorobenzene	3500		NaCl (Salt)	561
6	Water	2100		Aqueous Layer to ETP	2130
	Total	**8648**		**Total**	**8648**

145) Penoxsulam

Brief Manufacturing Process: -

To the mixture of Trizolopyrimidine amine,(Trizolopyrimidine Amine/ 5,8 Dimethoxy -[1,2,4] triazolo{1,5c) Pyrimidin -2 Amine) undergoes condensation reaction with 2-(2,2-Difluoroethoxy)-6-(trifluoromethyl)benzene-1-sulfonyl Chloride in Presence of Solvent - DMSO and Pyridine and the reaction mixture was stirred for 8h. After completion of reaction DMSO is distilled out completely. To the crude mixture water was added, stirred and filtered. Filtrate was dried completely to afford desired product as Penoxsulam.

Chemical Reactions: -



Mass Balance:

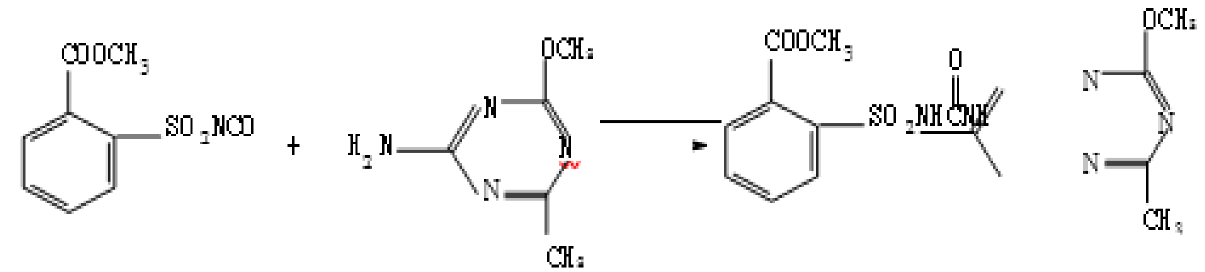
145	**Material / Mass Balance of Penoxsulam All Quantities are in kg)**				
	IN			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Trizolopyrimidine Amine	404		Penoxsulam	**1000**
2	2-(2,2-Difluoroethoxy) -6-(Trifluoro Methyl) Benzene-1-Sulfonyl Chloride	672		Recovered DMSO	1930
3	Pyridine	164		Loss DMSO	90
4	DMSO	2020		Waste Water	1160
5	Water	1000		Drying Loss	80
	TOTAL	**4260**		**TOTAL**	**4260**

146) Metsulfuron Methyl

Brief Manufacturing Process: -

Desired quantities of o-Carboxy Methyl Phenyl Isocyanate (CMPI) and Acetonitrile are added along with Triethyl Amine & 2-Amino-4-Methoxy-6-Methyl-1,3,5-Triazine in to the reactor & mixture is stirred at desired temp. until the desired conversion of the product, then the reaction mass is cooled & filtered. The crude product is washed with water & chilled solvent to get desired quality of the Product. Solvent is recovered andrecycled.

Chemical Reactions: -



O-carboxymethyl Phenylisocyanate
MF= $C_9H_7NO_5S$
FW=241.22

2-amino-4-methoxy-6-methyl-1,3,5- triazine
MF= $C_5H_8N_4O$
FW=140.14

Metsulfuron methyl
MF= $C_{14}H_{15}N_5O_6S$
FW=381.36

Mass Balance:

146	Material / Mass Balance of Metsulfuron Methyl All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Ortho-Carboxy Methyl Phenyl Isocyanate	680		Metsulfuron Methyl	**1000**
2	2-Amino-4-Methoxy-6-Methyl-1,3,5-Triazine	395		Acetonitrile Recovered	3088
3	Triethyl amine	210		Residue	75
4	Acetonitrile	3250		Aq. Layer	2310
5	Water	2100		Acetonitrile loss	162
	TOTAL	**6635**		**TOTAL**	**6635**

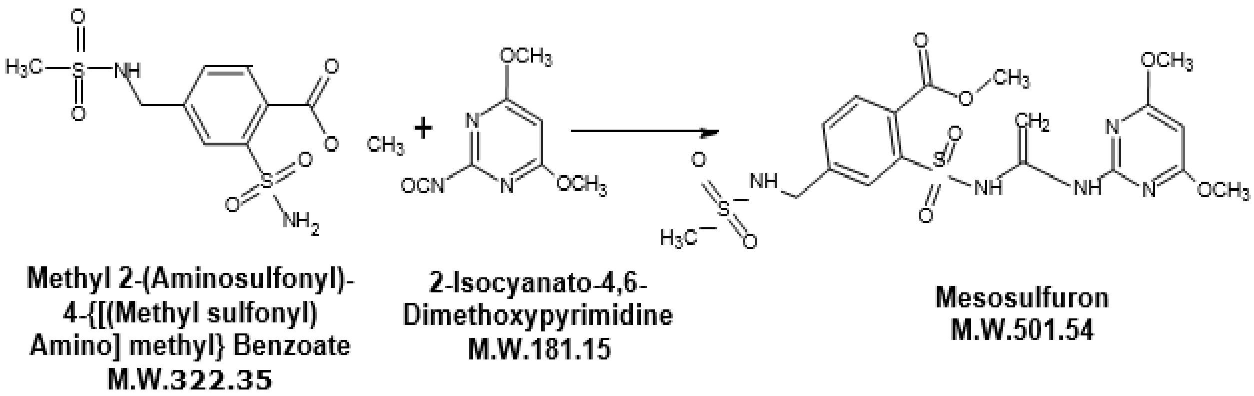
147) Mesosulfuron Methyl

Brief Manufacturing Process: -

Added desired quantities of 2-Isocyanato-4,6-Dimethoxypyrimidine, Triethyl Amine & Toluene in to the reactor. Cooled to reaction mass at desired temp. and the solution of Methyl 2-(Aminosulfonyl)-4-{[(Methylsulfonyl)Amino] Methyl} Benzoate (Methyl 4-(methylsulfonamidomethyl)-2-

sulfamoylbenzoate) in Toluene is added in to the reaction mass & stirred at desired temperature until reaction is over. pH is adjusted by adding 10% aqueous Hydrochloric Acid in to the mass, Organic and aqueous layers are separated and solvent is recovered and recycled. The crude solid mass is filtered & washed with water & Ethyl acetate to get desired quality of final product and the wet cake is thendried.

Chemical Reactions: -



Mass Balance:

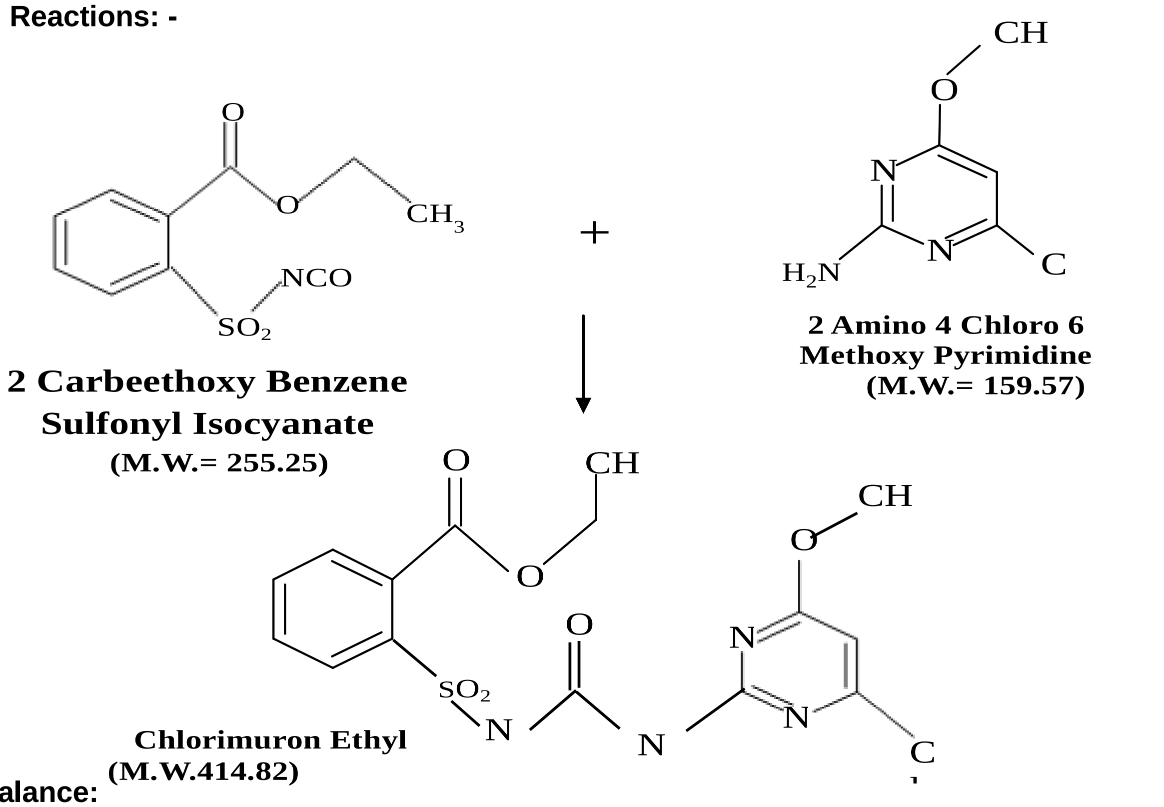
147	Material / Mass Balance of Metsulfuron Methyl All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Methyl-2-(Aminosulfonyl)-4-{[(Methyl Sulfonyl) Amino] Methyl} Benzoate	780		Mesosulfuron Methyl	**1000**
2	2-Isocyanato-4,6-Dimethoxy Pyrimidine	440		Recovered Toluene	3382
3	Triethylamine	489		Recovered Ethyl Acetate	1330
4	Toluene	3560		Residue	220
5	10% Hydrochloric Acid	1800		Aqueous Layer	3489
6	Ethyl Acetate	1400		Drying Loss	248
7	Water	1200			
	TOTAL	**9669**		**TOTAL**	**9669**

148) Chlorimuron Ethyl

Brief Manufacturing Process: -

Isocyanate and ACMP are reacted in presence of toluene solvent at controlled conditions of 65 – 70°C. Cool the mass obtained from reaction which, is then centrifuged and dried to obtain technical grade Chlorimuron Ethyl.

Chemical Reactions: -



Mass Balance:

148	Material / Mass Balance of Chlorimuron Ethyl All Quantities are in kg)				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Isocyanate in Xylene (50%)	1542		Chlorimuron Ethyl	**1000**
2	Toluene	770		Recovered Toluene	740
3	2-Amino 4-Chloro 6-Methoxy Pyrimidine (ACMP)	459		Loss Toluene	30
4				Recovered Xylene	731
5				Loss Xylene	41
6				Drying Loss	19
7				Residue	210
	TOTAL	**2771**		**TOTAL**	**2771**

149) Bispyribac Sodium

Brief Manufacturing Process: -

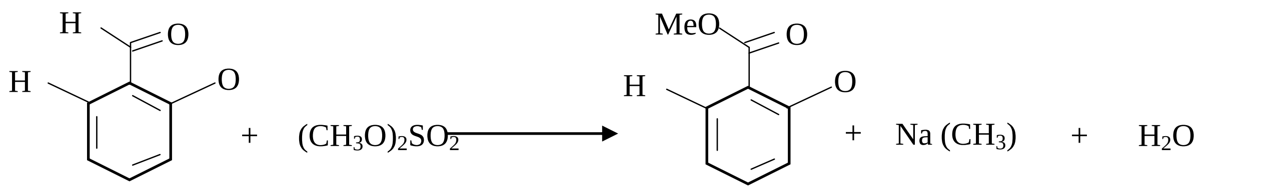
Step 1: -2,6 Dihydroxy Benzoic Acid converted to Benzoate by methylation by Dimethyl Sulphate (DMS) in presence of solvent-1 and base.

Step 2: - Condensation of 2,6 Dihydroxy Benzoate & 4,6 Dimethyl -2-(Methyl sulfonyl) Pyrimidine in presence of Solvent-2 as well as Inorganic Base to get intermediates product as Bispyribac Base.

Step 3: -Bispyribac Base is finally converted to Sodium Salt of by the reaction of Sodium Hydroxide in presence of solvent-3.

Chemical Reactions: -

Step 1: -



2,6-Dihydroxy Benzoic Acid C7H6O4 (M.W.154)

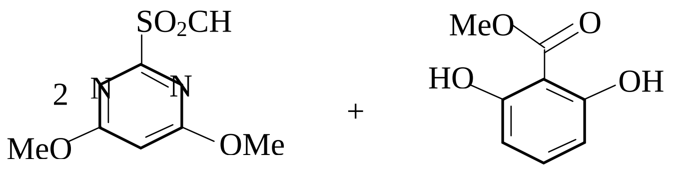
Dimethyl Sulfate $C_2H_6O_4S$

Methyl 2,6-Dihydroxy Benzoate $C_8H_8O_4$ (M.W.168)

Sodium Methyl Sulfate (M.W.134.0

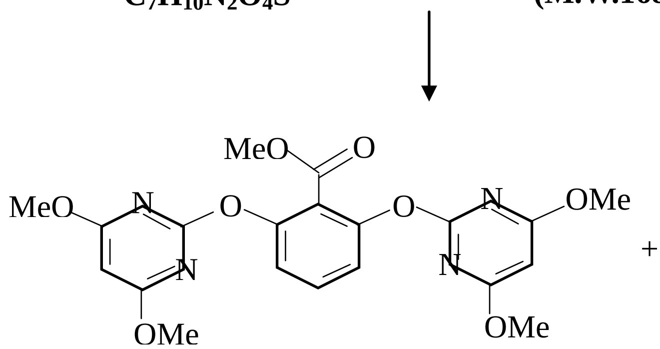
Water (M.W.18.0)

Step 2: -



4, 6-Dimethoxy-2-(Methyl sulfonyl)Pyrimidine $C_7H_{10}N_2O_4S$

Methyl 2, 6-Dihydroxy Benzoate $C_8H_8O_4$ (M.W.168.0)



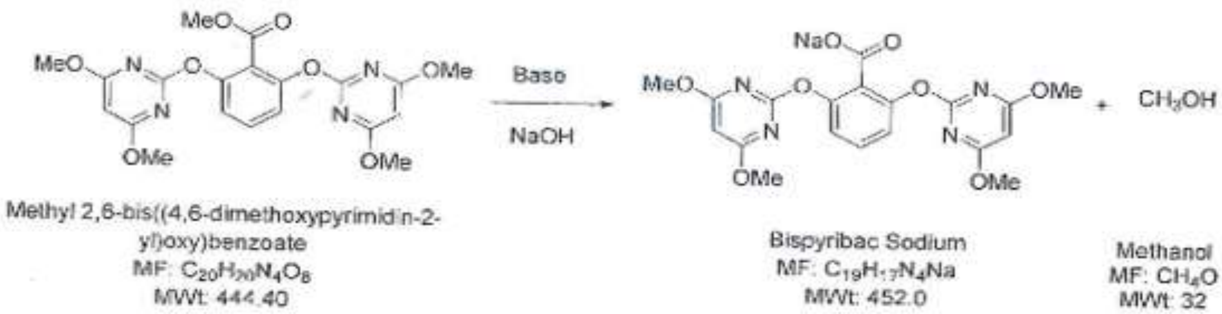
+ 2 + 2

Sulfur Dioxide $2\times O_2S$

Methane $2\times CH_4$ (M.W.16.0×

Methyl 2, 6-bis (2, 6-Dimethoxypyrimidin-2-yl) oxy) Benzoate $C_{20}H_{20}N_4O_8$

Step 3: -



Mass Balance:

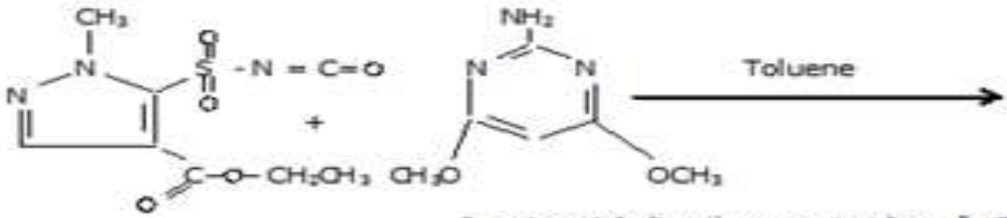
149	Material / Mass Balance of Bispyribac-Sodium All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2,6 Dihydroxy Benzoic Acid	599		Bispyribac-Sodium	**1000**
2	Acetone	2540		Recovered Acetone	2435
3	Sodium Bicarbonate	1557		Acetone Loss	105
4	Dimethyl Sulphate (DMS)	958		Inorganic Mixed Salt	3900
5	Water	1000		Aqueous Layer to ETP	5562
6	Sodium Bicarbonate 10% Solution	1500		Recovered Methanol	2880
7	Water for Washing	800		Methanol Loss	120
8	Acetone for Salt Washing	1200		Distillation Residue	325
9	Pottasium Carbonate	1868		Recovered IPA	12384
10	4,6 Dimethoxy 2-Methyl Sulfonyl Pyrimidine	1473		IPA Loss	516
11	Methanol	3000		Sodium Methyl Sulfate	300
12	Iso Propyl Alcohol	11800			
13	Caustic Flakes	132			
14	IPA for Washing	1100			
	TOTAL	**29527**		**TOTAL**	**29527**

150) Pyrazosulfuron Ethyl

Brief Manufacturing Process: -

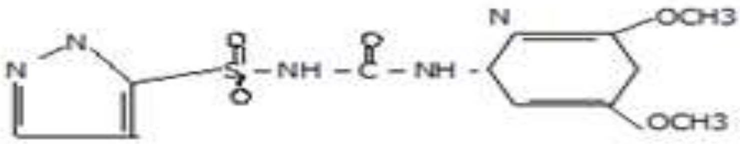
Ethyl-1-Methyl-5-Sulfenamideisocyanate-1H-Pyrazole-4-Carboxylate is reacted with 2-Amino-4,6-Dimethoxy Pyrimidine in presence of Toluene. Crude Pyrazosulfuron is purified by Methanol to get pure Pyrazosulfuron.

Chemical Reactions: -



2-amino-4,6-dimethoxy pyrimidine [155]

Ethyl-1-methyl-5-sulfenamide isocyanate-1H-pyrazole-4-carboxylate
MW=259



Pyrazosulfuron

MW=414

Mass Balance:

150	Material / Mass Balance of Pyrazosulfuron Ethyl All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Ethyl-1-Methyl -5-Sulphanamide Isocyanide- 1-H Pyrazole-4-Carboxylate	800		Pyrazosulfuron	**1000**
2	2- Amino -4,6-Dimethoxy Pyrimidine	490		Toluene	2900
3	Toluene	3000		Methanol	1930
4	Methanol	2000		Uncondensed vapor (Toluene)	100
5				Uncondensed vapor (Methanol)	70
6				Residue	290
	TOTAL	**6290**		**TOTAL**	**6290**

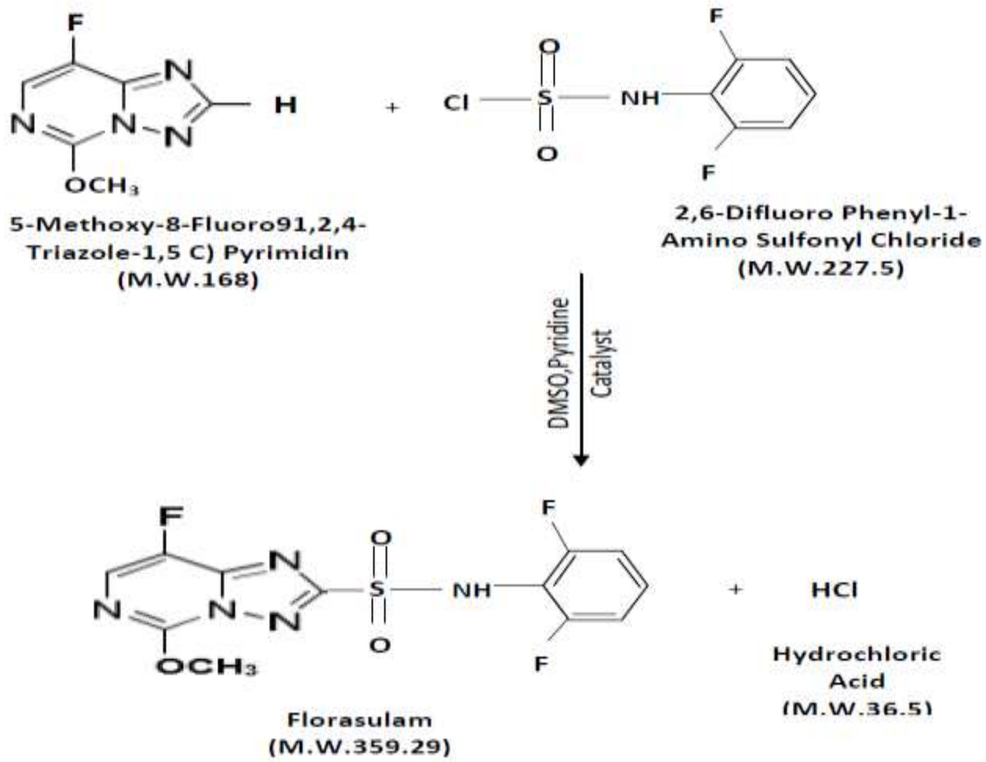
151) Florasulam

Brief Manufacturing Process: -

5-Methoxy-8-Fluoro [1,2,4] triazolo [1,5c] Pyrimidine -2- Sulfonyl Chloride when undergoes condensation reaction with 2,6- Difluoro Aniline in presence of Solvent DMSO as well as

Catalyst Pyridine it gives the final product Florasulam.

Chemical Reactions: -



Mass Balance:

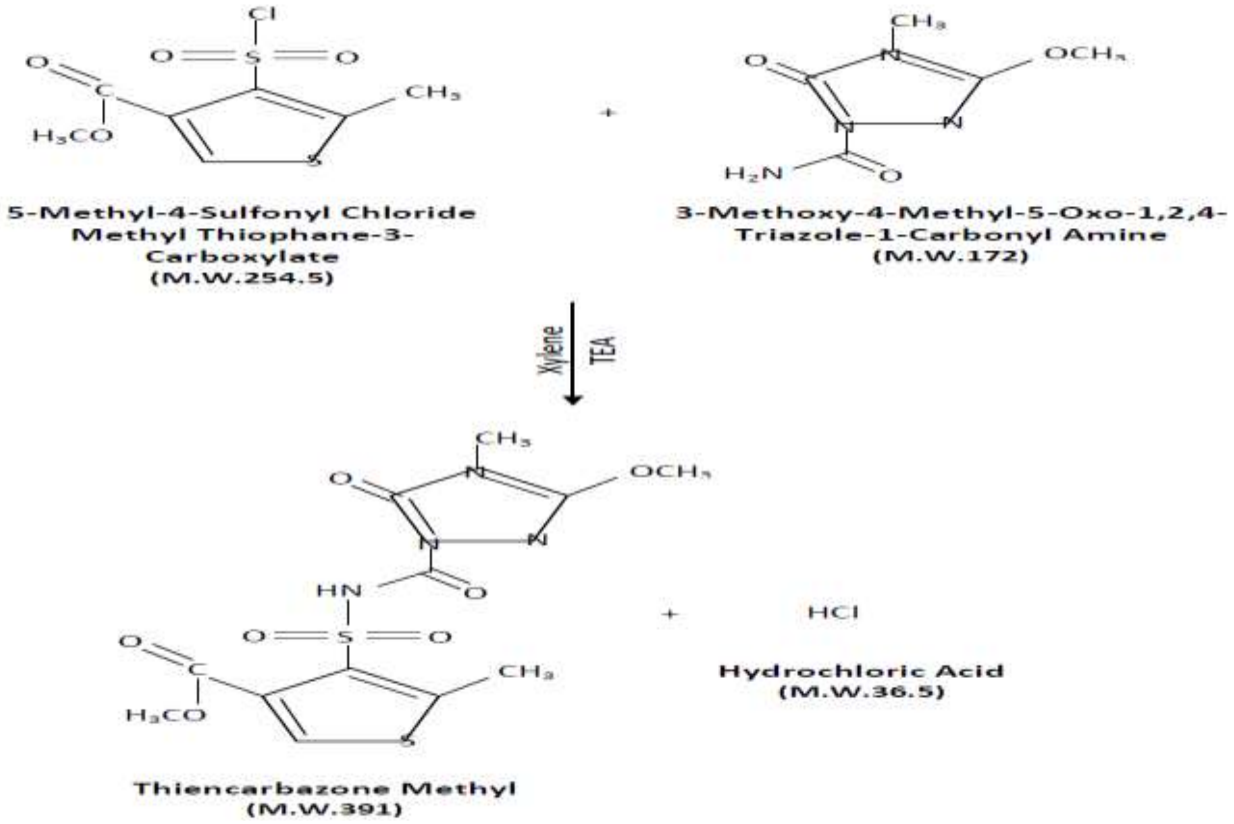
151	Material / Mass Balance of Florasulam All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	5-Methoxy-8-Fluoro [1,2,4] triazolo [1,5c] Pyrimidine -2-Sulfonyl Chloride	780		Florasulam	**1000**
2	Solvent DMSO	2200		Recovered Solvent DMSO	2130
3	2,6-Difluoro Aniline	378		Solvent DMSO Loss	70
4	Pyridine	244		Recovered Pyridine	220
5	Water for Reaction	550		Pyridine Loss	24
6	C.S. Lye 48%	268		Aqueous Layer to ETP	944
7				Dry Residue	32
	TOTAL	**4420**		**TOTAL**	**4420**

152) Thiencarbazone Methyl

Brief Manufacturing Process: -

Methyl 5- Methyl - 4 -Sulfomoylthiophene-3-Carboxylatewhen reacted with 3-Methoxy-4-Methyl-5-Oxo-1,2,4-Triazole-1-CarbonylAmine (3-Methoxy -5-oxo-1,2,4-Triazole-1-Carbonylchloride)in presence of Acid Scavenger Triethyl Amine (TEA) it gives the product Thiencarbazone Methyl.

Chemical Reactions: -



Mass Balance:

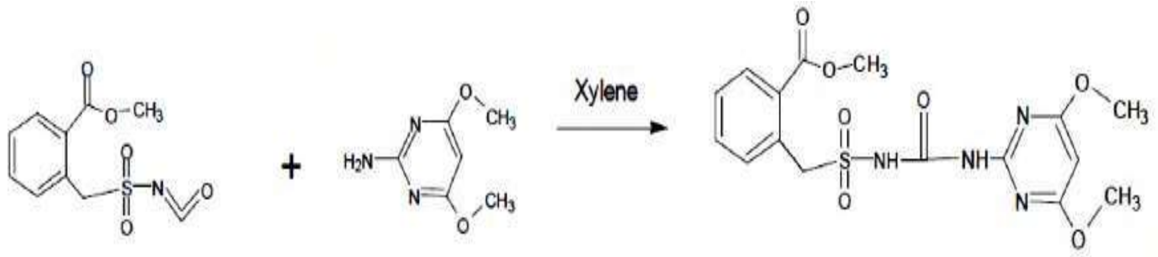
152	Material / Mass Balance of Thiencarbazone Methyl All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Methyl 5- Methyl - 4 – Sulfamoyl thiophene-3-Carboxylate	684		Thiencarbazone Methyl	**1000**
2	3-Methoxy -5-oxo-1,2,4-Triazole-1-Carbonylchloride	460		Recovered Xylene	2540
3	Solvent Xylene	2600		Xylene Loss	60
4	TEA	286		Recovered TEA	260
5	C.S. Lye 48%	250		TEA Loss	26
6	Water	700		Aqueous Layer to ETP	1056
7				Distillation Residue	38
	TOTAL	**4980**		**TOTAL**	**4980**

153) Bensulfuron Methyl

Brief Manufacturing Process: -

Methyl-2- {[Isocyanate Sulfamoyl] Methyl} Benzoate reacted with 4,6-Dimethoxypyrimidin-2-amine in presence of Solvent Xylene. This reaction gives out Bensulfuron Methyl (Methyl-2-({[4,6-Dimethoxypyrimidin-2-yl) Carbomoyl]Sulfamoyl}Methyl)Benzoate.

Chemical Reactions



Methyl 2 {[isocynate sulfamoyl] methyl}Benzoate — M.W. 229

4,6-dimethoxypyrimidin-2-amine — M.W. 155

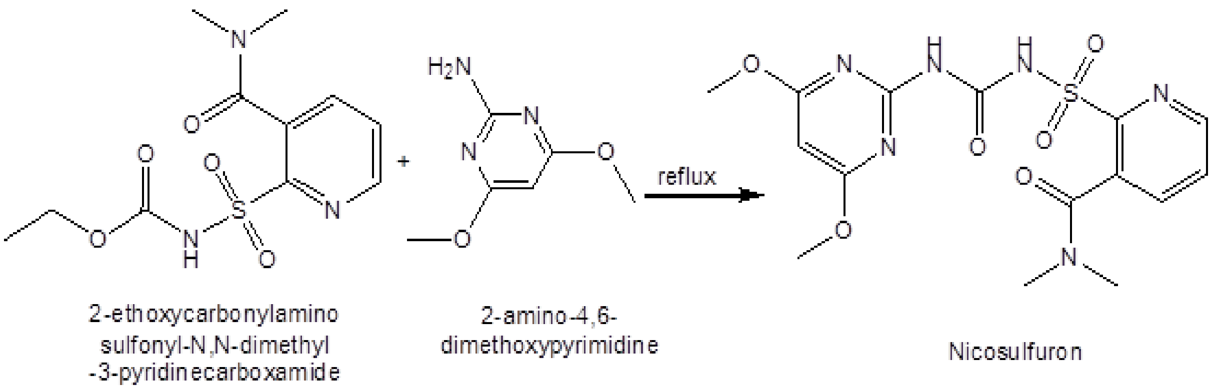
methyl 2-({[(4,6-dimethoxypyrimidin-2-yl)carbamoyl] sulfamoyl}methyl)benzoate — M.W. 410

153	Material / Mass Balance of Bensulfuron Methyl All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	4, 6- Dimethoxy Pyrimidine -2-Amine	418		Bensulfuron	**1000**
2	Methyl-2- {[Isocyanate Sulfamoyl] Methyl} Benzoate	620		Recovered Xylene	1565
3	Xylene	1600		Xylene Loss	35
4	Methanol	2000		Recovered Methanol	1970
5				Loss Methanol	30
6				Residue	38
	TOTAL	**4638**		**TOTAL**	**4638**

154) Nicosulfuron

Brief Manufacturing Process: -

Desired quantities of 2-Ethoxycarbonylaminosulfonyl-N, N-dimethyl-3- pyridinecarboxamide and 2-Amino-4,6-dimethoxypyrimidine are charged in to the reactor along with Toluene. The stirred mixture is heated up to reflux to remove reaction generated ethanol from the reaction mixture. Cooled the mixture & added 10% sodium carbonate solution to make the clear reaction mass, followed by layer separation & precipitation by 15%. Aqueous Hydrochloric Acid to get the final crude product. The cake of crude product is filtered & washed with Toluene & water and dried till complete removal of solvent & water. solvent is recovered & recycled.



154	Material / Mass Balance of Nicosulfuron All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2-EthoxyCarbonylAminoSulfonyl -N, N-Dimethyl-3-Pyridine Carboxamide	809		Nicosulfuron	**1000**
2	Toluene	3460		Ethanol	123
3	2-Amino-4,6-Dimethoxypyrimidine	404		Toluene Recovered	3287
4	10% Sodium Carbonate	2500		Toluene Loss	173
5	15% Hydrochloric Acid	575		Residue	90
6	Water	1000		Aq. Layer	4075
	TOTAL	**8748**		**TOTAL**	**8748**

155) Sulfosulfuron:

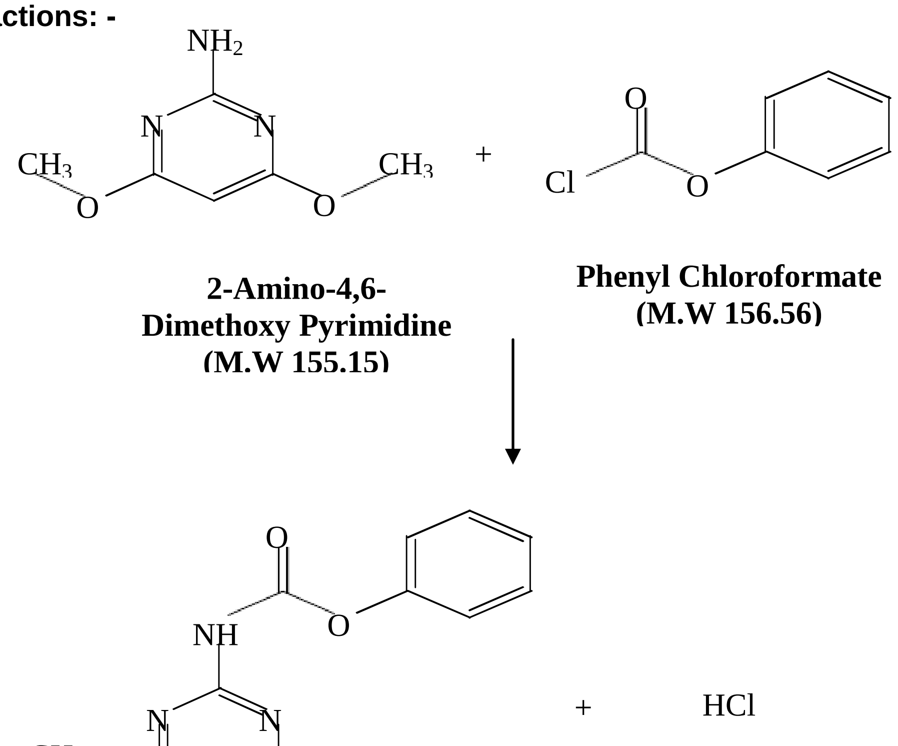
Brief Manufacturing Process: -

Step 1: -2-Amino-4,6- Dimethoxy Pyrimidine is dissolved in 1,4-Dioxane To Which N,N-Dimethylaniline is added. The temperature is cooled to 5^{o} C and Phenyl Chloroformate is added to it with temperature not exceeding 20^{o} C. The reaction mixture was stirred overnight and filtered. The precipitate is further washed with water and dried to obtain the titled product. 1,4-dioxane is separated from water by distillation. The remaining aqueous mixture is neutralized by caustic and N, N-Dimethylalinine is separated by layerseparation.

Step 2: -To a mixture of 2-Ethylsulfonylimidazo[1,2-A] Pyridine Sulphonamide and 4,6-Dimethoxy-2-((Phenoxy Carbonyl) Amino) Pyrimidine in EDC is added Potassium Hydroxide flakes and heated to 60^{o} C. After formation of the titled product, organic layer is washed with water. EDC is recovered by distillation and product is recrystallized from methanol. Phenol is formed as by-product which is recovered from aqueous layer after neutralization by extraction with EDC.

Chemical Reactions: -

Step 1: -



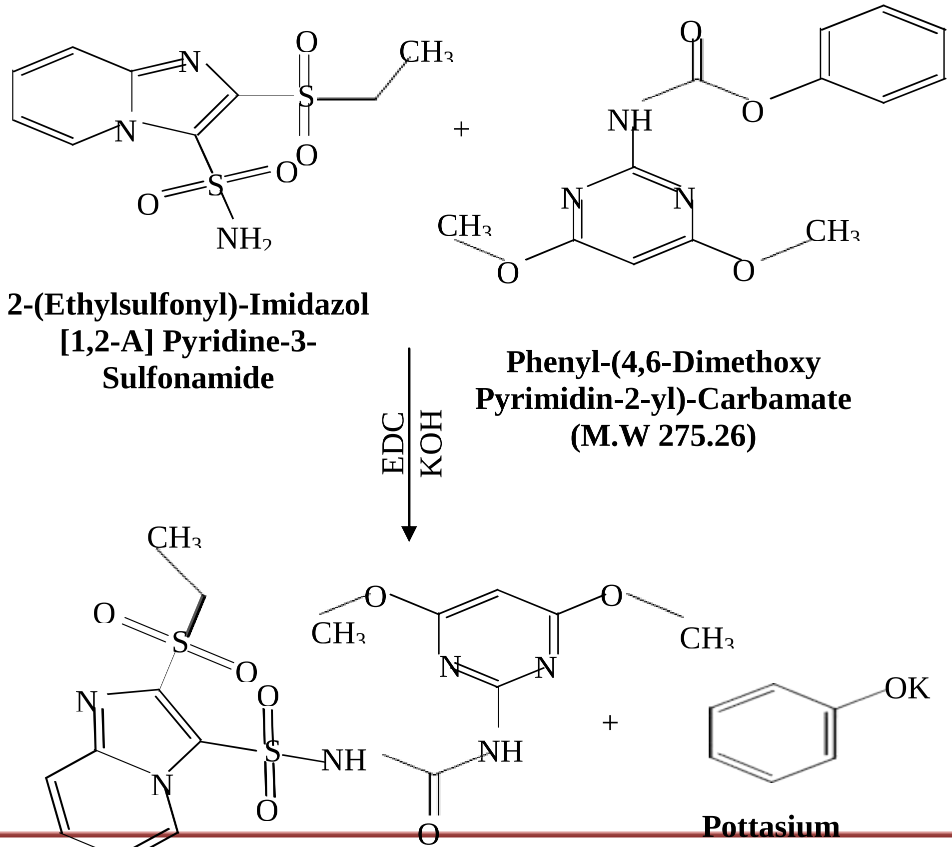
2-Amino-4,6-Dimethoxy Pyrimidine (M.W 155.15)

Phenyl Chloroformate (M.W 156.56)

Phenyl-(4,6-Dimethoxy Pyrimidin-2-yl)-Carbamate (M.W 275.26)

Hydrochloric Acid (M.W 36.5)

Step 2: -



2-(Ethylsulfonyl)-Imidazol [1,2-A] Pyridine-3-Sulfonamide

Phenyl-(4,6-Dimethoxy Pyrimidin-2-yl)-Carbamate (M.W 275.26)

Pottasium Phenoxide (M.W 132.2)

SulfoSulfuron (M.W 470.5)

Mass Balance:

155	Material / Mass Balance of Sulfosulfuron Methyl All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2-Amino-4,6-Dimethoxy Pyrimidine	396		Sulfosulfuron	**1000**
2	Phenyl Chloroformate	400		Hydrochloric Acid	77
3	2 - Ethylsulfonylimidazo [1,2-A] Pyridine Sulfonamide	835		Potassium Phenolate	270
4	Potassium Hydroxide	142		Potassium Chloride	150
5	Ethylene Dichloride (EDC)	13900		Methanol Recovered	3230
6	N, N-Dimethylaniline (DMA)	309		Methanol Loss	20
7	Methanol	3400		Methanol to Wastewater	34
8	Water	2900		Methanol in Residue	115
9	Caustic	85		EDC Recovered	13622
10	Hydrochloric Acid	92		EDC Loss	22
11				EDC in Residue	256
12				DMA Recovered	304
13				DMA Loss	1
14				DMA in Residue	4
15				2-Amino-4,6-Dimethoxy Pyrimidine	66
16				Phenyl Chloroformate	66
17				2-Ethylsulfonylimidazo [1,2-A] Pyridine Sulfonamide	139
18				Waste Water	2959
19				Sodium Chloride	124
	TOTAL	**22459**		**TOTAL**	**22459**

156) Trifloxysulfuron:
Brief Manufacturing Process: -

Step 1: -2-Chloro-3-Hydroxy Pyridine reacted with Benzyl Chloride in presence of Solvent Methyl Ethyl Chloride (MEK) as well as Sodium Carbonate. This reaction gives out 2-Chloro-3-Benzoxy Pyridine. Solvent Methyl Ethyl Chloride (MEK) and Benzyl Chloride are recovered from reaction mass. Methyl Ethyl Chloride (MEK) loss after completion of reaction.

Step 2: -2-Chloro-3-Benzoxy Pyridine undergoes Acylation reaction by Sodium Sulfide in presence of concentrated Hydrochloric Acid. This reaction gives out 2-Mercapto-3-Benzyloxy Pyridine. Sodium Chloride get separated out from the reaction mass.

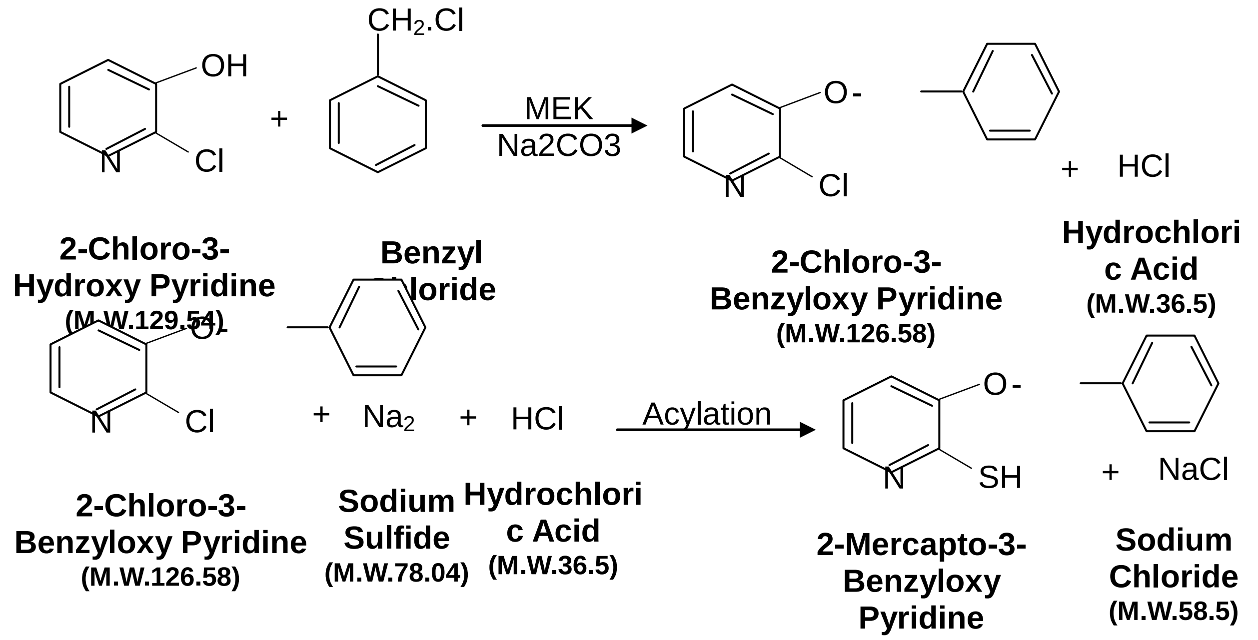
Step 3: -2-Mercapto-3-Benzyloxy Pyridine further reacted with Hydrogen Peroxide as well as Liquid Ammonia in presence of Catalyst Vanadium Pentoxide. This reaction gives out 3-Benzyloxy Pyridine-2-Sulfonamide.

Step 4: -3-Benzyloxy Pyridine-2-Sulfonamide undergoes Condensation reaction by 1-Chloro-2,2,2-Trifluoro Ethane. This reaction gives out 2-Sulfonamide-3-(Triluoro-1-Hydroxy Ethyl) Pyridine.

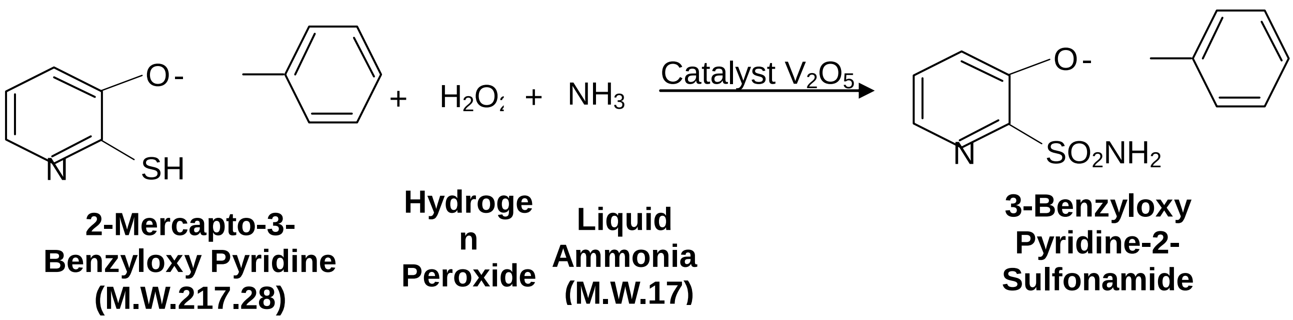
Step 5: -2-Sulfonamide-3-(Triluoro-1-Hydroxy Ethyl) Pyridine undergoes Condensation reaction by **3,5-**Dimethoxy Phenyl Amino Carbonyl Chloride. This reaction gives out Trifloxysulfuron as a Final product.

Chemical Reactions: -

Step 1: -



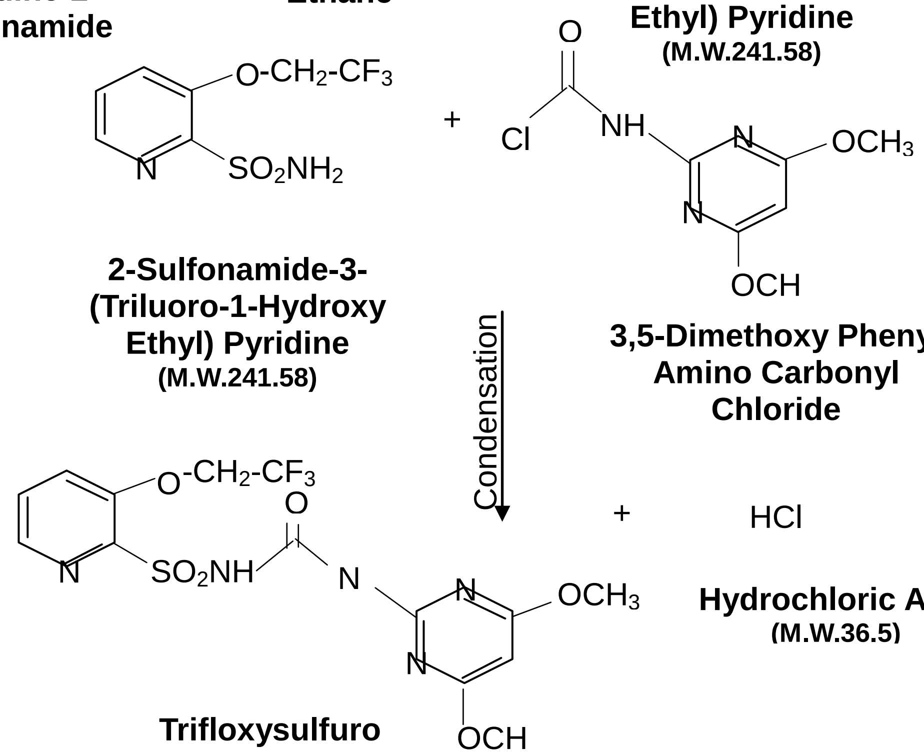
Step 3: -



Step 4: -

3-Benzyloxy Pyridine-2-Sulfonamide + **1-Chloro-2,2,2-Trifluoro Ethane** → **2-Sulfonamide-3-(Triluoro-1-Hydroxy Ethyl) Pyridine (M.W.241.58)** + **Benzyl Chloride**

Step 5: -



2-Sulfonamide-3-(Triluoro-1-Hydroxy Ethyl) Pyridine (M.W.241.58)

3,5-Dimethoxy Phenyl Amino Carbonyl Chloride

Hydrochloric Acid (M.W.36.5)

Trifloxysulfuro n

156	**Material / Mass Balance of Trifloxysulfuron All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2-Chloro-3-Hydroxy Pyridine	333		Trifloxysulfuron	**1000**
2	Benzyl Chloride	332		Aqueous Water for ETP	1980
3	MEK	2200		Recovered MEK	2140
4	Sodium Carbonate	286		Loss MEK	60
5	Sodium sulfide	188		Recovered Benzyl Chloride	300
6	30% Hydrochloric Acid Solution	300		Loss Benzyl Chloride	32
7	Hydrogen Peroxide	101		Distillation Residue	38
8	Catalyst	10		Organic matter for Incineration	250
9	Liquid Ammonia	55			

10	1-Chloro-2,2,2-Trifluoro Ethane	280			
11	3,5 Dimethoxy Phenyl Amino Carbonyl Chloride	465			
12	Water for Reaction and Washing	1250			
	TOTAL	**5800**		**TOTAL**	**5800**

157) Diclosulam

Brief Manufacturing Process: -

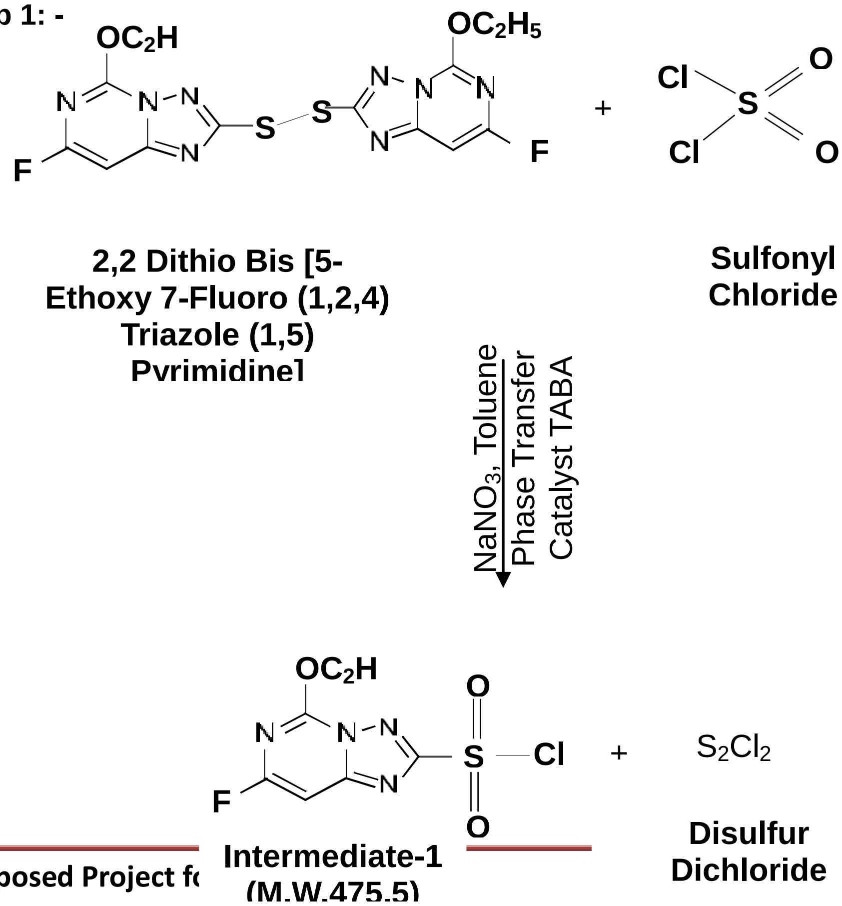
Step 1: - 2,2 Dithio Bis [5-Ethoxy 7-Fluoro (1,2,4) Triazole (1,5) Pyrimidine]undergoes Sulfonylation by means of reaction with Sulfonyl Chloride in presence of Sodium Nitrate as well as Solvent Toluene and Phase contrast Catalyst TABA. This reaction gives out Intermediate 1 as Sulfonyl Chloride derivatives of Cpd-1.

After completion of reaction water was added and layer of Aqueous and organic mass are separated out.

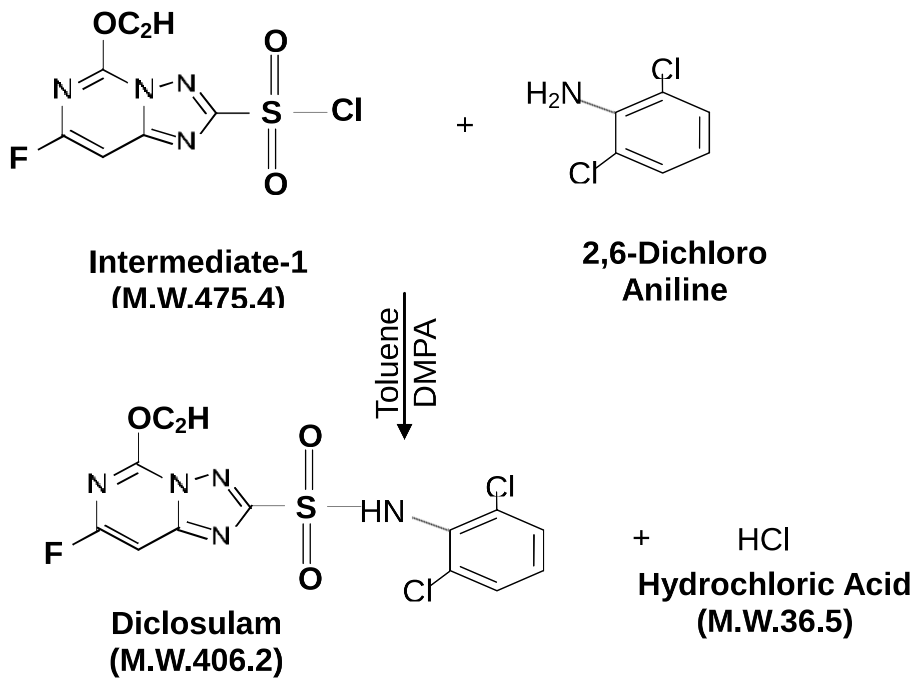
Step 2: - When intermediate -1 with organic mass undergoes Condensation reaction with 2,6-Dichloro Aniline in presence of Solvent Toluene as well as Catalyst DMPA (N, N-Dimethyl Propyl Amine). This reaction gives out final product Diclosulam.

Chemical Reactions: -

Step 1: -



Step 2: -



157	Material / Mass Balance of Diclosulam All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2,2 Dithio Bis [5-Ethoxy 7-Fluoro (1,2,4) Triazole (1,5) Pyrimidine]	1150		Diclosulam	**1000**
2	Sulfonyl Chloride	350		Recovered Solvent	2910
	Solvent - Toluene	3000		Solvent Loss	90
3	Catalyst TBAB	18		30% Hydrochloric Acid Solution	332
4	Water for Reactions	1250		Aqueous Layer to ETP	2298
5	Sodium Nitrite	220		Recovered Ethanol	500
6	2,6 Dichloro Aniline	440		Ethanol Loss	50
7	Ethanol for Washing	550		Distillation Residue	28
8	Water for 30% Hydrochloric Acid Solution formation	230			
	TOTAL	**7208**		**TOTAL**	**7208**

158) Pyroxsulam:
Brief Manufacturing Process: -
Step 1: - 2-Amino-4,6-Dimethoxy Pyrimidine reacted with Ethoxy Carbonyl Isothiocyanate in presence of Solvent Toluene. This reaction gives out Ethyl(3,5-DimethoxyPyrimidine-2-yl) Carbamothionyl Carbamate.

Step 2: - Ethyl(3,5-DimethoxyPyrimidine-2-y) Carbamothionyl Carbamate further reacted withAmmonium Hydroxide as well as Sodium Hydroxide. This reaction gives out Intermediate-1. Sodium Hydrosulfide and water get separated from reaction mass.

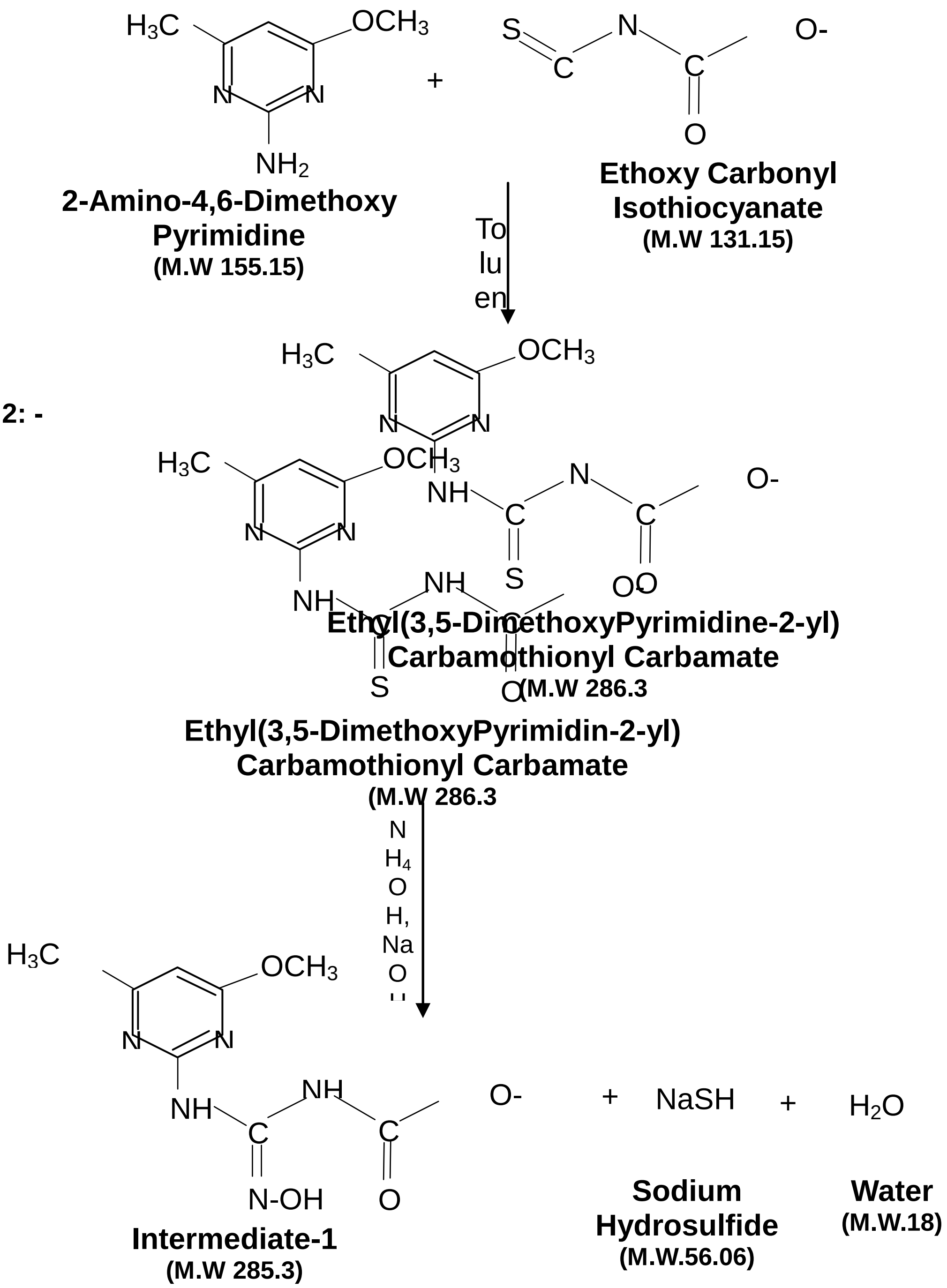
Step 3: - Intermediate-1 undergoes cyclization reaction. This reaction gives out 2,4-Dimethoxy[1,2,4]Triazolo[1,5-C]Pyrimidin-3-Amine.

Step 4: - 2,4-Dimethoxy[1,2,4]Triazolo[1,5-C]Pyrimidin-3-Amine further reacted with 2-Methoxy-4-Trifluoro methyl-3-Pyridine Sulfonyl Chloride in presence of Solvent Methanol. This reaction gives out Pyroxsulam as a final product.

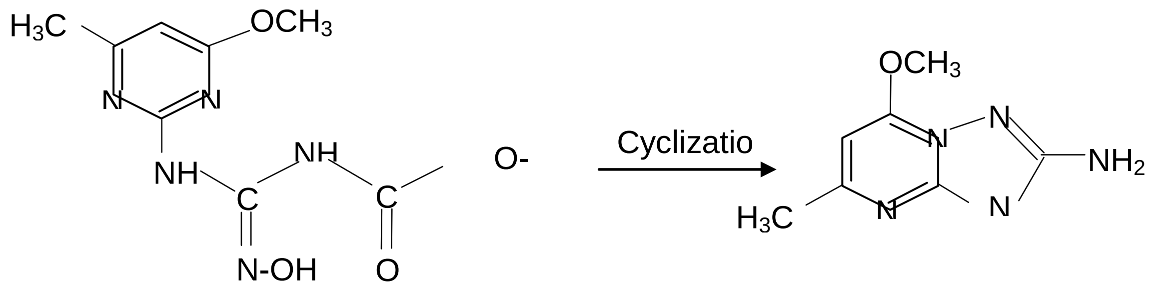
Chemical Reactions: -

Step 1: -

Step 2: -



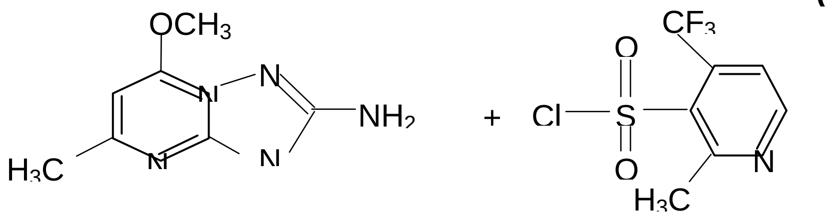
Step 3: -



Intermediate-1
(M.W 285.3)

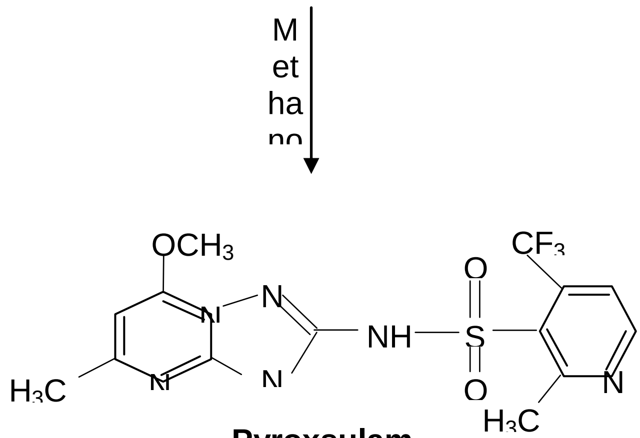
2,4-Dimethoxy [1,2,4] Triazolo [1,5-C] Pyrimidin-3-Amine (M.W.195.18)

Step 4: -



2,4-Dimethoxy [1,2,4] Triazolo [1,5-C] Pyrimidin -3-Amine (M.W.195.18)

2-Methoxy-4-Trifluoro methyl-3-Pyridine Sulfonyl Chloride (M.W.275.63)



Pyroxsulam
(M.W.434.35)

158	Material / Mass Balance of Pyroxsulam All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/ Batch**
1	2-Amino-4,6-Dimethoxypyrimidine	630		Pyroxsulam	**1000**
2	EthoxyCarbonyl Isothiocyanate	810		Recovered Solvent - 1	3000
3	Solvent-1Toluene	3680		Loss Solvent - 1	680
4	Slovent-2Hydroxylamine	1040		Recovered Solvent - 2	920
5	Solvent-3Methanol	5980		Loss Solvent -	720
6	Hydroxylamine Hydrochloride	270		Recovered Solvent-3	5430
7	Diisopropylethylamine	980		Loss Solvent - 3	55

8	Ethyl Acetate	860		Recovered Ethyl Acetate	800
9	Acetonitrile	1960		Loss Ethyl Acetate	60
10	Hydrochloric Acid (12%)	1020		Recovered Acetonitrile	1730
11	2-Methoxy-4-(Trifluoromethyl) Pyridine-3-Sulfonyl Chloride	880		Loss Acetonitrile	230
12	Toluene	1150		Recovered Toluene	1040
13	Water	920		Loss Toluene	110
14				Effluent	2490
15				Residue	660
16				Distillation solvent loss in vacuum	1255
	TOTAL	**20180**		**TOTAL**	**20180**

159) Glyphosate

Brief Manufacturing Process: -

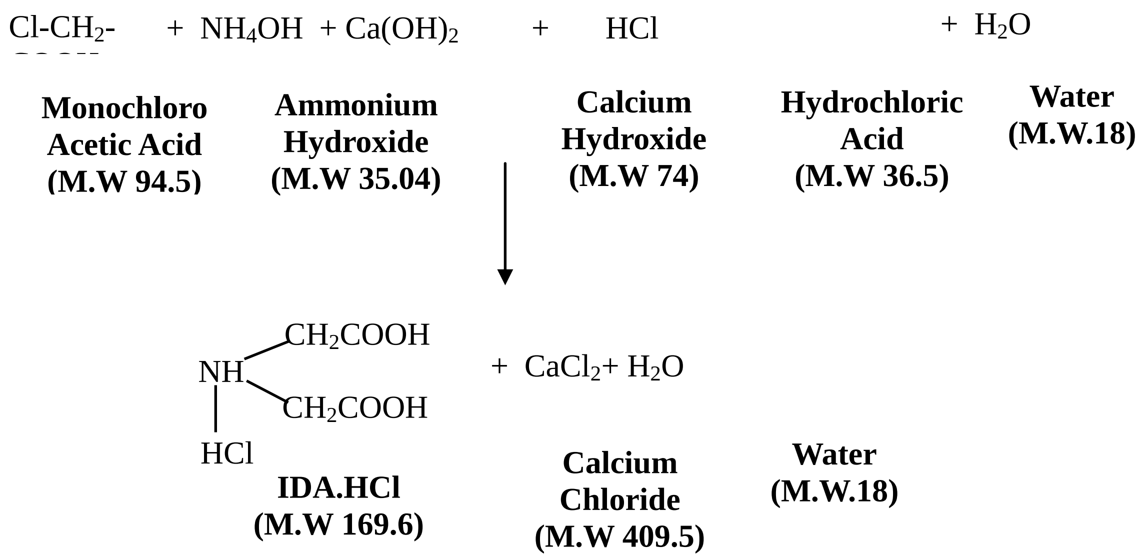
Step 1: - Mono Chloro Acetic Acid is reacted with Ammonia in presence of Calcium Hydroxide forming Hydrochloric Acid Salt of Imino Di Acetic Acid (IDA) and carrying out the reaction at 45°C under atmospheric condition. Hydrochloric Acid (HCl) is mixed to make slurry of Imino Di Acetic Acid (IDA). Imino Diacetic Acid (IDA) if further reacted with Formaldehyde as well as Ortho Phosphorous Acid at elevated temperature to form an intermediate, Phosphono Methyl Amino Diacetic Acid (PMIDA).

Step 2: -PMIDA is reacted with liquor Ammonia to convert it to Ammonium Salt of PMIDA, which on further undergoes oxidation reaction by molecular Oxygen in presence of Water as well as Catalyst as Activated Charcoal to give Ammonia Salt of Glyphosate.

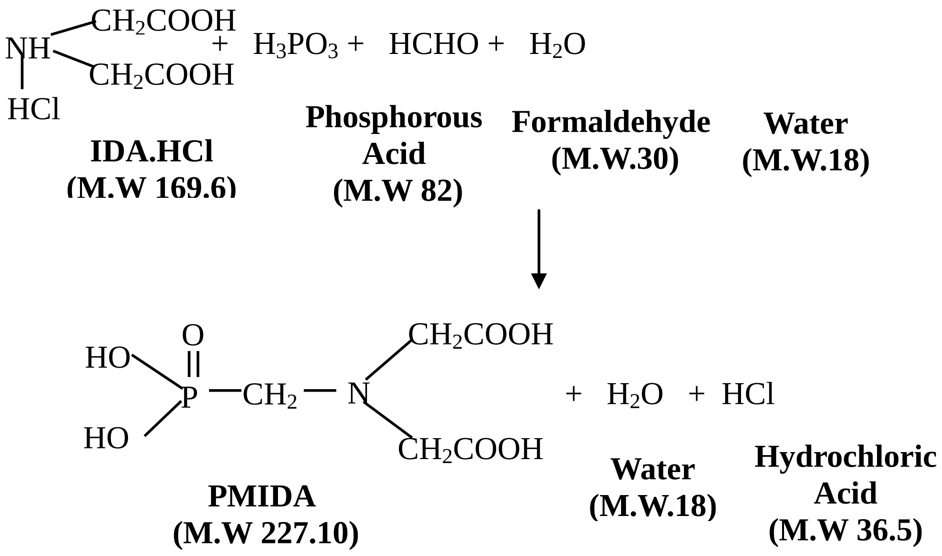
During the reaction Carbon Dioxide (CO2) as well as Formaldehyde gases are generated which are scrubbed to Water as we as Caustic solution. The resulting Mass is acidified by Sulfuric Acid & Product is crystallised at low temperature at 5°C to get the final product Glyphosate Acid.

Chemical Reactions: -

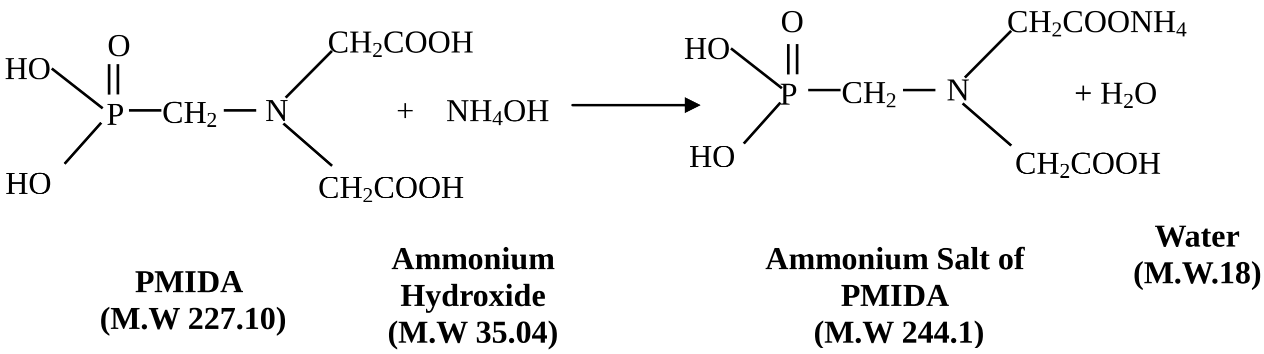
Step 1: -



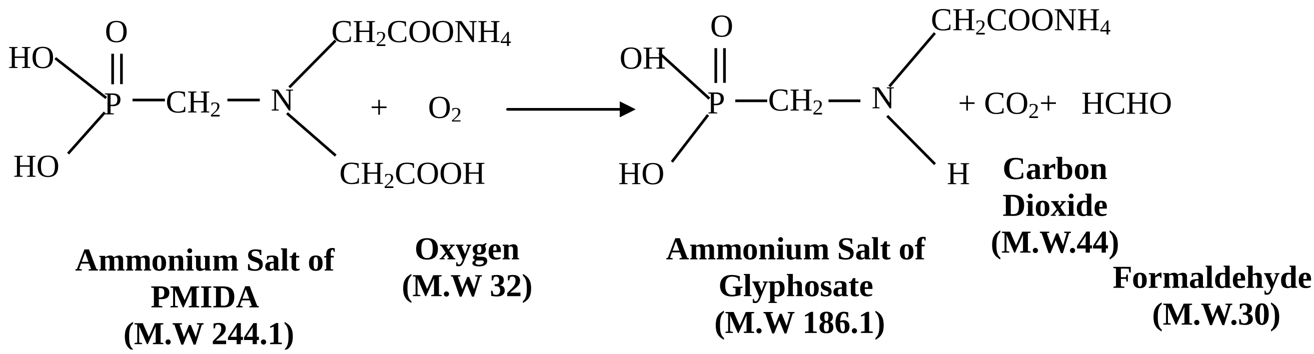
Step 1 (A): -



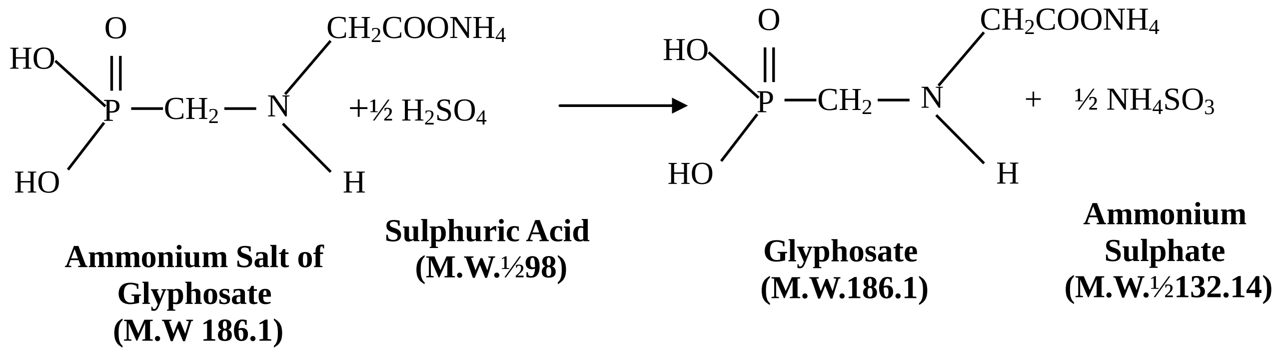
Step 2: -



Step 2 (A): -



Step 2 (B): -



Mass Balance:

159	Material / Mass Balance of Glyphosate All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Mono Chloro Acetic Acid	1332		Glyphosate	**1000**
2	20 % Ammonia Solution	120		34% Calcium Chloride Solution	2338
3	Calcium Chloride	522		Evaporation Loss	18
4	Hydrochloric Acid (HCl)	257		Aqueous Layer to ETP	2128
5	Water for Process	3324		Water Evaporated & Recycled	2784
6	Water for Calcium Chloride Dilution	1816		Carbon Dioxide Gas	310
7	Ortho Phosphoric Acid	558		HCHO	211
8	37 % Formaldehyde Solution	211		Catalyst Recovered as wet Cake	50
9	30 % HCl Solution	1410		Excess Oxygen to Air	33
10	Activated Charcoal	50		Mother Liquor to ETP	1150
11	Oxygen Gas	113		Drying Loss	36
12	Sulphuric Acid	345			

	TOTAL	10058		TOTAL	10058

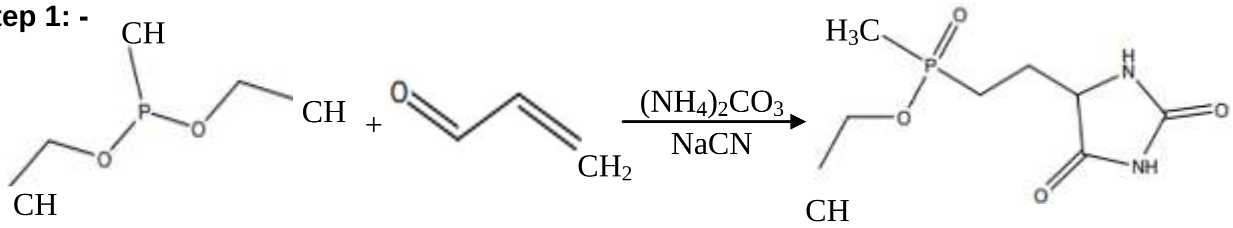
160) Glufosinate Ammonium

Brief Manufacturing Process: -

Charge Ethanol, Acrolein and Diethyl Methyl Phosphonate. Stir for room temperature for 1 hour. Charged Sodium Cyanide and Ammonium Carbonate. Reflux for 4 hours and filter. Distil out the solvent to get 5-[2-Ethoxy(Methyl)Phosphinylethyl) Hydantoin. Charge Barium Hydroxide and water. Rise to 60^{o}C and stir for 1 hour. Cool to room temperature and add 30% Sulfuric Acid to neutralize. Filter and wash withwater.Charge the filtrate and add Ammonium Hydroxide to pH 12. Filter the slurry to obtain Glufosinate Ammonium.

Chemical Reactions: -

Step 1: -

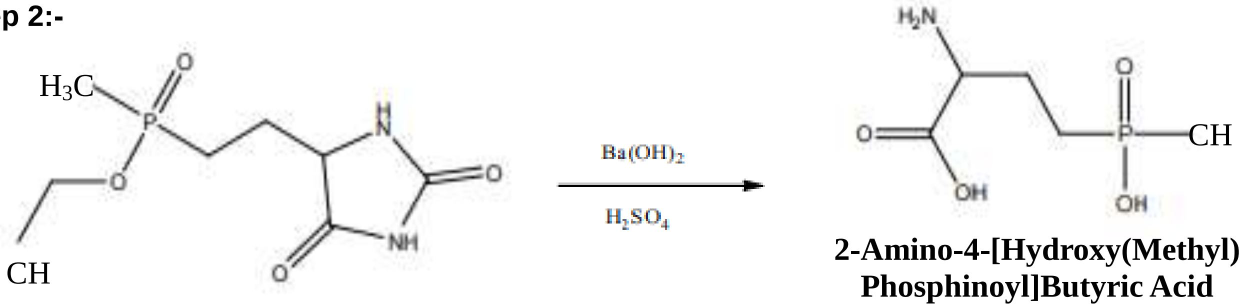


Diethyl Methyl Phosphonate (M.W.152.0)

Acrolein (M.W.56.0)

5 - [2-Ethoxy(Methyl) PhosphinoylEthyl]Hydantoin (M.W.174.0)

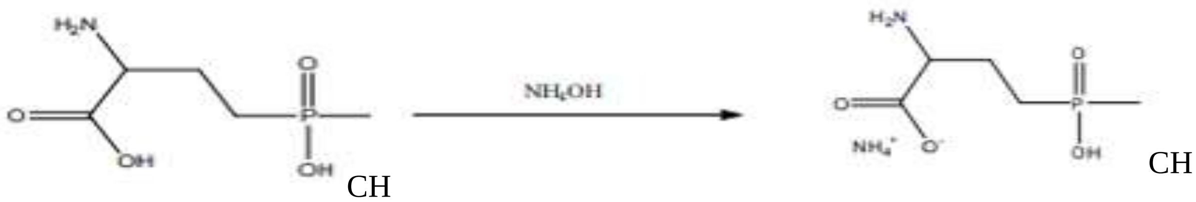
Step 2:-



5-[2-Ethoxy (Methyl) Phosphinylethyl] Hydantoin (M.W.174.0)

2-Amino-4-[Hydroxy(Methyl) Phosphinoyl]Butyric Acid (Glufosinate) (M.W.181.0)

Step 3:-



2-Amino-4- [Hydroxy(Methyl) Phosphinoyl]Butyric Acid (Glufosinate) (M.W.181.0)

2-Amino-4- [Hydroxy (Methyl) Phosphinoyl] Butyric Acid Mono AmmoniumSalt (Glufosinate Ammonium) (M.W.198.0)

Mass Balance:

160	Material / Mass Balance of Glufosinate Ammonium All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Ethanol	2000		Glufosinate Ammonium	**1000**
2	Acrolein	310		Ethanol Recovered	1900
3	Diethyl Methyl Phosphonate	750		Ethanol Loss	100
4	Sodium Cyanide	270		Solid Effluents (Mixed Salt)	1050
5	Ammonium Carbonate	530		Aqueous Effluent	3380
6	Water	1000			
7	Barium Hydroxide	870			
8	30% Sulfuric Acid	900			
9	Ammonium Hydroxide	800			
	TOTAL	**7430**		**TOTAL**	**7430**

161) Pendimethalin

Brief Manufacturing Process: -

Step 1: -Hydrogenation

In an autoclave reactor system 4-Nitro Ortho Xylene, Diethyl Ketone, pt/C (as Catalyst) and Naphthalene-2-SulfonicAcid(aspromoter)werecharged.Temperaturewasraisedto70-72 °C. Hydrogen gas pressure (4 kg) was applied to the autoclave reactor system. After completion of reaction, mass was filtered and subjected for separation. Recover Diethyl Ketone. N-Alkylated Xylidin (NAX) Intermediate thus obtained is used in 2nd step.

Step 2: -**Nitration**

First prepare mixed Acid with Nitric Acid, Sulfuric Acid and water in a reactor. Prepare a mixture of NAX with EDC solvent. Add slowly this mixture in mixed acid at 40 °C. Maintain this temperature for few hours. Check sample for completion of reaction.After completion of reaction stop agitation and settle it for 6 hrs. Separate Spent Acid from the bottom layer. Give water wash to organic mass and again separate water layer from organic layer.Aq.Ml thus obtained will be Acidic innature.

Step 3: - Denitrosation

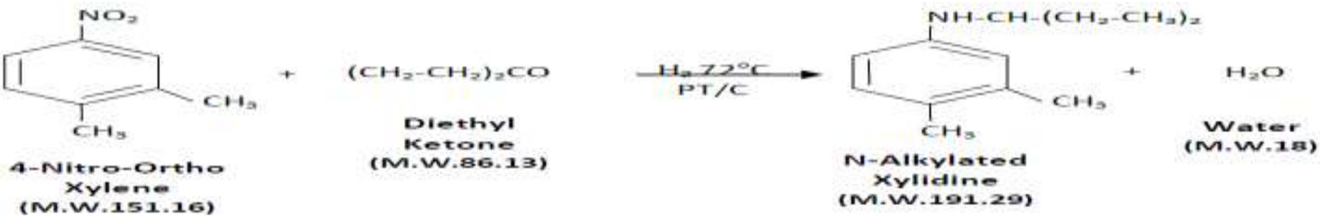
Charge organic mass into the glass line reactor and add acetone and 30%HydrochloricAcid. Raise the temperature to 70 °C and maintain temperature about 70^{o} C for 6 hrsza check sample for completion of reaction. After completion of reaction separate organic layer from aq. layer. Give Sodium Hydroxide wash to the Organic layer. Distilled this organic mass to recover EDC at atmospheric and under vacuum. Final product thus obtained is Pendimethalin.

Step 4: - Purification

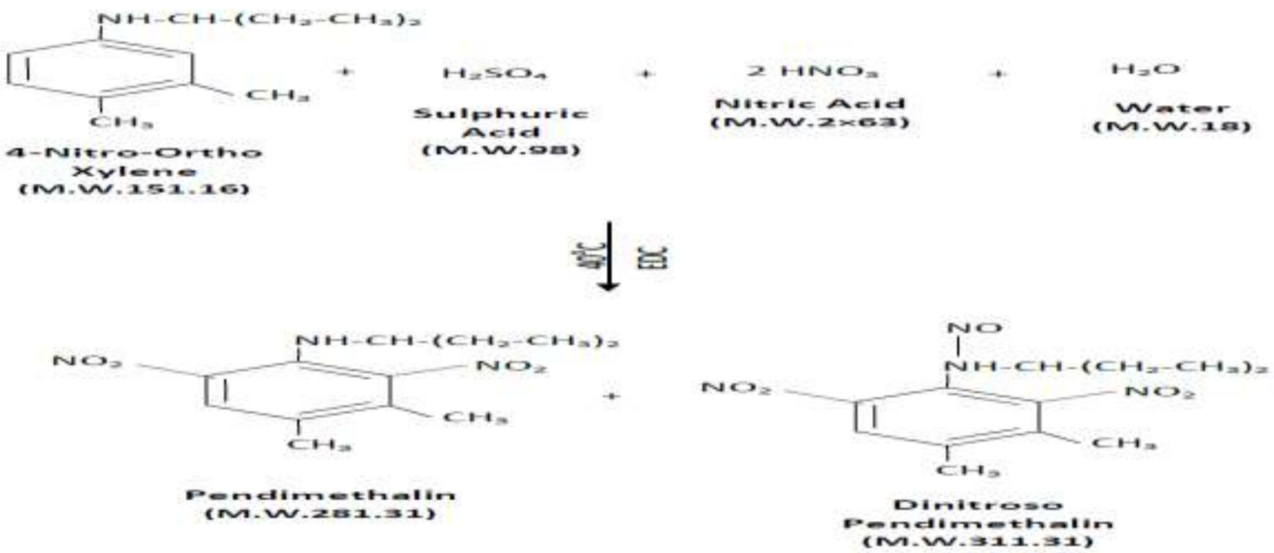
Pendimethalin thus obtained from step-3 is taken into a reactor and n-Hexane is charged. The reaction mass is than heated to reflux at 68 –70 °C for few hours. Hexane is recovered (distilled off) to produce pure Pendimethalin of desired specification.

Chemical Reactions: -

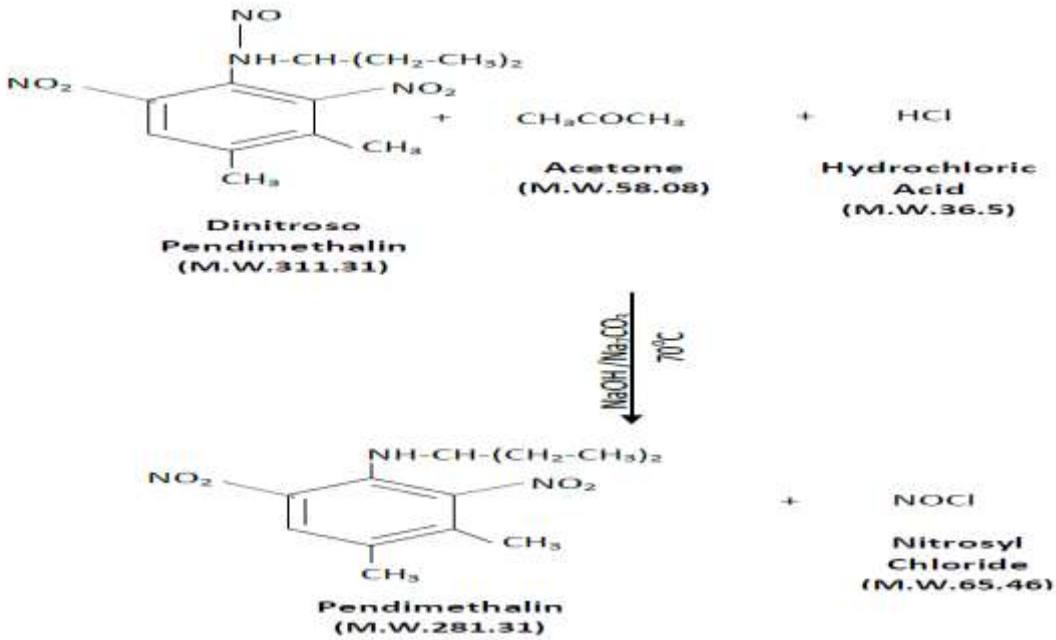
Step 1: -



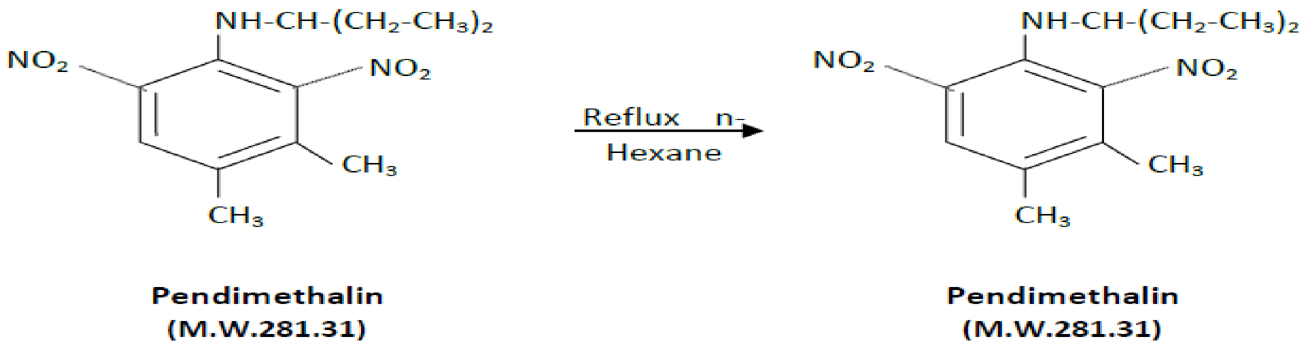
Step 2: -



Step 3: -



Step 4: -



Mass Balance:

161	Material / Mass Balance of Pendimethalin All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	4- Nitro Ortho Xylene	580		Pendimethalin	**1000**
2	Diethyl Ketone	360		Reaction water	210
3	Hydrogen gas	40		EDC Loss	100
4	Nitric Acid	1010		EDC Recovered	1900
5	Sulfuric acid	710		Spent Sulfuric Acid (45%)	1500
6	Ethylene Dichloride	2000		Aqueous Effluent	1980
7	Hydrochloric Acid	190		O-Xylene Loss	45
8	Acetone	52		4- Nitro Ortho Xylene	955
9	Caustic	20		Organic Impurities	72
10	Ortho-Xylene	1000			
11	Water	1800			
	TOTAL	**7762**		**TOTAL**	**7762**

162) Pretilachlor

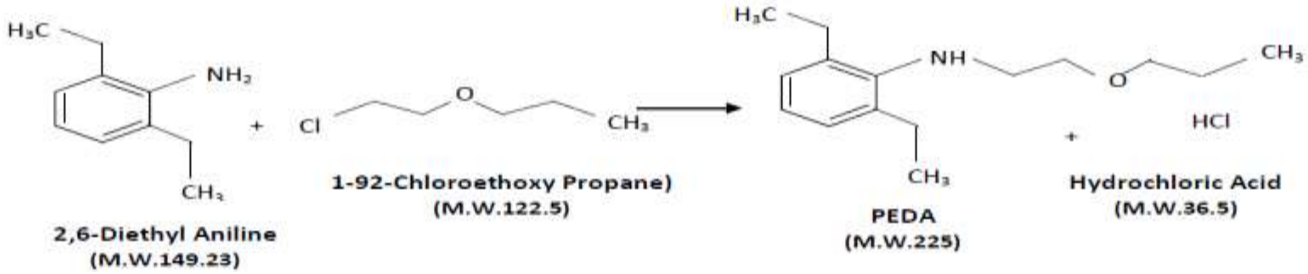
Brief Manufacturing Process: -

Step 1: - 2,6 Diethyl Aniline (DEA) is reacted with Chloro Propoxy Ethane to give Intermediate N Propoxy Ethyl 2,6 Diethyl Aniline Hydrochloride at 130^{o} C. After reaction, reaction mass is neutralized with Caustic at room temperature up to pH 7.0 Aqueous layer containing NaCl is separated out and organic layerPEDA.

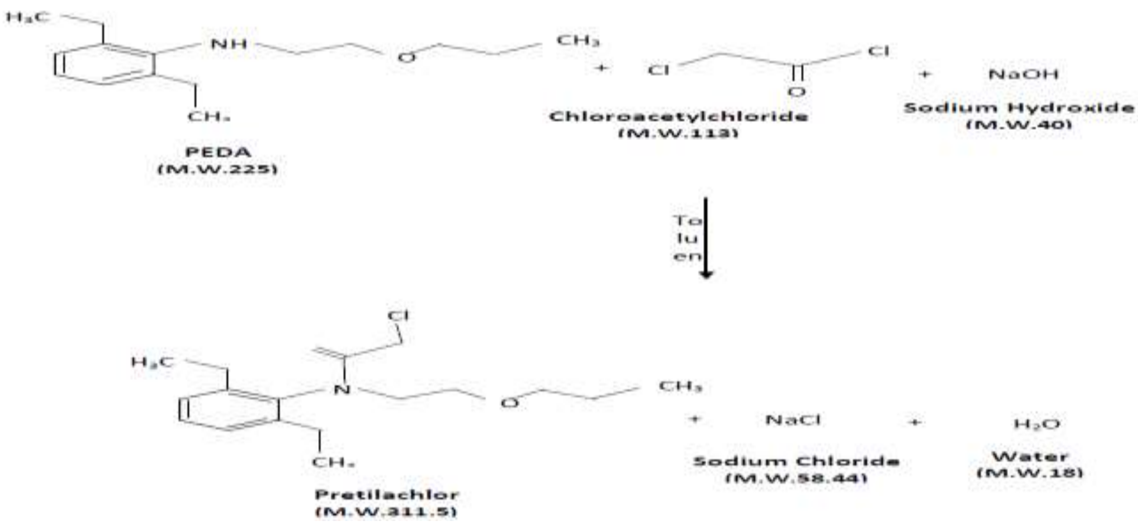
Step 2: -PEDA is reacted with Chloroacetylchloride in presence of solvent Toluene at 60^{o} C temperature. After the reaction, reaction mass is neutralized with Sodium Hydroxide. The Aqueous layer is separated and organic layer is taken for concentration.

Chemical Reactions: -

Step 1: -



Step 2: -



Mass Balance:

162	Material / Mass Balance of Pretilachlor All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch

1	2,6 Diethyl Aniline (2,6-DEA)	575		Pretilachlor	**1000**
2	1-(2-Chloro Ethoxy) Propane	471		Hydrogen Chloride	117
3	Chloroacetyl Chloride	435		Sodium Chloride	188
4	Sodium Hydroxide	154		Water formed in Reaction	58
5	Water	3600		Toluene Recovered	2572
6	Toluene	2640		Toluene Loss	8
7				Toluene in Residue	55
8				2,6 DiethylAniline (DEA)	96
9				1-(2-Chloro Ethoxy) Propane	78
10				Chloroacetyl Chloride	73
11				Sodium Hydroxide	25
12				Waste Water	3605
	Total	**7875**		**Total**	**7875**

163) Dicamba: -

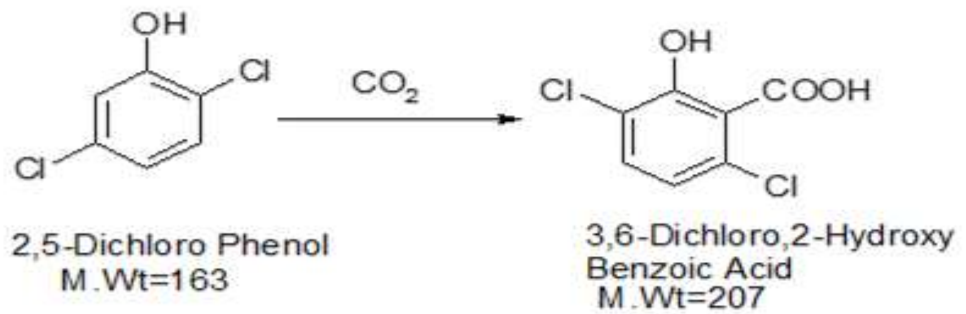
Brief Manufacturing Process: -

Step 1: -2,5-Dichloro Phenol reacts with carbon Dioxide under pressure to get 3,6-Dichloro-2-Hydroxy Benzoic Acid.

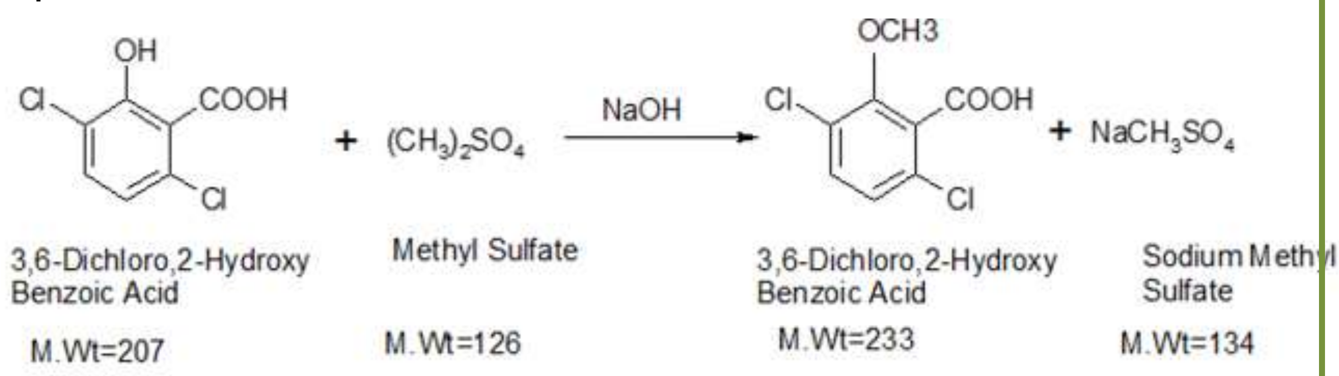
Step 2: -3,6- Dichloro-2-Hydroxy Benzoic Acid reacts with Dimethyl Sulphate in presence of Sodium Hydroxide to get 3,6-Diclhloro-2-Methoxy Benzoic Acid (Dicamba)

Chemical Reactions: -

Step 1: -



Step 2: -



Mass Balance:

163	Material / Mass Balance of Dicamba All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2,4-dichloro phenol	820		Dicamba	**1000**
2	Carbon Dioxide	260		Recovered Solvent-Methanol	1345
3	Dimethyl sulfate	320		Solvent Loss -Methanol	55
4	Sodium hydroxide	205		Recovered Solvent- Toluene	1540
5	Solvent -Methanol	1400		Solvent loss - toluene	60
6	Solvent -Toluene	1600		Distillate water	110
7	Water	1100		Unreacted CO_2	40
8				Sodium Sulfate	740
9				Aqueous Layer to E.T.P.	793
10				Distillation Residue	22
	TOTAL	**5705**		**TOTAL**	**5705**

164) Napropamide

Brief Manufacturing Process: -

Step 1: -Propionic Acid undergoes Bromination by Bromine liquid to form 2-Bromo Propionic Acid in presence of solvent EDC.

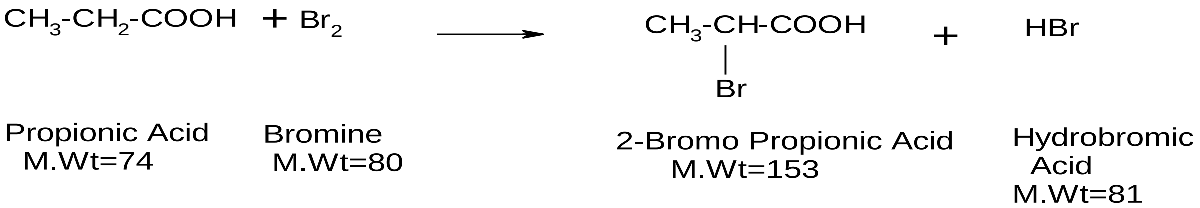
Step 2: -2-Bromo Propionic Acid undergoes Chlorination by Thionyl Chloride to give 2-Bromo Propionic Acid Chloride.

Step 3: -2-Bromo Propionic Acid Chloride when reacts with Diethyl Amine gives 2-Bromo-N, N-Diethyl Propionate.

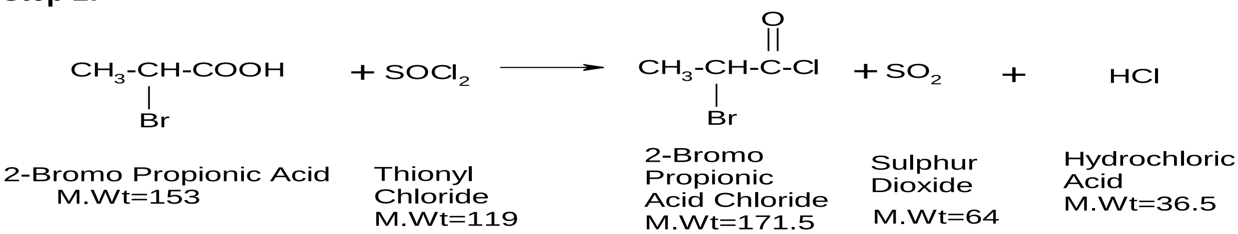
Step 4: -2-Bromo N, N-Diethyl Propionate finally reacts with 2-Naphthol to give the final product Napropamide.

Chemical Reaction:

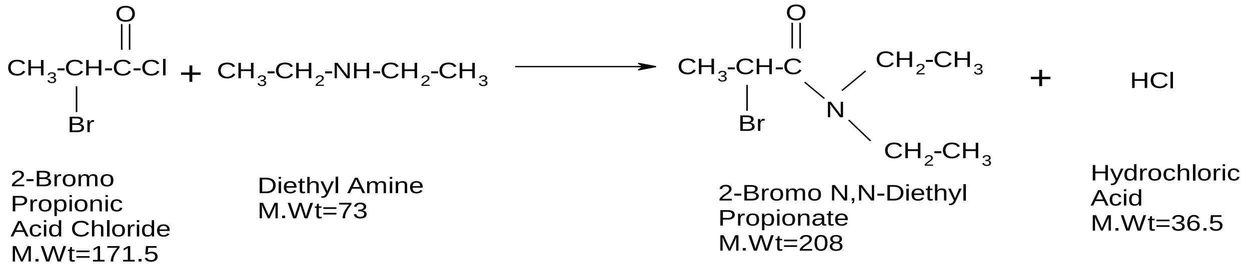
Step 1: -



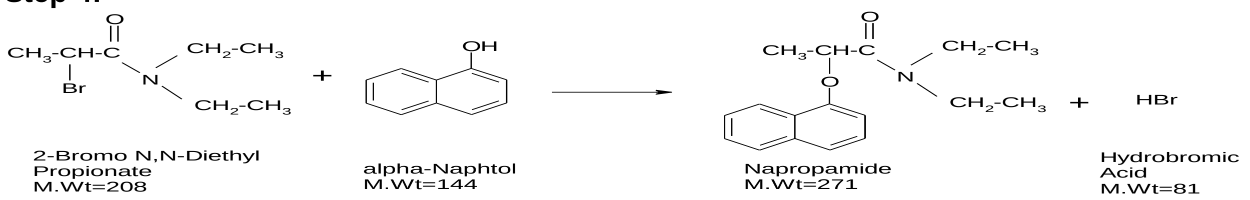
Step 2: -



Step 3: -



Step 4: -



Mass Balance:

164	Material / Mass Balance of Napropamide All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Propionic Acid	310		Napropamide	**1000**
2	Bromine	620		Recovered Xylene	2940
3	Thionyl Chloride	485		Xylene Loss	60
4	Dimethyl Amine	270		20% Sodium Sulfate Solution	2340
5	Alpha Naphthol	535		25% HBr Solution	1070
6	Solvent Xylene	3000		30% HCl Solution	900
7	Catalyst	20		Aq. Effluent to ETP	1230
8	Water for reaction and washing	3500			
9	Caustic Soda Lye (48%)	800			
	Total	**9540**		**Total**	**9540**

165) Dimethenamid

Brief Manufacturing Process: -

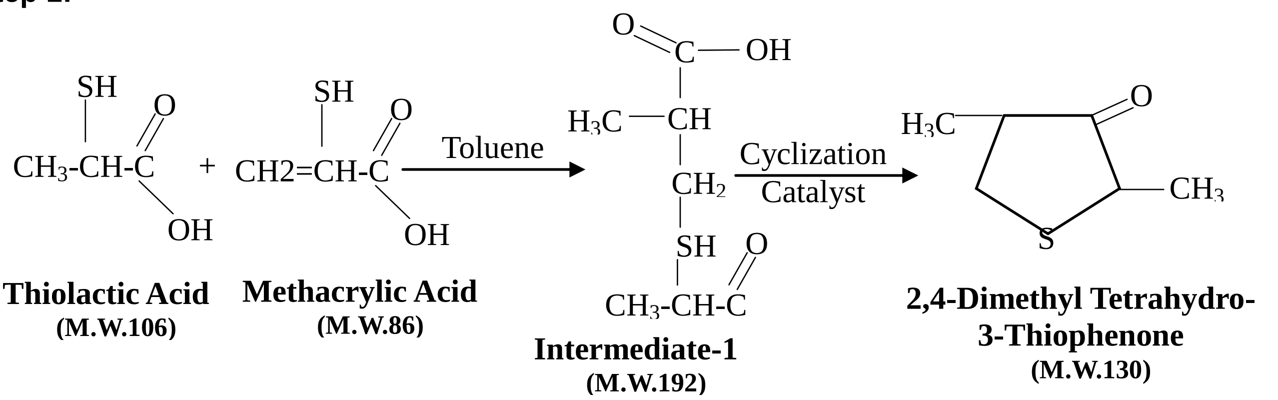
Step 1: - Thiolactic Acid reacted when with Methacrylic Acid in presence of Solvent Toluene and further undergoes Cyclization in presence of Catalyst it gives an Intermediate as 2,4-Dimethyl Tetrahydro-3-Thiophenone.

Step 2: -2,4-Dimethyl Tetrahydro-3-Thiophenone further reacted with 1-Methoxy-2-Amino Propane in presence of Solvent Toluene to give Amino Derivative which on reaction with Thionyl Chloride gives 2,4-Dimethyl-3-(1-Methoxy-2-Amino Propyl) Thiophenone.

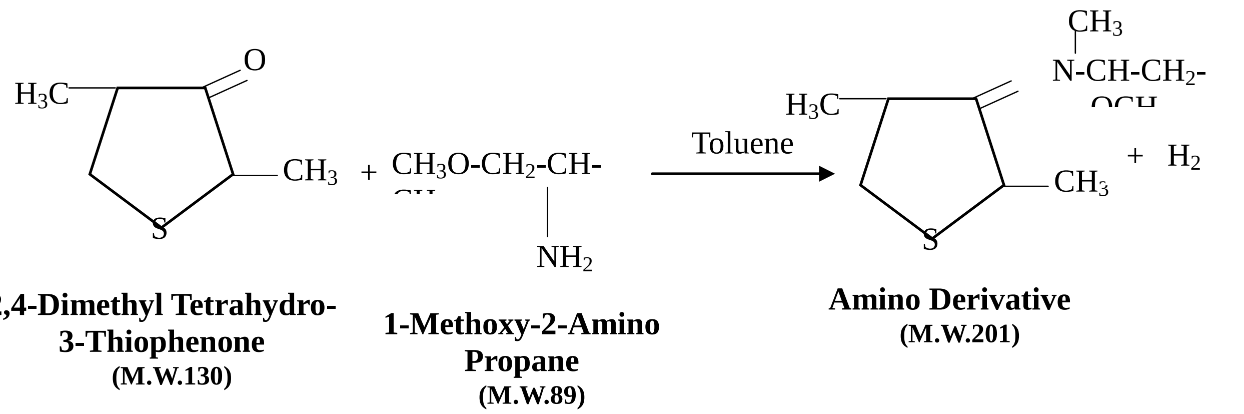
Step 3: - Finally when 2,4-Dimethyl-3-(1-Methoxy-2-Amino Propyl) Thiophenone reacted with Chloroacetyl Chloride in presence of Solvent as well as Caustic Soda Lye 48% to give the Final Product Dimethanamide.

Chemical Reactions: -

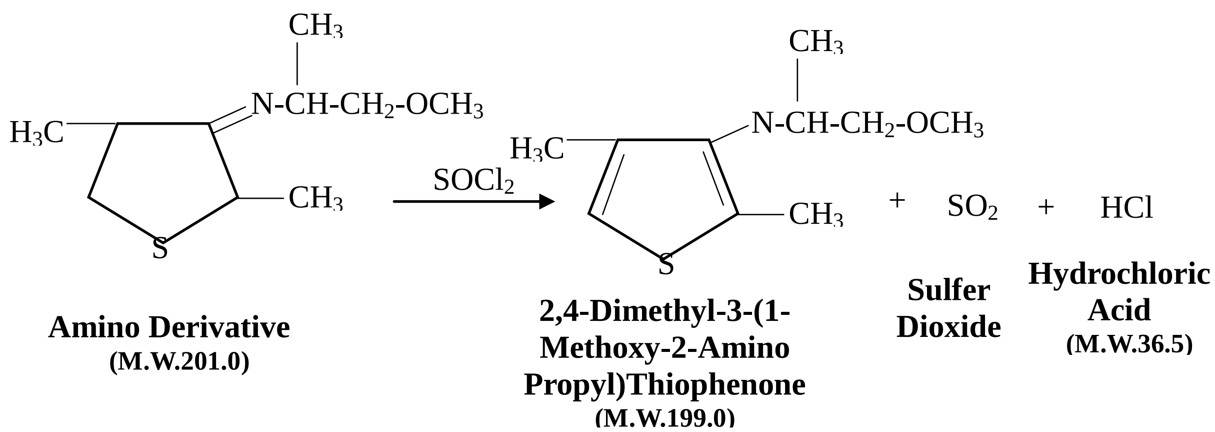
Step 1:-



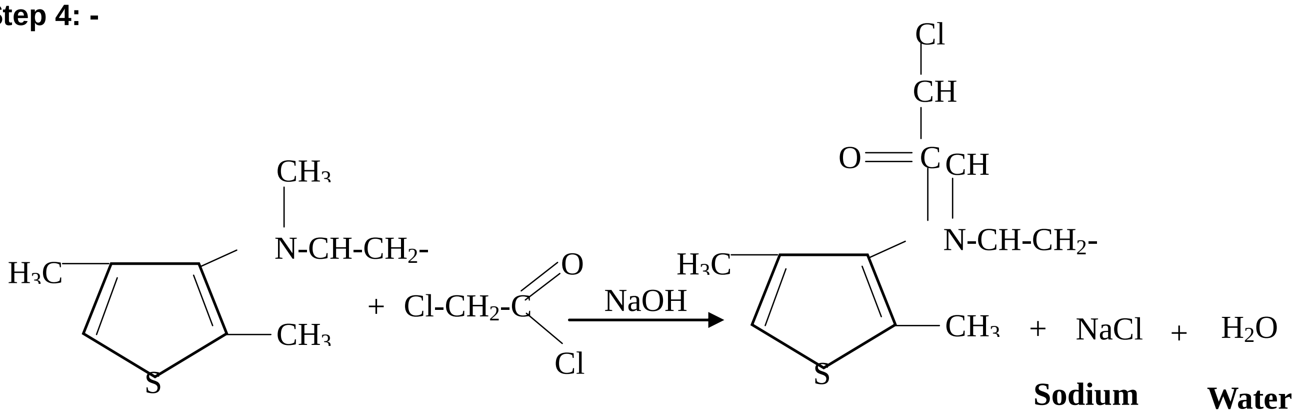
Step 2:-



Step 3: -



Step 4: -



2,4-Dimethyl-3-(1-Methoxy-2-Amino Propyl)Thiophenone (M.W.199.0)

Chloro Acetyl Chloride (M.W.113.0)

Dimethanamide (M.W.276.0)

Sodium Chloride (M.W.58.5)

Water (M.W.18.0

Mass Balance:

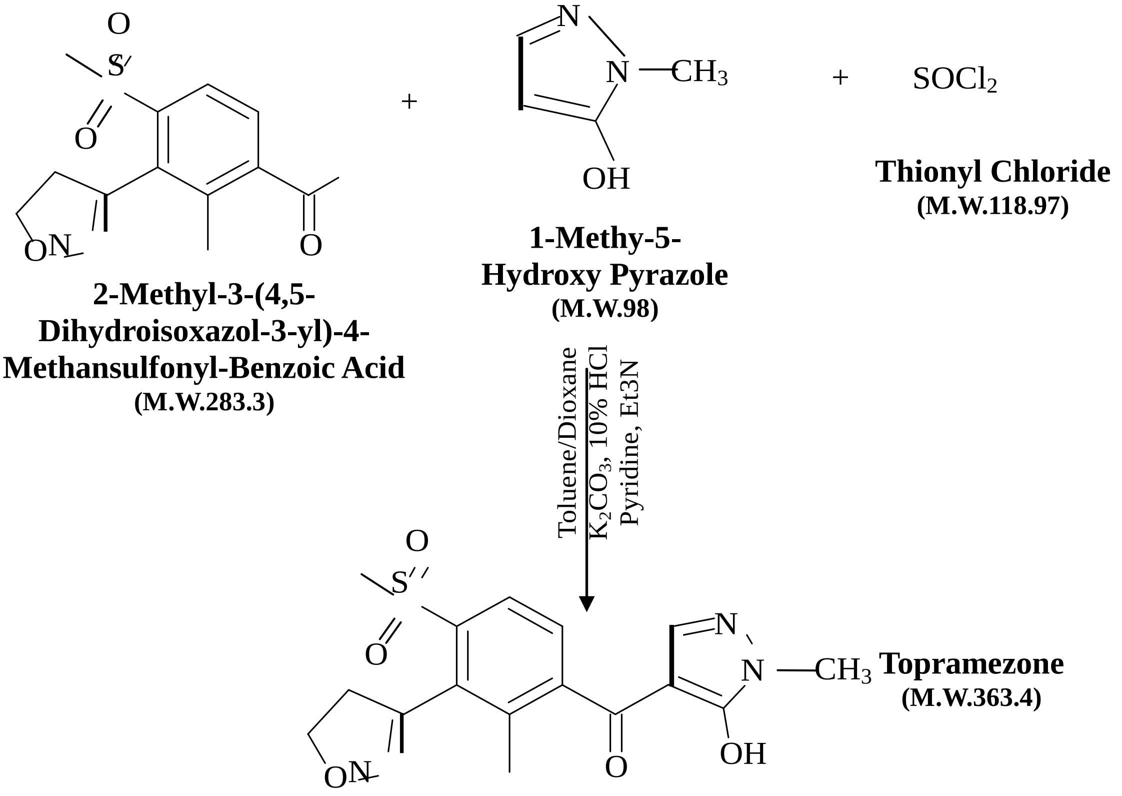
165	Material / Mass Balance of Dimethanamide All Quantities are in kg)				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Thiolactic Acid	512		Dimethanamide	**1000**
2	Methacrylic Acid	415		Recovered Toluene	2130
3	Solvent Toluene	2200		Toluene Loss	70
4	Catalyst	14		Carbon Dioxide	200
5	Water for Reaction	610		20% Sodium Sulphite	2540
6	1-Methoxy-2-Amino Propane	352		30% HCl Soln	490
7	Thionyl Chloride	480		Aq. Layer to ETP	1500
8	Caustic Soda Lye	1070		Distillation Residue	48
9	Water for HCl generation	345			
10	Water for Caustic Dilution	1980			
	TOTAL	**7978**		**TOTAL**	**7978**

166) Topramezone

Brief Manufacturing Process: -

Topramezone will be synthesis by the reaction from 2-Methyl-3-(4,5-Dihydroisoxazol-3-yl)-4-Methanesulfonyl-Benzoic Acid by first reaction it with Thionyl Chloride and 1 drop of Pyridine in Toluene. After that heating for 3h. After reaction the solvent and excess of Thionyl Chloride will distilled out. The obtained residue will be dissolved in Anhydrous Dioxane which will be added to 1-Methyl-5-Hydroxy Pyrazole and Anhydrous Dioxane solution to which further, Triethylamine will be added. After reaction the reaction mass will be filtered and again heated in the presence of Potassium Carbonate. The solvent will be distilled out and then the residue will be treated with 10% dilute Hydrochloric Acid to adjust pH to 2-3. The product will then be extracted with Ethyl Acetate, from which Topramezone will obtained by Crystallization

Chemical Reactions: -



Mass Balance:

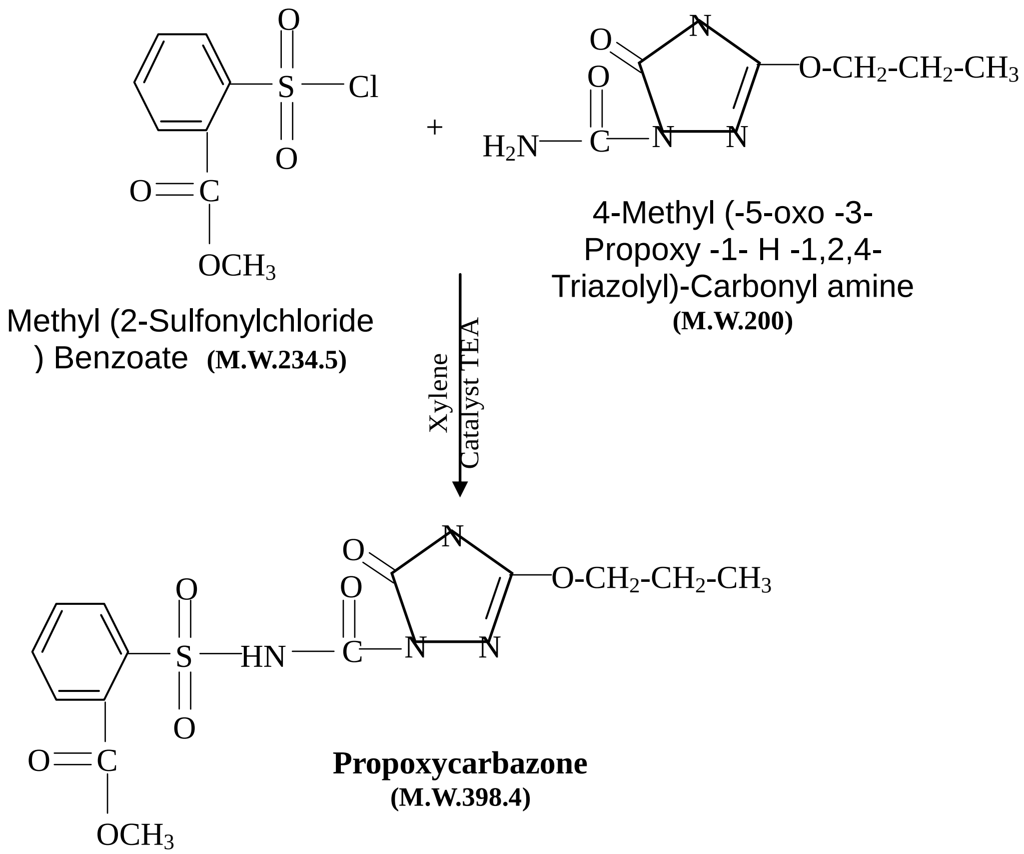
166	Material / Mass Balance of Toprammezone All Quantities are in kg)			
	IN – PUT		OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch	Product / By product	Kg/Batch
1	2-Methyl-3-(4,5- Dihydroisoxazol-3-yl)- 4-Methanesulfonyl-Benzoic Acid (Benzoic Acid)	957	Toprammezone	**1000**
2	Toluene	1000	Toluene Loss	50
3	Pyridine	63	Toluene Recovered	950
4	Thionyl Chloride ($SOCl_2$)	978	Organic Waste	705
5	Dioxane	1500	Pyridine	63
6	1-Methyl-5-Hydroxy Pyrazole	372	Thionyl ChlorideRecovered	450
7	Triethylamine	404	Dioxane Loss	150
8	Potassium Carbonate	394	Dioxane Recovered	1350
9	10% Dilute Hydrochloric Acid	1000	Ethyl acetate Loss	50
10	Water	1000	Ethyl acetate Recovered	950
11	Ethyl Acetate	1000	TEA	404
12	Water for Sodium Sulfite Solution	1000	KCl/ Pottasium Chloride Salt	363
13			Waste Water	1900
14			Sodium Sulfite Solution	1283
	TOTAL	**9668**	**TOTAL**	**9668**

167) Propoxycarbazone

Brief Manufacturing Process: -

Methyl (2-Sulfonylchloride)Benzoate (2-Chlorosufonyl Methyl Benzoate) reacted with 4-Methyl (-5-oxo -3-Propoxy -1- H -1,2,4-Triazolyl)-Carbonyl Amine in presence of Solvent Xylene aa well as Catalyst TEA it gives the final product as a Propoxycarbazone.

Chemical Reactions: -



Mass Balance:

167	Material / Mass Balance of Propoxycarbazone All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Methyl (2-Sulfonylchloride) Benzoate	634		Propoxycarbazone	**1000**
2	Solvent Xylene	2400		Recovered Xylene	2340
3	4-Methyl (-5-oxo -3-Propoxy -1-H -1,2,4-Triazolyl)-Carbonyl Amine	540		Xylene Loss	60
4	TEA	286		Recovered TEA	260
5	C.S. Lye 48%	250		TEA Loss	26

6	Water	750	Aq. Layer to ETP	1136
7			Distillation Residue	38
	TOTAL	**4860**	**TOTAL**	**4860**

168) Fomesafen:

Brief Manufacturing Process: -

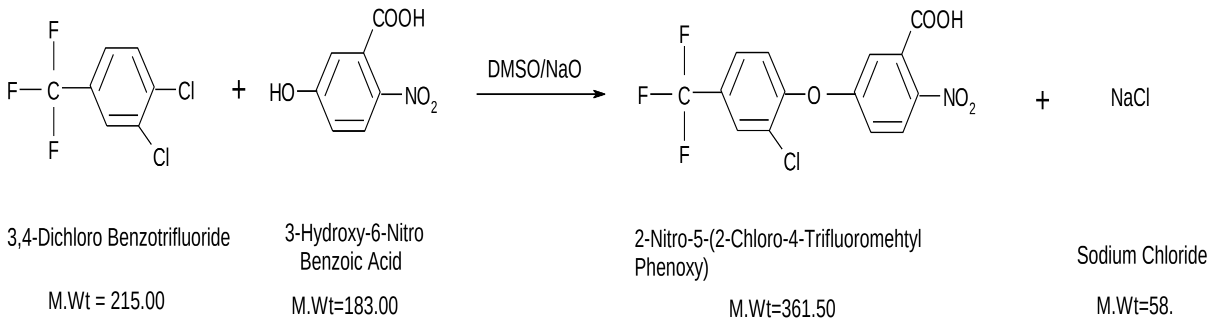
Step 1: - 3 - Hydroxy -6- Nitro Benzoic Acid is reacted with 3,4 – Chloro Benzotrifluoride in presence of Solvent – Di Methyl Sulfoxide (DMSO) and Sodium Hydroxide to form 2- Nitro -5- (2-Chloro -4- Trifluoromethyl Phenoxy) Benzoic Acid.

Step 2: - 2- Nitro -5- (2- Chloro -4- Trifluoromethyl Phenoxy) Benzoic Acid undergoes Chlorination by Thionyl Chloride in Presence of Solvent – Toluene to form Acid Chloride which on further reaction with Ammonium Hydroxide to form 2- Nitro -5- (2- Chloro -4- Trifluoromethyl Phenoxy) Benzamide.

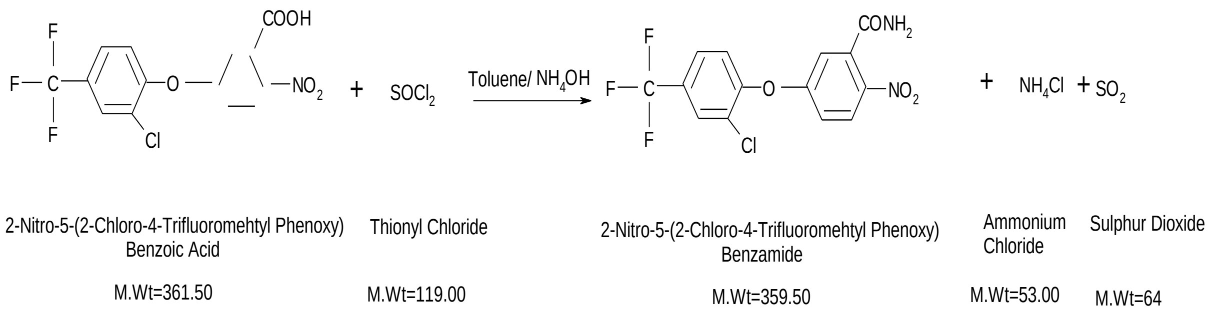
Step 3: - 2- Nitro -5- (2- Chloro -4- Trifluoromethyl Phenoxy) Benzamide is further reacted with Methane Sulfonyl Chloride (MSC) in presence of Solvent – Toluene to form the final product Fomesafen.

Chemical Reactions: -

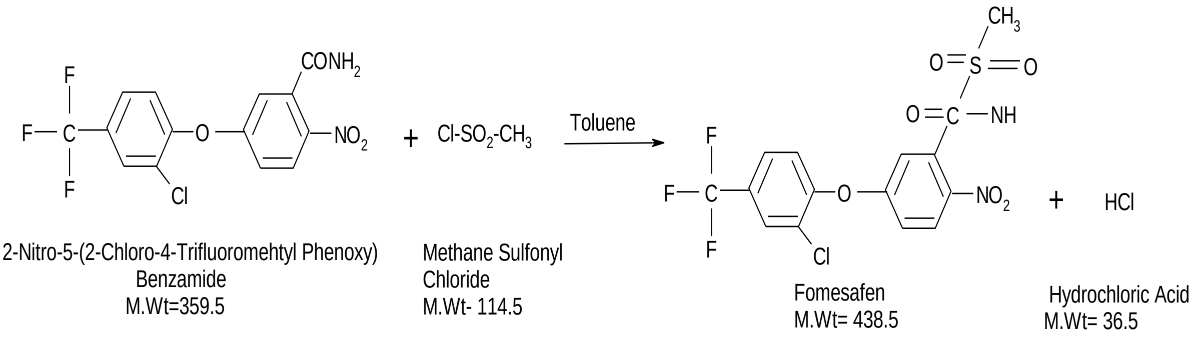
Step 1: -



Step 2 :-



Step 3: -



168	Material / Mass Balance of Fomesafen All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	3-Hydroxy -6-Nitro Benzoic Acid	485		Fomesafen	**1000**
2	3,4 -Di Chloro Benzotrifluoride.	567		Recovered Solvent - DMSO	2060
3	Sodium Hydroxide	105		Solvent Loss (DMSO)	40
4	Solvent -Di methyl Sulfoxide (DMSO)	2100		Sodium Chloride	154
5	Thionyl Chloride	300		Sodium Bi Sulphate	270
6	20 % Ammonium hydroxide Solution	458		Ammonium Chloride	142
7	Solvent - Toluene	2400		30 % Hydrochloric Acid	642
8	Methane Sulfonyl Chloride	300		Recovered Solvent - Toluene	2360
9	Water	700		Solvent loss (Toluene)	40
10				Aqueous Layer to ETP	697
11				Distillation Residue	10
	TOTAL	**7415**		**TOTAL**	**7415**

169) Halosafen:

Brief Manufacturing Process: -

Step -1:

3- Hydroxy -6- Nitro Benzoic Acid is reacted with 3,4 – Chloro Benzotrifluoride in presence of Solvent – Di Methyl Sulfoxide (DMSO) and Sodium Hydroxide to form 2- Nitro -5- (2- Chloro - 4- Trifluoromethyl Phenoxy) Benzoic Acid.

Step -2:

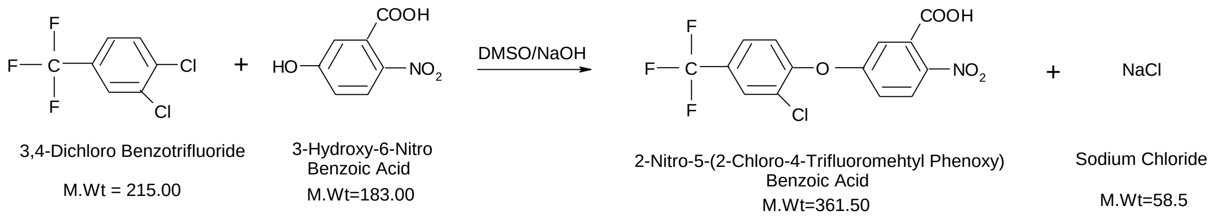
2- Nitro -5- (2- Chloro -4- Trifluoromethyl Phenoxy) Benzoic Acid undergoes Chlorination byThionyl Chloride in Presence of Solvent – Toluene to form Acid Chloride which on further reaction with Ammonium Hydroxide to form 2- Nitro -5- (2- Chloro -4- Trifluoromethyl Phenoxy) Benzamide.

Step -3:

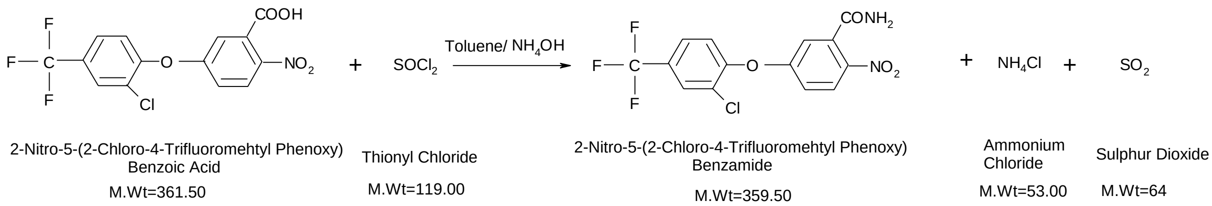
2- Nitro -5- (2- Chloro -4- Trifluoromethyl Phenoxy) Benzamide is further reacted with Ethane Sulfonyl Chloride (ESC) in presence of Solvent – Toluene to form the final product Halosafen.

Chemical Reaction:

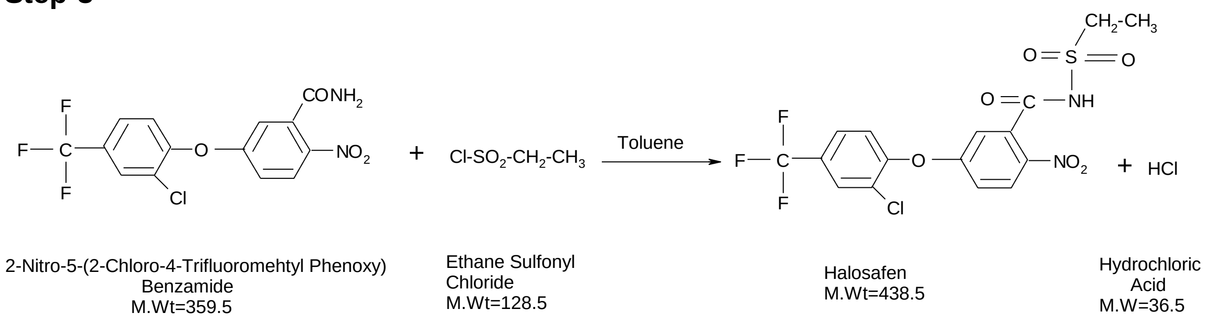
Step-1



Step-2



Step-3



Material Balance:

169	Material / Mass Balance of Halosafen All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr No	Raw Materials / Items	Kg/Batch		Product / Bi Product	Kg/Batch
1	3 - Hydroxy -6- Nitro Benzoic Acid	487		Halosafen	1000
2	3,4 -Di Chloro Benzotrifluoride.	570		Recovered Solvent - DMSO	1965
3	Sodium Hydroxide	105		Solvent Loss (DMSO)	35
4	Solvent -Di methyl Sulfoxide	2000		Sodium Chloride	156
5	Thionyl Chloride	300		Sodium Bi Sulphate	280
6	20 % Ammonium Hydroxide Solution	463		Ammonium Chloride	140
7	Solvent - Toluene	2200		Hydrochloric Acid (30 %) Solution	650
8	Ethane Sulfonyl Chloride	320		Recovered Solvent - Toluene	2170

9	Water	550		Solvent loss (Toluene)	30
10				Aqueous Layer to ETP	552
11				Distillation Residue	17
	Total	**6995**		**Total**	**6995**

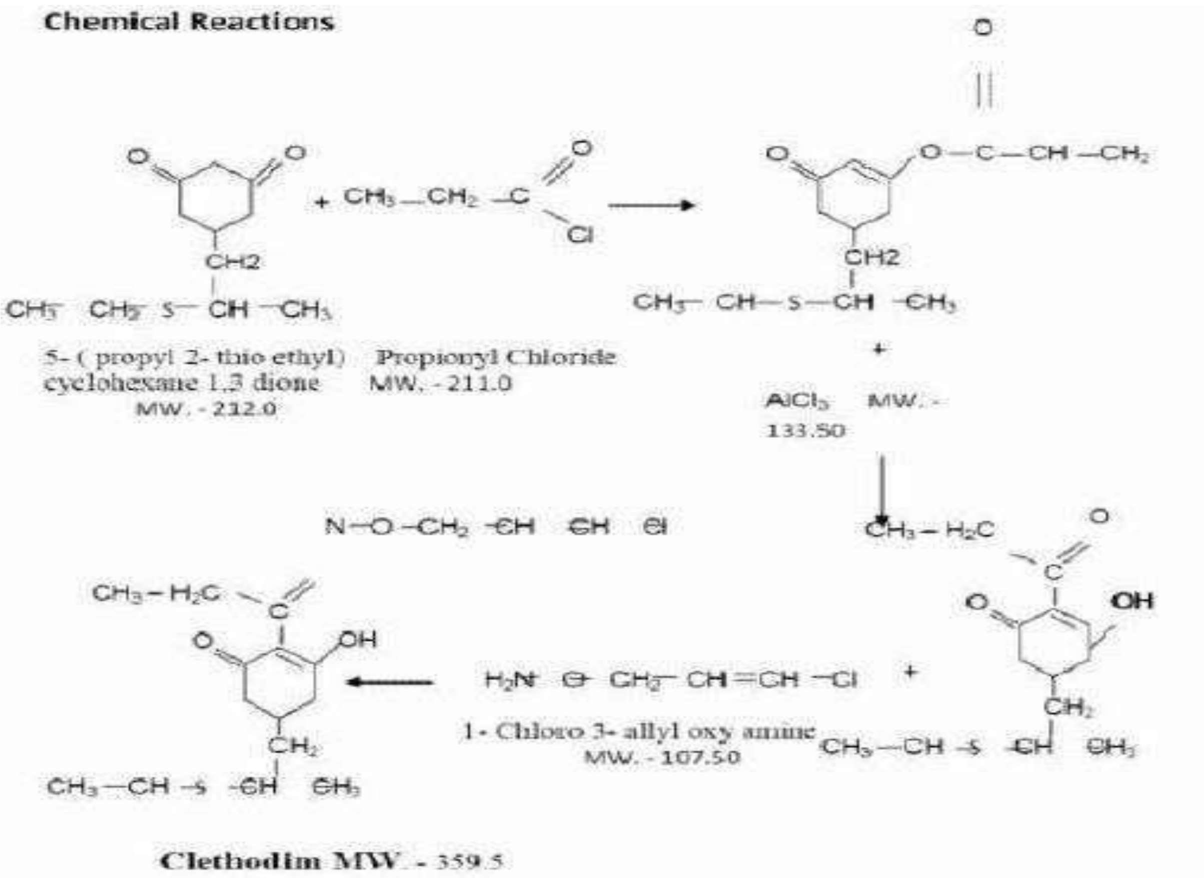
170) Clethodim

Brief Manufacturing Process: -

Step 1: -5-(Propyl-2-Thio Ethyl) Cyclohexane 1,3-Dione is reacted with Propionyl Chloride to form the Intermediate-1.

Step 2: - Intermediate-1 under goes Isomerization in presence of Aluminum Chloride gives the Intermediate-2.

Step 3: -Intermediate-2 is reacted with 1-Chloro-3-allyl Oxy Amine in presence of Solvent. This reaction gives out the final product Clethodim.



170	Material / Mass Balance of Clethodim All Quantities are in kg)				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	5- Propyl 2- Thio Ethyl Cyclohexane 1,3 Dione	625		Clethodim	**1000**

2	Propionyl Chloride	285	Recovered Toluene	2450
3	Aluminium Chloride (Anhydrous)	450	Toluene Loss	50
4	1- Chloro 3-Allyl Oxy Amine	330	20 % Aluminium Solution for Sale to Actual User	2250
5	Solvent - Toluene	2500	Aq. Washings to ETP	1240
6	Water	2800		
	TOTAL	**6990**	**TOTAL**	**6990**

171) Benoxacor

Brief Manufacturing Process:

Step: -1 (Ortho Nitro phenol to O-Nitrophenoxy Acetone)

Ortho Nitro phenol is Reacted with Chloroacetone in Presence of Sodium Bicarbonate and Toluene as a Solvent at desire temperature. After Reaction, Water is added & then Layer Separated. Toluene is Distilled off under vacuum to get O-Nitro phenol Acetone.

Step: -2 (O-Nitro Phenoxy Acetone to 3,4-Dihydro-3-methyl benzomorpholine)

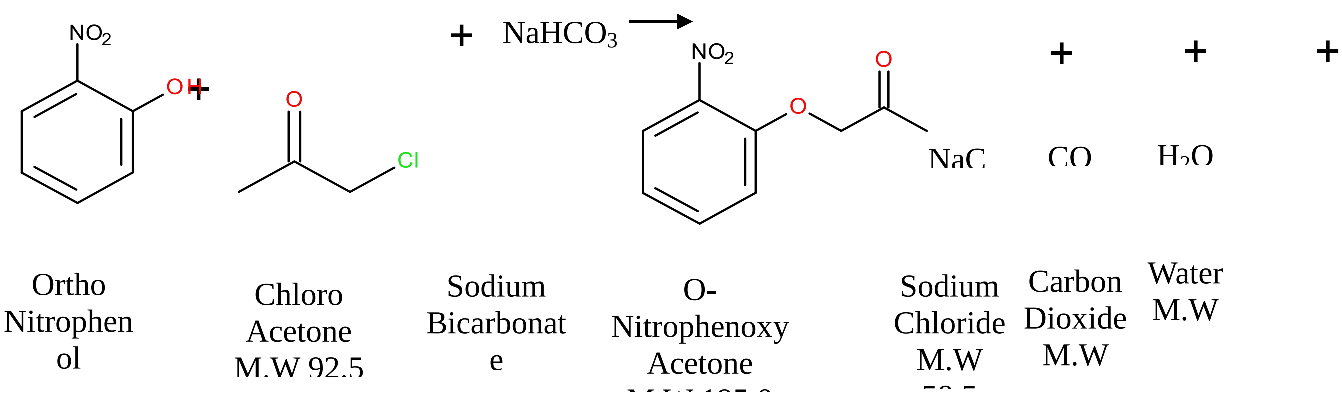
O-Nitro Phenoxy Acetone is hydrogenated and Cyclized in presence of a Catalyst and Toluene as a Solvent at desired temperature and pressure. After reaction Catalyst is filtered off. Layer is Separated. Toluene is Distilled off from organic layer to obtain 3,4-Dihydro-3-methyl benzomorpholine.

Step: -3 (3,4-Dihydro-3-methyl benzomorpholine to Benoxacor)

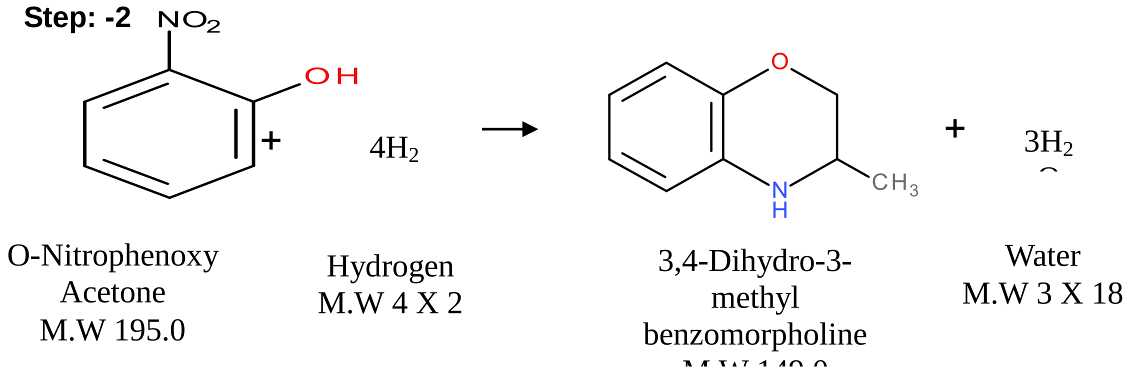
3,4-Dihydro-3-methyl benzomorpholine is reacted with Dichloro Acetyl Chloride in presence of Toluene as a Solvent at desire temperature. Liberated Hydrogen Chloride gas is Scrubbed in Water. After Reaction, Toluene is Distilled off to get Benoxacor as final product.

Chemical Reaction:

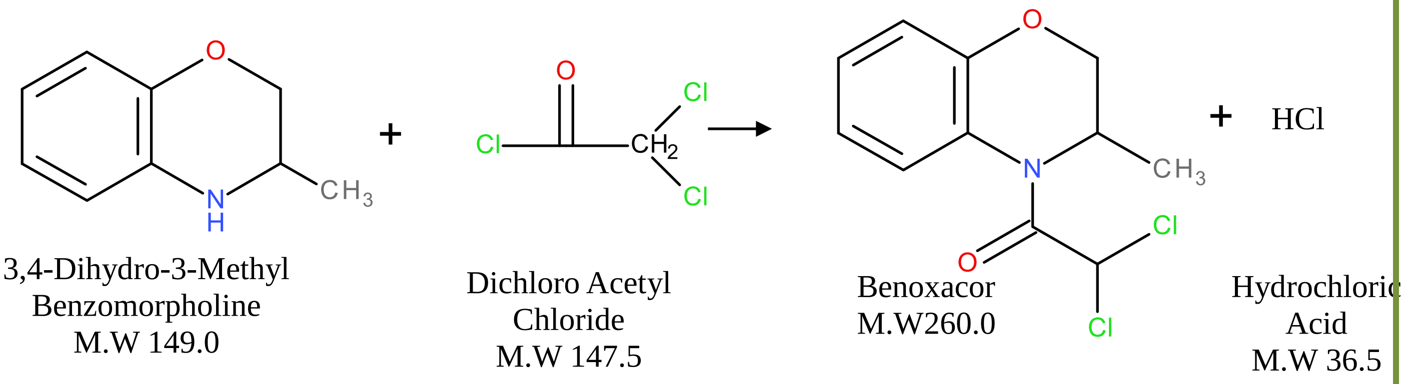
Step: -1



Step: -2



Step: -3



Material Balance:

171	Material / Mass Balance of Benoxacor All Quantities are in kg)				
Step: -1	**INPUT**			**OUTPUT**	
Sr. No.	**Raw Material/item**	**Kg/Batch**		**Product/Bi Product**	**Kg/Batch**
1	Ortho Nitro phenol	576		Ortho Nitro Phenoxy Acetone	800
2	Chloro Acetone	383		Recovered Toluene	950
3	Sodium Bicarbonate	348		Toluene Loss	50
4	Water	700		Aqueous Layer to ETP	1017
5	Solvent-Toluene	1000		CO_2 gas to Vent	182
				Distillation Residue	8
	Total	**3007**		**Total**	**3007**

171	Material / Mass Balance of Benoxacor All Quantities are in kg)				
Step: -2	**INPUT**			**OUTPUT**	
Sr. No.	**Raw Material/item**	**Kg/Batch**		**Product/Bi Product**	**Kg/Batch**
1	Ortho Nitro Phenoxy Acetone	800		3,4-Dihydro-3-Methyl Benzomorpholine	596
2	Catalyst	4		Recovered Toluene	660
3	Hydrogen-Gas	35		Toluene Loss	40
4	Toluene	800		Recover Catalyst	4
				Hydrogen to Vent	2

			Aqueous Layer to ETP	322
			Distillation Residue	15
	Total	**1639**	**Total**	**1639**

171	**Material / Mass Balance of Benoxacor All Quantities are in kg)**			
Step: -3	**INPUT**		**OUTPUT**	
Sr. No.	**Raw Material/item**	**Kg/Batch**	**Product/Bi Product**	**Kg/Batch**
1	3,4-Dihydro-3-Methyl Benzomorpholine	596	Benoxacor	1000
2	Dichloro Acetyl Chloride	590	Recovered Toluene	950
3	Solvent - Toluene	1000	Toluene loss	50
4	Water for HCl Scrubber	344	30% HCl Solution	490
			Distillation Residue	40
	Total	**2530**	**Total**	**2530**

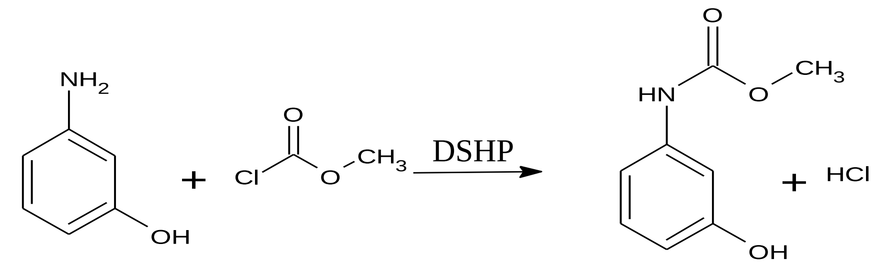
172) Phenmedipham (PMP)

Brief Manufacturing Process:

Meta Aminophenol (MAP) reacted with Methyl Chloroform ate in presence of Disodium Hydrogen Phosphate using Butyl Acetate as Solvent. In second step react with Tolylisocyanate in presence of Trimethylamine to get Phenmedipham (PMP).

Chemical Reaction:

Step:1



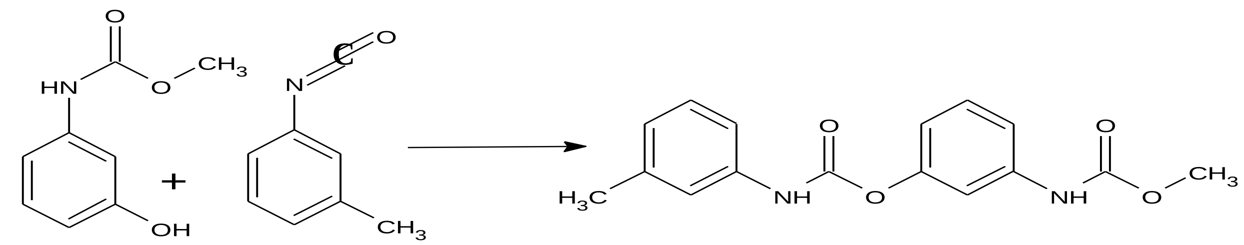
M.W 109.0 Meta Aminophenol

M.W 94.5 Methyl Chloroformate

M.W 167.0

Hydrochloric Acid M.W 36.5

Step: 2



M.W 167.0

M.W 133.0 Tolylisocyanate

M.W 300.0 Phenmedipham

Material Balance/Mass Balance (All Quantities are in Kgs.)

172	Material / Mass Balance of Phenmedipham All Quantities are in kg)				
INPUT				OUTPUT	
Sr. No.	Raw Material/item	Kg/Batch		Product/Bi Product	Kg/Batch
1	Meta Aminophenol	385		Phenmedipham	1000
2	Methyl Chloroformate	340		Recovered Butyl Acetate	3100
3	Disodium Hydrogen Phosphate	160		Solvent Loss	100
4	Solvent - Butyl Acetate	3200		30% HCl Solution	470
5	Caustic Lye	145		Aqueous Layer to ETP	2400
6	Meta Tolyl Isocyanate	470		Distillation Residue	40
7	Tri ethylamine	10			
8	Water	2400			
	Total	**7110**		**Total**	**7110**

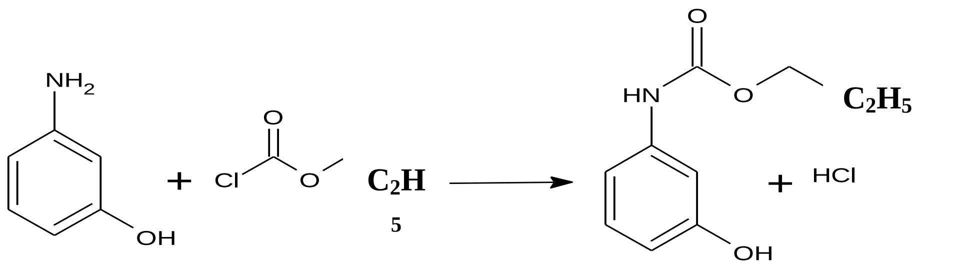
173) Desmedipham (DMP)

Brief Manufacturing Process:

Meta Aminophenol (MAP) reacted with Ethyl Chloroformate in presence of Disodium Hydrogen Phosphate using Butyl Acetate as solvent. In second step react with Phenyl isocyanate in presence of Triethylamine to get Desmedipham (DMP).

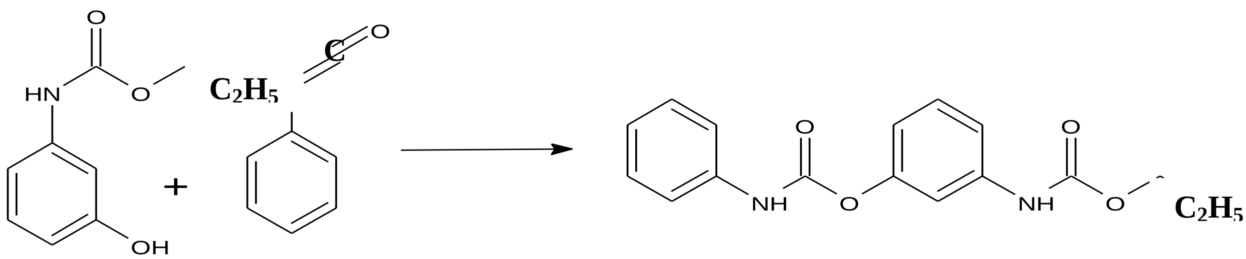
Chemical Reaction:

Step:1



M.W 109.0 Meta Aminophenol | M.W 108.5 Ethyl Chloroformate | M.W 181.0 Phenyl isocyanate | M.W 36.5 Hydrochloric Acid

Step:2



M.W 181.0 Phenyl isocyanate | M.W 119.0 Triethylamine | M.W 300.0 Desmedipham

Material Balance:

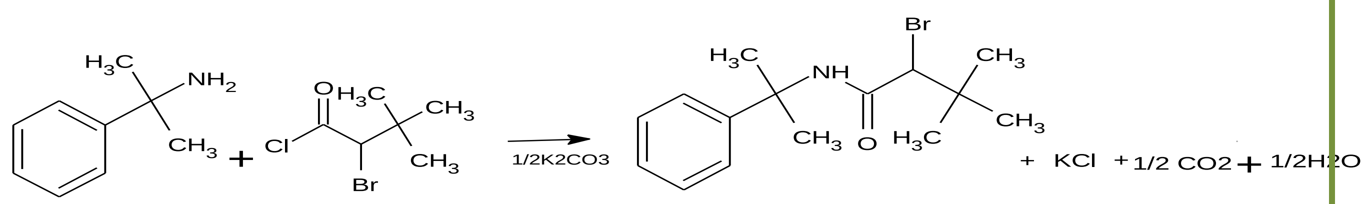
173	Material / Mass Balance of Desmedipham All Quantities are in kg)				
	INPUT			OUTPUT	
Sr. No.	Raw Material/item	Kg/Batch		Product/Bi Product	Kg/Batch
1	Meta Aminophenol	395		Desmedipham	1000
2	Ethyl Chloroformate	380		Recovered Butyl Acetate	3110
3	Disodium Hydrogen Phosphate	160		Solvent Loss	90
4	Butyl Acetate	3200		30% HCl Solution	475
5	Caustic Lye	145		Aqueous Layer to ETP	2197
6	Phenyl Isocyanate	416		Distillation Residue	38
7	Tri ethylamine	14			
8	Water	2200			
	Total	**6910**		**Total**	**6910**

174) Bromobutide

Brief Manufacturing Process:

Phenylpropan-2-Amine reacts with 2-Bromo-3,3-Dimethyl Butanoyl Chloride in presence of K2CO3 and Chlorobenzene as solvent. After reaction mass is taken for filtration to remove salt (KCl) then Chlorobenzene is recovered by distillation to get the final product as Bromobutide.

Chemical Reaction:



Phenyl Propan -2-Amine M.W 149.0 | 2-Bromo-3,3-Dimethyl Butanoyl Chloride M.W 213.5 | Bromobutide M.W 312.0 | Potassium Chloride M.W 74.5 | Carbon Dioxide M.W 22.0 | Water M.W 18.0

Material Balance:

174	Material / Mass Balance of Bromobutide All Quantities are in kg)				
INPUT				OUTPUT	
Sr. No.	Raw Material/item	Kg/Batch		Product/Bi Product	kg/Batch
1	Phenylpropan-2-Amine	500		Bromobutide	1000
2	2-Bromo-3,3-Dimethyl Butanoyl Chloride	790		Recovered Chlorobenzene	1450
3	Pottasium Carbonate	258		Chlorobenzene Loss	50
4	Solvent – Chloro Benzene	1500		Pottasium Chloride (Salt)	350
				Carbon Dioxide to Vent	82
				Aqueous Layer to ETP	90

				Distillation Residue	26
	Total	**3048**		**Total**	**3048**

175) Butachlor:
Brief Manufacturing Process: -

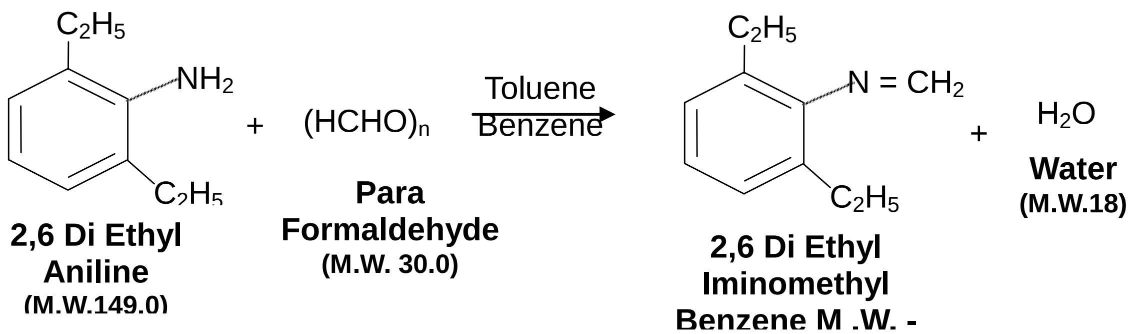
Step 1: - Charge 2,6-DEA, Benzene, Para Formaldehyde in to the reactor and heat the reaction mixture at 80^{0}C temperature for 4 hrs in the presents of Catalyst. When reaction is over, the material is cooled at 40^{0}C temperature. Distilled out Benzene under vacuum at 80^{0}C temperature and coolit.

Step 2: - Charge Chloro Acetyl Chloride into the reactor and charge intermediate (stage 1) slowly in the reaction mass at 20^{0}C temperature and maintain the reaction for 5 hrs.

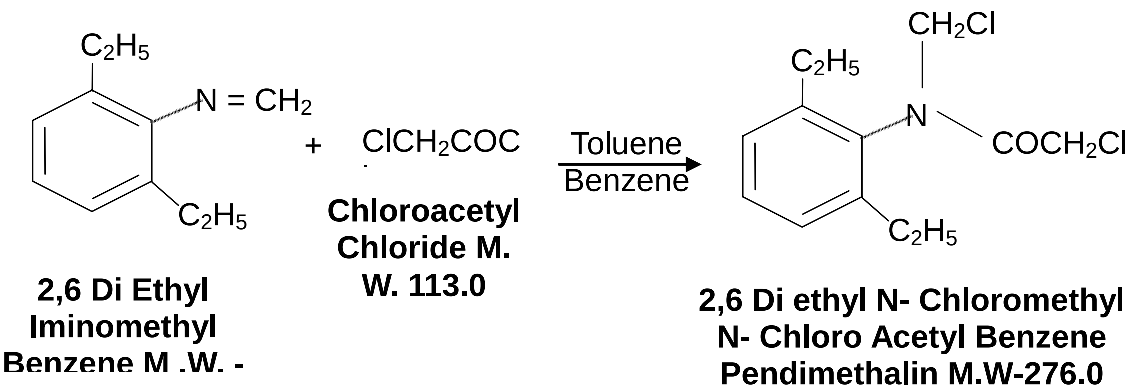
Step 3: - Charge n-Butanol into the reactor and react with intermediate (stage 2) at 40^{0}C temperature. Maintain the mass for 4 hrs. Neutralized the reaction mass with ammonia gas till pH-8. Wash the reaction mass with water. Separate organic layer and take it to distillation vessel for Butanol recovery under vacuum up to 90^{0}C temperature. Cool it to 10^{0}C and filter the Butachlor forpacking.

Chemical Reactions: -

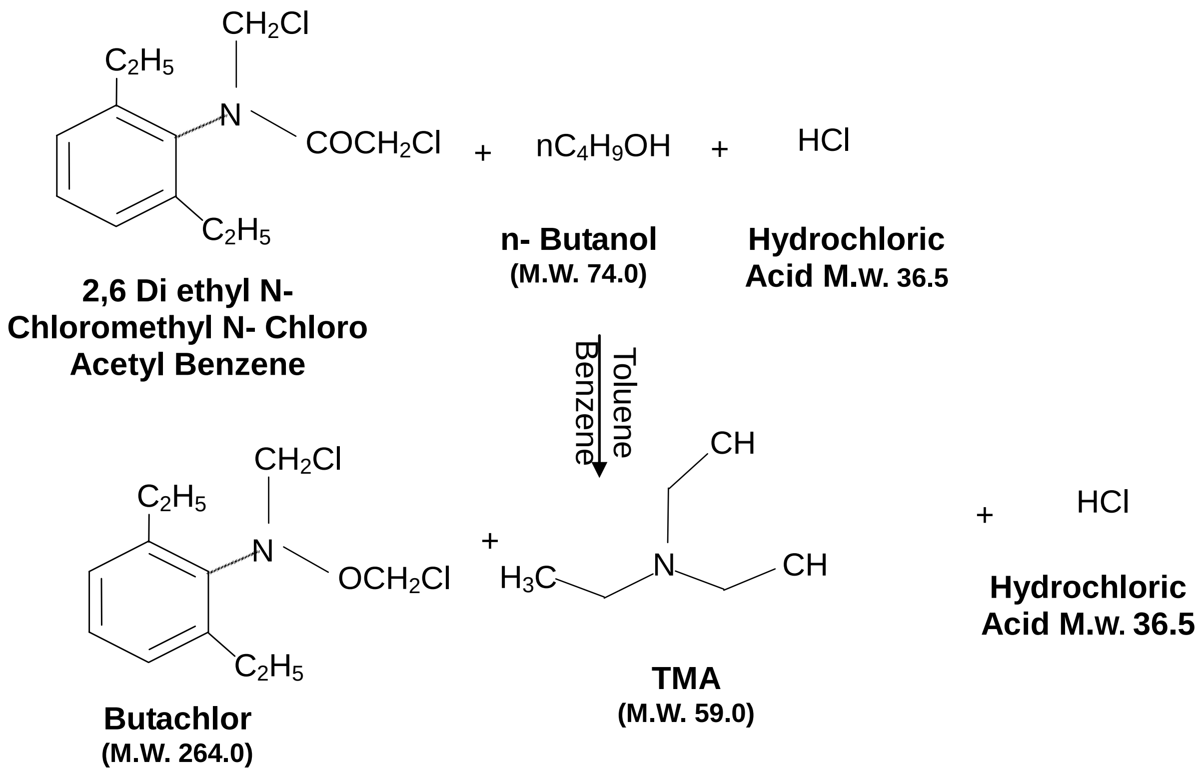
Step 1: -



Step 2: -



Step 3: -



175	Material / Mass Balance of Butachlor All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2,6 Diethyl Aniline (2,6-DEA)	500		Butachlor	**1000**
2	Para Formaldehyde	169		Recovered Benzene	210
3	Benzene	266		Loss Benzene	56
4	TEA	3		PFR Loss	64
5	Chloroacetyl Chloride	394		Aqueous Effluent	1479
6	N-Butanol	1052		N-Butanol Recovered	578
7	Ammonia Gas	62		N-Butanol loss	309
8	Water	1250			
	TOTAL	**3696**		**TOTAL**	**3696**

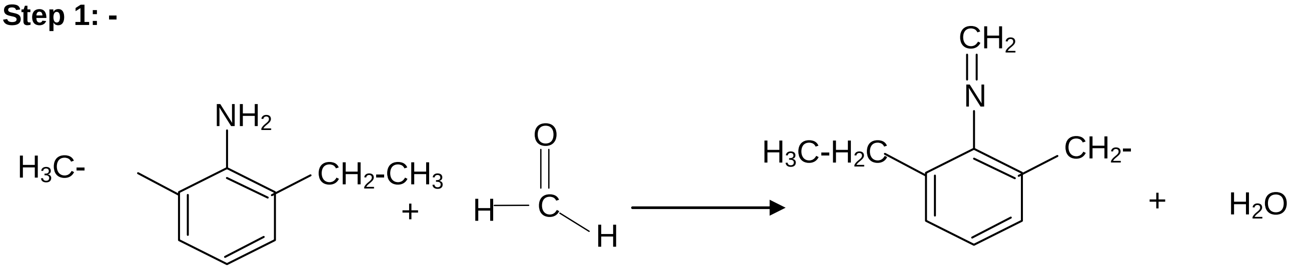
176) Metachlor

Brief Manufacturing Process: -
Step 1: -2,5-Diethyl Amine reacted with Formaldehyde in presence of Catalyst. This reaction gives out Intermediate-1.

Step 2: -Intermediate-1 is further reacted with Chloro Acetyl Chloride. This reaction gives out CDMA. **Step 3: -**CDMA is finally reacted with Methanol. This reaction gives out Metachlor (Alachlor) as a final product.

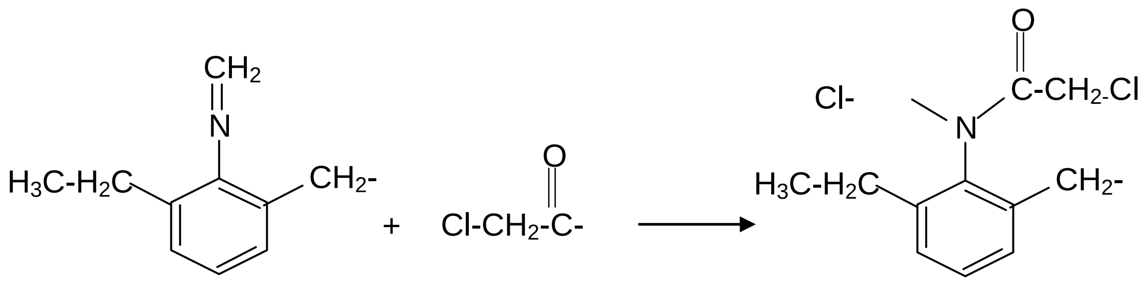
Chemical Reactions: -

Step 1: -



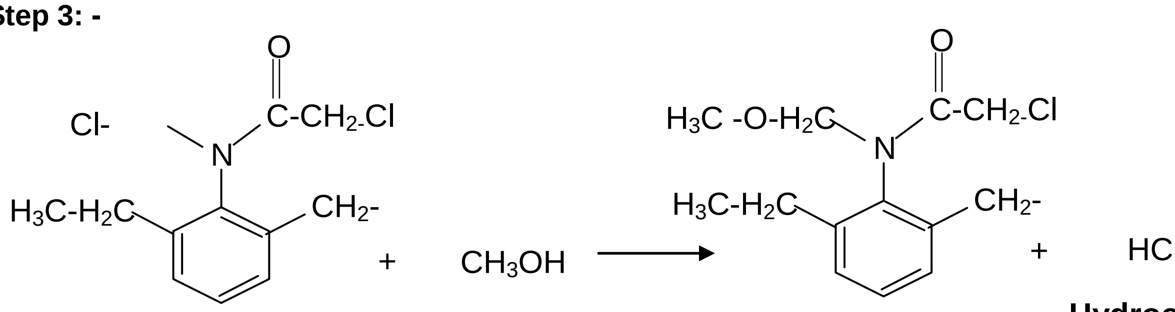
2,5-Diethyl Amine **Formaldehyde** **Intermediate-1** **Water (M.W.18)**

Step 2:



Intermediate-1 **Chloro Acetyl Chloride** **CDMA (M.W.273.94)**

Step 3: -



CDMA (M.W.273.94) **Methanol (M.W.32)** **Metachlor (Alachlor) (M.W.269.77)** **Hydrochloric Acid (M.W.36.5)**

Mass Balance:

176	Material / Mass Balance of Metachlor All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2,6 Diethyl Aniline	650		**Metachlor/ S Metachlor**	**1000**
2	Solvent - Toluene	2000		Recovered Solvent	1950
3	Catalyst PTSA	20		Solvent Loss	50
4	Formaldehyde	130		30% Hydrochloric Acid Soln	476
5	Chloro Acetic Acid	468		Recovered Methanol	325

6	Methanol	500		Methanol Loss	50
7	Water for 30% Hydrochloric Acid	335		Aqueous Layer to ETP	1074
8	Water for Reaction and Washing	850		Distillation Residue	28
	TOTAL	**4953**		**TOTAL**	**4953**

177) Prosulfocarb

Brief Manufacturing Process: -

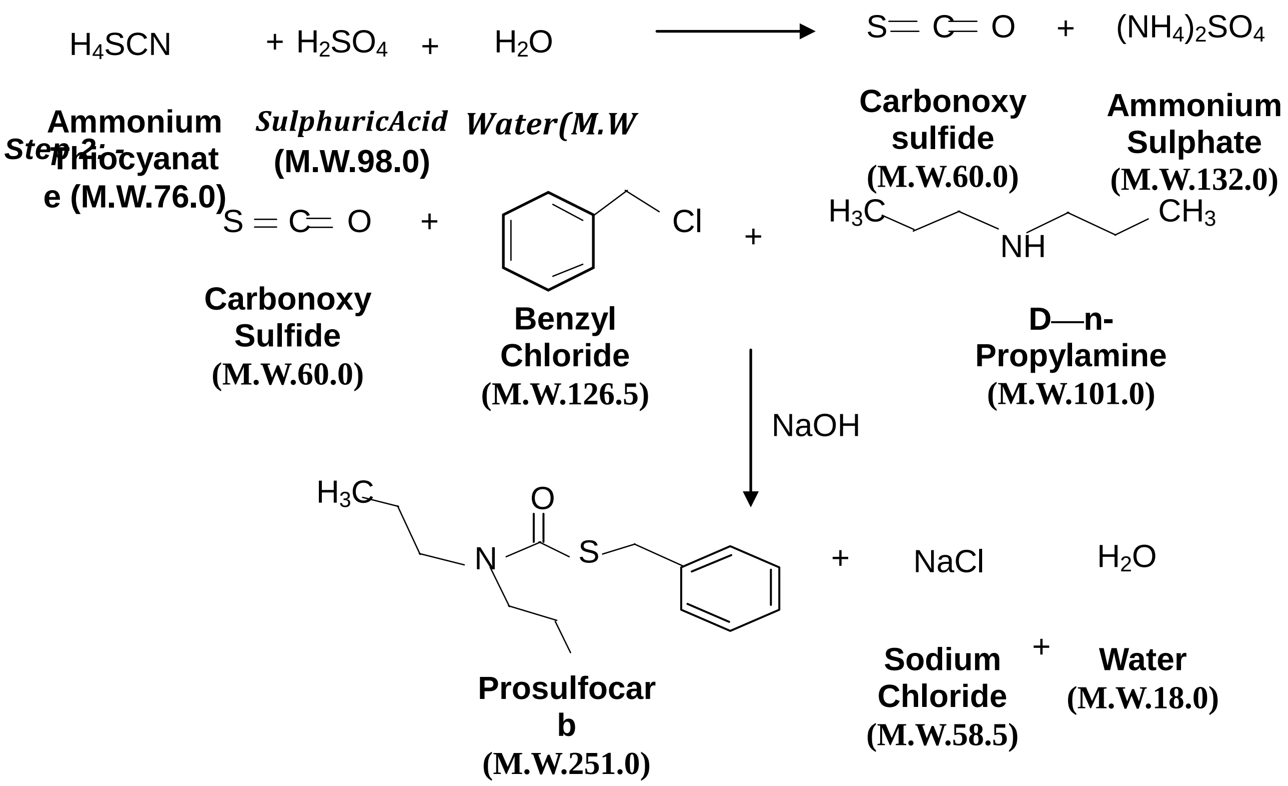
Step 1: -When 50% Ammonium Thiocyanate reacted with Concentrated Sulphuric Acid it generates Carbonoxy sulphide gas which is further utilized for step2.

Step2: -Carbonoxy sulphide gas reacted with Di-n-Propylamine as well as Benzyl Chlorideit gives out the final product Prosulfocarb.

During the reaction Hydrochloric gas is generated which is scavenged by using 22% Sodium Hydroxide (NaOH) Solution. 98%H_2SO_4 also used for pH adjustment.

Finally,Organic Layer is separated from aqueous layer & concentrated under vacuum to get pure Product.

Chemical Reactions: -



177	Material/MassBalanceofProsulfocarbAllQuantitiesareinkg)				
	IN–PUT			OUT–PUT	
Sr. No	Raw Materials/Items	Kg/Batch		Product/Byproduct	Kg/Batch
1	50%AmmoniumThiocyanate	708		Prosulfocarb	**1000**

2	SulphuricAcid	1392		AmmoniumSulphate	630
3	Di-n-Propylamine	602		Aqueous watertoETP	2319
4	BenzylChloride	547		OrganicSlurry	90
5	22% SodiumHydroxide	790			
	TOTAL	**4039**		**TOTAL**	**4039**

Group-10:Cyclohexandiones/Nitro Phenyl Ether Herbicides/Monothiocarbamic Ester/ Triazinone Herbicides / Cyclohexane Oxime

178)Quinclorac

Brief Manufacturing Process:

Step:1 Preparation of 7-Chloro-8-Methyl Quinoline.

Glycerol is reacted with 3-Chloro-2-Methyl-Aniline in presence of Dilute Sulphuric Acid Solution and catalyst at desired temperature. After completion of Reaction; Dilute Sodium Carbonate solution is added to neutralize the mass. Organic and Aqueous layers are separated. Organic layer then distilled to get Pure 7-Chloro-8-Methyl Quinoline.

Step-2 Preparation of 3,7-Dichloro-8-(Dichloromethyl) Quinoline

Chlorine gas is purged to a solution of 3,7-Dichloro-8-(Dichloromethyl) Quinoline in Ortho Dichloro Benzene (ODCB) Solvent then adding Catalyst at desired temperature. Generated Hydrogen Chloridegas is scrubbed in water to get 30% Hydrochloric Acid solution. After reaction completed, Solution is purged with Nitrogen, then distilled off most of the solvent.

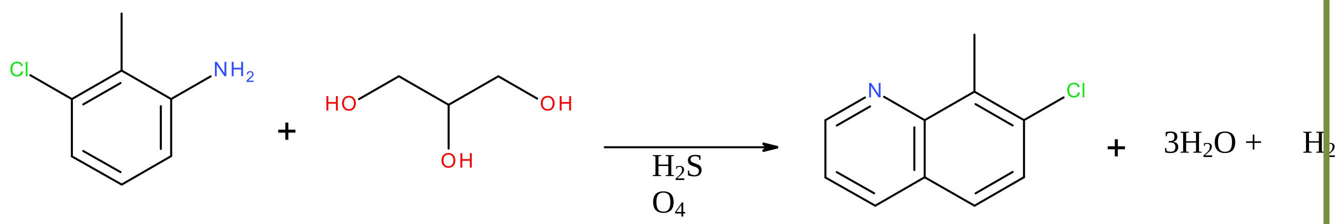
Finally precipitated solid is filtered and dried to get Pure 3,7-Dichloro-8-(Dichloromethyl) Quinoline.

Step-3 Preparation of Quinclorac.

3,7-Dichloro-8-(Dichloromethyl) Quinoline is heated in Diluted Sulphuric Acid (H2SO4) at desired temperature for 3 hrs. Then Dilute Nitric Acid is added at desired temperature and stirred for 10 hrs. After reaction; mass cooled and then mass is mixed with water, precipitated solid is filtered off, washed with water and dried to get pure Quinclorac.

Chemical Reaction:

Step: -1



3-Chloro-2-Methyl Aniline M.W. 141.5

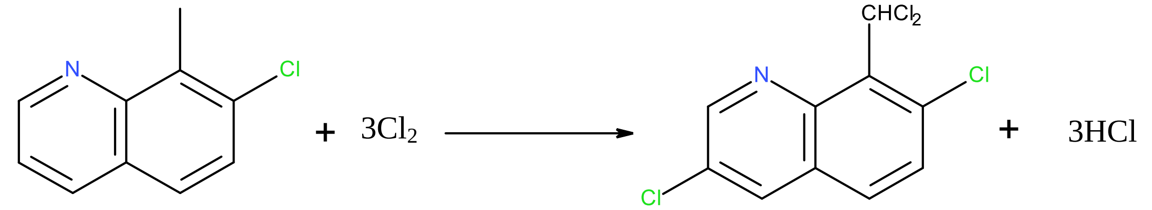
Glycerol M.W 92

7-Chloro-8-Methylquinoline M.W 177.5

Water M.W

Hydroge

Step: -2

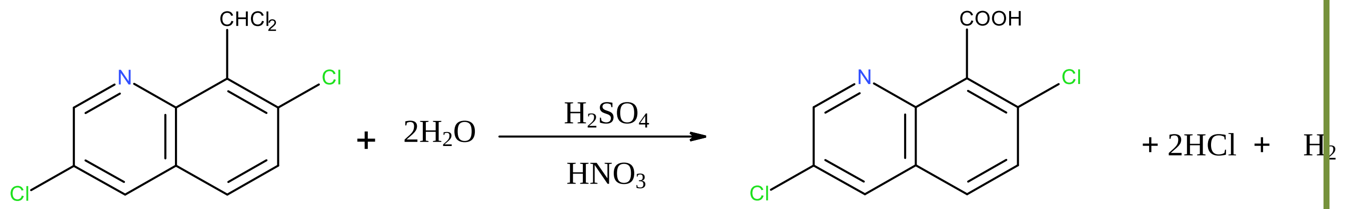


7-Chloro-8-Methylquinoline
M.W 177.5

3,7-Dichloro-8-(Dichloromethyl)quinoline
M.W 281

Hydrochloric Acid
M.W 3 x 36.5=109.5

Step: -3



3,7-Dichloro-8-(Dichloromethyl)quinoline
M.W 281

Water
M.W 18 x 2 =36

Quinclorac
M.W 242

Hydrochloric Acid
M.W 2 x 36.5=73

Hydrogen
M.W 2

178	**Material / Mass Balance of Quinclorac All Quantities are in kg)**			
Step-1	**Preparation of 7-Chloro-8-Methyl Quinoline**			
	INPUT		**OUTPUT**	
Sr. No.	**Raw Material/item**	**Kg/Batch**	**Product/Bi Product**	**Kg/Batch**
1	3-Chloro-2-Methyl-Aniline	740	7-Chloro-8-Methyl Quinoline	847
2	Glycerol	460	Carbon Dioxide gas to Scrubber	806
3	Conc. Sulphuric Acid - 98%	1830	Distillation Residue	28
4	Sodium Carbonate	1940	Aqueous Layer to ETP	9099
5	Water	5800		
6	Catalyst	10		
	Total	**10780**	**Total**	**10780**

178	**Material / Mass Balance of Quinclorac All Quantities are in kg)**			
	Preparation of 3,7-DIchloro-8-(Dichloromethyl) Quinoline			
Step-2	**INPUT**		**OUTPUT**	
Sr. No.	**Raw Material/item**	**Kg/Batch**	**Product/Bi Product**	**Kg/Batch**
1	7-Chloro-8-Methyl Quinoline	847	3,7-DIchloro-8-(Dichloromethyl) Quinoline	1220
2	Ortho Dichloro Benzene	3800	Recovered ODCB	3700
3	Chlorine Gas	1020	ODCB Loss	100
4	Catalyst	5	30% HCl Solution	1750
5	Water for HCl Gas Scrubbing	1218	Organic Mass	120

	Total	**6890**		**Total**	**6890**

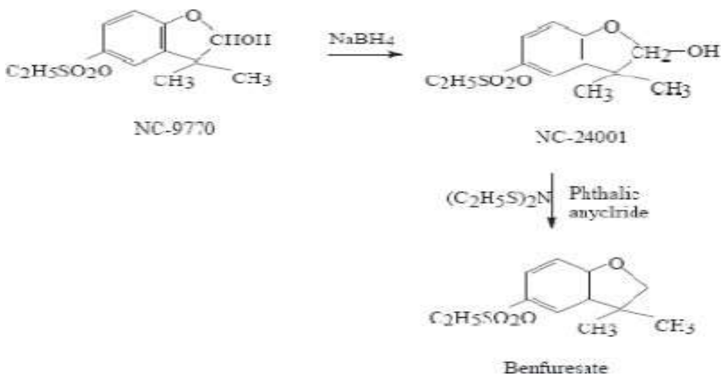
178	**Material / Mass Balance of Quinclorac All Quantities are in kg)**				
	Preparation of Quinclorac				
Step-3	**INPUT**			**OUTPUT**	
Sr. No.	**Raw Material/item**	**Kg/Batch**		**Product/Bi Product**	**Kg/Batch**
1	3,7-Dichloro-8-(Dichloromethyl) Quinoline	1220		Quinclorac	1000
2	Sulphuric Acid (H_2SO_4)	4340		Aqueous Layer to ETP	965
3	Conc. Nitric Acid	555		Water Loss in Drying	250
4	Water	3000		Spent Sulphuric Acid	6900
	Total	**9115**		**Total**	**9115**

179) Benfuresate

Brief Manufacturing Process:

Benfuresate is manufactured by reducing NC 9770 with Sodium Borohydride in pressure of an alkali.The resulting SOD salt of NC24001 is acidified in pressure of Sulphuric Acid. The acidified mass iscyclizedinthepresenceofacatalysttogivecrudeBenfuresate.ThecrudeBenfuresateisextractedinsolvent and thesolventisdistilledofftogive BenfuresateTechnical(98%).

ChemicalReaction:



179	**Material / Mass Balance of Benfuresate All Quantities are in kg)**				
Step-1	**IN-PUT**			**OUT-PUT**	
Sr. No	**Raw Material/items**	**Kg/batch**		**Product/By product**	**Kg/Batch**
1	NC9770 in toluene (3,3 Dimethyl (-2H-1-Benzofuran -5-yl) 2 hydroxy ethane sulfonate	1488		Toluene for recovery	1651
2	C.S lye 48%	435		NA -NC 24001	3266
3	Sodium borohydride	48			

4	Water	1594			
5	Toluene	1352			
	TOTAL	**4917**		**TOTAL**	**4917**

179	**Material / Mass Balance of Benfuresate All Quantities are in kg)**				
Step-2	**IN-PUT**			**OUT-PUT**	
Sr. No	**Raw Material/items**	**Kg/batch**		**Product/By product**	**Kg/Batch**
1	Na.NC24001	3266		Na.NC24001 Cake	2227
2	Sulfuric Acid 98%	325		Waste Water to ETP	2614
3	Water for acidolysis	1250			
	TOTAL	**4841**		**TOTAL**	**4841**

179	**Material / Mass Balance of Benfuresate All Quantities are in kg)**				
Step-3	**IN-PUT**			**OUT-PUT**	
Sr. No	**Raw Material/items**	**Kg/batch**		**Product/By product**	**Kg/Batch**
1	Na.NC24001 Cake	2227		Benfuresate	1000
2	Xylene (recycle & fresh)	2858		Recovered Xylene	2810
3	Catalyst (Phthalin Anhydride + TEA	74		Xylene loss	48
4	C.S. Lye 48%	82		Aq. Catalyst Waste to incineration	74
5	Water	2647		Waste Water to ETP	3956
	TOTAL	**7888**		**TOTAL**	**7888**

180) Metamitron

Brief Manufacturing Process: -

Step 1: -Benzaldehyde is reacted with Hydrogen Cyanide to get Mandelonitrile in presence of Solvent – toluene.

Step 2: -Mandelonitrile is then reacted with Methanol in presence of Hydrochloric Acid to give an intermediate, as Methyl Mandalate.

Step 3: -Methyl Mandalate on Oxidation by Sodium Hypochlorite gives an Ester as Methyl Phenyl Glyoxylate

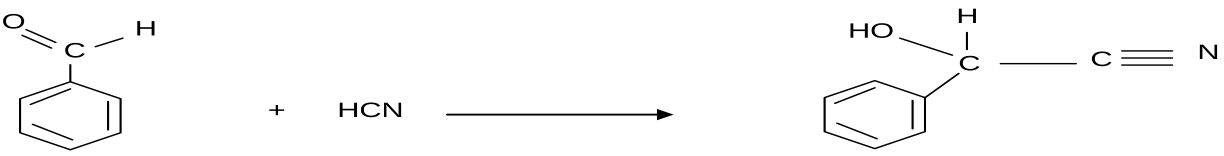
Step 4: -MPG on further reaction with Acetyl Hydrazine gives Hydrazone derivative,

Step -5: -Hydrazone then reacted with Hydrazine Hydrate to give Hydrazide derivative.

Step 6: -Hydrazide finally undergoes Cyclization to give the final product Metamitron (Tech.)

Chemical Reactions: -

Step – 1



Benzaldehyde

M.W. 106

Hydrogen Cyanide

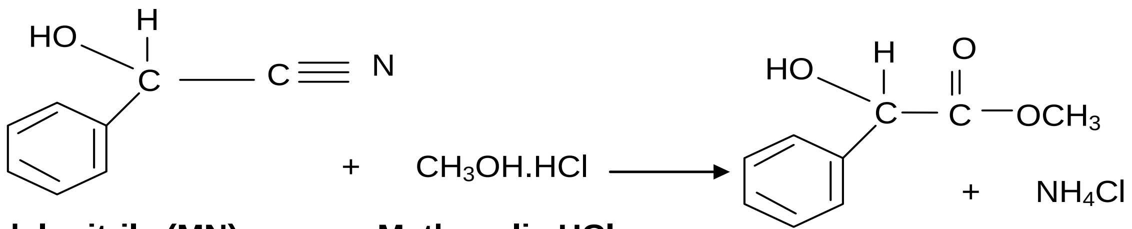
M.W. 27

Mandelonitrile (MN)

M.W. 133

S

tep 2:

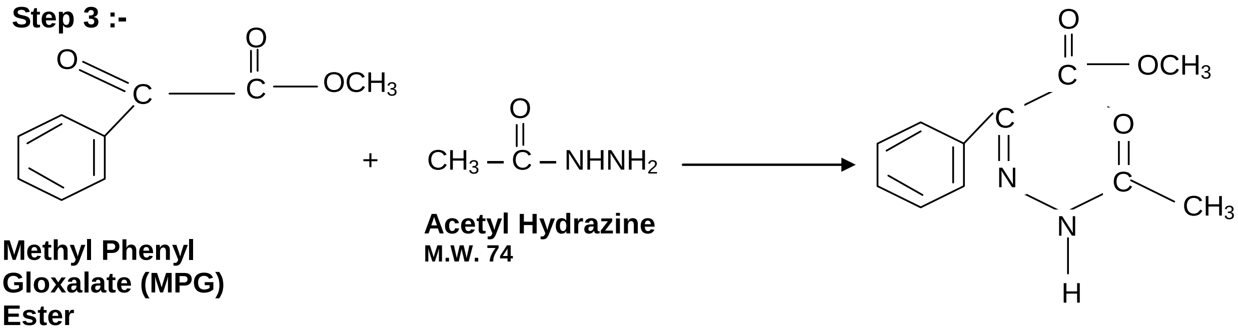


Mandelonitrile (MN)
M.W. 133

Methanolic HCl
M.W. 32 + 36.5

Methyl Mandalate
M.W. 166

Step 3 :-



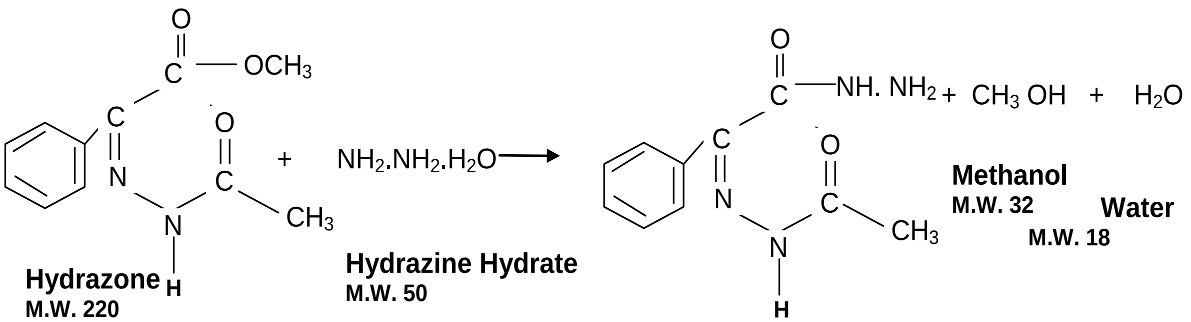
Methyl Phenyl Gloxalate (MPG) Ester
M.W. 164

Acetyl Hydrazine
M.W. 74

Hydrazone
M.W. 220

+ H_2O

Step 4:



Hydrazone
M.W. 220

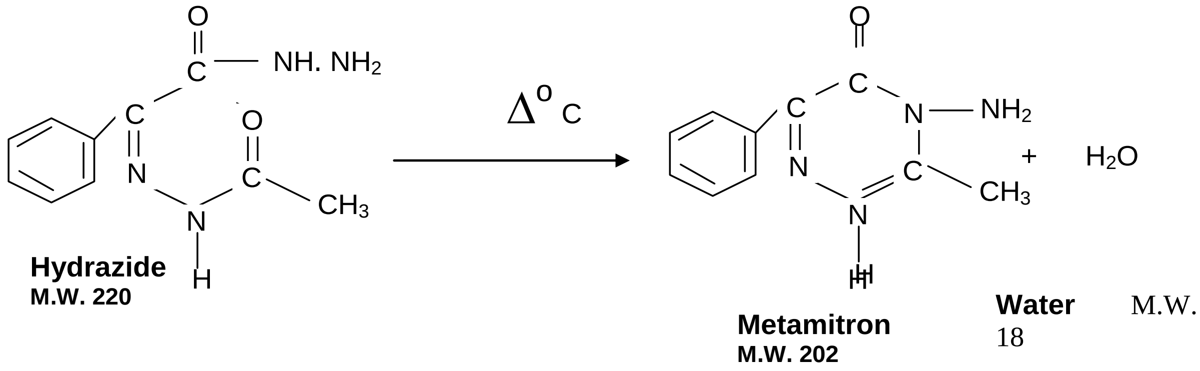
Hydrazine Hydrate
M.W. 50

Methanol
M.W. 32

Water
M.W. 18

Hydrazide **M.W. 220**

Step 5



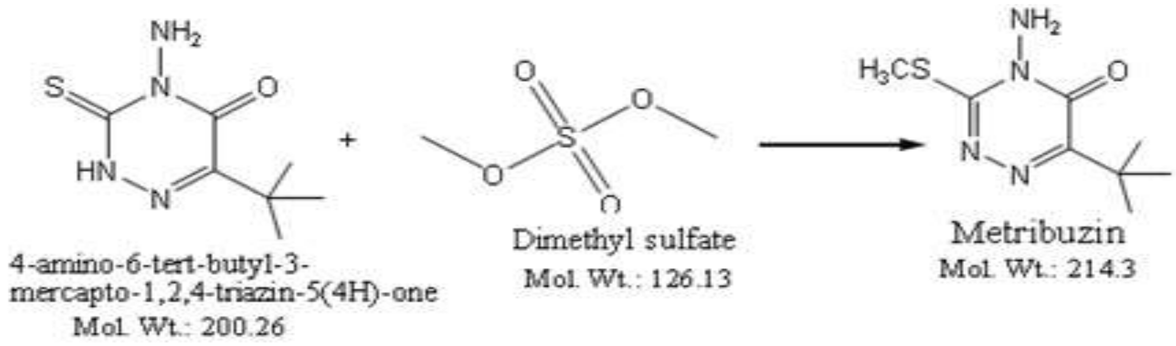
Mass Balance:

180	Material / Mass Balance of Metamitron All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Benzaldehyde	1060		Metamitron	1000
2	Sodium Cyanide	540		Recovered Solvent - Toluene	1880
3	Water for NaCN Dilution	1525		Solvent Loss- Toluene	60
4	30 % Hydrochloric Acid	1220		Recovered Solvent - Methanol	1921
5	Methanolic HCl	2143		Solvent Loss- Methanol	124
6	Sodium Hypochlorite 8-11 %	6087		Recovered Solvent - DMA	2150
7	Solvent - Toluene	1940		Solvent Loss - DMA	50
8	Solvent - DMA	2200		Ammonium Chloride	560
9	Hydrazine Hydrate 80 %	558		Organic Mother Liquor for Recycle	1363
10	Acetyl hydrazine	620		Aqueous layer to ETP	3155
11	Solvent - Methanol	730		Detoxified Mass to ETP/ MEE	6360
	Total	**18623**		**Total**	**18623**

181) Metribuzine
Brief Manufacturing Process: -

Step 1: **-**4-Amino-6-Tert-Butyl-3-Mercapto-1,2,4-Triazin-5(4H)-one (ATMT) reactedwith DimethylSulphate in presence of Sulphuric Acid to give Metribuzin.

Chemical Reactions: -



Mass Balance:

181	Material / Mass Balance of Metribuzine All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	4-Amino-6-Tert-Butyl-3-Mercapto-1,2,4-Triazin-5(4H)-one (ATMT)	1000		Metribuzine	**1000**
2	Di Methyl Sulphate	652		Sodium Sulphate	2130
3	Sulphuric Acid	1274		Organic Impurities	512
4	Soda Ash	1600		Carbon Dioxide Gas	664
5	Caustic Soda Flakes	30		Aqueous Layer to ETP	4750
6	Water	4500			
	TOTAL	**9056**		**TOTAL**	**9056**

182) Atrazine

Brief Manufacturing Process: -

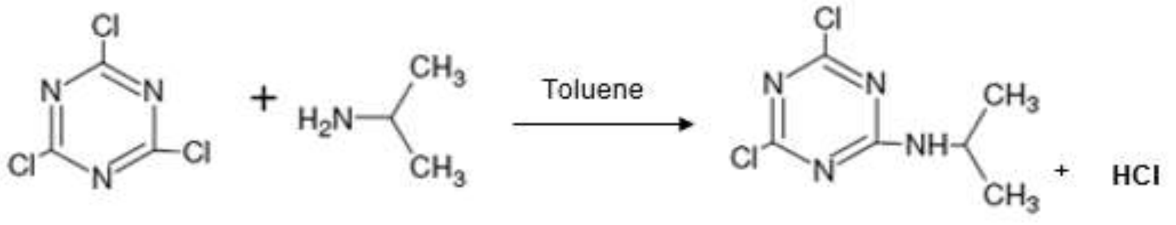
Required quantity of Toluene is taken in to reactor; Cyanuric chloride is charged and stirred so that Cyanuric chloride dissolved in the solvent completely. Isopropyl amine is charged slowly. Sodium hydroxide is charged to neutralize Hydrochloric acid which is generated inreaction.

Ethyl amine is charged slowly. Sodium hydroxide is charged to neutralize Hydrochloric acid which is generated inreaction.

Aqueous phase is separated out, fresh water is charged and Toluene is distilled out azotropically in presence of live steam. Product is filtered off. Centrifuged, dried and pulverized and pack as per requirement.

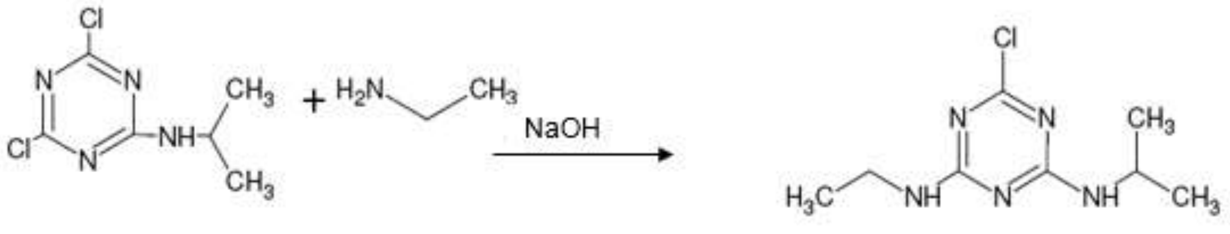
Chemical Reactions: -

Step 1: -



Cynuric Chloride (M.W.184.41) | Isopropyl Amine (M.W.59.11) | Intermediate 1 (M.W.207.02) | Hydrochloric Acid (M.W.36.5)

Step 2: -



Intermediate 1 (M.W.207.02) | Ethyl Amine (M.W.45.08) | Atrazine (M.W.215.68)

Mass Balance:

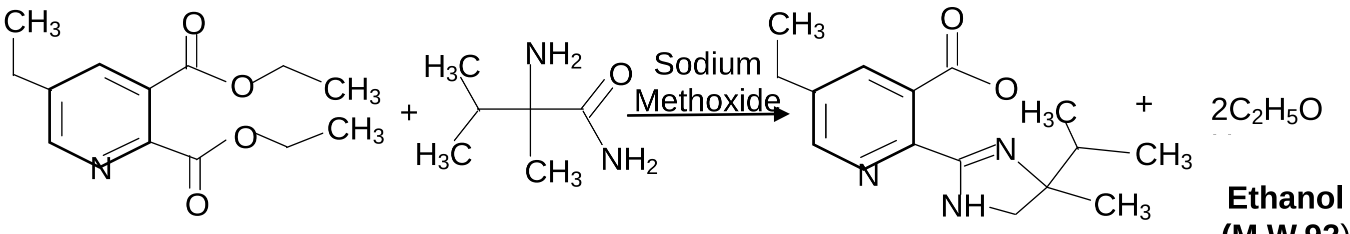
182	Material / Mass Balance of Atrazine All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Toluene	6950		Atrazine	**1000**
2	Cyanuric Chloride	900		Recovered Toluene	6900
3	Isopropyl Amine	435		Toluene Loss	50
4	NaOH	410		Waste Water	4930
5	Mono Ethyl Amine	320		Drying Loss	85
6	Water	3950			
	TOTAL	**12965**		**TOTAL**	**12965**

183) Imazethapyar
Brief Manufacturing Process: -

2-Amino-2,3-Dimethyl Butane Amide reacts with 5-Ethyl Pyridine Decarboxylate in presence of Sodium Methoxide and Toluene- Solvent. During reaction, Ethanol is distilled out which is collected separately. pH of Reaction Mass is adjusted to 3.5 with Hydrochloric Acid. & then cooled to RT and filtered to get Crude Imazethapyr.

Then crystallization carried out in Ethanol to get Imazethapyr Technical in pure form.

Chemical Reactions: -



5-Ethyl Pyridine Dicarboxylate (M.W.251) **2-Amino-2, 3-Dimethyl Butane Amide** **Imazethapyr (M.W.289)** **Ethanol (M.W.92)**

Mass Balance:

183	Material / Mass Balance of Imazethapyr All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Diethyl-5-Ethyl Pyridine Dicarboxylate	955		Imazethapyr	**1000**
2	2-Amino-2,3-Dimethyl Butane Amide	520		Recovered Toluene	3100
3	Sodium Methoxide	630		Toluene Loss	100
4	30% Hydrochloric Acid Soln.	1120		Recovered Ethanol	4000
5	Solvent -Toluene	3200		Ethanol Loss	200
6	Ethanol	4200		Ethanol Rec (Process)	300
7	Water	3750		Aqueous Layer to ETP	5650
8				Distillation Residue	25
	TOTAL	**14375**		**TOTAL**	**14375**

Group-11: Aryloxyphenoxypropionates/ Aryloxyphenoxypropionic/ Aniline /Pyridine/Ppo-Diphenyl Ethers / Phenyl Ether /Phenoxy Carboxylic Acid / Pyridine / Nitro Phenyl Ether 15/Aromatic Ketone

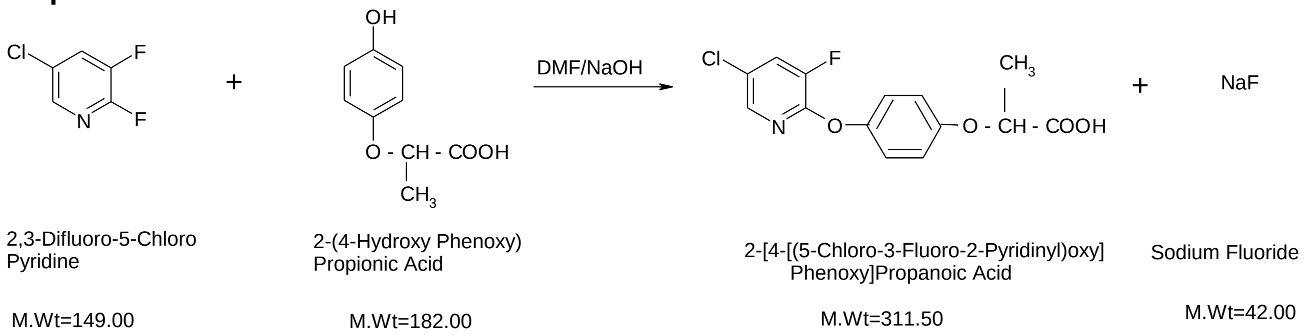
184) Clodinaflop & Clodinaflop Propargyl
Brief Manufacturing Process: -

Step 1: - 2,3 – Di Fluoro -5 - Chloro Pyridine is reacted with 2 - (4- Hydroxy Phenoxy) Propionic Acid in presence of Solvent - Di Methyl Formamide (DMF) and Sodium Hydroxide to form 2- [-4 – {(5 Chloro -3- Fluoro -2- Pyridinyl) Oxy} Phenoxy] Propionic Acid.

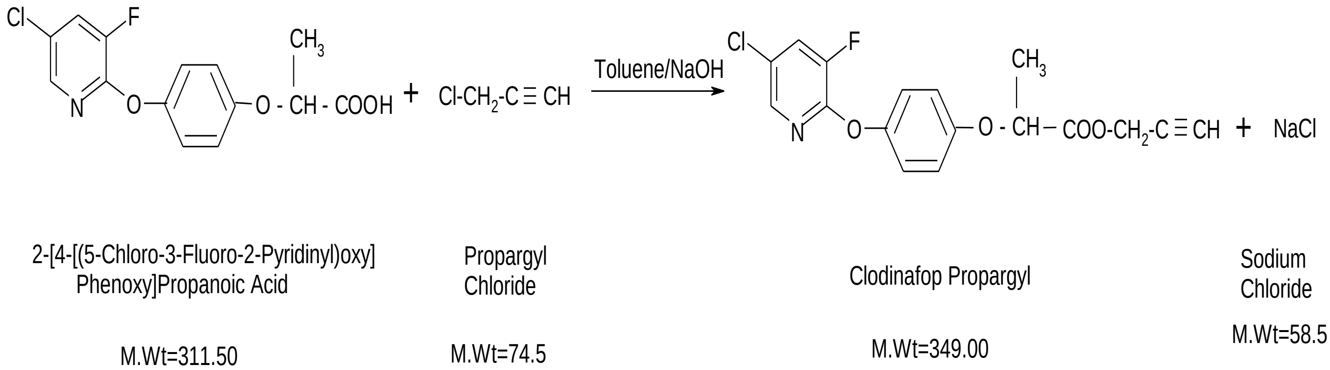
Step 2: - 2- [-4 – {(5 Chloro -3- Fluoro -2- Pyridinyl) Oxy} Phenoxy] Propionic Acid is reacted with Propargyl chloride in Presence of Sodium Hydroxide as well as Solvent -Toluene to form final product as Clodinaflop Propagyl.

Chemical Reactions: -

Step 1: -



Step 2: -



Mass Balance:

184	Material/Mass Balance of Clodinafop Propagyl (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2,3-Di Fluoro -5-Chloro Pyridine	448		Clodinafop Propagyl	**1000**
2	2- (4- Hydroxy Phenoxy) Propionic Acid	548		Recovered Solvent - DMF	1165
3	Sodium Hydroxide	240		Solvent Loss (DMF)	35
4	Solvent -Di Methyl Formamide (DMF)	1200		Sodium Chloride	180
5	Propargyl Chloride	180		Sodium Fluoride	128
6	Solvent - Toluene	1000		Recovered Solvent – Toluene	980
7	Water	450		Solvent loss (Toluene)	20
8				Aqueous Layer to ETP	537
9				Distillation Residue	21
	TOTAL	**4066**		**TOTAL**	**4066**

185) Quizalofop& Quizalofop Ethyl

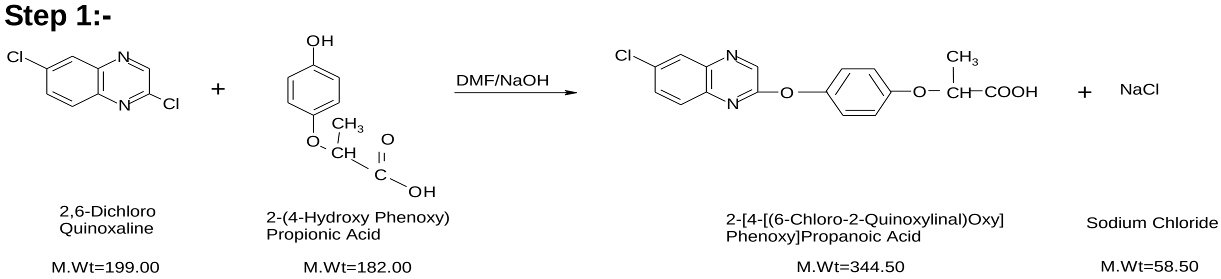
Brief Manufacturing Process: -

Step 1: - 2 ,6 - Dichloro Quinoxaline is reacted with 2- (4- Hydroxy Phenoxy) Propionic Acid in presence of Sodium Hydroxide as well as Solvent - Di Methyl Formamide (DMF) to form 2 – [4 – {(6- Chloro 2 – Quinoxalinyl) Oxy} Phenoxy] Propionic Acid.

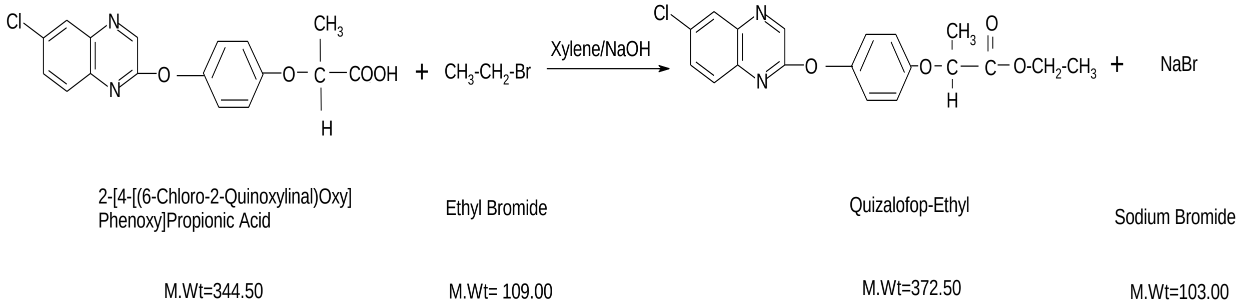
Step 2: - 2 ,6 - Dichloro Quinoxaline is reacted with 2- (4- Hydroxy Phenoxy) Propionic Acid in presence of Sodium Hydroxide as well as Solvent - Di Methyl Formamide (DMF) to form 2 – [4 – {(6- Chloro 2 – Quinoxalinyl) Oxy} Phenoxy] Propionic Acid.

Chemical Reactions: -

Step 1:-



Step 2: -



Mass Balance:

185	Material / Mass Balance of Quizalofop Ethyl (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2,6 – Dichloro Quinoxaline	580		Quizalofop Ethyl	**1000**
2	2- (4 – Hydroxy Phenoxy) Propionic Acid	525		Recovered Solvent - DMF	1070
3	Sodium Hydroxide	230		Solvent Loss – DMF	30
4	Solvent – Di Methyl Formamide	1100		Sodium Chloride	180

5	Ethyl Bromide	311		Sodium Bromide	305
6	Solvent – Xylene	1000		Recovered Solvent – Xylene	975
7	Water	624		Solvent loss - Xylene	25
8				Aqueous Layer to ETP	767
9				Distillation Residue	18
	TOTAL	**4370**		**TOTAL**	**4370**

186) Cyhalofop & Cyhalofop Butyl:

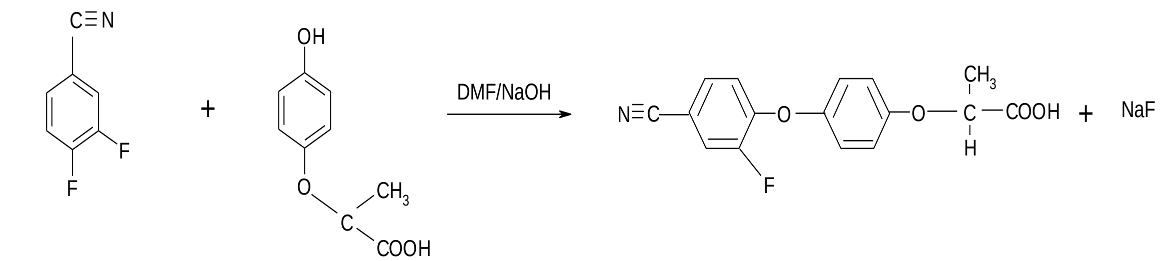
Brief Manufacturing Process: -

Step 1: -3,4 – Di Fluoro -5 - Chloro Benzonitrile is reactedwith 2 - (4- Hydroxy Phenoxy) Propionic Acid in presence of Solvent - Di Methyl Formamide (DMF) and Sodium Hydroxide to form 2- [-4 – {(4- Cyano -2 - Fluoro Phenoxy} Phenoxy] Propionic Acid.

Step 2: -2- [-4 – {(4- Cyano -2 - Fluoro Phenoxy} Phenoxy] Propionic Acid is reacted with 1- Butyl Bromide in Presence of Sodium Hydroxide as well as Solvent -Xylene to form final product as Cyhalofop Butyl.

Chemical Reactions: -

Step 1: -



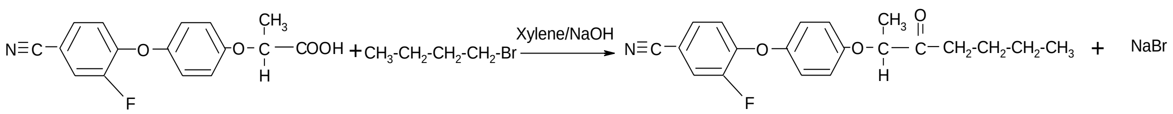
3,4-Difluoro Benzonitrile — M.Wt=139.00

2-(4-Hydroxy Phenoxy) Propionic Acid — M.Wt=182.00

2-[4-[(4-Cyano-2-Fluoro Phenoxy)Phenoxy] Propionic Acid — M.Wt=301.00

Sodium Flouride — M.Wt=42.00

Step 2 :-



2-[4-[(4-Cyano-2-Fluoro Phenoxy)Phenoxy] Propionic Acid — M.Wt=301.00

1-Butyl Bromide — M.Wt= 137.00

Cyhalofop Butyl — M.Wt=357.00

Sodium Bromide — M.Wt=103.00

186	Material / Mass Balance of Cyhalofop-Butyl All Quantities are in kg)			
	IN – PUT		OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch	Product / By product	Kg/Batch
1	3, 4 –Di Fluoro Benzonitrile	418	Cyhalofop-Butyl	**1000**
2	2-(4-Hydroxy Phenoxy) Propionic Acid	560	Recovered Solvent - DMF	1375
3	Sodium Hydroxide	238	Solvent Loss (DMF)	25
4	Solvent – Di Methyl Formamide (DMF)	1400	Sodium Bromide	311
5	N – Butyl Bromide	401	Sodium Fluoride	131
6	Solvent – Xylene	1100	Recovered Solvent - Xylene	1080
7	Water	500	Solvent Loss (Xylene)	20
8			Aqueous Layer to ETP	660
9			Distillation Residue	15
	TOTAL	**4617**	**TOTAL**	**4617**

187)Chlorazifop &Chlorazifop Propargyl:

Brief Manufacturing Process: -

Step -1:

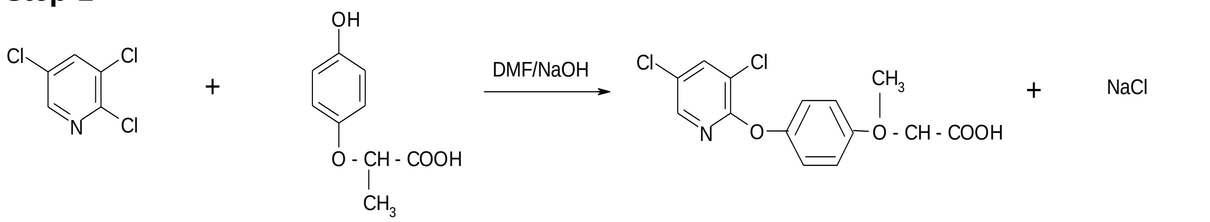
2,3,5 Tri Chloro Pyridine is reacted with 2 - (4- Hydroxy Phenoxy) Propionic Acid in presence of Solvent - Di Methyl Formamide (DMF) and Sodium Hydroxide to form 2- [-4 – {(3,5 Di Chloro -2- Pyridinyl) Oxy} Phenoxy] Propionic Acid.

Step -2:

2- [-4 – {(3,5 Di Chloro -2- Pyridinyl) Oxy} Phenoxy] Propionic Acid reacted with Propargyl Chloride in Presence of Sodium Hydroxide as well as Solvent -Toluene to form final product as Chlorazifop Propargyl.

Chemical Reaction:

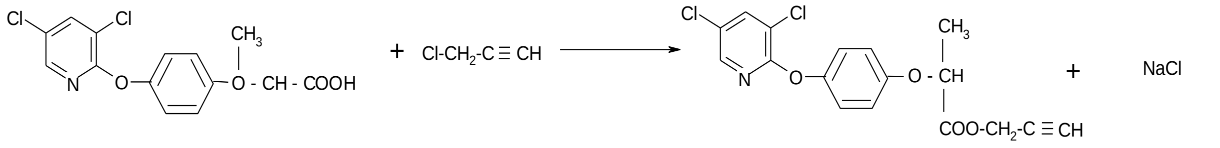
Step-1



2,3,5-Trichloro Pyridine | 2-(4-Hydroxy Phenoxy) Propionic Acid | 2-[4-[(3,5-Dichloro-2-Pyridinyl)oxy] Phenoxy]Propionic Acid | Sodium Chloride

M.Wt=182.50 | M.Wt=182.00 | M.Wt=324.00 | M.Wt=58.

Step-2



2-[4-[(3,5-Dichloro-2-Pyridinyl)oxy] Phenoxy]Propionic Acid M.Wt=324.00

Propargyl Chloride M.Wt=74.5

Chlorazifop Propagyl M.Wt=366.00

Sodium Chloride M.Wt=58.5

Material Balance:

187	Material / Mass Balance of Chlorazifop Propargyl (All Quantities are in kg)				
	IN- PUT			OUT- PUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / By Product**	**Kg/Batch**
1	2,4,5 Tri Chloro Pyridine	514		Chlorazifop Propargyl	1000
2	2- (4- Hydroxy Phenoxy) Propionic Acid	512		Recovered Solvent - DMF	1170
3	Sodium Hydroxide	224		Solvent Loss (DMF)	30
4	Solvent -Di Methyl Formamide (DMF)	1200		Sodium Chloride	340
5	Propargyl Chloride	208		Recovered Solvent - Toluene	975
6	Solvent - Toluene	1000		Solvent loss (Toluene)	25
7	Water	492		Aqueous Layer to ETP	586
				Distillation Residue	24
	Total	**4150**		**Total**	**4150**

188) Fenoxaprop & Fenoxaprop P Ethyl
Brief Manufacturing Process: -

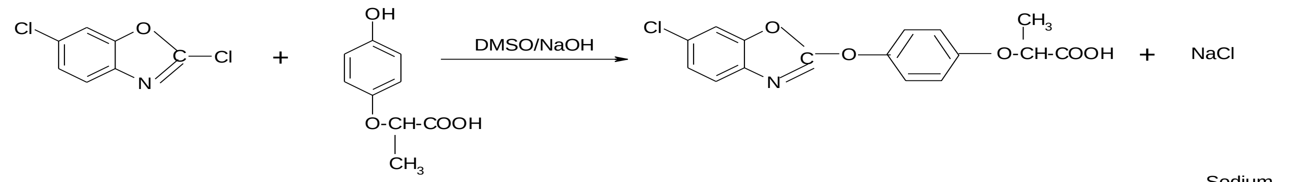
Step 1: - 2,6 - Dichloro Benzoxazole is reacted with 2- (4- Hydroxy Phenoxy) Propionic Acid in presence of Sodium Hydroxide as well as Solvent – Di Methyl Sulfoxide (DMSO) to form 2 – [4 - (6 – Chloro -2- Benzoxazole) Phenoxy] Propionic Acid.

Step 2: - 2 – [4 - (6 – Chloro -2- Benzoxazole) Phenoxy] Propionic Acid undergoes chlorination by Thionyl Chloride in presence of Solvent – Toluene to form 2- [4 - (6 – Chloro -2- Benzoxazole) Phenoxy] Propionic Acid Chloride.

Step 3: - 2 – [4 - (6 – Chloro -2- Benzoxazole) Phenoxy] Propionic Acid Chloride is finally reacted with Sodium Ethoxide in presence of Solvent – Toluene to form the Final Product as Fenoxaprop P Ethyl.

Chemical Reactions: -

Step 1: -



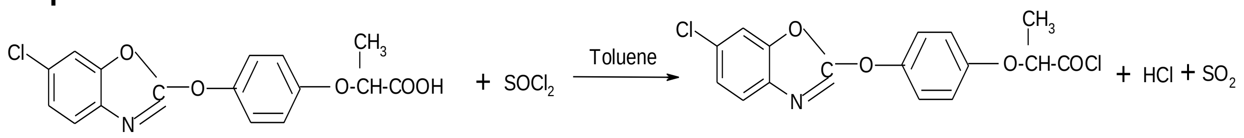
2,6-Dichloro Benzoxazole M.Wt=188.00

2-(4-Hydroxy Phenoxy) Propionic Acid M.Wt=182

2-[4-(6-Chloro-2-Benzoxazolyl)Phenoxy]Propionic Acid M.Wt=333.50

Sodium Chloride M.Wt=58.50

Step 2: -



2-[4-(6-Chloro-2-benzoxazolyl)Phenoxy]Propionic Acid M.Wt=333.50

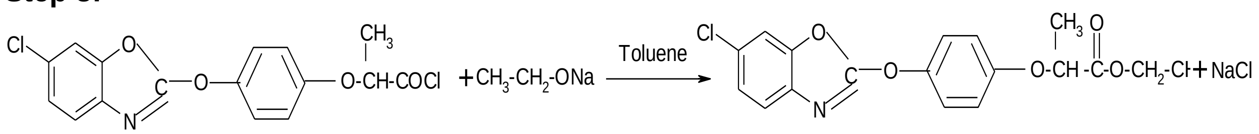
Thionyl Chloride M.Wt=119.00

2-[4-(6-Chloro-2-Benzoxazolyl)Phenoxy] Propinyl Chloride M.Wt=352.00

Hydrochloric Acid M.Wt=36.50

Sulphuric Acid M.Wt=64

Step 3: -



2-[4-(6-Chloro-2-Benzoxazolyl)Phenoxy] Propinyl Chloride M.Wt=352.00

Sodium salt of Ethanol M.Wt=68

Fenoxaprop P Ethyl M.Wt=361.5

Sodium Chloride M.Wt=58.5

Mass Balance:

188	**Material / Mass Balance of Fenoxaprop P Ethyl (All Quantities are in kg)**				
IN- PUT				**OUT- PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	3,6 - Di Chloro Benzoxazole	610		Fenoxaprop P Ethyl	**1000**
2	2- (4 – Hydroxy Phenoxy) Propionic Acid	590		Recovered Solvent - DMSO	1360
3	Sodium Hydroxide	130		Solvent Loss - DMSO	40
4	Solvent – Di Methyl Sulfoxide	1400		Sodium Bisulphate	340
5	Thionyl Chloride	384		Sodium Chloride	380
6	Solvent – Toluene	1250		30 % Hydrochloric Acid	398
7	Sodium Ethoxide	222		Recovered Solvent - Toluene	1210
8	Water	920		Solvent loss - Toluene	40
9				Aqueous Layer to ETP	716
10				Distillation Residue	22
	TOTAL	**5506**		**TOTAL**	**5506**

189) Fluazifop &Fluazifop P Butyl

Brief Manufacturing Process: -

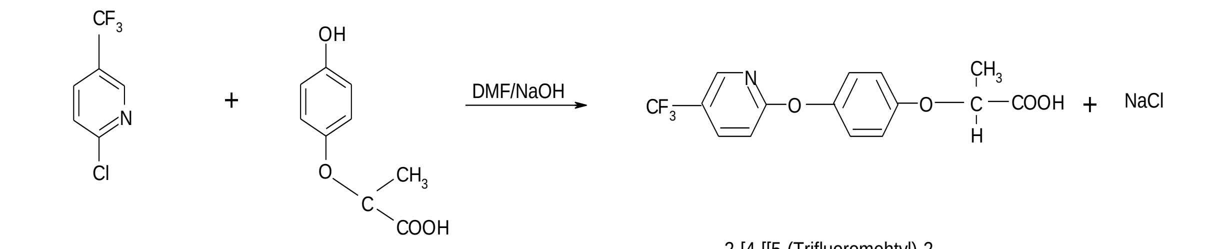
Step 1: -2 - Chloro -5- Trifluoromethyl Pyridine is reacted with 2- (4- Hydroxy Phenoxy) Propionic Acid in presence of Sodium Hydroxide as well as Solvent - Di Methyl Formamide (DMF) to form 2

– [4 – {(5– Trifluoromethyl) -2- Pyridinyl) Oxy} Phenoxy] Propionic Acid.

Step 2: -2 - [4 - {(5 - Trifluoromethyl) -2- Pyridinyl) Oxy} Phenoxy] Propionic Acid is finally reacted with 1- Butyl Bromide in presence of Solvent - Xylene to form the Final Product as Fluazifop P Butyl.

Chemical Reactions: -

Step 1: -



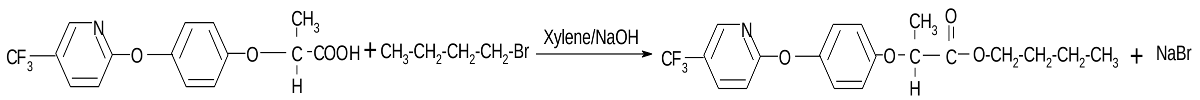
2-Chloro-5-(Trifluoromethyl) Pyridine — M.Wt=181.50

2-(4-Hydroxy Phenoxy) Propionic Acid — M.Wt=182.00

2-[4-[[5-(Trifluoromehtyl)-2-Pyridinyl]oxy][Phenoxy] Propanoic Acid — M.Wt=327.00

Sodium Chloride — M.Wt=58.50

Step 2: -



2-[4-[[5-(Trifluoromehtyl)-2-pyridinyl]oxy][Phenoxy]Propanoic Acid — M.Wt=327.00

1-Butyl Bromide — M.Wt= 137.00

Fluazifop-p-Butyl — M.Wt=383

Sodium Bromide — M.Wt=103.00

Mass Balance:

189	Material / Mass Balance of Fluazifop P Butyl (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2- Chloro -5- Triflouromethyl Pyridine	500		Fluazifop	**1000**
2	2- (4 – Hydroxy Phenoxy) Propionic Acid	496		Recovered Solvent - DMF	1065
3	Sodium Hydroxide	215		Solvent Loss - DMF	35
4	Solvent – Di Methyl Formamide	1100		Sodium Chloride	164
5	1-Butyl Bromide	364		Sodium Bromide	288
6	Solvent – Xylene	1000		Recovered Solvent - Xylene	970
7	Water	558		Solvent loss - Xylene	30
8				Aqueous Layer to ETP	654
9				Distillation Residue	27

	TOTAL	4233		TOTAL	4233

190) Haloxyfop & Haloxyfop Methyl

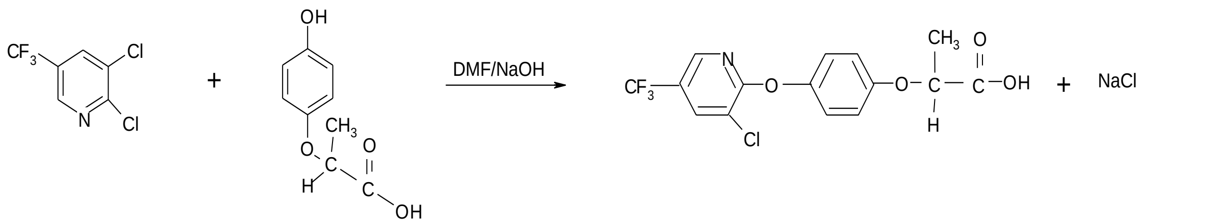
Brief Manufacturing Process: -

Step 1: -2 ,3 - Dichloro -5- Trifluoromethyl Pyridine is reacted with 2- (4- Hydroxy Phenoxy) Propionic Acid in presence of Sodium Hydroxide as well as Solvent - Di Methyl Formamide (DMF) to form 2 – [4 – {(3- Chloro 5– Trifluoromethyl) -2- Pyridinyl) Oxy} Phenoxy] Propionic Acid.

Step 2: -2 - [4 - {(3- Chloro, -5 - Trifluoromethyl) -2- Pyridinyl) Oxy} Phenoxy] Propionic Acid is finally reacted with Methyl Bromide in presence of Solvent - Xylene to form the Final Product as Haloxyfop Methyl.

Chemical Reactions: -

Step 1: -



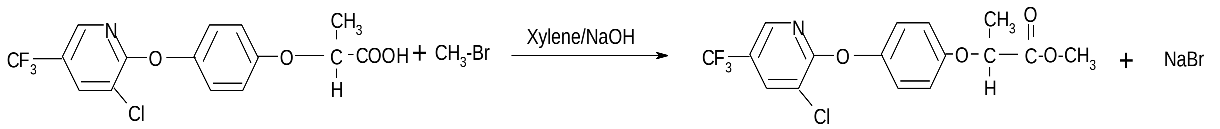
2,3 Dichloro 5-(Trifluoro Methyl) Pyridine M.Wt=216.00

2-(4-Hydroxy phenoxy) Propionic Acid M.Wt=182.00

2-[4-[[3-Chloro-5-(Trifluoromethyl)-2-Pyridinyl]oxy]Phenoxy]Propanoic Acid M.Wt=361.50

Sodium Chloride M.Wt=58.50

Step 2: -



2-[4-[[3-Chloro-5-(Trifluoromethyl)-2-Pyridinyl]oxy]Phenoxy]Propanoic Acid M.Wt=361.5

Methyl Bromide M.Wt=

Haloxyfop-Methyl M.Wt=375.50

Sodium Bromide M.Wt=103.00

Mass Balance:

190	Material / Mass Balance of Haloxyfop Methyl All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2,3 Dichloro 5- (Trifluoro Methyl Pyridine)	540		Haloxyfop	**1000**
2	2-(4-Hydroxy Phenoxy) Propionic Acid	452		Sodium Chloride	135

3	Solvent Toluene	2500		Sodium Bromide	240
4	Sodium Hydroxide	100		Rec. Toluene	2450
5	Catalyst	18		Toluene Loss	50
6	Bromo Ethoxy Ethane	370		28% HBr Solution	675
7	Water	1415		Aq. Effluent to ETP	845
	TOTAL	**5395**		**TOTAL**	**5395**

191) Quizalofop p-Tefuryl
Brief Process Description:

Step-1

Propionic Acid when undergoes chlorination by means of chlorine in presence of solvent EDC and catalyst gives 2-Chloro Propionic Acid.

Step-2

2-Chloro Propionic Acid further reacts with tetrahydro furfuryl Methanol in presence of Solvent EDC and catalyst to give 2-Chloro tetrahydro furfuryl Methyl Propionate.

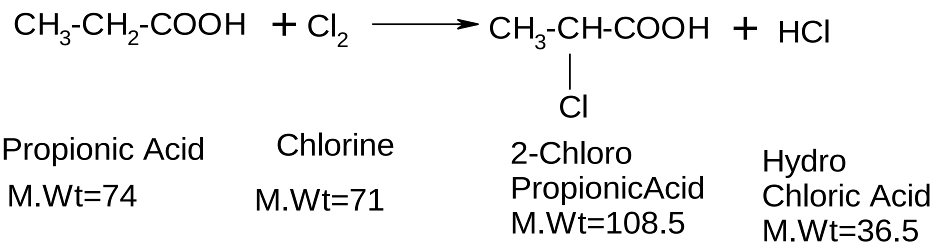
Step-3

2-Chloro tetrahydro furfuryl Methyl Propionate reacts with hydroquinone it gives 2-(4-Hydroxy Phenoxy) tetrahydro furfuryl Methyl Propionate.

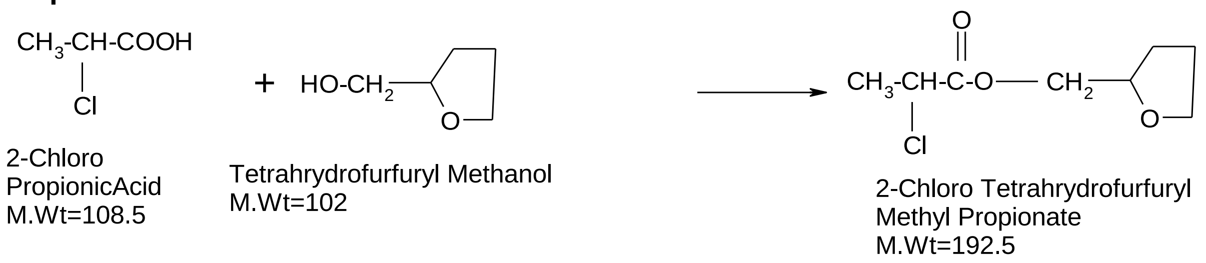
Step-4

2-(4-Hydroxy Phenoxy) tetrahydro furfuryl Methyl Propionate finally reacts with 2,6-Dichloro Quinoxaline to give the final product in presence of solvent toluene to give the final product Quizalofop Tefuryl.

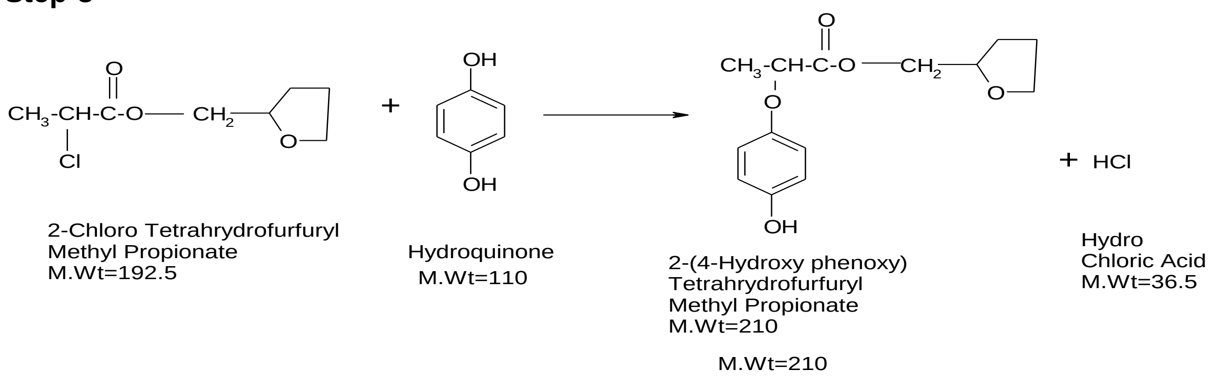
Chemical Reaction:
Step-1



Step-2



Step-3



Material Balance:

191	Material / Mass Balance of Quizalofop p-Tefuryl (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	Propionic Acid	190		Quizalofop p-Tefuryl	1000
2	Solvent EDC	4000		Rec. Solvent EDC	3920
3	Catalyst	18		EDC loss	80
4	Chlorine	170		30% HCl Solution	850
5	Tetra hydro Furfuryl Methanol	250		Water Distillate	84
6	Hydroquinone	270		Rec. Toluene	1950
7	2,6 Dichloro Quinoxaline	490		Toluene loss	50
8	Solvent Toluene	2000		Aqueous Layer to ETP	819
9	Catalyst	15			
10	Water	1350			
	Total	**8753**		**Total**	**8753**

192) Haloxyfop Ethoxy Ethyl (Haloxyfop Etotyl)
Process Description:

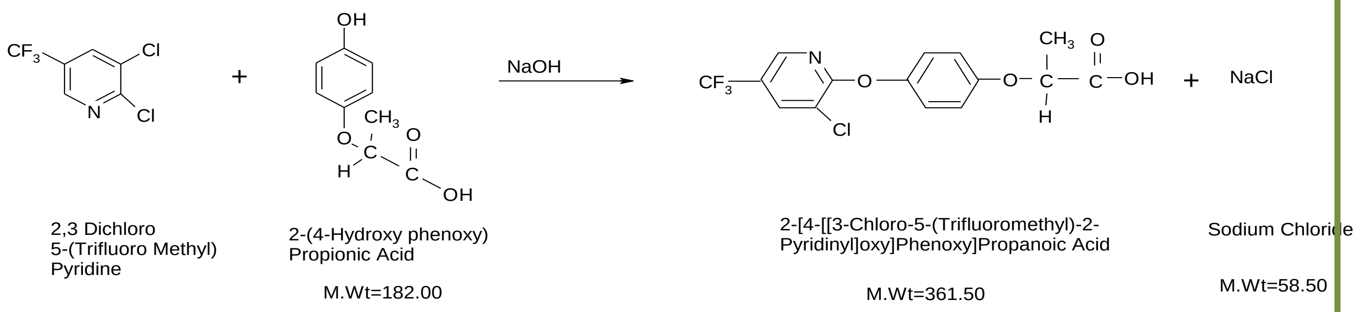
Step-1

2,3-Dichloro-5-(Trifluoromethyl) Pyridine reacts with 2-(4-Hydroxy Phenoxy) Propionic Acid in presence of sodium hydroxide and catalyst to give 2-[4-[[3-chloro-5-(Trifluoromethyl)-2-pyridinyl] oxy] Phenoxy] Propionic acid.

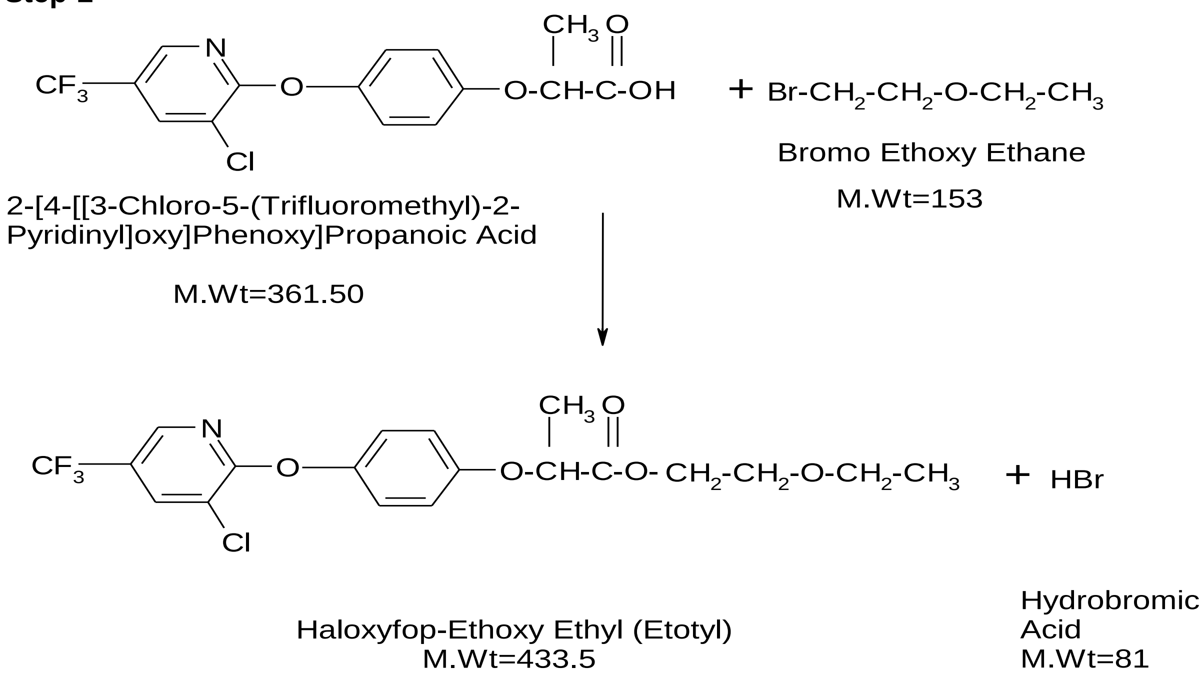
Step-2

2-[4-[[3-chloro-5-(trifluoromethyl)-2-pyridinyl] oxy] Phenoxy] Propionic acid reacts with Bromo Ethoxy Ethane in presence of Solvent to give final product Haloxyfop-Ethoxy Ethyl (Etolyl).

Chemical Reaction:
Step-1



Step-2



Material Balance

192	Material / Mass Balance of Haloxyfop Etotyl (All Quantities are in kg)				
	IN – PUT			**OUT – PUT**	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	2,3 Dichloro 5- (Trifluoro Methyl Pyridine)	540		Haloxyfop Etotyl	1000
2	2-(4-Hydroxy Phenoxy) Propionic Acid	452		Sodium Chloride	135
3	Solvent Toluene	2500		Sodium Bromide	240
4	Catalyst	18		Rec. Toluene	2450
5	Bromo Ethoxy Ethane	370		Toluene Loss	50
6	Water	1215		28% HBr Solution	665
				Aqueous Layer to ETP	555
	Total	**5095**		**Total**	**5095**

193) Oxardiargyl

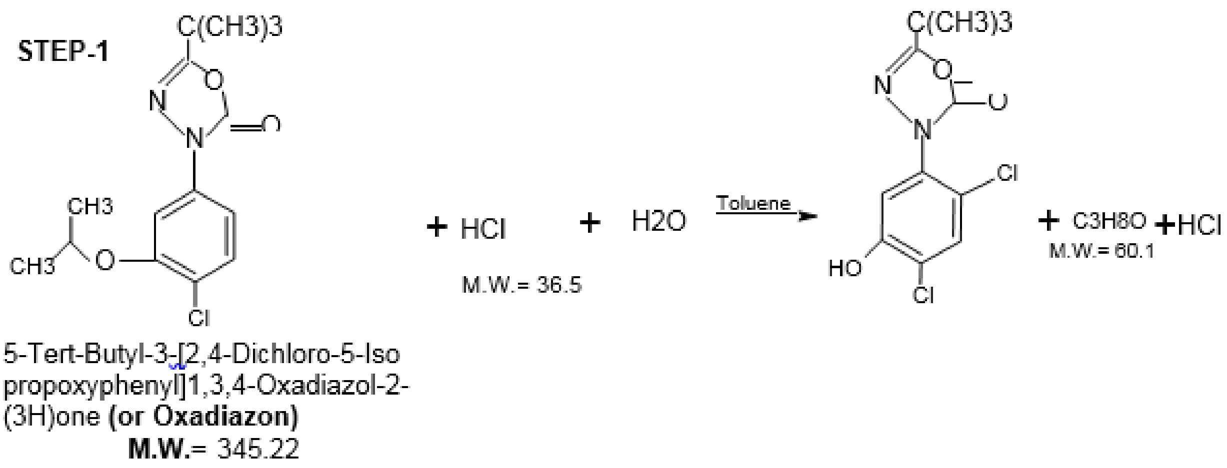
Brief Manufacturing Process: -

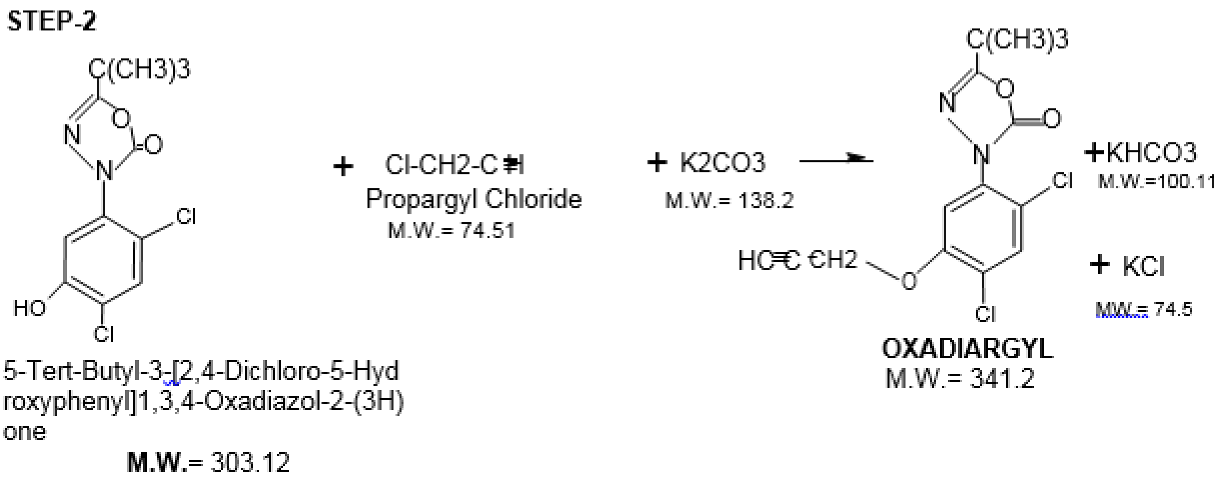
Oxadiazon is subjected to Acidolysis under Acidic conditions at 40 -45°C and the resulting Intermediate is extracted with Toluene after completion of Acidolysis.

The Intermediate is reacted with Propargyl Chloride under Alkaline conditions at 50 – 55°C to form crude Oxadiargyl. The solvent is distilled out and the crude product is taken in Methanol.

This mass is cooled and crystallized, centrifuged and the cake is dried to get Oxadiargyl Technical.

Chemical Reactions: -





Mass Balance:

193	Material / Mass Balance of Oxadiargyl (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Oxadiazon	1066		Oxadiargyl	**1000**
2	35% Hydrochloric Acid	323		30% Hydrocholric Acid	377
3	Propargyl Chloride	230		Recovered Toluene	1925
4	Pottasium Carbonate	429		Toluene Loss	75
5	Toluene	2000		Recovered Methanol	950

6	Methanol	1000	Methanol Loss	50
7	Water	320	Drying Loss	11
8			Aqueous Layer to ETP	980
	TOTAL	**5368**	**TOTAL**	**5368**

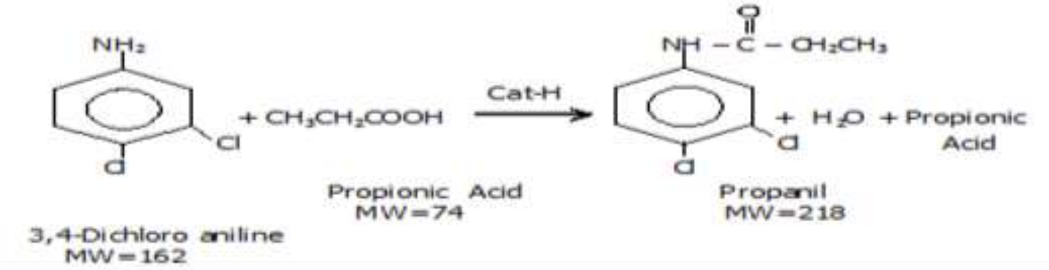
194) Propanil

Brief Manufacturing Process: -

3,4-Dichloroaniline (DCA) with Propionic Acid at 140-150°C. Water is formed during the course of reaction.

ExcessPropionicAcidandAzeotropicwaterareremoved.Theresidualmassthusobtainedin molten state is Propaniltechnical.

Chemical Reactions: -



Mass Balance:

194	Material / Mass Balance of Propanil (All Quantities are in kg)			
	IN – PUT		OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**	**Product / By product**	**Kg/Batch**
1	3,4 - Dichloro Aniline (3,4DCA)	747	Propanil	1000
2	Propionic acid	403	Reaction water	82
3			Organic Impurity	68
	TOTAL	**1150**	**TOTAL**	**1150**

195) Isoproturon

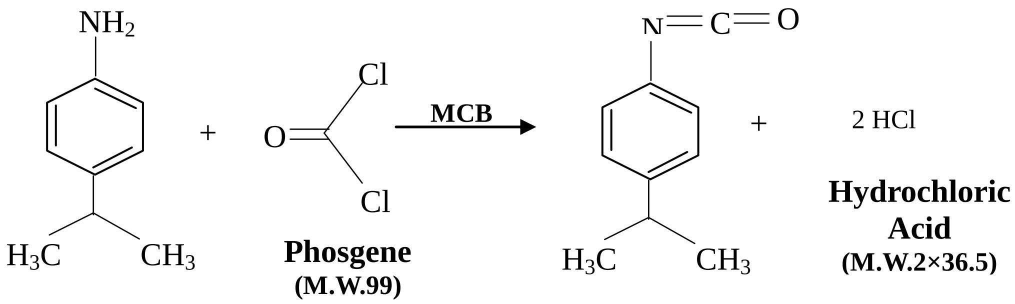
Brief Manufacturing Process: -

Step 1: - Para-Cumidine undergoes Phosgenation Reaction by reaction of Phosgene Gas in presence of Solvent MCB to form the Solution of Para-Cumidine Isocyanate Intermediate-1.

Step 2: - Para-Cumidine Isocyanate Intermediate-1 when reacted with Dimethyl Amine it gives the final product Isoproturon

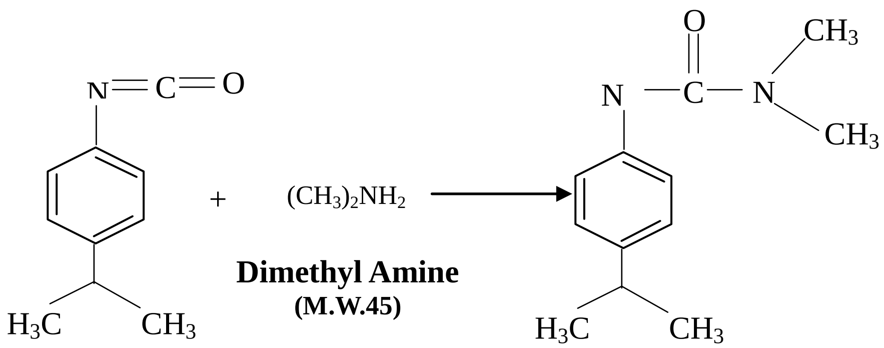
Chemical Reactions: -

Step 1: -



Para-Cumidine (M.W.105) + **Phosgene** (M.W.99) → **Para-Cumidine Isocyanate** (M.W.105) + **Hydrochloric Acid** (M.W.2×36.5)

Step 2: -



Para-Cumidine Isocyanate (M.W.105) + **Dimethyl Amine** (M.W.45) → **Isoproturon** (M.W.206.3)

Mass Balance:

195	Material / Mass Balance of Isoproturon (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Para-Cumidine	533		Isoproturon	1000
2	MCB Solvent	2800		Recovered MCB Solvent	2710
3	Phosgene Gas	505		MCB Loss	90
4	Water for Hydrochloric Acid	434		30% Hydrochloric Acid	620
5	C.S. Lye 15% for Phosgene Scrubbing	200		C.S. Lye Soln to Recycle	220
6	Dimethyl Amine	218		Aqueous Layer to ETP	822
7	Water for Product Washing	800		Distillation Residue	28
	TOTAL	**5490**		**TOTAL**	**5490**

196) Metamifop

Brief Manufacturing Process:

Step -1:

2,6 - Dichloro Benzoxazole is reacted with 2- (4- Hydroxy Phenoxy) Propionic Acid in presence of Sodium Hydroxide as well as Solvent – Di Methyl Sulfoxide (DMSO) to form 2 – [4 - (6 – Chloro -

2- Benzoxazole) Phenoxy] Propionic Acid.

Step -2:

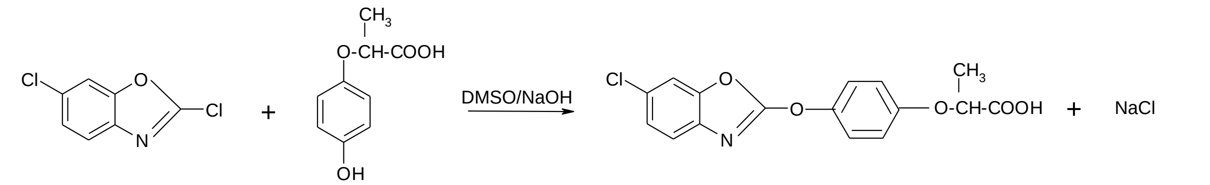
2 – [4 - (6 – Chloro -2- Benzoxazole) Phenoxy] Propionic Acid undergoes chlorination by Thionyl Chloride in presence of Solvent – Toluene to form 2- [4 - (6 – Chloro -2- Benzoxazole) Phenoxy] Propionic Acid Chloride.

Step -3:

2 – [4 - (6 – Chloro -2- Benzoxazole) Phenoxy] Propionic Acid Chloride is finally reacted with 2- Fluoro –N- Methyl Aniline in presence of Solvent – Toluene to form the Final Product as Metamifop.

Chemical Reaction:

STEP-1



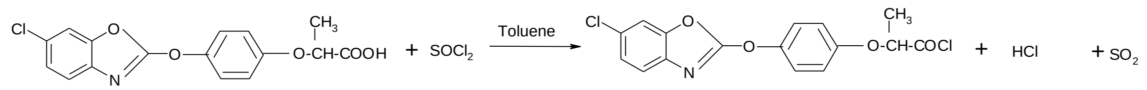
2,6-Dichloro Benzoxazole — M.Wt=188.00

2-(4-Hydroxy Phenoxy) Propionic Acid — M.Wt=182.00

2-[4-(6-Chloro-2-benzoxazolyl)Phenoxy]Propionic Acid — M.Wt=333.50

Sodium Chloride — M.Wt=58.50

Step-2



2-[4-(6-Chloro-2-benzoxazolyl)Phenoxy]Propionic Acid — M.Wt=333.50

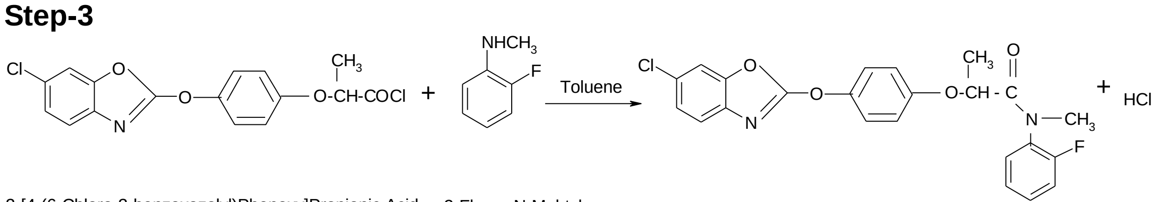
Thionyl Chloride — M.Wt=119.00

2-[4-(6-Chloro-2-benzoxazolyl)Phenoxy]Propinyl chloride — M.Wt=352.00

Hydrochloric Acid — M.Wt=36.50

Sulphur Dioxide — M.Wt=64

Step-3



2-[4-(6-Chloro-2-benzoxazolyl)Phenoxy]Propionic Acid — M.Wt=352.00

2-Fluoro-N-Mehtyl Aniline — M.Wt=125.00

Metamifop — M.Wt=440.50

Hydrochloric Acid — M.Wt=36.50

Material Balance

196	Material / Mass Balance of Metamifop (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr No	Raw Materials / Items	Kg/Batch		Product / Bi Product	Kg/Batch
1	3,6 Di Chloro Benzoxazole	534		Metamifop	1000
2	2-(4-Hydroxy Phenoxy) Propionic Acid	517		Recovered Solvent - DMSO	1765

3	Sodium Hydroxide	226		Solvent Loss (DMSO)	35
4	Solvent -Di Methyl Sulfoxide (DMF)	1800		Sodium Chloride	170
5	Thionyl Chloride	333		Sodium Bi Sulphate	295
6	Solvent - Toluene	1800		30 % Hydrochloric Acid	696
7	2- Fluoro -N- Methyl Aniline	350		Recovered Solvent - Toluene	1770
8	Water	1120		Solvent Loss (Toluene)	30
				Aqueous Layer to ETP	904
				Distillation Residue	15
	Total	**6680**		**Total**	**6680**

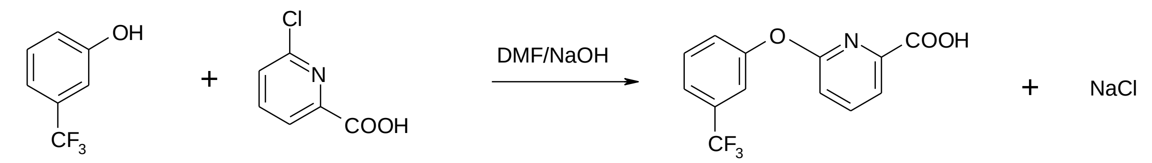
197) Picolinafen:
Brief Manufacturing Process:

Step -1:
3- Hydroxy Benzotrifluoride is reacted with 6- Chloro Pyridine -2- Carboxylic Acid in presence of Solvent - Di Methyl Formamide (DMF) and Sodium Hydroxide to form 6- (3- Trifluoro Methyl Phenoxy] Picolinic Acid.

Step -2:
6- (3- Trifluoro Methyl Phenoxy) Picolinic Acid undergoes Chlorination by Thionyl Chloride in Presence of Solvent - Toluene to form 6- (3- Trifluoro Methyl Phenoxy] Picolinic Acid Chloride.

Step -3:
6- (3- Trifluoro Methyl Phenoxy) Picolinic Acid Chloride is finally reacted with Para Fluoro Aniline in presence of Solvent-Chloro Benzene to form the final product PICOLONAFEN.

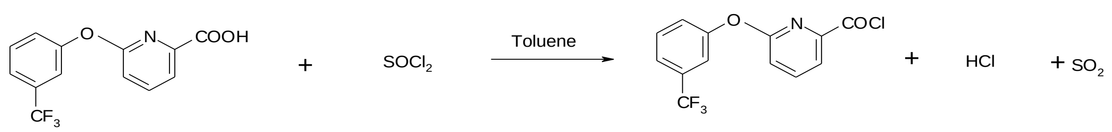
Chemical Reaction:
Step-1



3-Hydroxy Benzotrifluoride | 6-Chloro-Pyridine -2-Carboxylic Acid | 6-(3-Trifluoromethyl Phenoxy) Picolinic Acid | Sodium Chloride

M.Wt=162.00 | M.Wt=157.00 | M.Wt=283.00 | M.Wt=58.5

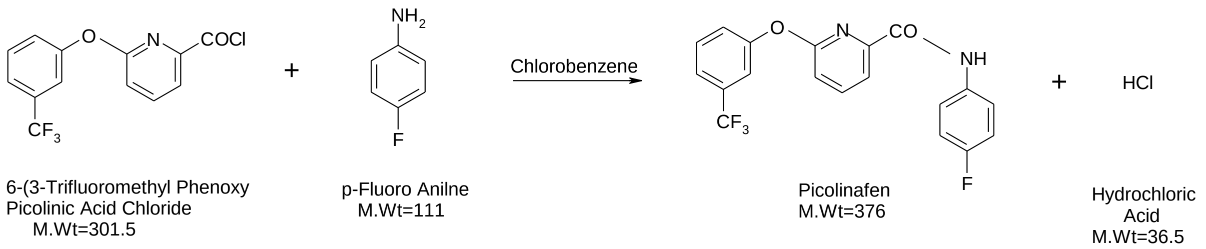
Step-2



6-(3-Trifluoromethyl Phenoxy) Picolinic Acid | Thionyl Chloride | 6-(3-Trifluoromethyl Phenoxy) Picolinic Acid Chloride | Hydrochloric Acid | Sulphur Dioxide

M.Wt=283.00 | M.Wt=119.00 | M.Wt=301.50 | M.Wt=36.5 | M.Wt=64

Step-3



Material Balance

197	Material / Mass Balance of Picolinafen (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	3- Hydroxy Benzotrifluoride	456		Picolinafen	1000
2	6- Chloro Pyridine -2- Carboxylic Acid	442		Recovered Solvent - DMF	860
3	Sodium Hydroxide	223		Solvent Loss (DMF)	40
4	Solvent -Di Methyl Formamide (DMF)	900		Sodium Chloride	170
5	Thionyl Chloride	330		Sodium Bi Sulphate	298
6	Solvent - Toluene	1100		30 % Hydrochloric Acid	706
7	Para Fluoro Aniline	306		Recovered Solvent - Toluene	1075
8	Solvent – Chloro Benzene	800		Solvent loss (Toluene)	25
9	Water	1000		Recovered Solvent – Chloro Benzene	785
				Solvent loss Chloro Benzene	15
				Aqueous Layer to ETP	558
				Distillation Residue	25
	Total	**5557**		**Total**	**5557**

198) Sulfentrazone

Brief Manufacturing Process: -

Step 1: - A mixture of Phenyl Hydrazine, Acetaldehyde, Sodium Cyanate and Acetic Acid in solvent Methanol was Chlorinated using Chlorine gas over a period of 6 – 8 hours at 50 – 55°C. Product of this step (Intermediate I) was filtered after recovery of Methanol under reduced pressure.

Step 2: - A mixture of Intermediate – II in solvent dimethyl Formamide and Potassium Carbonate was heated to 175 – 180°C. Freon 22 gas was purged for 3 – 4 hours. The mass was cooled to 50 – 60°C and the resultant solid was filtered. Chlorine Gas was purged to the filtrate over a period of 4 – 5 hours maintaining the temperature of the mass at 65 – 75°C. Solvent Dimethyl Formamide was distilled off under reduced pressure, residue quenched in water and filtered to give Intermediate – II.

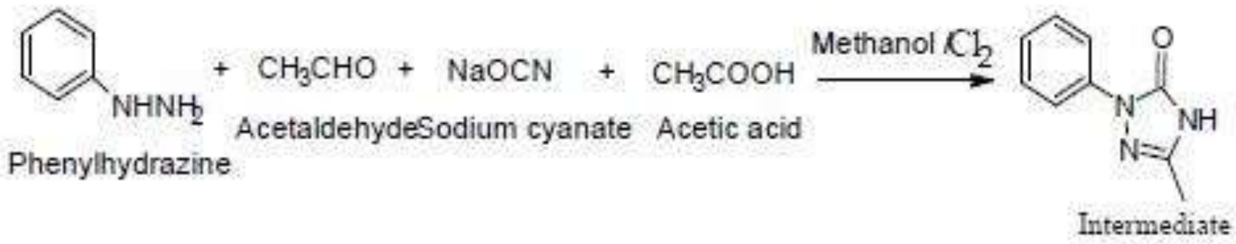
Step 3: - Nitric Acid was charged to a mixture containing Intermediate – II in solvent Dichloroethane and Oleum at ambient temperature. The mass was quenched in water & the resultant product (Intermediate – III) was obtained by filtration. Solvent Dichloroethane recovered during the process was recycled.

Step 4: - A solution containing intermediate – III in solvent Isopropyl Alcohol and Pd/C Catalyst was pressurized using Hydrogen at 70 – 80^{o}C for a period of 10 – 11 hours. The mass was cooled to 50 – 60^{o}C & Pd/C Catalyst was filtered off and recycled. Solvent IPA was distilled, residue was quenched in water and the product (Intermediate-IV) was obtained by filtration.

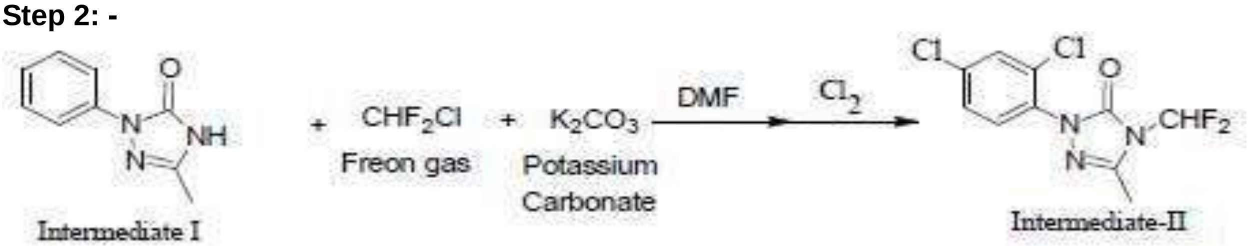
Step 5: - A mixture of Intermediate – IV, Toluene and Pyridine was charged to the reactor. Mixture was heated to 50 – 60oC and Methane Sulfonyl Chloride was charged. Reaction was subjected to a series of extractions. Pyridine was recovered by extraction with Dichloromethane. Toluene was distilled and the residue was quenched in water and filtered to yield Sulfentrazone technical. Recovered Toluene was recycled in subsequent batches.

Chemical Reactions: -

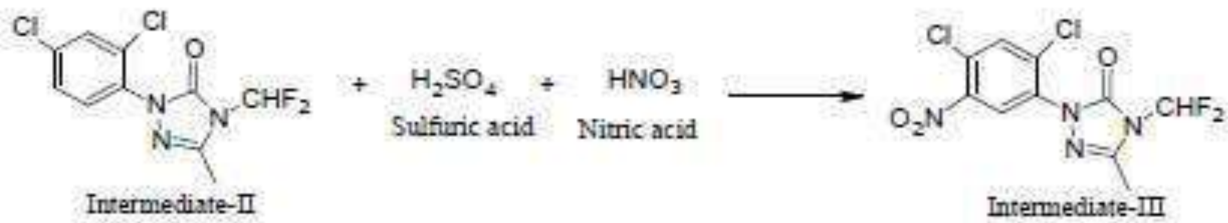
Step 1: -



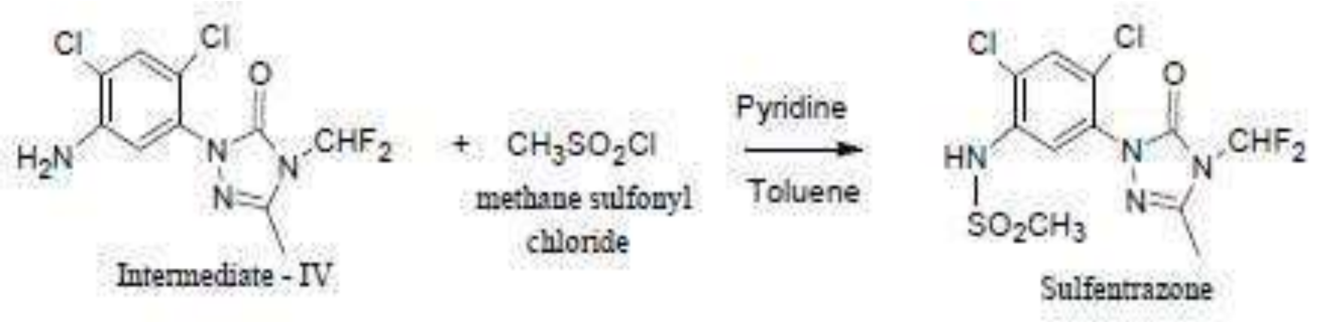
Step 2: -



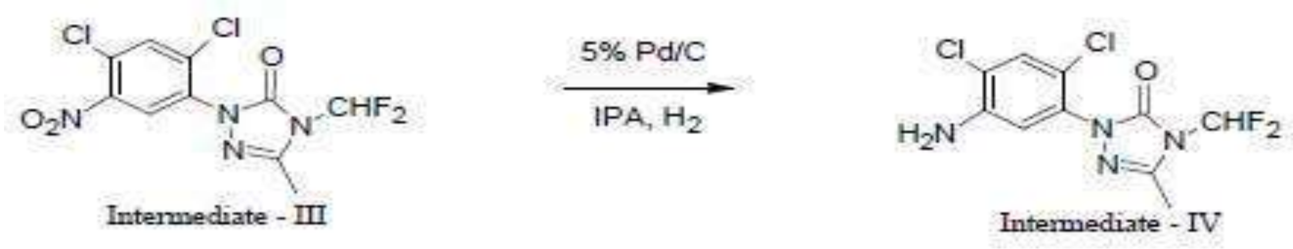
Step 3: -



Step 4: -



Step 5: -



Mass Balance:

198	Material / Mass Balance of Sulfentrazone (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Phenyl Hydrazine	765		Sulfentrazone	**1000**
2	Acetaldehyde	376		Methanol Recovered	3788
3	Sodium Cyanate	530		Methanol Loss	212
4	Chlorine	530		Aqueous Effluent	1980
5	Acetic Acid	500		Scrubbed Sodium Hydroxide Solution	2472
6	Methanol	4000		Drying Loss	803
7	Water	3500		Dimethyl Formamide Recovered	6578
8	10% Sodium Hydroxide Solution	1500		Dimethyl Formamide Loss	972
9	Potassium Carbonate	900		Dichloroethane Recovered	2546
10	Diemethyl Formamide	7550		Dichloroethane loss	74
11	Dichlorodifluoromethane	650		Isopropyl Alcohol Recovered	2566
12	Chlorine Gas	1778		Isopropyl Alcohol Loss	3849
13	Oleum	4450		Catalyst Pd/C Recovered	60
14	Nitric Acid	385		Toluene Recovered	4599
15	Dichloroethane	2620		Toluene Loss	384
16	Isopropyl Alcohol	6415		Dichloromethane Recovered	1806
17	Catalyst Pd/C	63		Dichloromethane Loss	319
18	Methane Sulfonyl Chloride	689		Pyridine Recovered	441

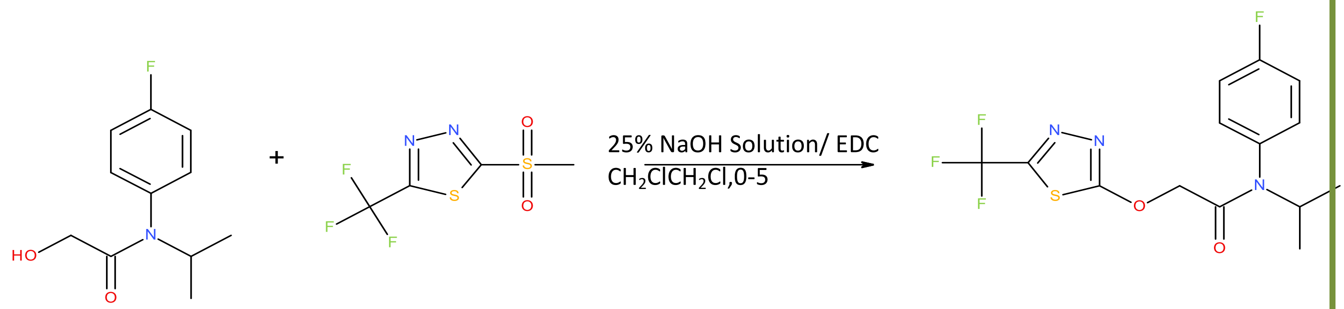
19	Pyridine	480		Pyridine Loss	49
20	Toluene	4983		Spent Acid	10291
21	Dichloromethane	2125			
	TOTAL	**44789**		**TOTAL**	**44789**

199)Flufenacet

Brief Manufacturing Process:

2-(Methyl sulfonyl)-5-(Trifluoromethyl)-1,3,5-Thiadiazole, catalyst and EDC are added into the reactor. The solution of N-(4-fluorophenyl)-2-Hydroxy-N-Isopropylacetamide in EDC is added in reaction mass to maintaining the desired temperature. 25% Aqueous Sodium Hydroxide solution is also added at desired temperature. After reaction over; layers are separated. Aqueous layer is further extracted and acidified. Excess solvent is recovered for recycling. The Mass is filtered to get Crude Product and washed by Methanol to get desired quality of Final Product.

Chemical Reaction:



N-(4-fluorophenyl)-2-hydroxy-N-isopropyl-acetamide M.W. = 211

2-(methyl sulfonyl)-5-(Trifloro methyl)-1,3,4-thiadiazole M.W. = 232

Flufenacet M.W. = 363

199	Material / Mass Balance of Flufenacet (All Quantities are in kg)				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Material/item**	**Kg/Batch**		**Product/Bi Product**	**Kg/Batch**
1	N-(4-Fluorophenyl)-2-Hydroxy-N-Isopropylacetamide	580		Flufenacet	1000
2	2-(Methylsulfonyl)-5-(Trifluoromethyl)-1,3,4-Thiadiazole	638		Recovered Methanol	1330
3	Catalyst	6		Methanol Loss	70
4	25% Sodium Hydroxide (NaOH)	708		Recovered EDC	2350
5	Solvent -1: Ethylene Dichloride (EDC)	2450		EDC Loss	100
6	Solvent -2: Methanol	1400		Aqueous Layer to ETP	1482
7	5% Hydrochloric Acid (HCl)	575		Distillation Residue	25
	Total	**6357**		**Total**	**6357**

200)Cloransulam-Methyl

Brief Manufacturing Process:

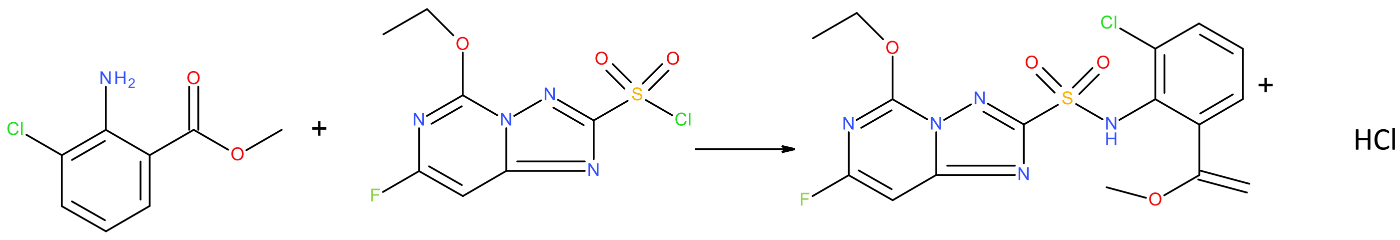
Methyl-2-Amino-3-Chloro Benzoate is reacted with 5-Ethoxy-7-Fluoro-[1, 2, 4]-Triazolo-[1,5-c]

Pyrimidine-2-Sulfonyl Chloride are reacted in presence of Solvent - Toluene at desired Temperature.

During the reaction Hydrogen Chloride gas is generated which is scrubbed in water to convert it to sealable bi product as 30 % Hydrochloric Acid Solution.

Finally, the product Cloransulam-Methyl is isolated by filtration and drying of crystallized mass.

Chemical Reactions:



2-Amino-3-Chlorobenzoic Acid Methyl Ester M.W. = 185.5

5-Ethoxy-7-fluoro[1,2,4] triazolo [1,5-c]Pyrimidine-2-Sulfonyl Chloride M.W. = 280.5

Cloransulam-Methyl M.W. = 429.5

Hydrochloric Chloride M.W. = 36.5

Material Balance

200	Material / Mass Balance of Cloransulam-Methyl All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Material/item**	**Kg/Batch**		**Product/Bi Product**	**Kg/Batch**
1	Methyl-2-Amino-3-Chloro Benzoate	441		Cloransulam-Methyl	1000
2	5-Ethoxy-7-Fluoro-[1,2,4]-Triazolo-[1,5-c] Pyrimidine-2-Sulfonyl Chloride	667		Recovered Toluene	1800
3	Solvent - Toluene	2000		Toluene Loss	200
4	Water for 30 & HCl solution formation	200		30 % HCl Solution	285
5				Distillation Residue	23
	Total	**3308**		**Total**	**3308**

201)Diflufenican [N-(2,4-difluoro phenyl)-2-(3-trifluomethyl Phenoxy)] Nicotinamide (Proposed)

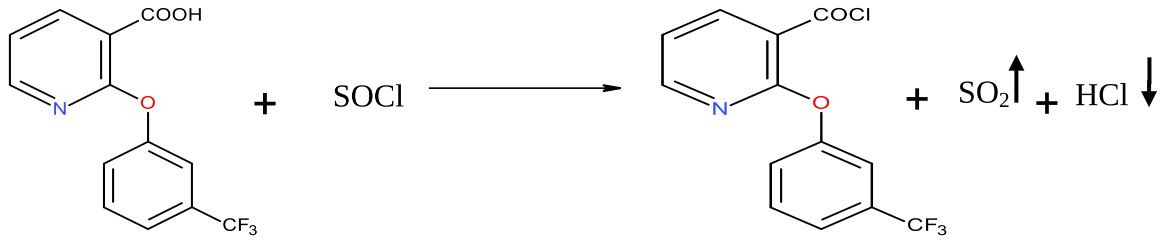
Brief Manufacturing Process:

2-[(3-Trifluromethyl) Phenoxy] Nicotinic Acid is First reacted with Thionyl Chloride and then condensed in situ with 2,4-Difluoro Aniline using Toluene as a Solvent. After Reaction, Mass is Cooled. Precipitated Diflufenican is filtered and dried.

During the chlorination reaction by Thionyl Chloride Hydrochloric Acid as well as Sulphur Dioxide gas are evolved which are scrubbed to water and Dilute Caustic solution respectively to get 30%

Hydrochloric Acid solution and 20% Sodium Sulphite solution as bye-product.

Chemical Reaction:
Step 1:



2-[3-(Trifluoromethyl) Phenoxy] Nicotinic Acid

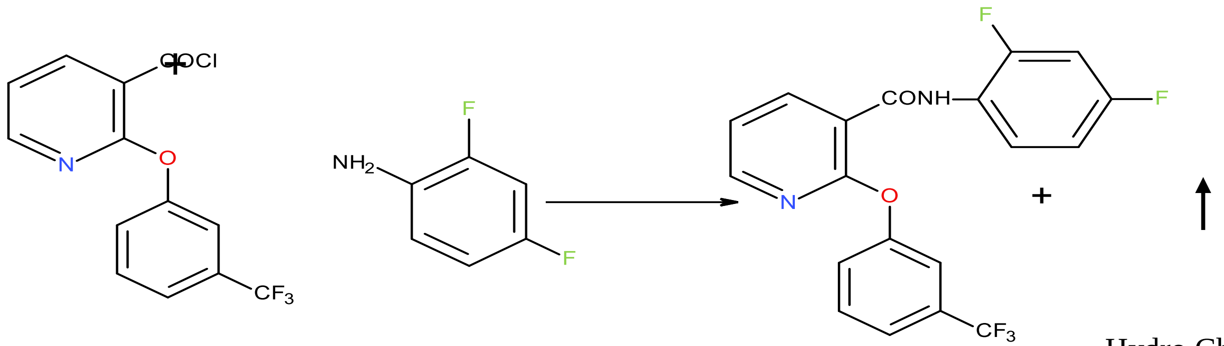
Thionyl Chloride M.W 119.0

2-[(3-Trifluromethyl) Phenoxy] Nicotinic Acid M.W 301.5

Sulphur Dioxide M.W 64.0

Hydro Chloric Acid M.W 36.5

Step 2:



2-[(3-Trifluromethyl) Phenoxy] Nicotinic Acid

2,4-Difluoro Aniline

Diflufenican M.W394.0

Hydro Chloric Acid M.W 36.5

201	Material / Mass Balance of Diflufenican (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Material/item**	**Kg/Batch**		**Product/Bi Product**	**Kg/Batch**
1	2-[3-(Trifluoromethyl)Phenoxy] Nicotinic Acid	757		Diflufenican	1000
2	Thionyl chloride	318		Recover Toluene	1940
3	2,4-Difluoro Aniline	345		Toluene loss	60
4	Toluene	2000		20% Na_2SO_3 Solution	1690
5	15% NaOH for Caustic Scrubber	1512		30% HCl Solution	670
6	Water for HCl Scrubber	456		Distillation Residue	28
	Total	**5388**		**Total**	**5388**

202) Aclonifen:

Brief Manufacturing Process:

Phenol is reacted with 2- Amino 3,4 – Di Chloro Nitro Benzene in presence of Sodium Hydroxide as well as Solvent - Di Methyl Sulfoxide (DMSO) to form 2- Chloro -6- Nitro 3- Phenoxy Aniline (Aclonifen).

Chemical Reaction:

Phenol	2-Amino-3,4 -Dichloro Nitrobenzene	2-Chloro-6-Nitro-3-Phenoxy Aniline (Aclonifen)	Sodium Chloride
M.Wt=94.00	M.Wt=207.00	M.Wt=264.5	M.Wt=58.50

Material Balance

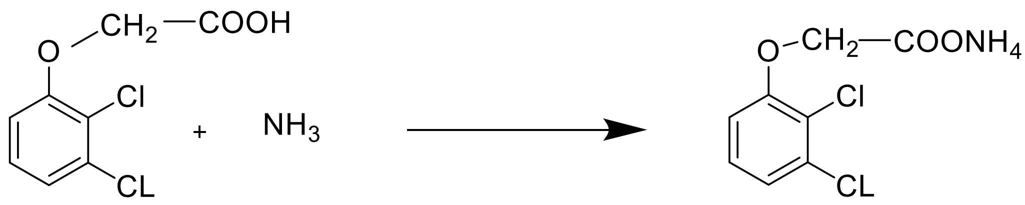
202	Material / Mass Balance of Aclonifen All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	2- Amino – 3,4 – Di Chloro Nitro Benzene	756		Aclonifen	1000
2	Phenol	350		Recovered Solvent - DMSO	1165
3	Sodium Hydroxide	150		Solvent Loss - DMSO	35
4	Solvent – Di Methyl Sulfoxide	1200		Recovered Solvent - Xylene	975
5	Water	640		Solvent Loss - Xylene	25
6	Solvent – Xylene	1000		Sodium Chloride	205
7				Aqueous Layer to ETP	672
8				Distillation Residue	19
	Total	**4096**		Total	**4096**

203) 2,4-D Amine Salt

Brief Manufacturing Process:

2,4 -D Acid is reacted with Liquor Ammonia to give Amine Salt. Ammonia reacts with acids to produce an ammonium ion.

Chemical Reactions: -



2,4-D Acid M.W. 221.0 | Ammonia M.W. 17 | 2,4 D-Amine Salt M.W. 238.0

Mass Balance:

203	Material / Mass Balance of 2,4 D Amine Salt 58 % W/W (All Quantities are in Kg)				
	IN-PUT			OUT-PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By Product**	**Kg/Batch**
1	2,4-Dichloro Phenoxy Acetic Acid	600		2,4-D Amine 58 % Salt	1000
2	Dimethyl Amine	300		Distillation Residue	36
3	Triethyl Amine	3			
4	Water	128			
5	Hyflow	5			
6					
	TOTAL	**1036**		**TOTAL**	**1036**

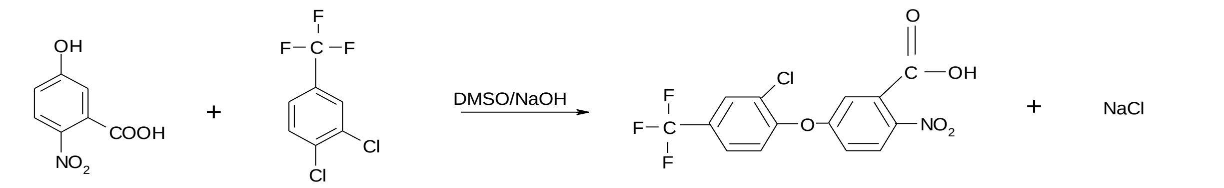
204) Acifluorfen

Brief Manufacturing Process:

Step -1:3- Hydroxy -6- Nitro Benzoic Acid is reacted with 3,4 – Di Chloro Benzotrifluoride, in presence of Sodium Hydroxide as well as Solvent - Di Methyl Formamide (DMF) to form 2 – Nitro - 5- (2- Chloro 4 – Trifluoromethyl) Phenoxy} Phenoxy] Benzoic Acid.

Step -2: 2 – Nitro -5- (2- Chloro 4 – Trifluoromethyl) Phenoxy} Phenoxy] Benzoic Acid is finally reacted with Methyl Bromide in presence of Sodium Hydroxide & Solvent Toluene to form the Final Product as 5 – [2- Chloro -4- (Trifluoromethyl) Phenoxy] -2- Nitro benzoate - Acifluorfen Methyl.

Chemical Reaction:
Step-1



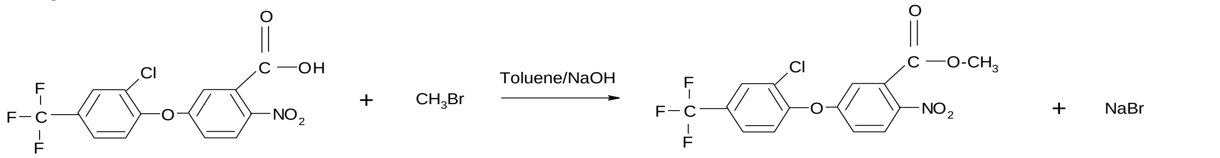
3-Hydroxy-6-Nitro Benzoic Acid M.Wt=183.00

3,4-Dichloro Benzotrifluoride M.Wt=215.00

5-[2-(Chloro-4-(Trifluoromethyl) Phenoxy]-2-Nitrobenzoic acid M.Wt=361.50

Sodium Chloride M.Wt=58.50

Step-2



5-[2-(Chloro-4-(Trifluoromethyl) Phenoxy]-2-Nitrobenzoic acid M.Wt=361.50

Methyl Bromide M.Wt=95.00

Methyl 5[2-(Chloro-4-(Trifluoromethyl) Phenoxy]-2-Nitrobenzoate Acifluorfen-methyl M.Wt=375.50

Sodium Bromide M.Wt=103.00

Material Balance

204	Material/Mass Balance of Acifluorfen Methyl (All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	3- Hydroxy 6- Nitro Benzoic Acid	505		Acifluorfen Methyl	1000
2	3,4 Di Chloro Benzotrifluoride	592		Recovered Solvent - DMSO	1070
3	Sodium Hydroxide	220		Solvent Loss - DMSO	30
4	Solvent – Di Methyl Sulfoxide	1100		Sodium Chloride	160
5	Methyl Bromide	218		Sodium Bromide	280
6	Solvent – Toluene	1000		Recovered Solvent - Toluene	975
7	Water	595		Solvent loss - Toluene	25
8				Aqueous Layer to ETP	672
9				Distillation Residue	18
	Total	**4230**		**Total**	**4230**

205)Chlomethoxyfen:

Brief Manufacturing Process:

Step -1:

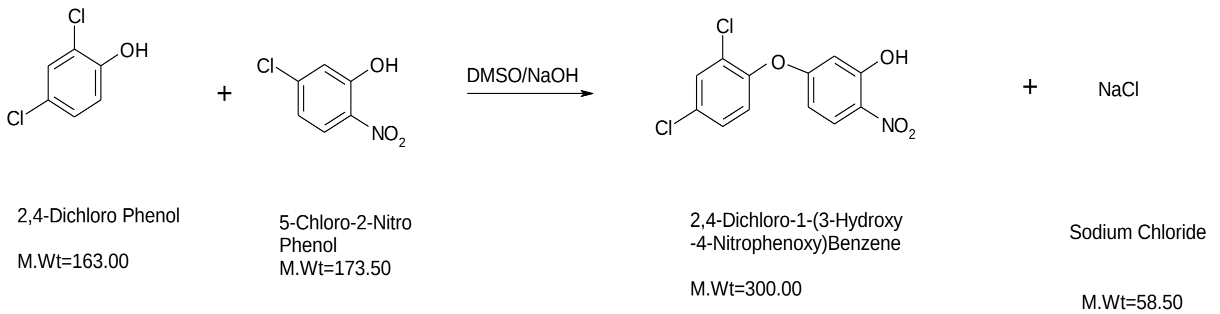
2 ,4 – Dichloro Phenol is reacted with 5 – Chloro -2- Nitro Phenol in presence of Sodium Hydroxide as well as Solvent - Di Methyl Sulfoxide (DMSO) to form 2,4 – Di Chloro -1-(3– Hydroxy -4- Nitro Phenoxy) Benzene.

Step -2:

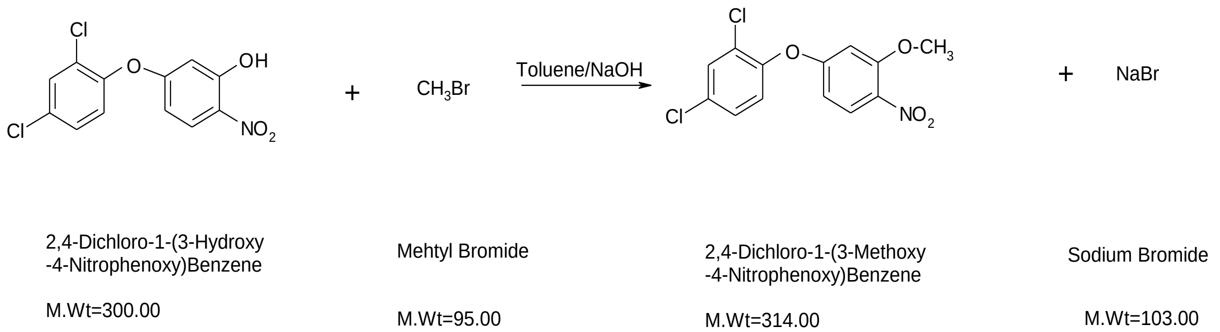
2,4 – Di Chloro -1-(3– Hydroxy -4- Nitro Phenoxy) Benzene is finally reacted with Methyl Bromide in presence of Solvent - Toluene to form the Final Product as 2,4 – Di Chloro -1- (3- Methoxy -4- nitro Phenoxy) Benzene - Chlomethoxyfen

Chemical Reaction:

STEP-1



STEP-2



Material Balance

205	**Material/Mass Balance of Chlomethoxyfen (All Quantities are in kg)**				
IN- PUT				**OUT- PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	2,4 – Dichloro Phenol	525		Chlomethoxyfen	1000
2	5- Chloro -2- Nitro Phenol	550		Recovered Solvent -DMSO	1175
3	Sodium Hydroxide	258		Solvent Loss - DMSO	25
4	Solvent – Di Methyl Sulfoxide	1200		Sodium Chloride	195
5	Methyl Bromide	300		Sodium Bromide	340
6	Solvent – Xylene	1000		Recovered Solvent - Xylene	980
7	Water	640		Solvent loss - Xylene	20
8				Aqueous Layer to ETP	720
9				Distillation Residue	18
	Total	**4473**		**Total**	**4473**

206) Fluoroglycofen:

Process Description:

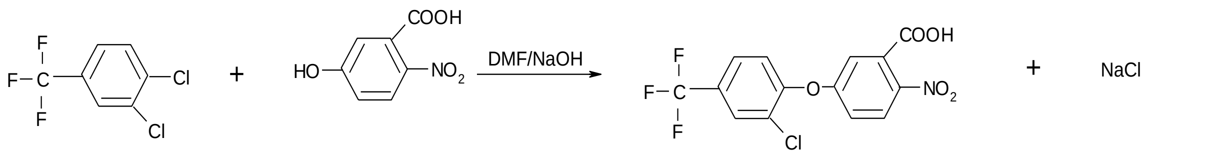
Step -1:

3- Hydroxy -6- Nitro Benzoic Acid is reacted with 3,4 – Di Chloro Benzotrifluoride in presence of Sodium Hydroxide as well as Solvent - Di Methyl Formamide (DMF) to form 2- Nitro -5-(2- Chloro -

4- Trifluoromethyl Phenoxy) Benzoic Acid.

Step -2:
2- Nitro -5-(2- Chloro -4- Trifluoromethyl Phenoxy) Benzoic Acid is finally reacted with Ethyl Chloro Acetate in presence of Solvent - Xylene to form the Final Product as 2- Ethoxy 2- Oxo - Ethyl 5- {2- Chloro 4- (Trifluoro Methyl) Phenoxy} -2- Nitro Benzoate. – FLUOROGLYCOFEN.

Chemical Reaction:
Step-1



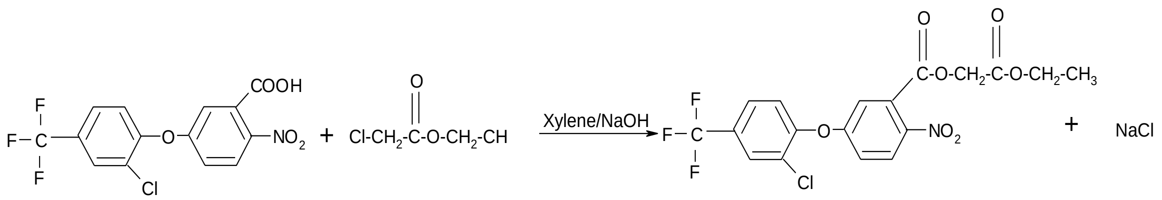
3,4-Dichloro Benzotrifluoride M.Wt=215.00

3-Hydroxy-6-Nitro Benzoic acid M.Wt=183.00

2-Nitro-5-(2-Chloro-4-Trifluoromethyl Phenoxy Benzoic Acid M.Wt=361.50

Sodium Chloride M.Wt=58.50

Step-2



2-Nitro-5-(2-Chloro-4-Trifluoromethyl Phenoxy Benzoic Acid M.Wt=361.50

Ethyl Chloro Acetate M.Wt=122.50

2-Ethoxy-2-Oxoethyl-5-[2-Chloro-4-(Trifluoromethyl) Phenoxy]-2-Nitrobenzoate M.Wt=447.50

Sodium Chloride M.Wt=58.50

Material Balance

206	Material/Mass Balance of Fluoroglycofen (All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr No	Raw Materials / Items	Kg/Batch		Product / Bi Product	Kg/Batch
1	2,4 – Dichloro Phenol	516		Fluoroglycofen	1000
2	5- Chloro -2- Nitro Phenol	540		Recovered Solvent - DMF	1175
3	Sodium Hydroxide	252		Solvent Loss - DMF	25
4	Solvent – Di Methyl Formamide	1200		Sodium Chloride	220
5	Methyl Bromide	295		Sodium Bromide	295
6	Solvent – Xylene	1000		Recovered Solvent - Xylene	970
7	Water	625		Solvent loss - Xylene	30
				Aqueous Layer to ETP	693
				Distillation Residue	20

	Total	**4428**		**Total**	**4428**

207) Lactofen:

Brief Process Description:

Step -1:

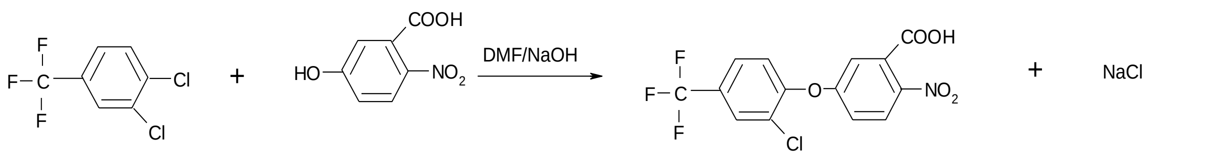
3- Hydroxy -6- Nitro Benzoic Acid is reacted with 3,4 – Di Chloro Benzotrifluoride in presence of Sodium Hydroxide as well as Solvent-Di Methyl Formamide (DMF) to form 2- Nitro -5-(2- Chloro -4- Trifluoromethyl Phenoxy) Benzoic Acid.

Step -2:

2- Nitro -5-(2- Chloro -4- Trifluoromethyl Phenoxy) Benzoic Acid is finally reacted with L-2 Chloro Propionic Acid Ethyl Ester in presence of Solvent - Xylene to form the Final Product as LACTOFEN.

Chemical Reaction:

Step-1



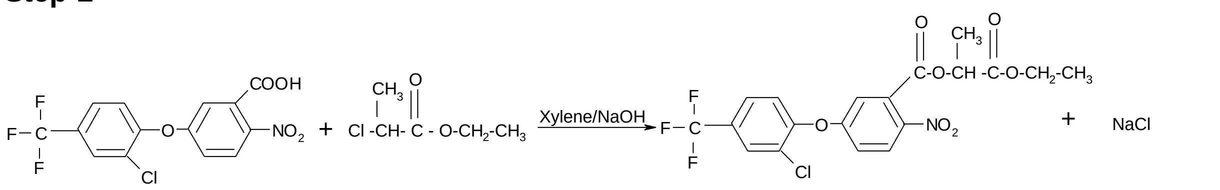
3,4-Dichloro Benzotrifluoride M.Wt=215.00

3-Hydroxy-6-Nitro Benzoic acid M.Wt=183.00

2-Nitro-5-(2-Chloro-4-Trifluoromethyl Phenoxy Benzoic Acid M.Wt=361.50

Sodium Chloride M.Wt=58.50

Step-2



2-Nitro-5-(2-Chloro-4-Trifluoromethyl Phenoxy Benzoic Acid M.Wt=361.50

2-Chloro Propionic Acid Ethyl Ester M.Wt=136.50

Lactofen M.Wt=461.50

Sodium Chloride M.Wt=58.50

Material Balance

207	**Material/Mass Balance of Lactofen (All Quantities are in kg)**				
IN- PUT				**OUT- PUT**	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	3,4-Dichloro Benzotrifluoride	500		Lactofen	1000
2	3-hydroxy-6-nitro-benzoic acid	421		Recovered Solvent - Di Methyl formaldehyde	1070
3	Sodium Hydroxide	185		Solvent Loss	30
4	Solvent – Di Methyl formaldehyde	1100		Sodium Chloride	130
5	L-2 chloro propionic acid ethyl ester	310		Recovered Solvent xylene	970

6	Solvent - xylene	1000		Solvent loss	30
7	water	654		Aqueous Layer to ETP	919
8				Distillation Residue	21
	Total	**4170**		**Total**	**4170**

208) Oxyfluorfen

Brief Manufacturing Process: -

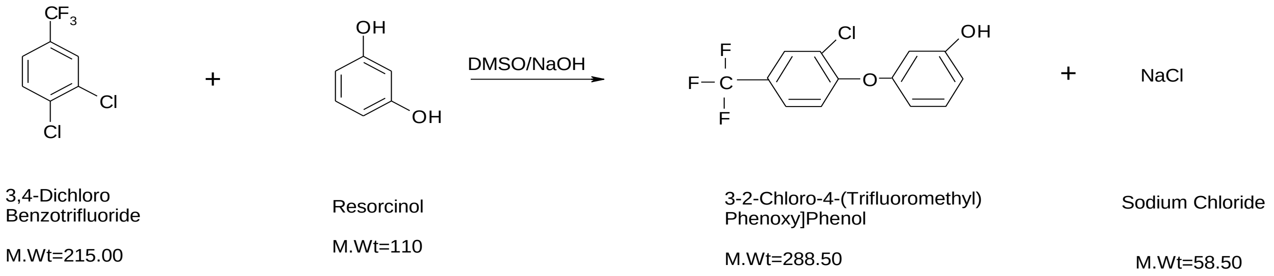
Step 1: -Resorcinol is reacted with 3,4 - Di Chloro Benzotrifluoride in presence of Sodium Hydroxide as well as Solvent - Di Methyl Sulfoxide (DMSO) to form 3 - (2 – Chloro – 4 - (Trifluoromethyl) Phenoxy) Phenol.

Step 2: -3-(2- Chloro -4-(Trifluoromethyl) Phenoxy) Phenol is further reacted with Ethyl Bromide in presence Sodium Hydroxide as well as Solvent - Toluene to form 3-(2- Chloro -4- (Trifluoromethyl) Phenoxy) Ethoxy Benzene.

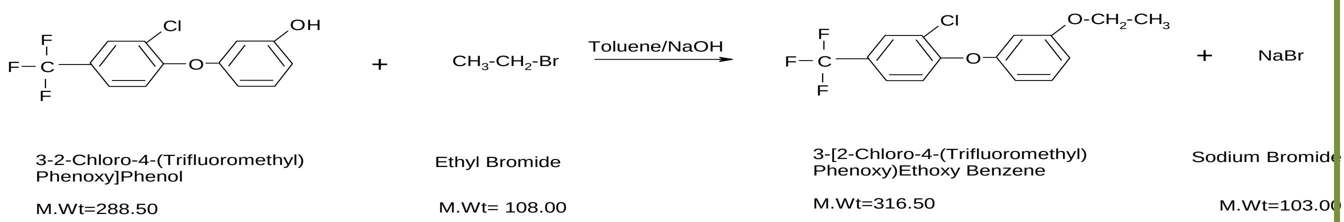
Step 3: -3-(2- Chloro -4- (Trifluoromethyl) Phenoxy) Ethoxy Benzene is finally reacted with Nitric Acid in presence of Solvent - EDC to form the Final Product as Oxyfluorfen.

Chemical Reactions: -

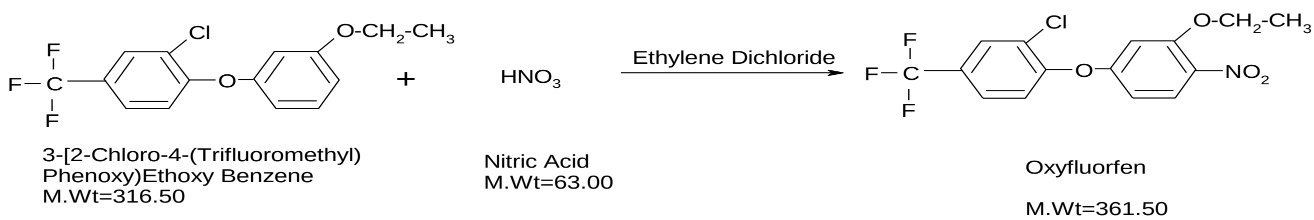
Step 1: -



Step 2: -



Step 3: -



Mass Balance:

208	Material/Mass Balance of Oxyfluorfen (All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	3,4-Dichloro Benzotrifluoride	614		Oxyfluorfen	**1000**
2	Resorcinol	317		Recovered Solvent – DMSO	1075
3	Sodium Hydroxide	233		Solvent Loss – DMSO	25
4	Solvent – Di Methyl Sulfoxide	1100		Sodium Chloride	173
5	Ethyl Bromide	306		Sodium Bromide	300
6	Nitric Acid	180		Recovered Solvent Toluene	980
7	Solvent – Toluene	1000		Solvent loss - Toluene	20
8	Solvent - EDC	800		Recovered Solvent – EDC	775
9	Water	800		Solvent Loss – EDC	25
10				Aqueous Layer to ETP	956
11				Distillation Residue	21
	TOTAL	**5350**		**TOTAL**	**5350**

209) Fluoroxypyr-Meptyl
Brief Manufacturing Process:
Step -1

3,5 Di Chloro 4- Amino, 5 - Fluoro Pyridinol (TCP) is reacted with Sodium Hydroxide in presence of Solvent – EDC to form Sodium Salt of Pyridinol.

Step -2

Sodium Salt further reacts with Chloro Acetic Acid in presence of Solvent – EDC as well s Catalyst to give the Base product Fluroxypyr.

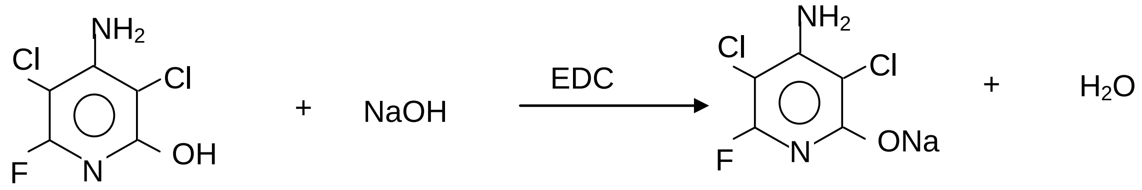
Step-3

Fluroxypyr Base finally reacts with 2- Chloro Octane to form the final product Fluroxypyr Meptyl. The organic mass is washed by Sodium Hypochlorite Solution and finally solvent is distilled out from Organic mass to get the final product Technical Fluroxypyr Meptyl

Finally, Toxic Effluent Which contains traces of Pesticides is taken to Hydrolysis stage for detoxification. Where Aq. Mass is treated at high temperature by Alkali for the rapid hydrolysis of pesticides to simpler non-toxic compounds.

Chemical Reaction:

STEP -1

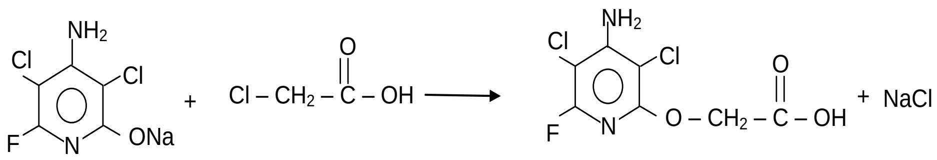


3,5 Di Chloro 4- Amino 5- Fluoro Pyridinol M.W. 197.0

Sodium Hydroxide M.W. 40.0

Sodium Salt - 3,5 Di Chloro 4- Amino 5- Fluoro Pyridinol M.W. 219.0

STEP -2



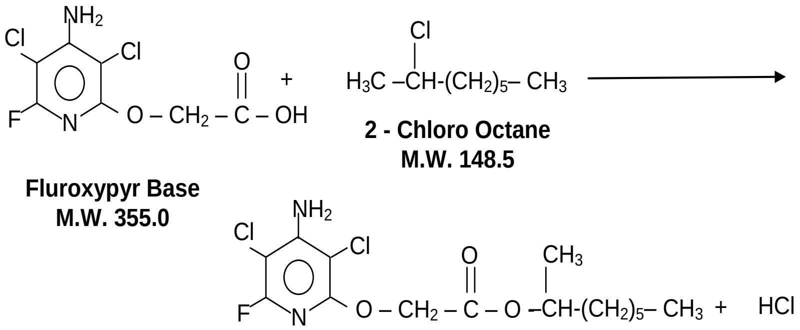
Sodium Salt - 3,5 Di Chloro 4- Amino 5- Fluoro Pyridinol M.W. 219.0

Chloro Acetyl Chloride M.W. 130.0

Fluroxypyr Base M.W. 355.0

Sodium Chloride M.W. 58.5

STEP -3



Fluroxypyr Base M.W. 355.0

2 - Chloro Octane M.W. 148.5

Fluroxypyr Meptyl M.W. 467.0

Material Balance

209	Material/Mass Balance of Fluoroxypyr-Meptyl (All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	Pyridine	440		Fluoroxypyr-Meptyl	1000
2	Sodium Hydroxide	100		Recovered Solvent EDC	2920
3	Chloro Acetyl Chloride	305		Solvent Loss	80
4	Catalyst	20		Water Distillate	40
5	Solvent-EDC	3000		30% HCl Solution	260

6	10% Sodium Hypochlorite Solution	100		Aq. Detoxified Mass	820
7	Caustic Lye 47%	120			
8	2-Chloro Octane	335			
9	Water	700			
	Total	**5120**		**Total**	**5120**

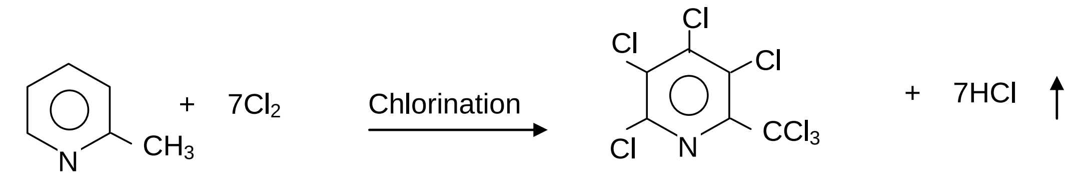
210) Picloram

Brief Manufacturing Process:

α - Picoline (2-Methyl Pyridine) undergoes chlorination in presence of Catalyst to give 2-Trichloro Methyl 3,4,5,6 Tetra Chloro Pyridine as an Intermediate. This Intermediate on Hydrolyses in presence of Sulfuric Acid, gives the final Product Picloram.

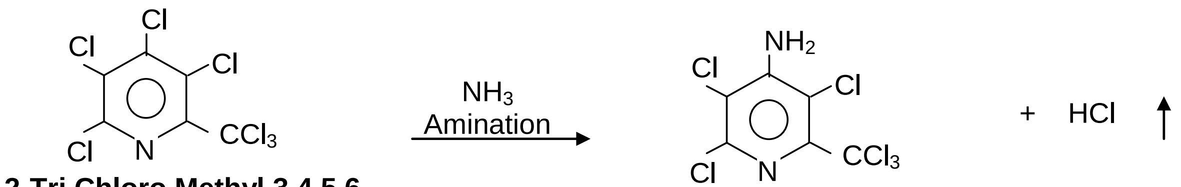
Finally, Toxic Effluent Which contains traces of Pesticides is taken to Hydrolysis stage for detoxification. Where Aq. Mass is treated at high temp. by Alkali for the rapid hydrolysis of pesticides to simpler non-toxic compounds.

Chemical Reaction:



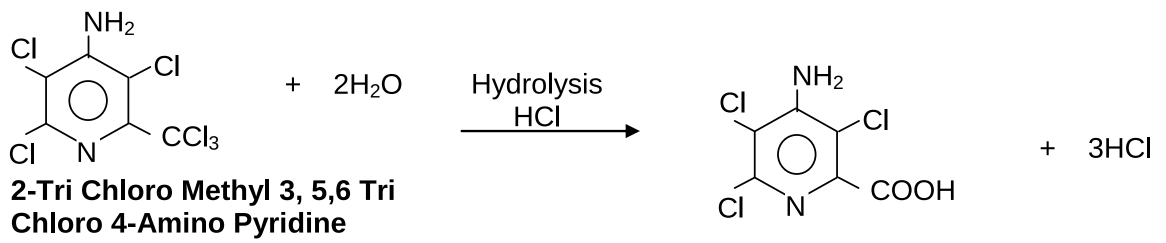
α - Picoline (2-Methyl Pyridine) M.W. 93.13

2-Tri Chloro Methyl 3,4,5,6 Tetra Chloro Pyridine M.W. 334.5



2-Tri Chloro Methyl 3,4,5,6 Tetra Chloro Pyridine M.W. 334.5

2-Tri Chloro Methyl 3, 5,6 Tri Chloro 4-Amino Pyridine M.W. 315



2-Tri Chloro Methyl 3, 5,6 Tri Chloro 4-Amino Pyridine M.W. 315

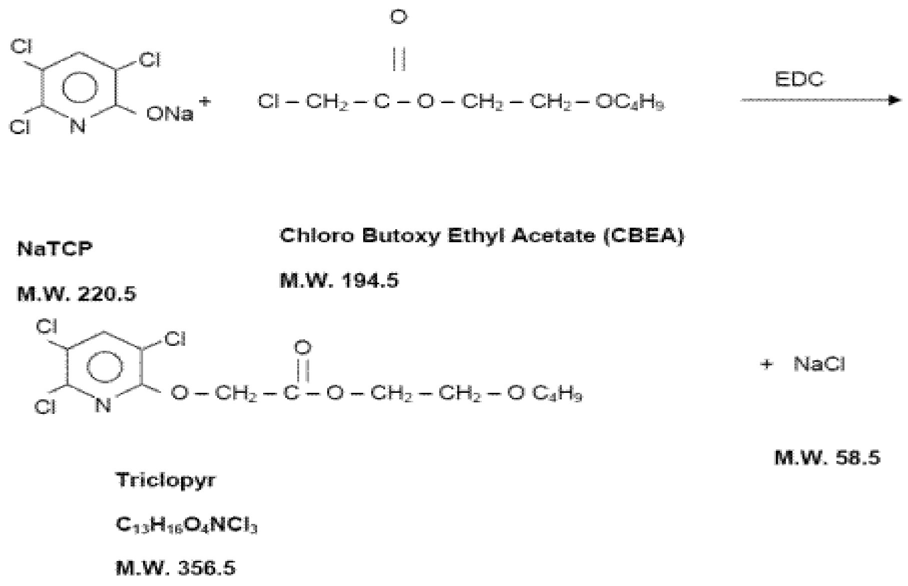
Picloram M.W. 241.6

Material Balance/Mass Balance (All Quantities are in Kg)

210	Material/Mass Balance of Picloram (All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	a - Picoline (2-Methyl Pyridine)	417		Picloram	1000
2	Chlorine	2230		Inorganic Salt	68
3	Catalyst-I	5		Water Loss	46
4	Water	4545		Water Recovered	502
5	Ammonia Gas	75		30% Hydrochloric Acid Soln	5396
6	Catalyst-II	5		Aqueous Layer	1050
7	C.S. Lye 48%	50			
8	Water for Hydrochloric Acid	725			
9	30% Hydrochloric Acid	10			
	Total	**8062**		**Total**	**8062**

211) Triclopyr/Triclopyr Butotyl

Brief Manufacturing Process:
NaTCP is reacted with Chloro Butoxy Ethyl Acetate (CBEA) to give the crude product Triclopyr. The organic mass is washed by Sodium Hypochlorite Solution and finally solvent is distilled out from Organic mass to get the final product Technical Triclopyr.
Chemical Reaction:



211	Material / Mass Balance of Triclopyr (All Quantities are in Kg)				
	IN-PUT			OUT-PUT	
Sr. No	**Raw Materials / Items**	**Kg/Batch**		**Product / By Product**	**Kg/Batch**
1	Sodium TCP	710		**Triclopyr**	1000

2	Chloro Butoxy Ethyl Acetate	490	EDC recover	1650
3	Catalyst-Pd	10	EDC Loss	50
4	10% Sodium Hypochlorite Wash	80	Distillation Residue	7
5	Water	250	Spent Catalyst	10
6	EDC	1700	Effluent	623
7	Caustic Soda Lye	100		
	TOTAL	**3340**	**TOTAL**	**3340**

GROUP 12: Aryloxyphenoxypropionates/ Aryloxyphenoxypropionic/ Aniline /Pyridine/Ppo-Diphenyl Ethers / Phenyl Ether /Phenoxy Carboxylic Acid / Pyridine / Nitro Phenyl Ether 15/Aromatic Ketone (G-2)

212)Sulcotrione

Brief Manufacturing Process:

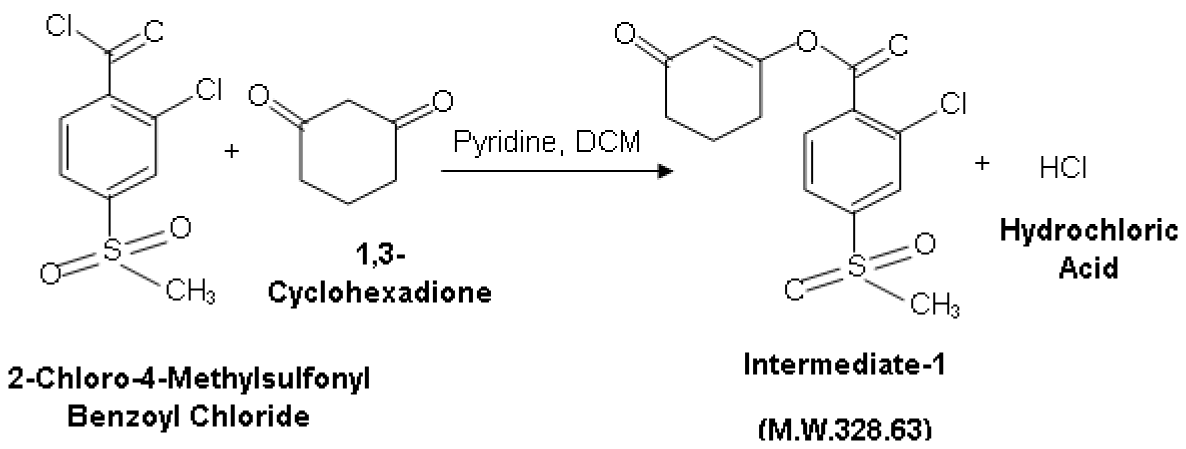
Step 1: - 2-Chloro-4-Methylsulfonyl Benzoyl Chloride reacted with 1,3-Cyclohexanedione in presence of Pyridine as well as Dichloro Methane which gives out Intermediate-I, Hydrochloric Acid is separated out during the reaction.

Step 2: - Intermediate-I is further reacted with Acetonitrile in presence of Triethyl Amine, Pottasium Cyanide as well as Ethylene Dichloride to get Sulcotrione.

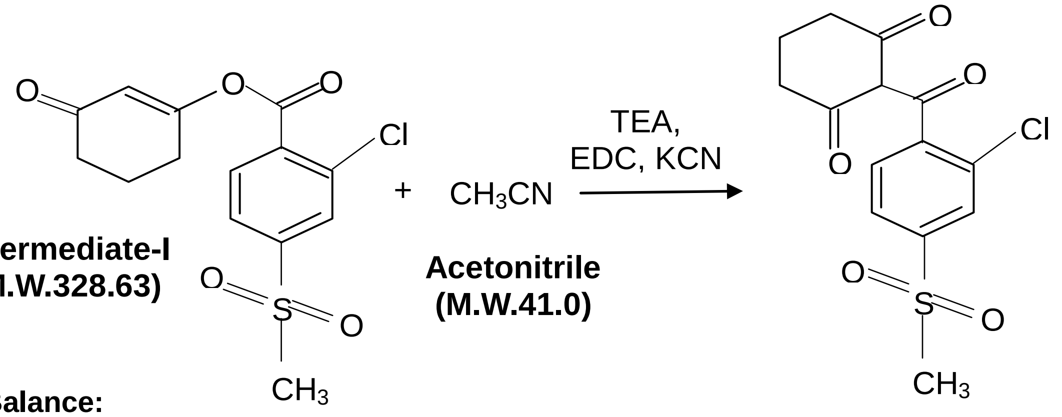
After completion of reaction aqueous layer and Ethylene Dichloride Solvent is distilled out to get as a pure product which is recrystallised using Dichloromethane as a solvent.

Chemical Reaction:

Step:1-



Step:2-



Intermediate-I (M.W.328.63)

Acetonitrile (M.W.41.0)

Sulcotrione (M.W.329.0)

Mass Balance:

212	**Material / Mass Balance of Sulcotrione (All Quar**				
	IN PUT			**(**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	1,3-Cyclohexanedione	485		**Sulcotrione**	1000
2	Pyridine	374		Methylene chloride	3872
3	2-Chloro-4-Methylsulfonyl Benzoyl Chloride	1106		30% Hydrochloric Acid Soln	225
4	Dilute Hydrochloric Acid	2550		Recovered EDC	2400
5	Acetonitrile	5106		EDC loss	155
6	Triethyl amine	425		Recovered Dichloromethane	4130
7	Potassium Cyanide	65		Residue	69
8	Ethylene Dichloride	2555		Aqueous layer	9315
9	Dichloro Methane	4250			
10	Water	4250			
	TOTAL	**21166**		**TOTAL**	**21166**

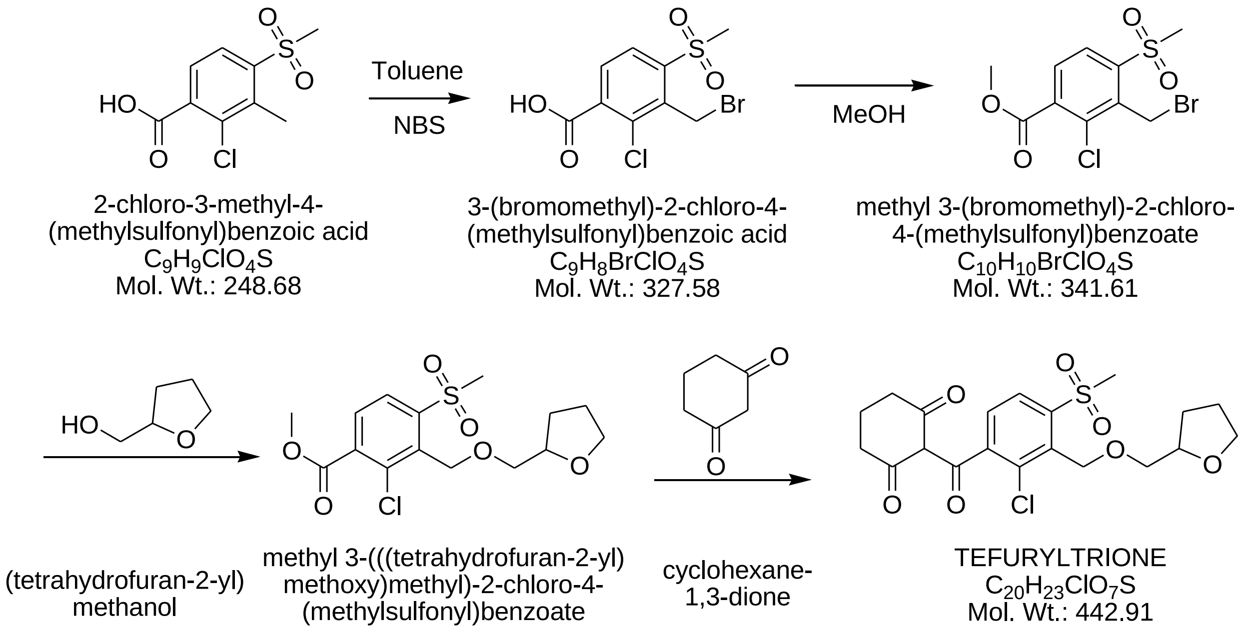
213) Tefuryltrione

Manufacturing Process

The Solvent Toluene and 2-Chloro-3-Methyl-4-(MethylSulfonyl)Benzoic Acid (2-CMMSBA) are charged. The temperature is raised to 50^{o}C and N-BromoSuccinimide is added portion-wise for 4 hours. Methanol is added and the mass is maintained at reflux for 4 hours. The mass is cooled to 60^{o}C and (TetraHydroFuran-2-Yl)Methanol (THFM) is added for 2 hours and maintained for 4 hours. Water is added and the aqueous phase is separated.

Cyclohexane 1,3-Dione is charged to the organic phase and refluxed for 6 hours. The by-product Methanol is distilled out. After completion of the reaction, water is added and aqueous phase is separated. The organic phase is cooled to 0^{o}C and filtered the slurry. The wet cake is dried to obtain Tefuryltrione TC.

Chemical Reactions:



213	Material / Mass Balance of TefuryltrioneAll Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2-Chloro-3-Methyl-4-(MethylSulfonyl)Benzoic Acid	800		**Tefuryltrione**	**1000**
2	N-BromoSuccinimide	575		Recovered Solvent Toluene	2900
3	TetraHydroFuran-2-Yl)Methanol	305		Toluene Loss	100
4	Cyclohexane 1,3-Dione	280		Recovered Methanol	80
5	Toluene	3000		Aqueous Layer to ETP	4355
6	Methanol	125		Organic Residue	100
7	Water	3500		Drying Loss	50
	TOTAL	**8585**		**TOTAL**	**8585**

214) Mecoprop& its Methyl Isomers

Brief Manufacturing Process:

Step 1: -

The Solvent Dichloroethane and O-Cresol are charged. The Catalyst is added and the temperature is raised to 60°C and chlorine is passed for 6 hours and the by-product Hydrogen Chloridegas is scrubbed in water. The reaction is maintained at 60°C for 2 hours to complete. The reaction mass of 4-Chloro-O-Cresol in Dichloroethane is cooled to room temperature.

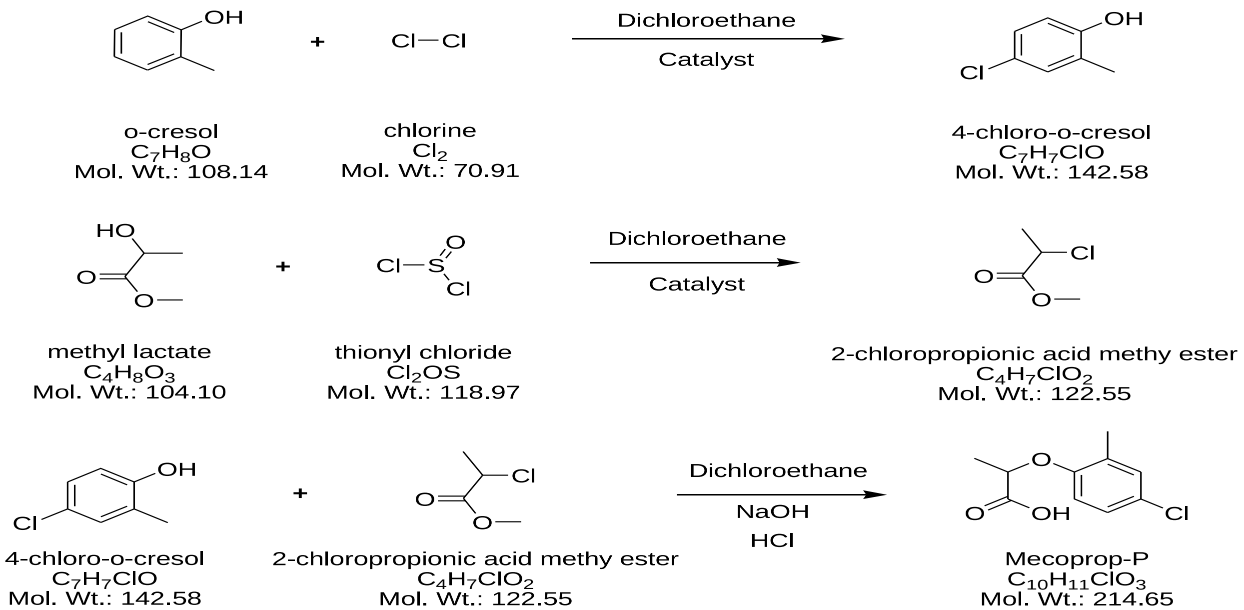
Step 2: -

The Solvent Dichloroethane and Methyl Lactate are charged. The Catalyst is added and the temperature is raised to 70°C and Thionyl Chloride is added for 4 hours and the by-product Hydrogen Chloride gas is scrubbed in water and Sulphur Dioxide is scrubbed in Caustic Lye Solution. The reaction is maintained at 70°C for 4 hours to complete. The reaction mass of 2-Chloropropionic Acid Methyl Ester is cooled to room temperature.

Step 3: -

The reaction mass of 4-Chloro-O-Cresol in Dichloroethane and 50% Caustic Lye Solution are charged and raised the temperature to 60°C. The reaction mass of 2-Chloropropionic Acid Methyl Ester is added for 6 hours and maintained the reaction for 4 hours to complete. The reaction mass is cooled to 30°C and 30% Hydrochloric Acid is added to precipitate the product. The mass is filtered and dried to obtain Mecoprop-P TC.

Chemical Reactions:



214	Material / Mass Balance of Mecoprop(All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product/ Byproduct	Kg/Batch
1	Chlorine	440		**Mecoprop**	**1000**
2	O-Cresol	660		Recovered Dichloroethane	3900
3	Dichloroethane	4000		Dichloroethane Loss	100
4	Methyl lactate	635		Sodium Sulfite Solution	890
5	Thionyl Chloride	725		30% Hydrochloric Acid Soln	1465
6	50% CS lye solution	1750		Aqueous Effluent	4090
7	Catalyst	10		Drying Loss	50
8	30% Hydrochloric Acid	1250			
9	Water for Hydrochloric Acid Soln	1025			

10	Water for Washing	1000			
	Total	**11495**		**Total**	**11495**

215) 2,4-D Acid/(2,4-Dichlorophenoxy) Acetic Acid

Brief Manufacturing Process: -

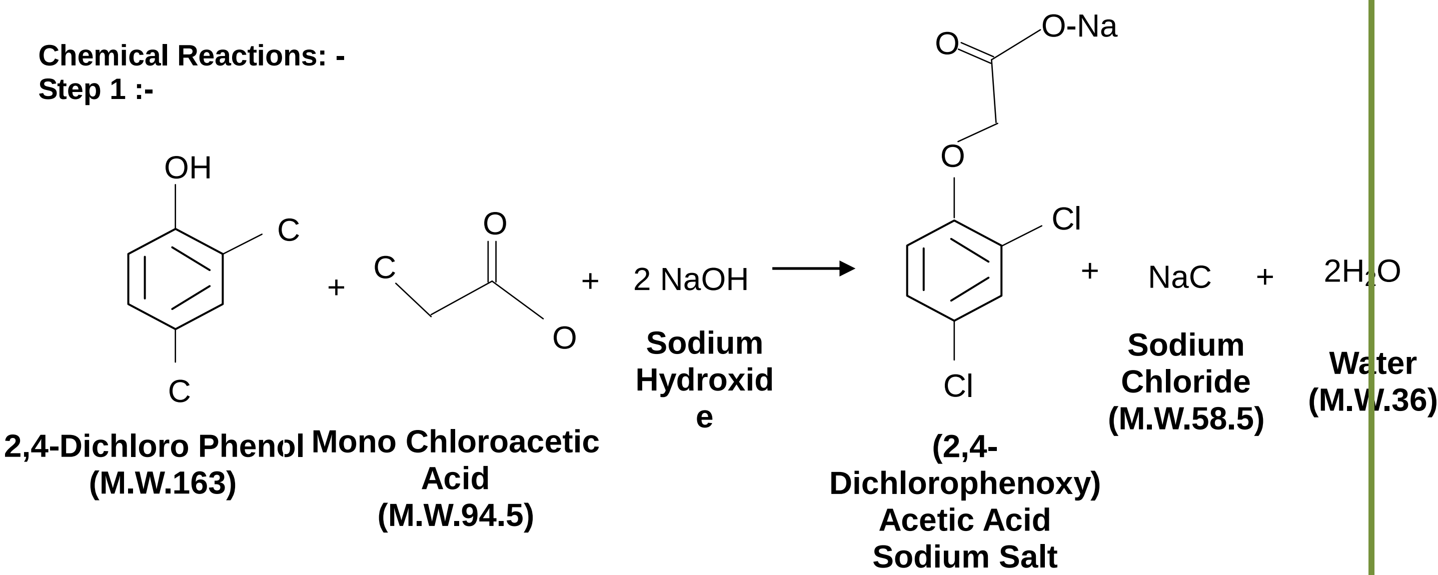
Step 1: - 2,4-Dichloro Phenol reacted with Chloroacetic Acid and Sodium Hydroxide to get (2,4-Dichlorophenoxy) Acetic Acid Sodium Salt.

Step 2: - (2,4-Dichlorophenoxy) Acetic Acid Sodium Salt further reacted with Hydrochloric Acid. This reaction gives out (2,4-Dichlorophenoxy) Acetic Acid as a crude product and Sodium Chloride as a by-product.

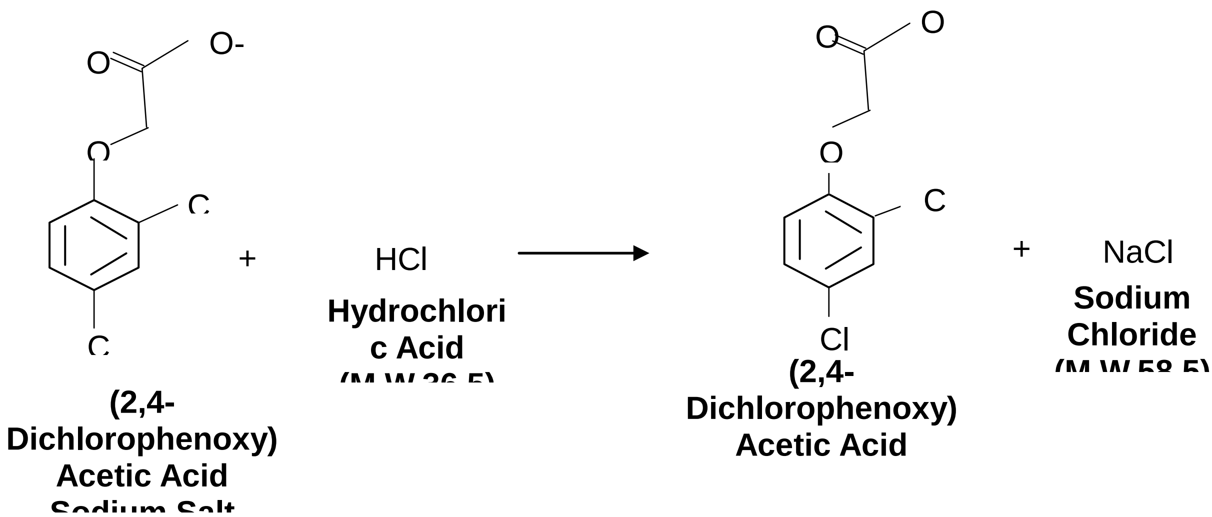
After the reaction gets completed crude product is distilled out to get the pure product.

Chemical Reactions: -

Step 1 :-



Step 2: -



Mass Balance:

215	Material / Mass Balance of 2,4 D Acid (All Quantities are in Kg)				
	IN-PUT			**OUT-PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By Product**	**Kg/Batch**
1	2,4 Dichloro Phenol	818		2,4 D Acid	1000
2	Monochloro Acetic Acid	472		Water to ETP	3100
3	48 % Caustic Lye	890		Tarry Waste	75
4	Water for 20 % Caustic	1245			
5	Hydrochloric Acid	750			
	TOTAL	**4175**		**TOTAL**	**4175**

216) 2,4-D Ethyl Ester

Brief Manufacturing Process: -

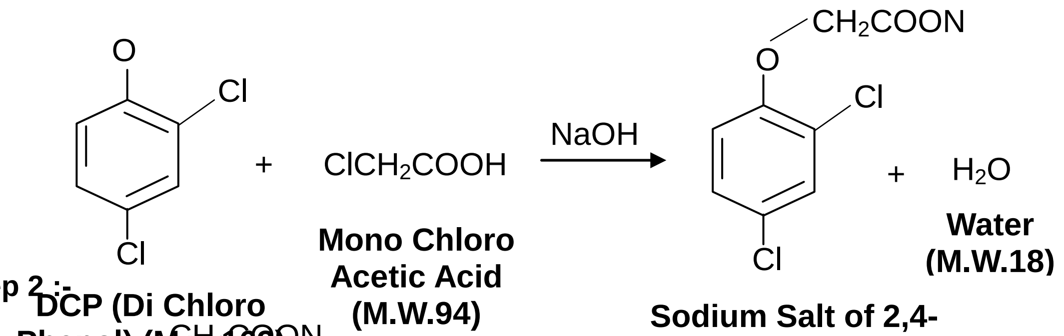
Step 1: - When Di Chloro Phenol reacted with Mono Chloro Benzene as well as Sodium Hydroxide it gives Sodium Salt of 2,4-Dichlorophenoxy Acetic Acid.

Step 2: - Sodium Salt of 2,4-Dichlorophenoxy Acetic Acid further reacted with Sulphuric Acid in to form 2,4-D Acid.

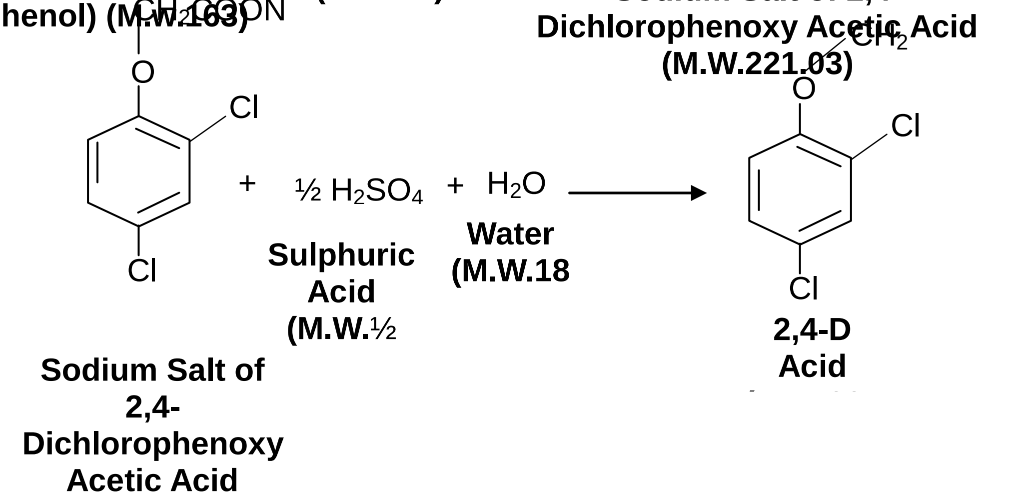
Step 3: - When 2,4-D Acid reacted with Ethanol in presence of Catalyst to gives 2,4-D Ethyl Ester as a final product.

Chemical Reactions: -

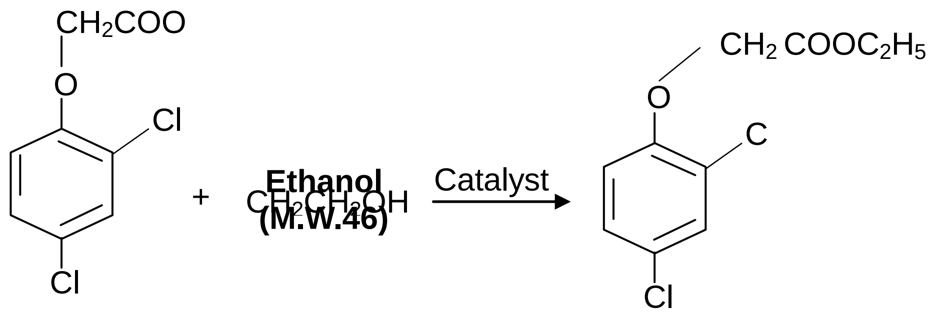
Step 1: -



Step 2 :-



Step 3: -



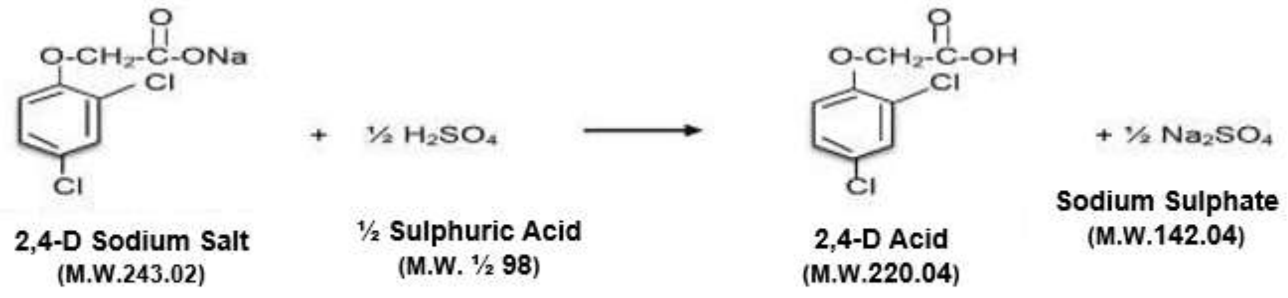
2,4-D Acid (M.W.221)

2,4-D Ethyl Ester (M.W.267)

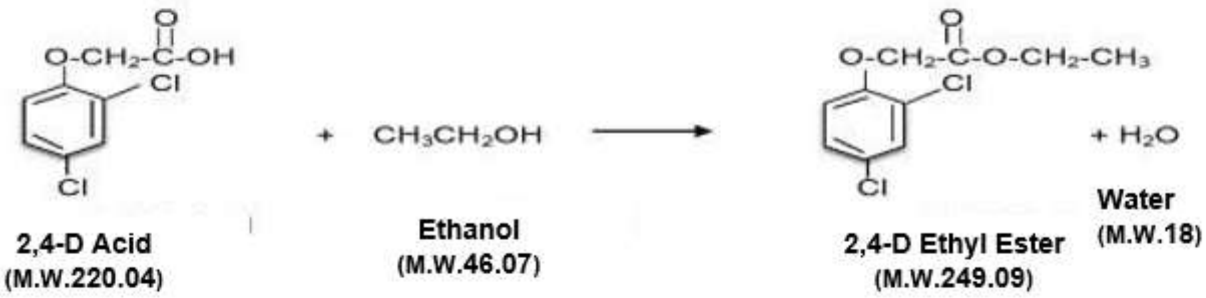
216	**Material / Mass Balance of 2,4 D Ethyl Ester (All Quantities are in Kg)**				
	IN-PUT			**OUT-PUT**	
Sr. No	**Raw Materials / Items**	**Kg/Batch**		**Product / By Product**	**Kg/Batch**
1	2,4-Dichloro Phenol	642		2,4-D Ethyl ester	1000
2	Monochloro Acetic Acid	459		Aqueous effluent	2943
3	Caustic lye 47%	963			
	Dilute sulphuric acid	183			
5	Ethanol	201			
6	Catalyst	9			
7	Sodium bicarbonate	64			
8	Water	1422			
	TOTAL	**3943**		**TOTAL**	**3943**

OR

Chemical Reactions: -
Step 1: -



Step 2: -



Mass Balance:

216	Material / Mass Balance of 2,4 D Ethyl Ester (All Quantities are in Kg)				
	IN-PUT			OUT-PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By Product**	**Kg/Batch**
1	2,4-Dichloro Phenoxy Acetic Acid	945		2,4-D Ethyl Ester	1000
2	Ethanol	358		Recovered Benzene	590
3	Sulphuric Acid	42		Benzene Loss	40
4	Benzene	630		Waste water	1247
5	Soda Ash	24		Distillation Residue	20
6	Water	898			
	TOTAL	**2897**		**TOTAL**	**2897**

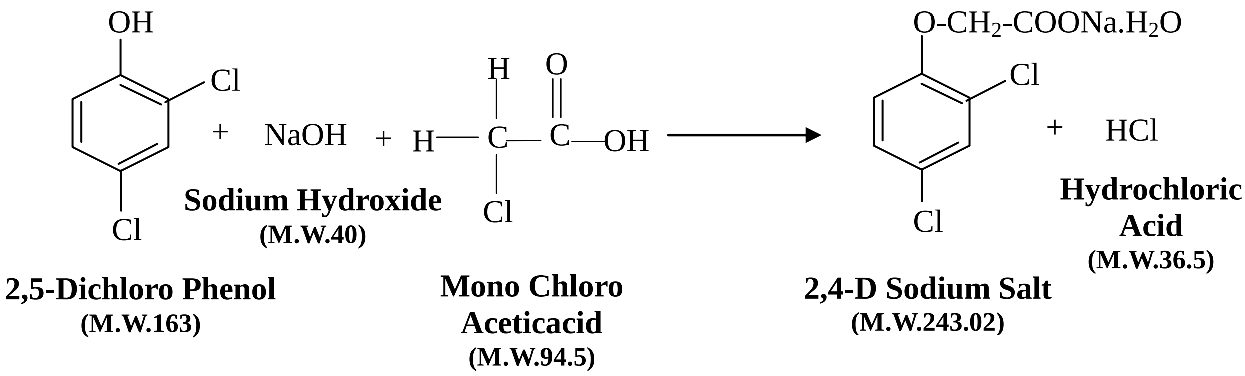
217) 2,4-D Sodium Salt

Brief Manufacturing Process: -

Step1: - Charge 2,4-DCP and caustic lye in the reaction vessel. Stir the reaction mass for 1 hour. Charge Mono Chloro Acetic Acid slowly in the reaction mass in 3-4 hrs and stir the reaction mass at 80-90^{0}C and reflux the reaction mass for 2 hrs at 90-100^{0}C. Until the reaction iscomplete.

Cool it and filter the reaction mass to remove mother liquor. Wash wet cake with water and dry the wet 2,4-D Sodium salt in drier at 80-90^{0}C.

Chemical Reactions: -



Mass Balance:

217	Material / Mass Balance of 2,4-D Sodium Salt (All Quantities are in Kg)				
	IN-PUT			OUT-PUT	
Sr. No	**Raw Materials / Items**	**Kg/Batch**		**Product / By Product**	**Kg/Batch**
1	2,4 Dichloro Phenol 97 %	708		2,4 D Sodium Salt	1000
2	Monochloro Acetic Acid	462		2,4 DCP recovered	126
3	NaOH 100 %	434		Water to ETP	2142
4	Water for 47 % NaOH	490			
5	Water for Reaction	848			
6	30% Hydrochloric Acid Solution	326			
	TOTAL	**3268**		**TOTAL**	**3268**

218) Cloquintocet Mexyl
Process Description:

Step – 1

Methyl Hexanol (Mexylol) is reacted with mono Chloro Acetate Acid (MCA) in presence of Solvent and Catalyst to give Mono Chloro Acetic Acid 1-Mexyl Ester.

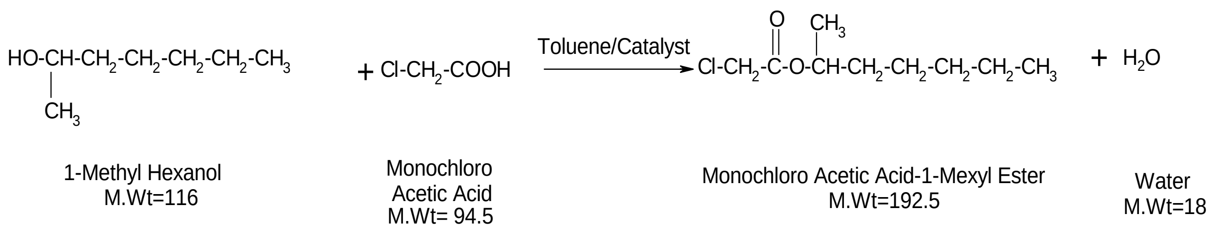
Step – 2

5-Chloro 8-Hydroxy Quinoline is reacted with Potassium Carbonate in presence of MIBK – Solvent and Catalyst to give the Potassium Salt of 5-Chloro 8-Hydroxy Quinoline.

Step – 3

Mono Chloro Acetic Acid 1-Mexyl Ester and Potassium Salt of 5-Chloro 8-Hydroxy Quinoline is finally reacted in presence of Catalyst and Solvent to give the final product Cloquintocet Mexyl – Safener.

Chemical Reaction:
Step-1



Step-2

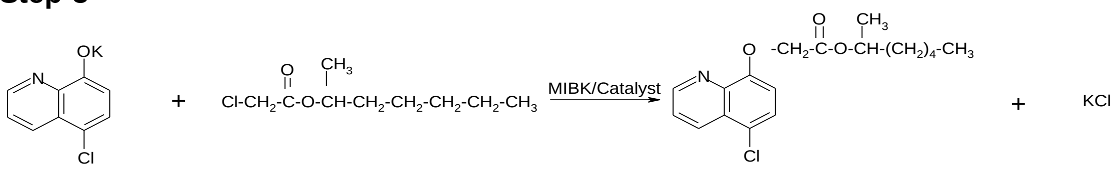
5-Chloro-8-Hydroxy Quinoline — M.Wt=179.50

Potassium Carbonate — M.Wt=138

Potassium Salt of 5-Chloro-8-Hydroxy Quinoline — M.Wt=217.50

Potassium Bycarbonate — M.Wt=100

Step-3



Potassium Salt of 5-Chloro-8-Hydroxy Quinoline — M.Wt=217.50

Mono Chloro Acetic Acid -1-Mexyl Ester — M.Wt= 192.50

Cloquintocet -Mexyl — M.Wt= 335.53

Potassium Chloride — M.wt=74.5

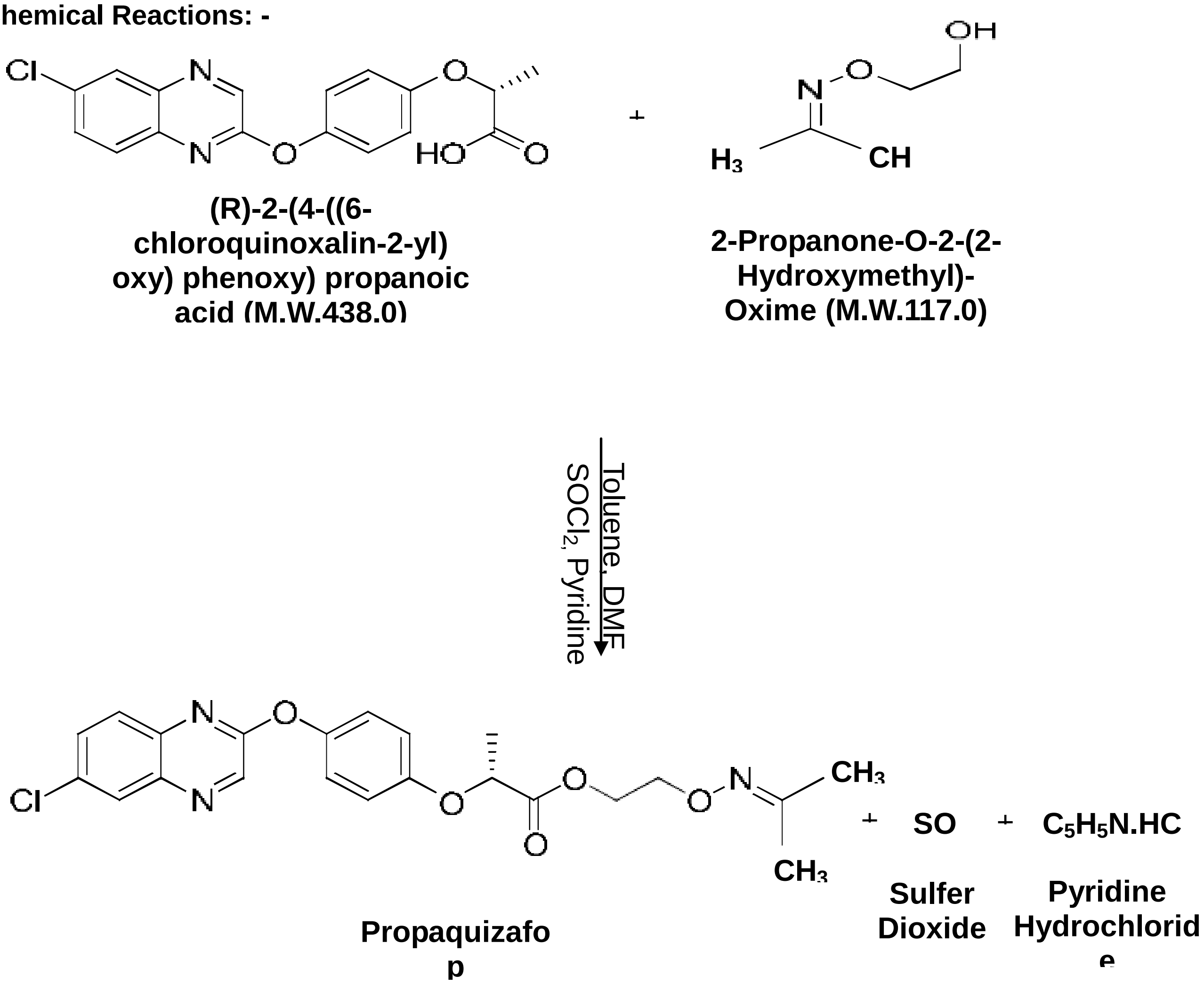
Material Balance

218	Material / Mass Balance of Cloquintocet Mexyl (All Quantities are in kg)			
	IN – PUT		OUT – PUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**	**Product / Bi Product**	**Kg/Batch**
1	Mono Chloro Acetic Acid (MCA)	405	Cloquintocet Mexyl (93%)	1000
2	1-Methyl Hexalol (HOL)	472	Water (Distilled out Azeotropically)	80
3	Solvent – Toluene	1200	Aqueous Washing to ETP	1760
4	Catalyst -1	13	Recovered Solvent - Toluene	1150
5	5- Chloro 8- Hydroxy Quinoline	663	Solvent Loss Toluene	50
6	Solvent – MIBK	3000	Potassium Chloride + Potassium Bi Carbonate Salt	802
7	Potassium Carbonate	538	Recovered Solvent - MIBK	6200
8	Catalyst-2	37	Solvent loss - MIBK	300
9	Water for washing	1150	Aqueous Layer to ETP	1185
10	2 % Sodium Bi Carbonate Soln	540	Recovered Solvent - Hexane	3950
11	Solvent - MIBK	3500	Solvent loss - Hexane	50
12	Catalyst -3	37	Solvent Loss During Drying	50
13	SHS	37	Distillation Residue	15
14	Solvent - Hexane	4000		
15	Water – for Washing	1000		
	Total	**16592**	**Total**	**16592**

219) Propaquizafop:

Brief Manufacturing Process: -Thionyl chloride was added to the stirred solution of (R)-2-(4-((6-chloroquinoxalin-2-yl) oxy) Phenoxy) Propanoic acid in toluene and stirred for few hours. After completion of reaction toluene was distilled out. Into this DMF and propan-2-one O-(2-hydroxyethyl) oxime was charged, pyridine was added slowly into this reaction and stirred for 6h. After completion of reaction DMF was distilled completely and crude mixture was treated with water. White solid was filtered and dried to get desired product.

Chemical Reactions: -



Mass Balance:

219	Material / Mass Balance of Propaquizafop All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Carboxylic acid	777		Propaquizafop	**1000**
2	Alcohol	265		Recovered Toluene	2960
3	Thionyl chloride	269		Loss Toluene	148

4	Pyridine	178		Drying Loss	189
5	DMF	3885		Waste Water	2300
6	Toluene	3108		DMF Recovered	3690
7	Water	2000		DMF Loss	195
	TOTAL	**10482**		**TOTAL**	**10482**

220) Carfentrazone:

Brief Manufacturing Process: -

Step 1: - Sodium Sulphite solution was charged to a mixture of 2-fluoroaniline, sodium nitrite solution & hydrochloric acid at 40 – 45^{o}C. The subsequent mass was basified with caustic lye solution & resultant product of this step (Intermediate – I) was obtained by filtration.

Step 2: - A mixture of intermediate – II, acetaldehyde, sodium cyanate and acetic acid in solvent methanol was chlorinated using chlorine gas at 50 – 55^{o}C for 6 – 8 hours. Product of this step (Intermediate II) was filtered after recovery of methanol under reduced pressure.

Step 3: - A mixture of intermediate – II in solvent dimethyl formamide and potassium carbonate was heated to 175 – 180oC. Freon 22 gas was purged for 3 – 4 hours. The mass was cooled to 50 – 60oC and resultant solid was filtered. Chlorine gas was purged to the filtrate for 2 – 3 hours at 65 – 75oC. Dimethyl formamide was distilled off, residue quenched in water and the product of this step (Intermediate III) was obtained by filtration.

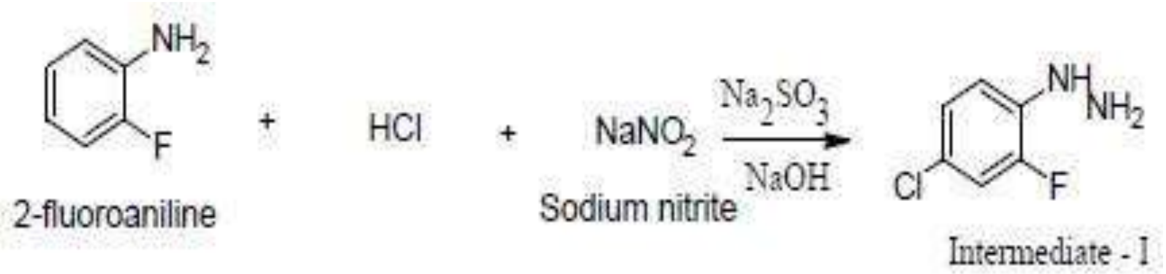
Step 4: - Nitric acid was charged to a mixture containing Intermediate – III in solvent Dichloroethane and Oleum at room temperature. The reaction mass was quenched in water and the resultant product (Intermediate – IV) was obtained by filtration. Solvent Dichloroethane recovered during the process was recycled.

Step 5: - A solution containing intermediate – IV in solvent isopropyl alcohol (IPA) and Pd/C catalyst was pressurized using hydrogen at 70 -80^o C for a period of 11 – 12 hours. The mass was cooled to 50 – 60oC & Pd/C Catalyst was filtered off & recycled. Solvent IPA was distilled, residue was quenched in water and the product (Intermediate-IV) was obtained by filtration.

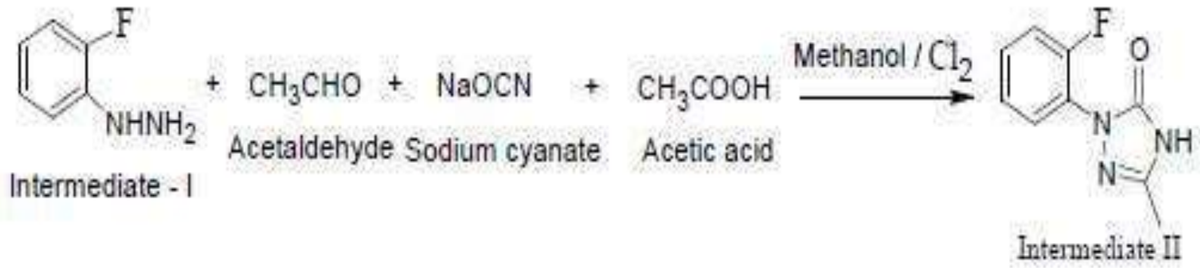
Step 6: - A mixture of intermediate – V, ethyl acrylate and Acetonitrile was charged to the reactor. Mixture was heated to 50 – 60^{o}C and chlorine gas was purged. Acetonitrile was distilled off and the residue was quenched in water & the product was isolated by filtration. Recovered Acetonitrile was recycled was recycled in subsequentbatches.

Chemical Reactions: -

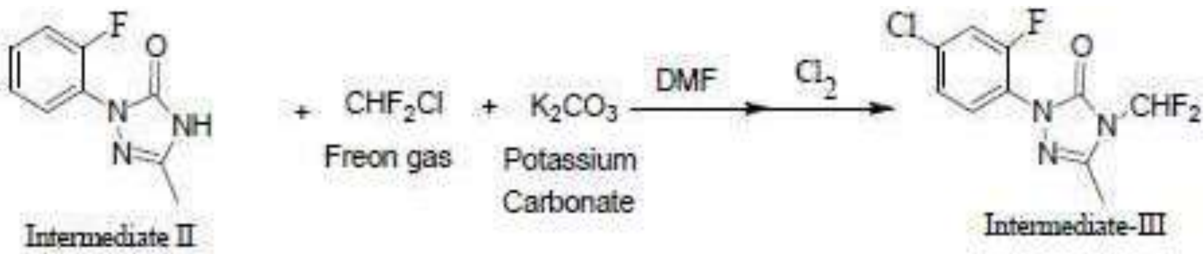
Step 1: -



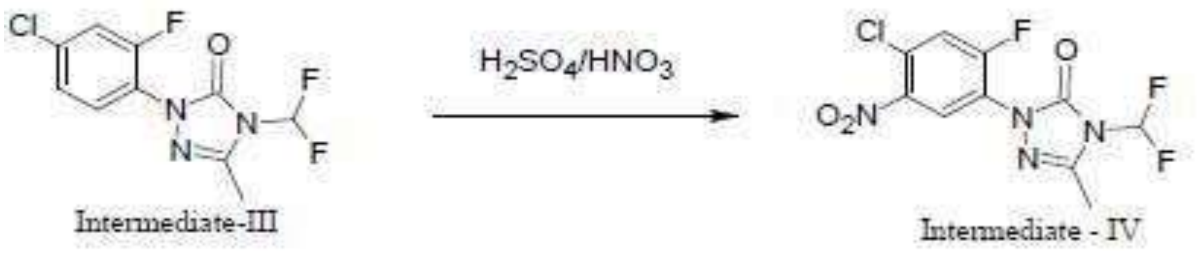
Step 2: -



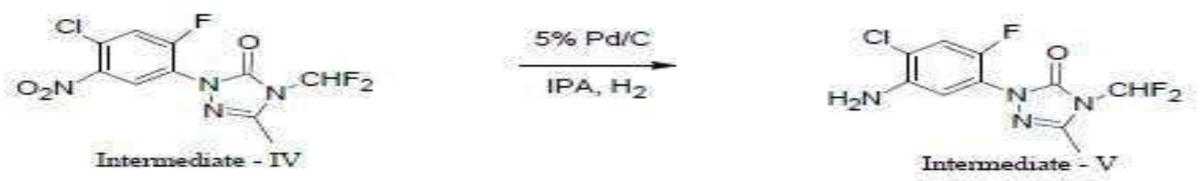
Step 3: -



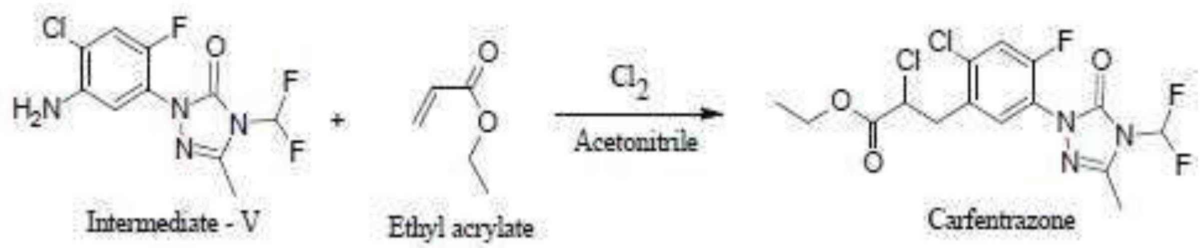
Step 4: -



Step 5: -



Step 6: -



220	Material / Mass Balance of Carfentrazone All Quantities are in kg)			
	IN – PUT		OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch	Product / By product	Kg/Batch
1	2 - Fluor Aniline	730	Carfentrazone	**1000**
2	Sodium Nitrite	460	Aqueous Effluent	6456
3	Hydrochloric Acid	4210	Sodium Sulphite	2852
4	Sodium Sulphite	2710	Water Vapour	5408
5	Caustic Lye Solution	2644	Methanol Recovered	3678
6	Water	4100	Methanol Loss	322
7	20% Sodium Hydroxide Solution	4775	Scrubbed Sodium Hydroxide Solution	3207
8	Acetaldehyde	322	Drying Loss	730
9	Sodium Cyanate	544	Recovered DMF	6141
10	Chlorine Gas	945	DMF Loss	1359
11	Acetic Acid	500	Dichloroethane Recovered	3074
12	Solvent -Methanol	4000	Dichloroethane loss	176
13	10% Sodium Hydroxide Solution	1000	Isopropyl Alcohol Recovered	5249
14	Potassium Carbonate	924	Isopropyl Alcohol Loss	1076
15	Solvent -Dimethyl Formamide	7500	Catalyst Pd/C Recovered	56
16	Dichloro Difluoromethane	665	Spent Acid	12266
17	Chlorine Gas	895	Acetonitrile Recovered	4825
18	Oleum	5565	Acetonitrile Loss	475
19	Nitric Acid	502		
20	Solvent -Dichloromethane	3250		
21	Solvent - Isopropyl Alcohol	6325		
22	Catalyst Pd/C	59		
23	Ethyl Acrylate	425		
24	Solvent - Acetonitrile	5300		
	TOTAL	**58350**	**TOTAL**	**58350**

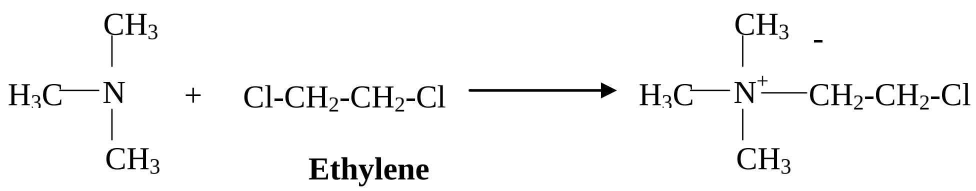
❖ Group-13: Plant Growth Regulators & Rotenticides/HPPD Inhibitors/ Others/ Triazines / PGR/Pyrazoles

221) Chlormequat Chloride

Brief Manufacturing Process: -

Trimethylamine is reacted with Ethylene Dichloride as a reactant as well as used as Solvent also in presence of Catalyst. This reaction gives out Chlormequat Chloride as a final product. After reaction gets completed Excess Ethylene Dichloride is recovered from the reaction mass get pure product. Recovered Ethylene Dichloride is recycled for same product.

Chemical Reactions: -



Trimethylamine (M.W.59.0) **Ethylene Dichloride** (M.W.99.0) **Chlormequat Chloride** (M.W.158.0)

221	Material / Mass Balance of Chlormequat Chloride (All Quantities are in kg)				
	IN-PUT			OUT-PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Trimethyl Amine (27.5)	1380		**Chlormequat Chloride**	**1000**
2	Reactant EDC	630		Recovered Solvent EDC	1950
3	Solvent EDC	2000		Solvent EDC Loss	50
4				Aqueous Water to ETP	1000
5				Organic Residue	10
	TOTAL	**4010**		**TOTAL**	**4010**

222) Ethephon

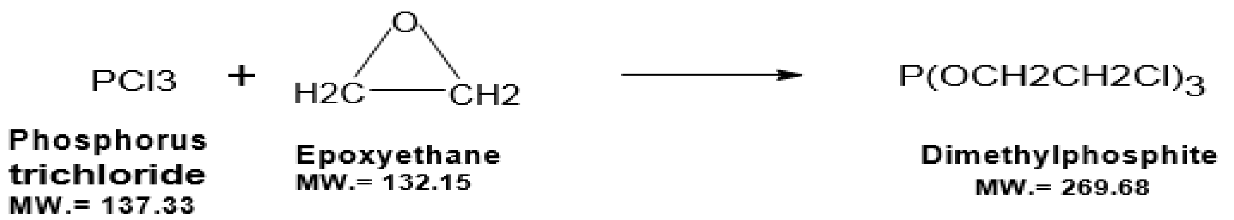
Brief Manufacturing Process: -

Complete the reaction to form Tris (2-Chloroethyl) Phosphite under 1 kg/cm^2 at 20 – 25°C temperature in 5 hrs. Transfer Tris(2-Chloroethyl) Phosphite into another reactor and then slowly heat up to 70 - 80°C temperature. When it reaches the temperature of rearranging reaction, Tris(2-Chloroethyl) Phosphite is converted into Phosphodiester. Cool the mass to 50°C.

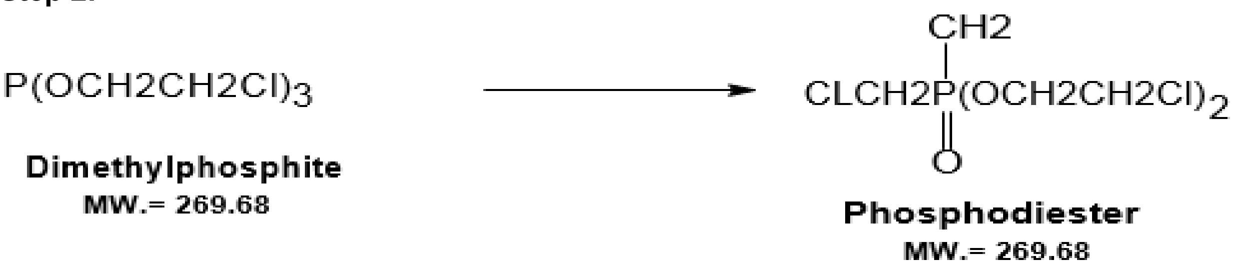
Put Phosphodiester into another reactor, then slowly add Hydrogen Chloridegas at 90 – 95°C for 5 hrs. Dichlorethane generated in reaction process distils out through the condenser and is collected as byproduct. And the Ethephon is collected from reaction mass as a Final Product.

Chemical Reactions: -

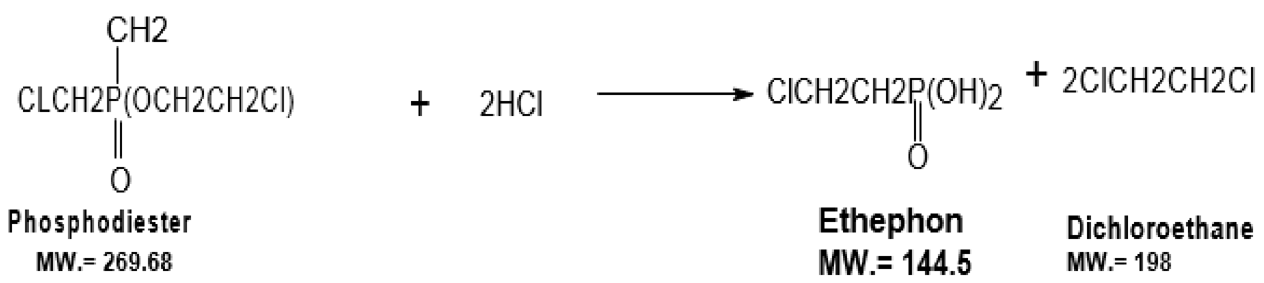
Step 1: -



Step 2: -



Step 3: -



Mass Balance:

222	Material / Mass Balance of Ethephon (All Quantities are in kg)			
	IN – PUT		OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**	**Product / By product**	**Kg/Batch**
1	Epoxyethane	825	Ethephon	**1000**
2	Phosphorus Trichloride	855	Recovered EDC	1075
3	Hydrogen Chloride Gas	460	EDC Loss	30
4	Solvent EDC	1105	Aqueous Layer to ETP	1405
4	Water	265		
	TOTAL	**3510**	**TOTAL**	**3510**

223) Forchlorfenuron

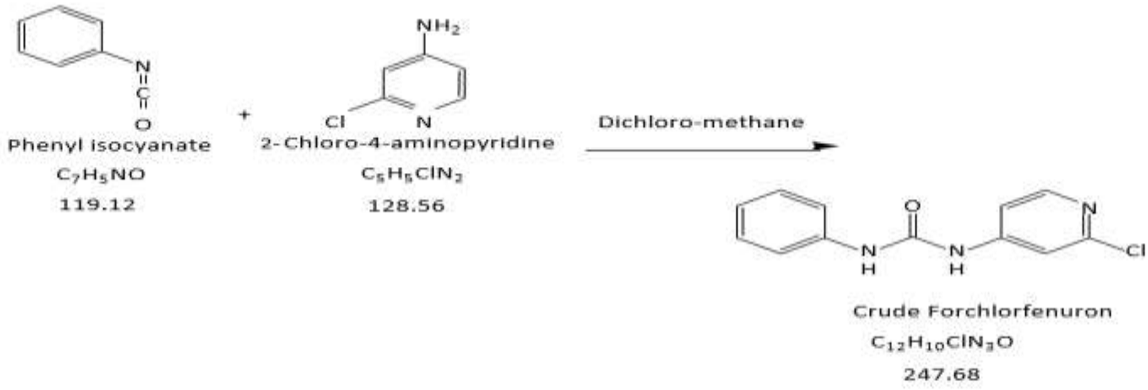
Brief Manufacturing Process: -

Step 1: - Phenyl Iso Cyanate reacts with 2-Chloro-4-Aminopyridine in presence of Dichloromethane to give Crude Forchlorfenuron.

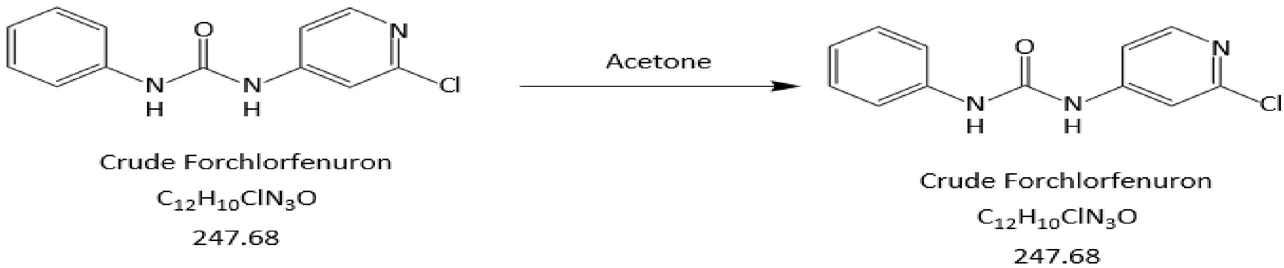
Step 2: - Crude Forchlorfenuron further treated with Acetone and which give pure Forchlorfenuron as a final product.

Chemical Reactions: -

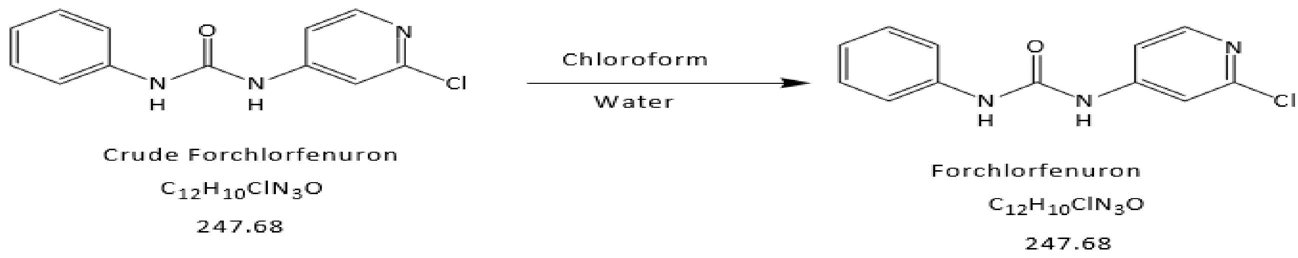
Step 1: -



Step 2: -



Step 3: -



Mass Balance:

223	**Material / Mass Balance of Forchlorfenuron (All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Phenyl Iso Cyanate	575		Forchlorfenuron	**1000**
2	2-Chloro-4-Aminopyridine	640		Recovered Dichloromethane	1190
3	Dichloromethane	1250		Dichloromethane Loss	60
4	Acetone	500		Recovered Acetone	475

5	Chloroform	500	Acetone Loss	25
6	Water	600	Recovered Chloroform	475
7			Chloroform Loss	25
8			Effluent Water	765
9			Organic Residue	50
	TOTAL	**4065**	**TOTAL**	**4065**

224) Mepiquat Chloride

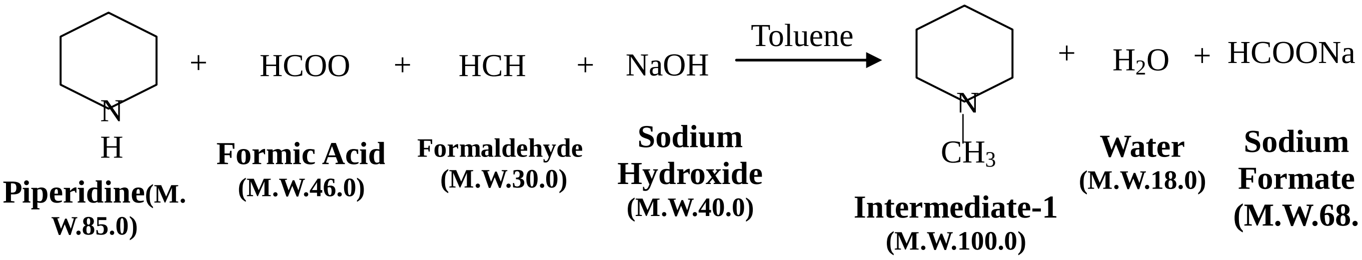
Brief Manufacturing Process: -

Step 1: - Piperidine reacted with Formic Acid as well as Paraformaldehyde in presence of Solvent Toluene. This reaction gives out Intermediate-1. After completion of reaction excess Toluene is recovered from reaction mass.

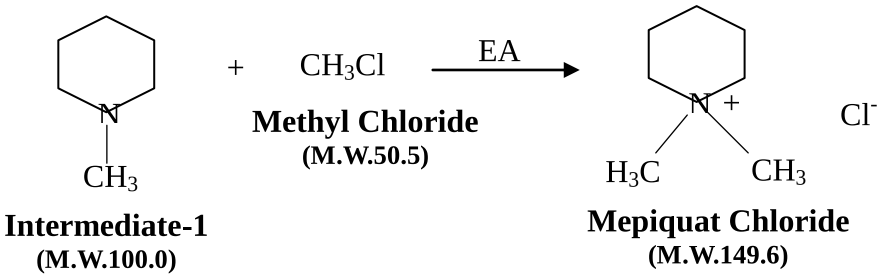
Step 2: - Intermediate-1 further reacted with Methyl Chloride in presence of Solvent Ethyl Acetate. This reaction gives out Mepiquat Chloride as a final product. Excess Ethyl Acetate is recovered from reaction mass to get their Product.

Chemical Reactions: -

Step 1: -



Step 2: -



Mass Balance:

224	**Material / Mass Balance of Mepiquate Chloride (All Quantities are in kg)**			
	IN - PUT		**OUT - PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**	**Product / By product**	**Kg/Batch**
1	Piperidine	600	Mepiquate Chloride	**1000**
2	Formic Acid	322	Recovered Toluene	2900
3	Formaldehyde	210	Toluene Loss	100

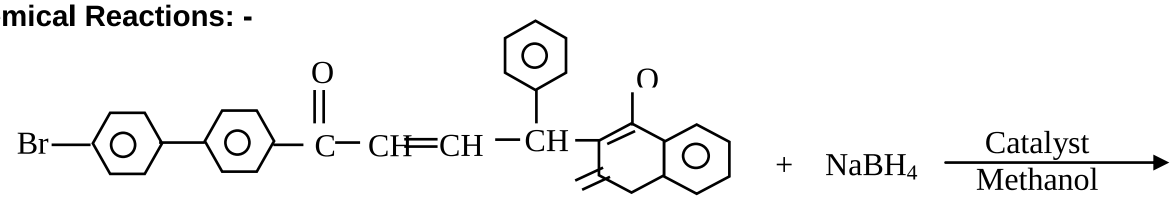
4	Solvent Toluene	3000		Recovered Ethyl Acetate	1940
5	Solvent Ethyl Acetate	2000		Ethyl Acetate Loss	60
6	Caustic Soda Lye	640		Sodium salt of Formic Acid	454
7	Methyl Chloride	353		Aqueous Layer to ETP	643
				Organic Residue	28
	TOTAL	**7125**		**TOTAL**	**7125**

225) Bromadiolone
Brief Manufacturing Process: -

Bromadiolone Ketone undergoes the reduction by Sodium Borohydride in presence of Catalyst and Solvent. This Alkaline mass is then neutralized by Hydrochloric Acid Soln. This neutralized mass is then filtered & Washed. Finally, it is taken for drying to get the final product

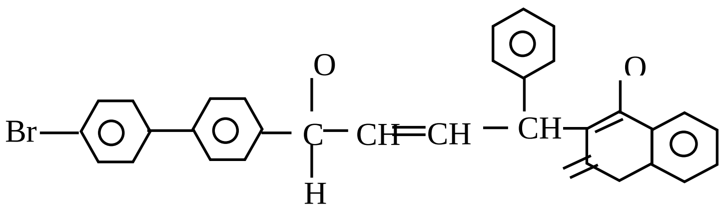
Finally, Toxic Effluent Which contains traces of Pesticides is taken to Hydrolysis stage for Detoxification. Where Aq. Mass is treated at high temp. by Alkali for the rapid Hydrolysis of pesticides to simpler non-toxic compounds.

Chemical Reactions: -



Bromadiolone Ketone
(M.W. 525)

Sodium borohydride
(Sodium Tetra hydro borate)
(M.W. 37.83)



+ $NaBH_2$

Bromadiolone
(M.W. 527.0)

Sodium borohydride
(Sodium Dihydro borate)
(M.W. 35.83)

Mass Balance:

225	Material / Mass Balance of Bromodiolone (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Bromodiolone Ketone	1040		Bromodiolone	**1000**
2	Sodium Tetra Hydro Borate	90		Recovered Methanol	2860
3	Solvent Methanol	3000		Methanol Loss	140
4	Catalyst	5		Drying Loss	20

5	Water for Washing	800		Detixified Mass to ETP	915
	TOTAL	**4935**		**TOTAL**	**4935**

226) Paclobutrazol:

Brief Manufacturing Process: -

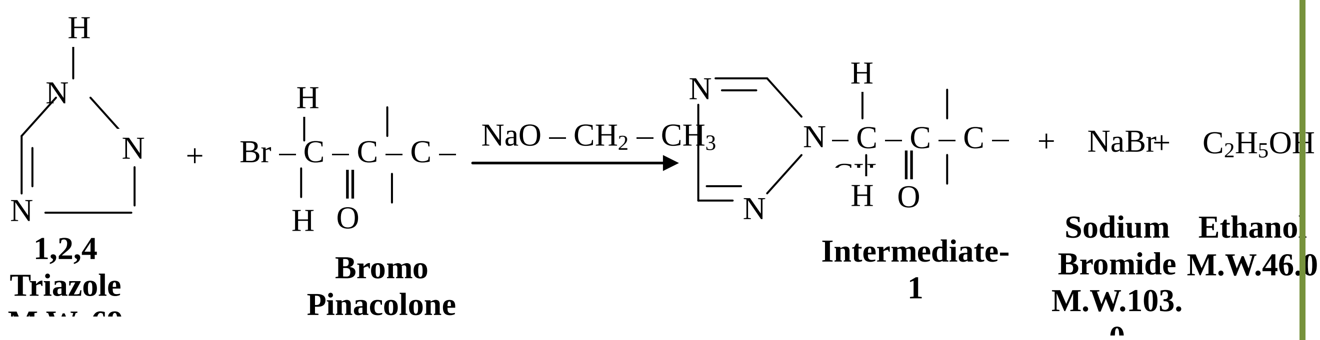
Step 1: -Bromo Pinacolone (Bromo 3,3 Dimethyl 2-Butanone) is reacted with 1,2,4 Triazole in presence of Solvent n-Hexane and Sodium Ethoxide to give 1,2,4 Triazole Butanone Complex as an Intermediate-1.

Step 2: -Intermediate-1 of first step is further undergoes condensation reaction with Para Chloro Benzyl Chloride in presence of Catalyst to give Keto-Derivative of Paclobutrazol.

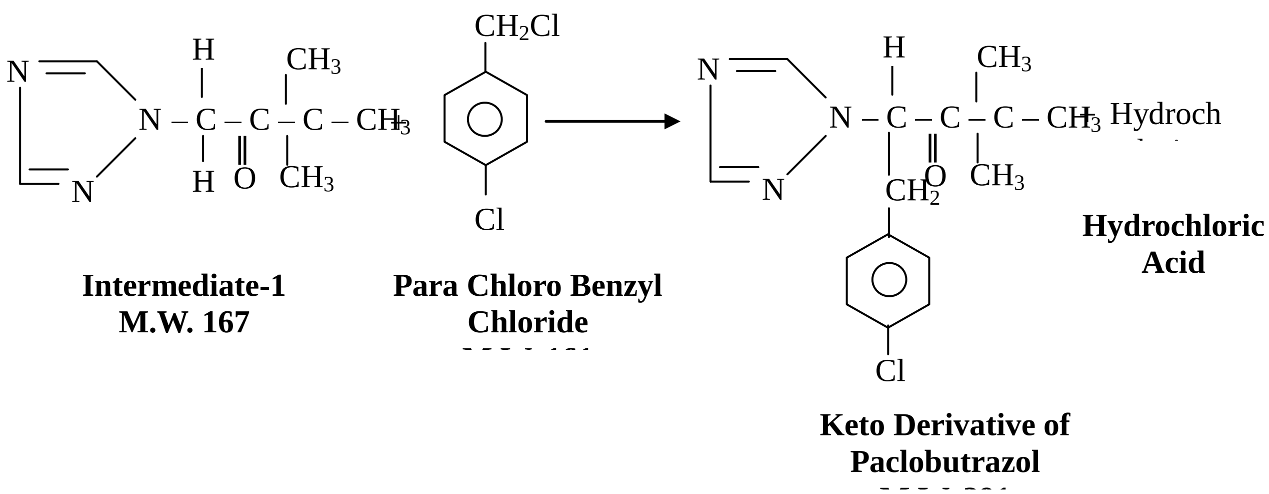
Step 3: - Finally, this Keto-Derivative undergoes reduction by Sodium Borohydride in Alkaline medium to give the final product Paclobutrazol Technical, which is on crystallization from Iso Propyl Alcohol Solvent gives the pure product as Paclobutrazol.

Chemical Reactions: -

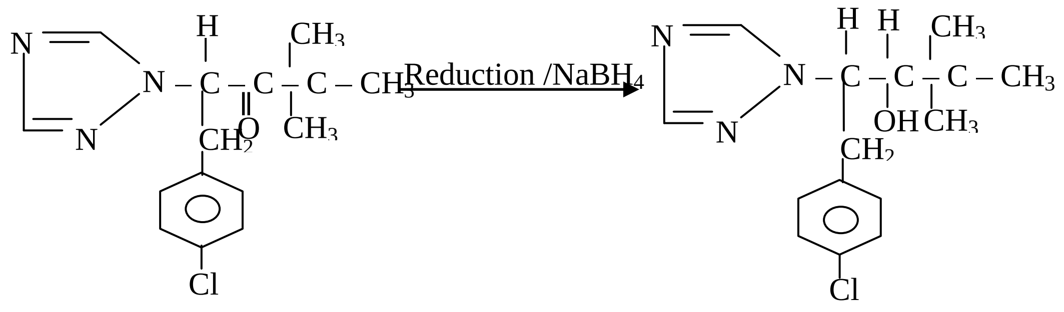
Step 1: -



Step 2: -



Step 3: -



Mass Balance:

226	Material / Mass Balance of Paclobutrazol (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Bromo Pinacolone	716		Paclobutrazol	**1000**
2	Solvent n- Hexane	2500		Recovered n- Hexane	2375
3	1,2,4 Triazole	270		n- Hexane Loss	125
4	Sodium Ethoxide	40		Recovered IPA Solvent	940
5	Para Chloro Benzyl Chloride	602		IPA Loss	60
6	Sodium Hydride	80		28- 30% NaBr Solution	1170
7	Sodium Borohydride	30		30% Hydrochloric Acid Soln	460
8	Solvent- IPA	1000		Recovered Ethanol	170
9	Water for 30 % Hydrochloric Acid Solution	315		Organic Process Residue	78
10	Water for 28 % NaBr Soln	825			
	TOTAL	**6378**		**TOTAL**	**6378**

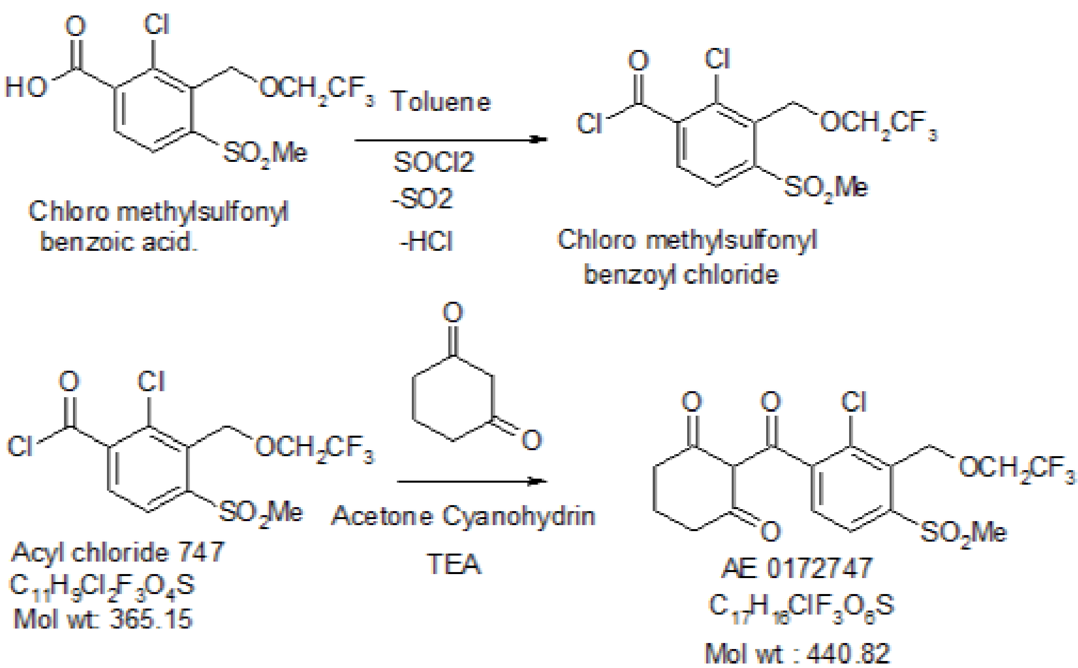
227) Tembotrione:

Brief Manufacturing Process: -

Step 1: - Chloromethyl sulfonyl benzoic acid is taken with Toluene & SOCl2 is added atelevated temperature. During the reaction Sulfur Dioxide &Hydrogen Chloridegas generated is scrubbed in caustic solution. After the reaction is complete excess Thionyl Chloride is distilled with some Toluene under vacuum which is recycled. Product is then taken for next step.

Step 2: - To the mixture of 1, 3 Cyclohexane dione in Toluene & Acid chloride, addition ofTEA & Cyanohydrin (ACH) is done below 40-degree Condensation & Rearrangement reaction takes place simultaneously. Water and Hydrochloric Acid addition is done to remove TEA HCl, ACH & aqs layer separated. Organic layer is treated with NaOH Soln & further Aqueous layer is acidified by Hydrochloric Acid for Crystallization of product. Solid product Tembotrione is filtered & dried under vacuum.

Chemical Reactions: -



227	Material / Mass Balance of Tembotrione All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2-Chloro-3-(2,2,2-Trifluoroethoxymethyl)-4-Methylsulfonylbenzoic Acid	941		Tembotrione	**1000**
2	Toluene	1362		Wastewater to ETP for Evaporator	3823
3	Thionyl Chloride	328		Recovered Triethyl Amine (Recycle)	506
4	Triethyl Amine (TEA)	633		Loss Triethyl Amine	127
5	Acetone Cyanohydrine	44		Recovered Ethanol (Recycle)	2077
6	1,3-Cyclohexadione	371		Loss Ethanol	231
7	Water	3060		Distillation Residue to Incinerator	465
8	Hydrochloric Acid (HCl)	976		Recovered Toluene (Recycle)	2727
9	Sodium Hydroxide	1610		TEA-ACH-Mixture	677
10	Ethanol	2308			
	TOTAL	**11633**		**TOTAL**	**11633**

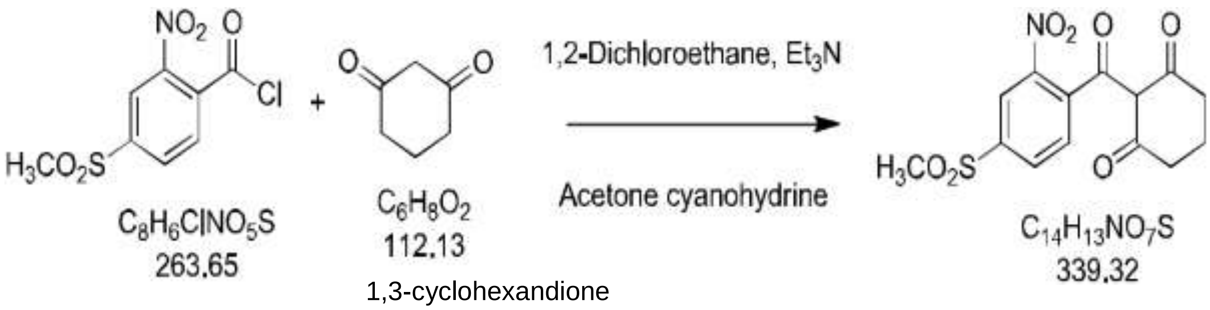
228) Mesotrione:

Brief Manufacturing Process: -

The desired quantities of 1,3-cyclohexadione, EDC, acetone cyanohydrin, Triethyl amine and 2-nitro-4-methylsulfonyl benzoyl chloride under a nitrogen blanket are added in to the reactor. Heated the mass up to desired temperature until reaction is completed.

After the completion of the reaction, cool the reaction mass and water is added. pH is adjusted by sulfuric acid then layers are separated. Organic layer is washed by sodium hydroxide solution and layers are separated. Solvent is recovered from organic layer and recycled. Aqueous layer pH is adjusted by sulfuric acid, Cooled & filtered to get product.

Chemical Reactions: -



1,3-cyclohexandione

2-nitro-4-methylsulfonyl benzoyl chloride

Mesotrione

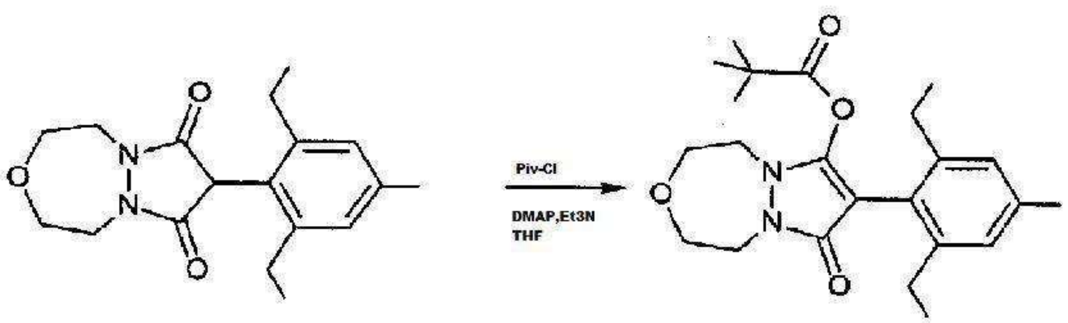
228	Material / Mass Balance of Mesotrione All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	1,3-Cyclohexadione	387		Mesotrione	**1000**
2	Ethylene Dichloride	9000		EDC Recovered	8925
3	Acetone Cyanohydrin	107		EDC Loss	75
4	Triethylamine	100		Residue	301
5	2-Nitro-4-Methylsulfonyl Benzoyl Chloride	914		Aqueous Layer	4860
6	Water	3000		Drying Loss	182
7	Sulphuric Acid	835			
8	10% Sodium Hydroxide Solution	1000			
	TOTAL	**15343**		**TOTAL**	**15343**

229) Pinoxaden:

Brief Manufacturing Process: -

Pinoxaden will be prepared by the reaction of 8-(2,6-Diethyl-4-methylphenyl) tetrahydro-7H-pyrazolo[1,2-d] [1,4,5] oxadiazepine-7,9(8H)-dione (oxadiazepine compound) and pivaloyl chloride in the catalytic presence of 4-dimethylaminopyridine and triethylamine in tetrahydrofuran (THF). The mixture will have stirred at a temperature of 0 °C to 25 °C. After reaction THF will distilled out and the reaction mass will be diluted with tert-butyl methyl ether (MTBE), which then poured intosaturated aqueous sodium chloride solution. Further layer separation and crystallization result into the desired product Pinoxaden Technical.

Chemical Reactions: -



8-(2,6-Diethyl-4-methylphenyl) tetrahydro-7H- pyrazolo[1,2-d] [1,4,5] oxadiazepine-7,9(8H)-dione

Pinoxaden

229	Material / Mass Balance of Pinoxaden All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Oxadiazepine Compound	934		Pinoxaden	**1000**
2	Pivaloyl chloride	458		THF Loss	350
3	4-Dimethylaminopyridine (4-DMAP)	18		THF Recovered	650
4	Triethylamine	607		MTBE Loss	300
5	Tetrahydrofuran (THF)	1000		MTBE Recovered	700
6	Tert-Butyl Methyl Ether (MTBE)	1000		Water Waste	1000
7	20% Sodium Chloride solution (NaCl solution)	250		Salt	60
8	Water	200		Organic waste	407
	TOTAL	**4467**		**TOTAL**	**4467**

230) Clomazone:
Brief Manufacturing Process: -

Step 1: - Charge water and hydroxylamine Hydrochloric Acid and adjust pH to 7−8 with caustic lye. Add 3CPC and caustic lye simultaneously. Filter solid and use for next step.

Step 2: - Chargewaterandstep−1solidandunderstirringaddcausticlye&adjustpH8−9,maintainfor4−5.

Use 4, 4 DMI solutions forstep−3.

Step 3: -
Charge4,4DMIsolutionandaddOCBCandmaintainfor5−6hrs.Coolreactionmassandseparate aqueous layer and organicmass.

Dry Hydrogen Chloride gas is passed in organic mass and maintains for 4−5 hrs, add sodium carbonate and caustic lye and heat mass and add water and maintain temp 70−90^{0}C for 30 minute, separate organic and aqueous layer. Dehydrate organic mass by distillation to get Clomazone Tech.

Chemical Reactions: -

Step1: -

	$C_5H_8Cl_2O$		$NH_2OH.HCl$		2NaOH		$C_5H_{10}ClNO_2$		2NaCl		$2H_2O$
	3Chloro−2,2−Dimethylpropanoyl Chloride	+	Hydroxy−lamine Hydrochloride	+	Caustic		3Chloro−N−Hydroxy 2,2− Dimethyl propanamide	+	Sodium Chloride	+	Water
MW	155		69.5		80		151.5		117		36

STEPに2

	$C_5H_{10}ClNO_2$		NaOH		$C_5H_9NO_2$		NaCl		H_2O
	3Chloro−N−Hydroxy 2,2−Dimethylpropanamide	+	Caustic		4,4−Dimethyl isoxazolidin −3−one (4,4−DM)	+	Sodium Chloride	+	Water
MW	151.5		40		115		58.5		18

STEPに3

	$C_5H_9NO_2$		$C_7H_6Cl_2$		NaOH		$C_{12}H_{14}NO_2Cl$		NaCl		H_2O
	4,4−Dimethyl isoxazolidin−3−one (4,4−DM)	+	O−Cgloro Benzylchloride	+	Caustic		Clomazone isomer	+	Sodium Chloride	+	Water
MW	115		161		40		239.5		58.5		18

STEP-4

	$C_{12}H_{14}NO_2Cl$		HCl		NaOH		$C_8H_5Cl_2NaO_3$		NaCl		H_2O
	Clomazone isomer	+	Hydrochloric Acid	+	Caustic		Clomazone	+	Sodium Chloride	+	Water
MW	239.5		36.5		40		239.5		58.5		18

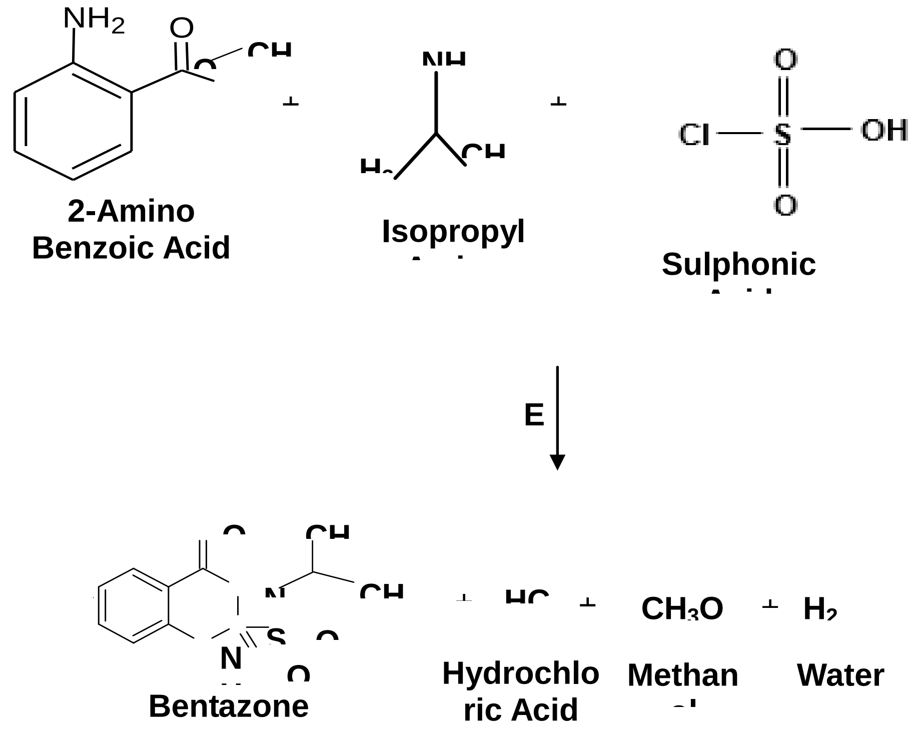
Mass Balance:

230	Material / Mass Balance of Clomazone All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Caustic Flakes	968		Clomazone	**1000**
2	Water for Caustic	2258		Salt Evaporation 1	699
3	3-Chloro−2,2−Dimethylpropanoyl Chloride	830		Salt Evaporation 2	898
4	Hydroxylamine Hydrochloride	460		Organic Residue	218
5	Water	150		Evaporation Losses 1	1075
6	Catalyst	8		Evaporation Losses 2	1708
7	O−Cgloro Benzylchloride	705			
8	Hydrogen Chloride Gas (Dry)	200			
9	Sodium Carbonate	19			
	TOTAL	**5598**		**TOTAL**	**5598**

231) Bentazone:
Brief Manufacturing Process: -

2-Amino benzoic acid is charged in to ethylene dichloride and reacted with isopropyl amine and Chloro sulphonic acid at room temperature for 6 h. Washed with water and concentrate EDC under vacuum and filtered dried to get the desired product.

Chemical Reactions: -



Mass Balance:

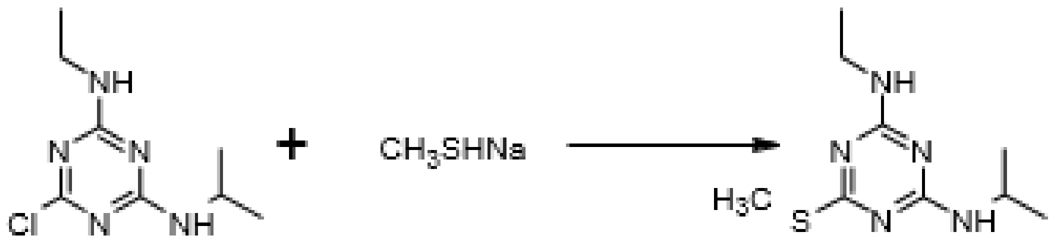
231	Material / Mass Balance of Bentazone All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Amino Benzoic Acid	741		Bentazone	**1000**
2	Isopropyl Amine	304		Recovery EDC	2046
3	Chloro sulphonic Acid	628		Loss EDC	177
4	EDC	2223		Aqueous Waste	1837
5	Water	1500		30% Hydrochloric Acid	593
6	Water for Hydrochloric Acid	415		Methanol	158
	TOTAL	**5811**		**TOTAL**	**5811**

232) Ametryn:

Brief Manufacturing Process: -

Ametryn will be synthesized from the reaction of Atrazine and Sodium Methyl Mercaptan in water and Tetrahydrofuran as solvent at reflux temperature. After reaction Tetrahydrofuran will be removed under reduced pressure. The residue will then have added to water and extracted by dichloromethane. The combined organic extract will have washed with saturated brine. The filtrate will then have concentrated under reduced pressure. The residue was purified by recrystallization from a mixture of methanol and water to afford Ametryn Technical.

Chemical Reactions: -



Atrazine(M.W.215.5) **Sodium Methyl Mercaptan**(M.W.71.0) **Ametryn** (M.W.227.5)

232	Material / Mass Balance of Ametryn All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Atrazine	1511		Ametryn	**1000**
2	20% aq. Sodium Methyl Mercaptan	2222		THF Loss	350
3	Methylene Dichloride (MDC)	1500		THF Recovered	650

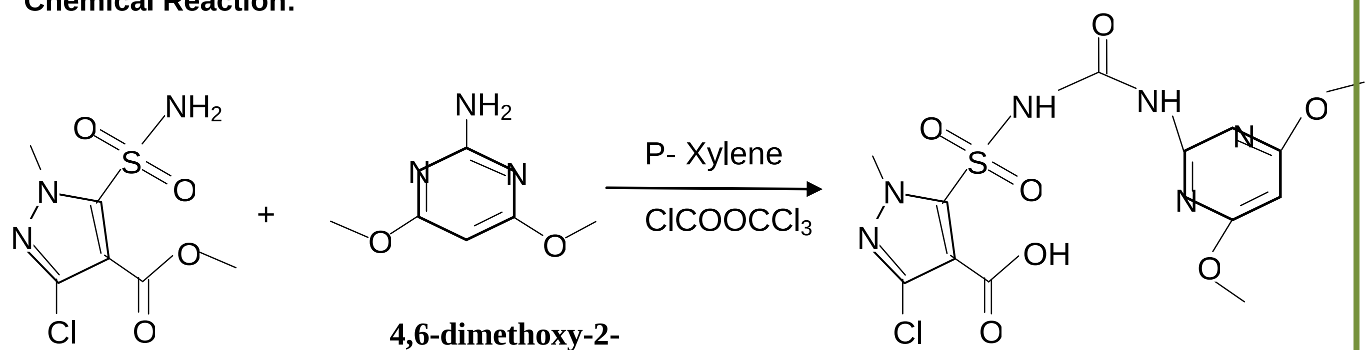
4	Methanol	1000		MDC Loss	535
5	Tetrahydrofuran (THF)	1000		MDC Recovered	965
6	2% Sodium Chloride solution (NaCl solution)	1000		Methanol Loss	200
7	Water	500		Methanol Recovered	800
8				Water Waste	1700
9				Organic waste	2533
	TOTAL	**8733**		**TOTAL**	**8733**

233) Halosulfuron

Brief Manufacturing Process:

Halosulfuron-Methyl will be synthesis from 3-Chloro-1-Methyl-5-Sulfonamide Group-4- Pyrazole Carboxylic Acid Methyl ester which will reacted with N-Butyl Isocyanate in presence of P- Xylene as Solvent and Tri Ethylene Diamine as Catalyst. At 140 °C add Trichloromethyl Chloroformate drop wise. After reaction distil P-Xylene to obtain the residue. This residue will dissolve in Acetonitrile and added then4, 6-Dimethoxy-2-Pyrimidinamine drop wise at 20-25 °C, after stirring for 24 h, filter out the cake and wash with chilled Acetonitrile, which will on drying result in Halosulfuron-Methyl TC.

Chemical Reaction:



3-Chloro-1-Methyl-5-Sulfonamide Group-4-Pyrazole Carboxylic Acid Methyl ester + **4,6-dimethoxy-2-pyridinamine** → **Halosulfuron M.W.421.0**

233	Material / Mass Balance of Halosulfuron (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product/ Byproduct**	**Kg/Batch**
1	3-Chloro-1-Methyl-5-Sulfamoyl-1H-Pyrazole-4-Carboxylic AcidMethylEster	727		**Halosulfuron**	**1000**
2	4,6-Dimethoxy-2-Pyrimidin Amine	435		Recovered Acetonitrile	3270
3	N-ButylIsocyanate	277		Acetonitrile Loss	363
4	TriethyleneDiamine	17		Recovered P-Xylene	1317
5	TrichloromethylChloroformate	834		P-Xylene Loss	16

6	P-Xylene	1333		Residue	1290
7	Acetonitrile	3633		Effluent	1455
8	Ethoxy Methyl Chloride	255			
9	Water	1200			
	Total	**8711**		**Total**	**8711**

234) Iodosulfuron-methyl/ Iodosulfuron

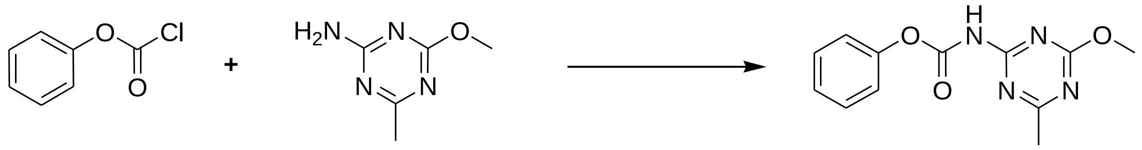
Brief Manufacturing Process:
Step:1-

The Solvent Dichloroethane and 2-Amino-4-Methoxy-6-Methyl-1,3,5-Triazine (2-AMMT) are charged. The temperature is raised to 50^{o}C and Phenyl Chloroformate is added for 2 hours. The reaction mass is maintained at reflux for 4 hours. The by-product Hydrogen Chloridegas is scrubbed in water. After completion of the reaction, the mass is cooled to 60^{o}C.

Step:2-

Benzoic Acid, 2-(Aminosulfonyl)-4-Iodo-, Methyl Ester (BAASIME) is added for 6 hours. The reaction mass is maintained for 4 hours to complete. The by-product HCl is scrubbed in water. After completion of the reaction, water is charged and the aqueous phase is separated. The organic phase is cooled to 10^{o}C and the slurry is filtered. The wet cake is dried to obtain Iodosulfuron-Methyl TC.

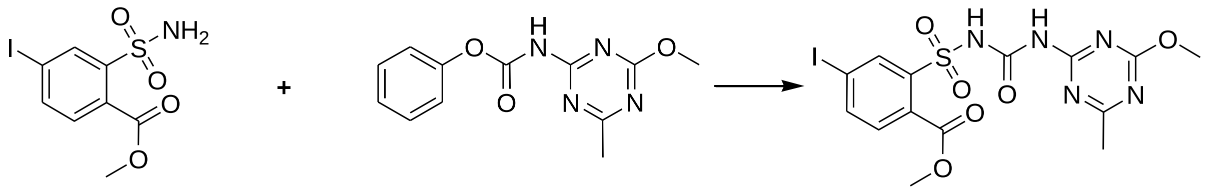
Chemical Reaction:



phenyl chloroformate
$C_7H_5ClO_2$
Mol. Wt.: 156.57

2-amino-4-methoxy-6-methyl-1,3,5-triazine
$C_5H_8N_4O$
Mol. Wt.: 140.14

phenyl N-(4-methoxy-6-methyl-1,3,5-triazin-2-yl)carbamate
$C_{12}H_{12}N_4O_3$
Mol. Wt.: 260.25



Benzoic acid, 2-(aminosulfonyl)-4-iodo-, methyl ester
$C_8H_8INO_4S$
Mol. Wt.: 341.12

phenyl N-(4-methoxy-6-methyl-1,3,5-triazin-2-yl)carbamate
$C_{12}H_{12}N_4O_3$
Mol. Wt.: 260.25

IODOSULFURON-METHYL
$C_{14}H_{14}IN_5O_6S$
Mol. Wt.: 507.26

234	Material / Mass Balance of Iodosulfuron-methyl (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product/ Byproduct	Kg/Batch
1	2-Amino-4-Methoxy-6-Methyl-1,3,5-Triazine	350		**Iodosulfuron-Methyl**	**1000**
2	Benzoic Acid, 2-(Aminosulfonyl)-4-Iodo-, Methyl Ester	750		Recovered Dichloroethane	2900
3	Dichloroethane	3000		Dichloroethane Loss	100
4	Phenyl chloroformate	390		30% Hydrochloric Acid	535
5	Water	1500		Organic Residue	100
6	Water for Hydrochloric Acid	375		Drying Loss	50
				Aqueous Layer to ETP	1680
	Total	**6365**		**Total**	**6365**

❖ **GROUP- 14: Advance Specific Pesticide Intermediates**

235) Meta-Phenoxy Benzaldehyde (MPB / MPBAD): -

Brief Manufacturing Process: -

Step – 1: - Benzaldehyde (BZH) undergoes Chloro -Bromination reaction by means of Bromine as well as Chlorine in presence of Anhydrous Aluminium Chloride as well as Solvent- Ethylene Dichloride (EDC) to form Meta Bromo Benzaldehyde (MBB) Organic mass is quenched in 3-4 % Hydrochloric Acid Solution and washed with Sodium Thio Sulphate. Hydrochloric Acid generated during reaction and quenching is scrubbed with water to form 28 – 30 % Hydrochloric Acid Solution which is recycled to quenching stage again. Aluminium Chloride Solution of 25-30 % w/w is generated as by-product.

Step – 2: - MBB formed at first Step is converted into Meta Bromo Benzyl Acetal (MBBA) in presence of Mono Ethylene Glycol (MEG) in presence of Catalyst & Solvent - Toluene.

Step – 3: - Potassium Phenate (K-Phenate) is formed by the reaction of Phenol and Potassium Hydroxide (KOH). K-Phenate in turns reacts with MBBA to form Meta-Phenoxy Benzyl Acetate (MPBA). KBr Solution is formed during this reaction which is used for Bromine recovery. Recovered Bromine liquid is recycled in MBB stage.

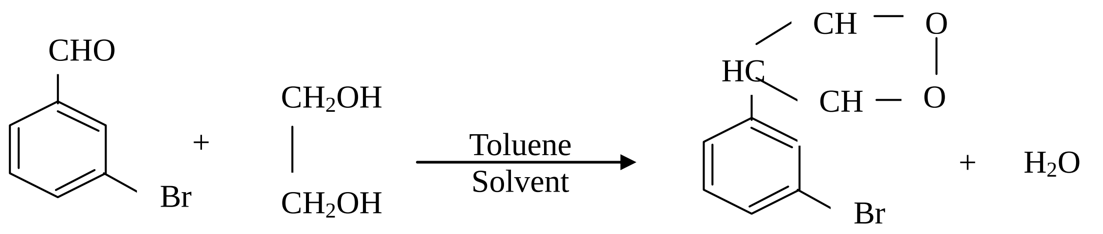
Step – 4: - MPBA is converted into Meta Phenoxy Benzaldehyde (MPBAD) by hydrolysis with H_2SO_4. Aqueous MEG liberated is distilled and recycled in MBBA stage.

Chemical Reactions: -

Step:1 :-

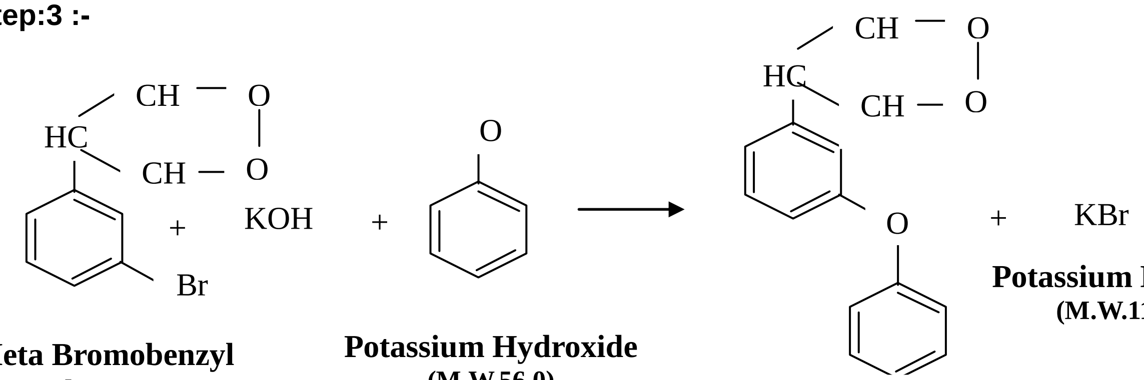
Benzaldehyde (M.W.105.0) + **Bromine** (M.W.159.8) + **Chlorine** (M.W.70.9) → **Meta-Bromo Benzaldehyde** (M.W.185) + **Hydrochloric Acid** (M.W.36.5)

Step:2 :-



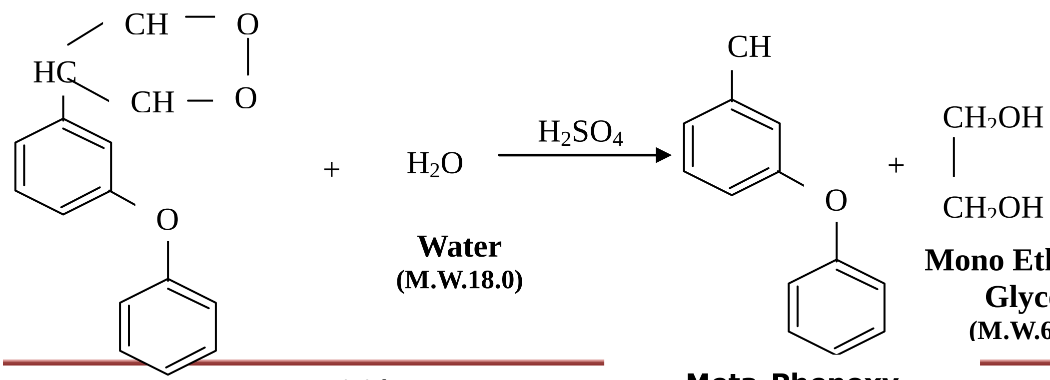
Meta-Bromo Benzaldehyde (M.W.185) + **Mono Ethylene Glycol** (M.W.62) → **Meta Bromobenzyl Acetal** (M.W.229) + **Water** (M.W.18)

Step:3 :-



Meta Bromobenzyl Acetal (M.W.229.0) + **Potassium Hydroxide** (M.W.56.0) → Meta-Phenoxy Benzyl Acetate(M.W.242.0) + **Potassium Bromide** (M.W.119.0)

Step:4 :-



Meta-Phenoxy Benzyl Acetate (M.W.242.0) + **Water** (M.W.18.0) → **Meta-Phenoxy Benzaldehyde Acetate** (M.W.229.0) + **Mono Ethylene Glycol** (M.W.62.0)

235	Material / Mass Balance of m-Phenoxy Benzaldehyde All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Benzaldehyde	750		m-Phenoxy Benzaldehyde	**1000**
2	Ethylene Dichloride	2200		Recovered EDC	2050
3	Catalyst Aluminium Chloride	1230		Vent & Handling Loss	73
4	Bromine	550		Effluent to ETP	1520
5	Chlorine gas	260		Recovered MEG	348
6	30%Hydrochloric Acid Soln	20		Wash Water recycle	842
7	Water	7530		Recovered Toluene	2015
8	Mono Ethylene Gylcol (MEG)	570		Aqueous Layer (Bromine Recovery)	3383
9	Catalyst (Cuprous Chloride)	20		Vent Loss	155
10	Toluene	2090		Residue	231
11	Phenol	560		Aluminium Chloride Soln	5318
12	Pottasium Hydroxide	340			
13	Sulfuric Acid	790			
14	Caustic Lye	25			
	TOTAL	**16935**			**16935**

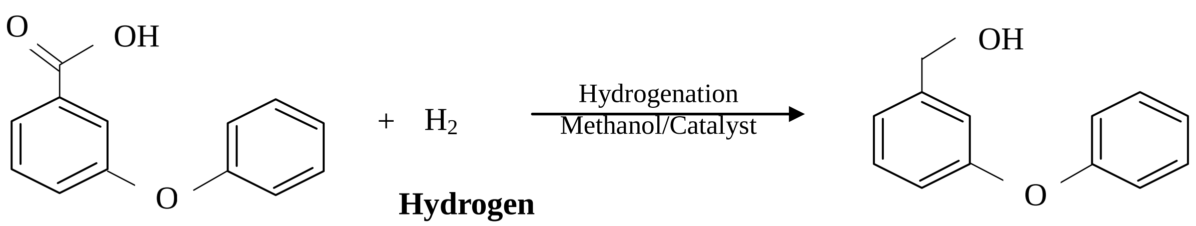
236) Meta-Phenoxy Benzyl Alcohol: -

Brief Manufacturing Process: -

Meta-Phenoxy Benzaldehyde undergoes Hydrogenation reaction by Hydrogen in presence of Methanol to give Product Meta-Phenoxy Benzyl Alcohol.

After the reaction gets completed excess Methanol and catalyst in reaction mass are recovered by distillation and crude product is distilled out to get the pure product.

Chemical Reactions: -



Hydrogen
(M.W.2)

Meta-Phenoxy Benzaldehyde
(M.W.198)

Meta-Phenoxy Benzayl Alcohol
(M.W.200)

Mass Balance:

236	Material / Mass Balance of m-Phenoxy Benzyl Alcohol (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Methanol	2000		m-Phenoxy Benzyl Alcohol	**1000**
2	m-Phenoxy Benzaldehyde	1000		Methanol Recovered	1940
3	Hydrogen	30		Methanol Loss	60
4	Catalyst	3		Hydrogen Loss	5
				waste water to ETP	18
				Tarry Waste	8
				Recovered Catalyst	2
	TOTAL	**3033**		**TOTAL**	**3033**

237) Cypermethric Acid Chloride (CMAC): -

Brief Manufacturing Process: -

Step – 1: - Acrylonitrile (ACN) and Carbon Tetrachloride (CTC) are reacted in presence of Acetonitrile –Solvent &Catalyst at elevated temperature and pressure to give Tetra Chloro Butyronitrile (TCBN). Crude TCBN is separated as Organic Layer. This organic layer is distilled under vacuum to recover mixture of Carbon Tetrachloride and Acetonitrile as first cut and Distilled TCBN as main cut. The mixture is completely recycled back at Crude TCBN Reaction stage.

Step – 2: - Purified TCBN is hydrolysed by water at elevated temperature in presence of Acid and converted to Tetra Chloro Butyric Acid (TCBA). TCBA is further extracted in Toluene. Toluene is further stripped off and recycled at reaction stage, using vacuum distillation.

Step – 3: - Thionyl Chloride chlorinates TCBA in presence of Catalyst to make TCB Acid Chloride (TCBACL). During this reaction Hydrogen Chloride as well as Sulfur Dioxide gases are generated which are scrubbed with Water& Caustic Solution respectively to form 28-30 % Hydrochloric Acid Solution as well 20 % Sodium Sulphite Solution.

ORTCBA is undergoes chlorination reaction by Phosphorus Pentachloride (PCl_5) which is formed in-situ by utilising Phosphorus Tri Chloride (PCl_3) & Chlorine.

By product Phosphorus Oxy- chloride is removed by distillation from crude TCBACL, which is sent for further purification to get commercial grade quality. On the other hand, crude TCBACL is distilled under high vacuum and elevated temperature to remove the traces of the impurities.

Step – 4: - Distilled Tetra Chloro Butyric Acid Chloride is reacted with Isobutylene at high temperature in presence of Tri Ethyl Amine (TEA) & n-Hexane as Solvent and is converted to 2-Chloro Cyclo Butanone (2-CB). TEA is recovered for reuse from aqueous layer of TEA + HCl by Caustic wash, distillation and demoisturization.

Step - 5: -2-Chloro Cyclo Butanone in Hexane is further concentrated by Hexane recovery. This recovered Hexane is recycled at 2-CB and 4-CB stage. Concentrated 2-CB isomerized in presence of catalyst and TEA as well Fluoro Catalyst to 4-Chloro Cyclobutanone (4-CB).

Step -6: - 4- CB is reacted with Caustic Soda Solution at elevated temperature to form Sodium Salt of DVA/ CMA (DVA Na). DVA Na is separated as aqueous layer from the reaction mass & Hexane is recovered for reuse by distillation of the organic layer.

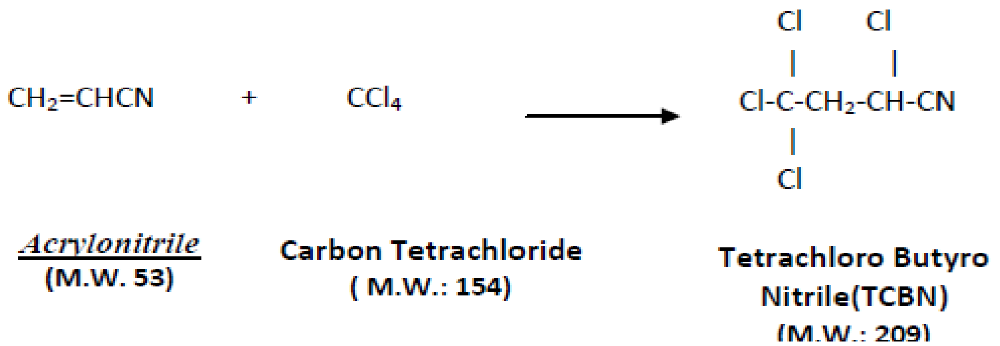
Step – 7: - DVA Na is acidified with Sulphuric Acid / Hydrochloric Acid Solution using Hexane as Solvent to give DVAcid / CMA which is separated as organic layer along with Hexane from the reaction mass. Organic layer is then given mild caustic washes to remove the traces of impurities from DV Acid (CMA). Hexane is recovered from this organic layer by distillation, which gives concentrated DVAcid (CMA).

Step – 8: - DVAcid (CMA) is chlorinated by Thionyl Chloride in presence of Solvent – Hexane and catalyst at elevated temperature to obtain DVA Chloride (DVACl). Hydrogen Chloride andSulfur Dioxide Gases are liberated during this chlorination which are scrubbed to Water& Caustic Solution scrubbers to get 28-30 % Hydrochloric Acid solution as well as 20 % Sodium Sulphite Solution respectively.

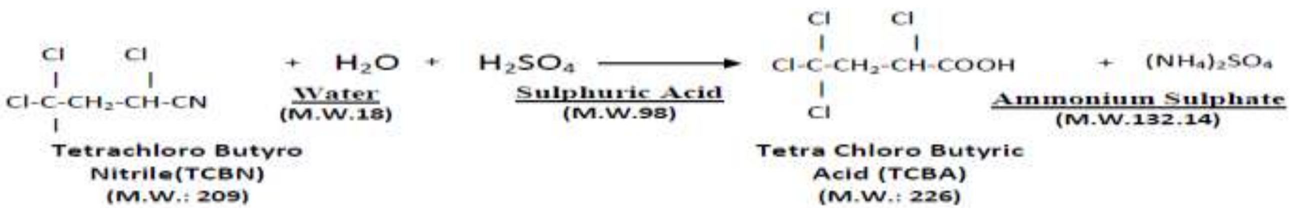
Crude DVACl is finally taken for Hexane recovery & this recovered Hexane is recycled to process. Finally, crude DVACl / CMAC is taken for fractional distillation under high vacuum at elevated temperature to get purified DVACl / CMAC.

Chemical Reaction: -

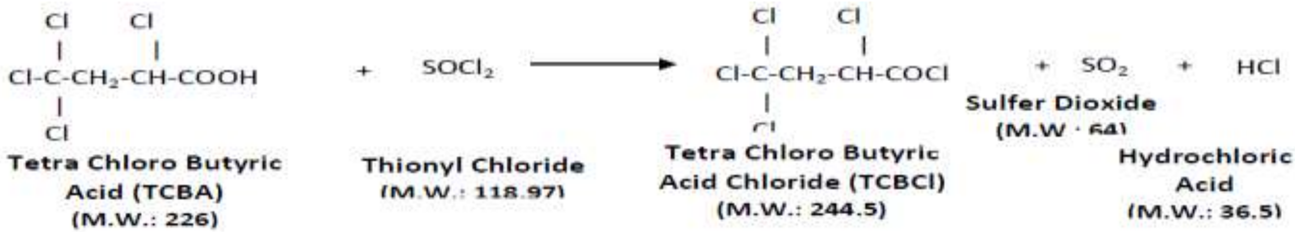
Step:1



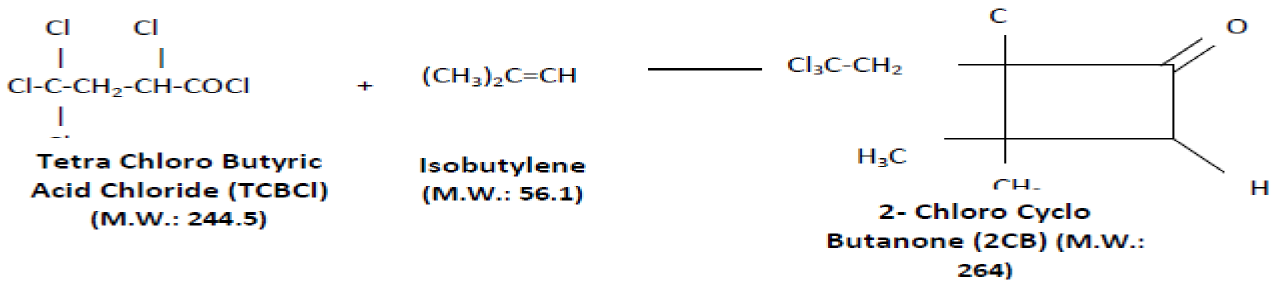
Step:2



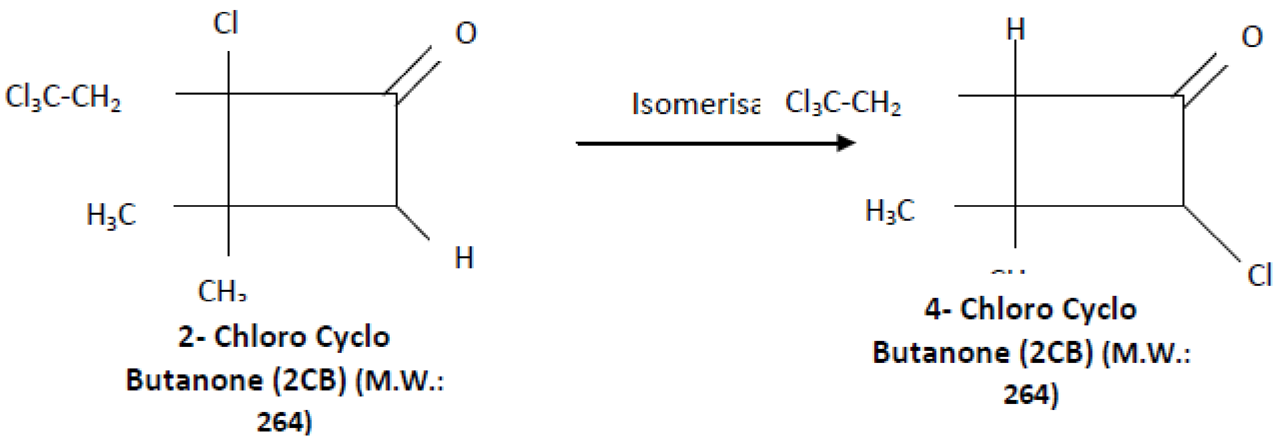
Step:3



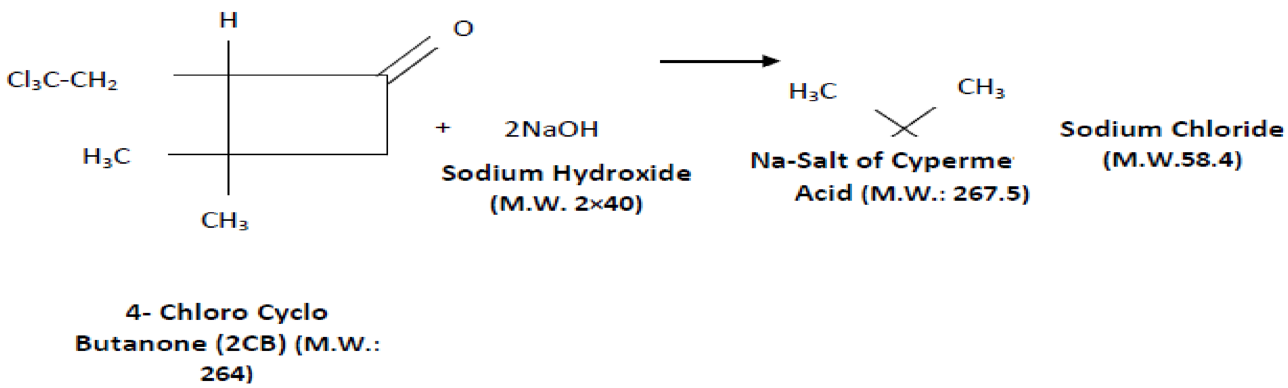
Step:4



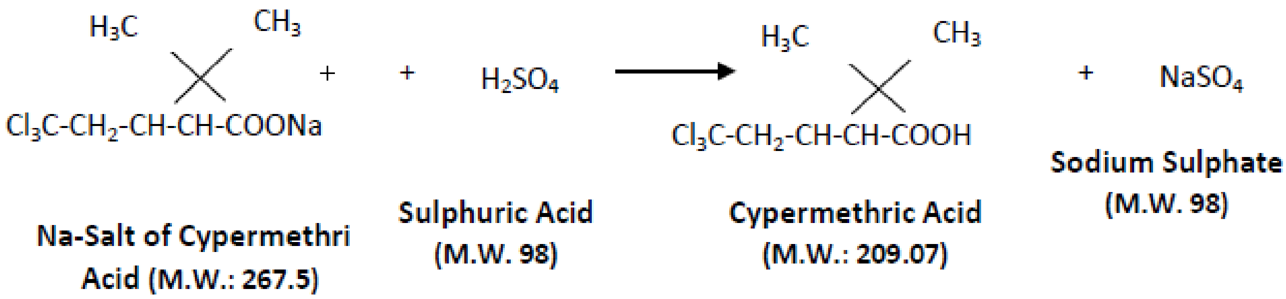
Step:5



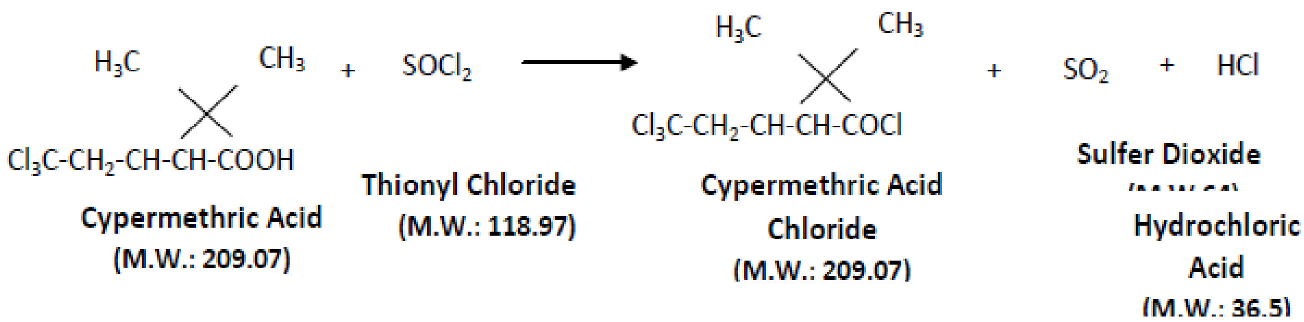
Step:6



Step:7



Step:8



Mass Balance:

237	**Material / Mass Balance of Cypermethric Acid Chloride (All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Acrylonitrile	530		Cypermethric Acid Chloride	**1000**
2	Carbon Tetra Chloride (CTC)	1965		Recovered Solvent - CTC	465
3	Acetonitrile	250		Solvent Loss (CTC)	50
4	Catalyst - 1	20		Recovered Solvent - Acetonitrile	174
5	Catalyst - 2 DEA HCl	25		Solvent Loss (Acetonitrile)	76
6	Ammonia Liquor (25 %)	30		Spent Sulfuric Acid	3298
7	Sulfuric Acid (98 %)	2236		Sodium Sulphite Solution (20 %)	10650
8	Thionyl Chloride	1905		HCl Solution (30 %)	2236
9	Caustic Lye (46 – 48 %)	5860		Recovered Solvent – TEA	736
10	Catalyst - 3	25		Solvent Loss (TEA)	94
11	Isobutylene	496		Recovered Solvent - n-Hexane	11145
12	Tri Ethyl Amine (TEA)	830		Solvent Loss (n-Hexane)	685
13	Solvent – n-Hexane	11830		Isobutylene Loss	46
14	Sodium Bi Carbonate	250		Aqueous Layer to ETP	1580
15	Catalyst - 4 BF3 Etherate	25		Distillation Residue	25
16	Catalyst - 5 DMF	15			
17	Catalyst - 6 TEBA	18			

18	Catalyst - 7 -n TBAB	25			
19	Caustic Soda Flakes	285			
20	Water for Reaction & Washing	5640			
	Total	**32260**		**Total**	**32260**

238) 2-Chloro-5-Chloromethyl Pyridine (CCMP)
Brief Manufacturing Process: -

Part –I (2-Chloro 5-Methyl Pyridine (CMP)): -

Step 1: - Benzyl Amine undergoes condensation reaction with Propanaldehyde to give an intermediate as Imino Derivative.

Step 2: - Imino intermediate on reaction with Acetic Anhydride gives an intermediate as Acetaldehyde.

Step 3: - Acetaldehyde on Cyclization reaction presence of Phosphorus Oxy Chloride and Solvent gives the Products CMP along with Bi product as Benzyl Chloride.

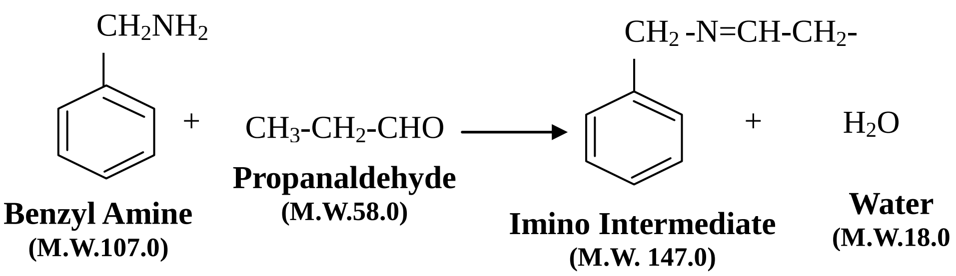
Part-II (2-Chloro 5-Chloro ethyl Pyridine (CCMP)): -

Step 4: -Chloro Methyl Pyridine (CMP) undergoes selective Chlorination by Chlorine gas in presence of Catalyst to give 2-Chloro 5-Chloromethyl Pyridine (CCMP). During this chlorination reaction Hydrochloric Acid gas in generated which is scavenged by putting excess quantity of TEA. This TEA is recovered after treatment of Caustic Soda Lye & Distillation & recycled back to fresh Batches.

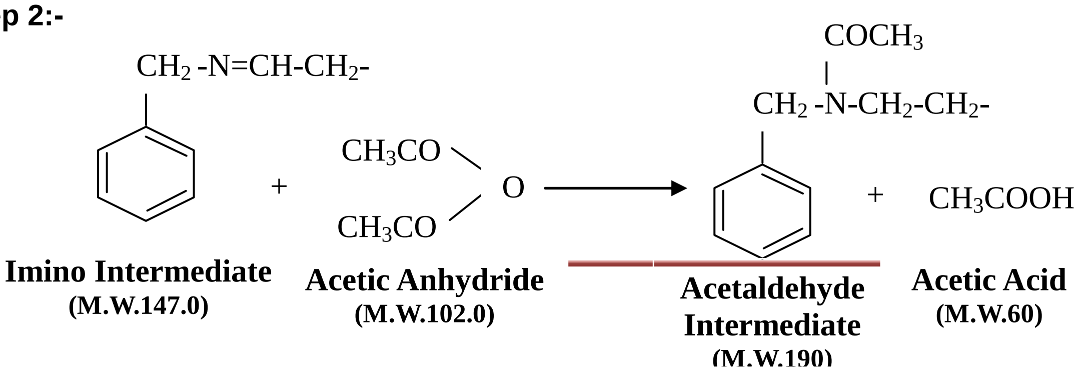
Chemical Reactions: -

Part – 1

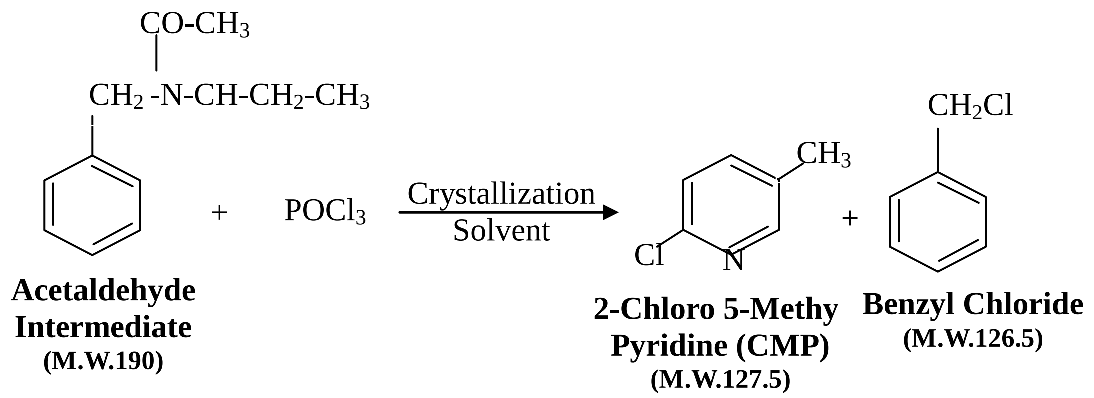
Step 1:-



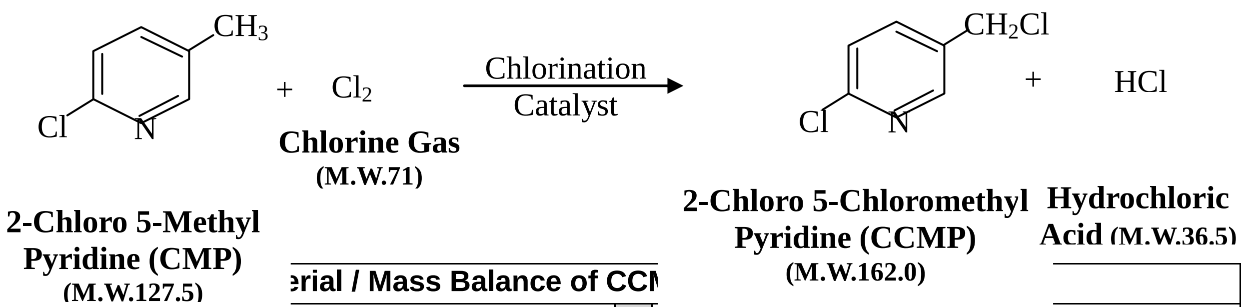
Step 2:-



Step 3:-



Part – 2
Step 4 :-



M

2 ...erial / Mass Balance of CCM...

	IN-PUT			
Sr. No.	**Raw Materials / Items**	**Kg/Batch**	**Product / By product**	**Kg/Batch**
1	Benzyl Amine	912	CCMP	**1000**
2	Catalyst – 1	15	Recovered Solvent Toluene	1925
3	Propanaldehyde	494	Solvent Loss Toluene	75
4	Solvent - Toluene	2000	Benzyl Chloride	850
5	Acetic Anhydride	802	Recovered Solvent DMF	1450
6	Solvent - DMF	1500	Solvent Loss DMF	50
7	Tri ethyl Amine	950	Recovered TEA	902
8	Solvent - EDC	3000	TEA Loss	48
9	Solvent - Acetonitrile	2000	Recovered Solvent EDC	2870
10	Phosphorus Oxy Chloride	2125	Solvent Loss EDC	130
11	Chlorine Gas	330	Phosphoric Acid	2610
12	Catalyst – 2	10	Acetic Acid	370
13	Caustic Lye 47%	1000	Recovered Solvent Acetonitrile	1900
14	Water for Hydrochloric Acid	550	Solvent Loss Acetonitrile	100
15	Water	270	Aqueous Layer to ETP	1638
			Distillation Residue	40
	TOTAL	**15958**	**TOTAL**	**15958**

239) 55) 2-Chloro 5-Chloromethyl Thiazole (CCMT)

Brief Manufacturing Process: -

Step-1: Allyl Chloride undergoes chlorination reaction with Chlorine in presence of 30% Hydrochloric Acid Solution which is used as Solvent media to give 1,2,3 Trichloro Propane.

Step- 2: Tri Chloro Propane further undergoes De-Hydro Halogenation reaction by the reaction with Caustic Soda Lye Solution gives Dichloro Propene.

Step -3: - Dichloro Propene further reacts with Potassium Thiocyanate to give Chloro Isothiocyanate (CITC) intermediate.

Step- 4: - CITC finally undergoes cyclization reaction by the action of Cyclization Agent as Sulfuryl Chloride to give the final product as 2-Chloro 5-Chloromethyl Thiazole (CCMT).

Chemical Reactions: -

Step 1 :-

$$CH_2{=}CH{-}CH_2Cl \quad + \quad Cl_2 \xrightarrow{\text{Chlorination}} ClCH_2{-}CHCl{-}CH_2Cl$$

Allyl Chloride (M.W.76.5) + **Chlorine Gas (M.W.71.0)** → **1,2,3 Trichloro Propane (M.W.147.5)**

Step 2 :-

$$ClCH_2{-}CHCl{-}CH_2Cl \quad + \quad NaOH \xrightarrow{\text{De-Hydro Halogenation}} ClCH_2{-} \quad + \quad NaC \quad + \quad H_2O$$

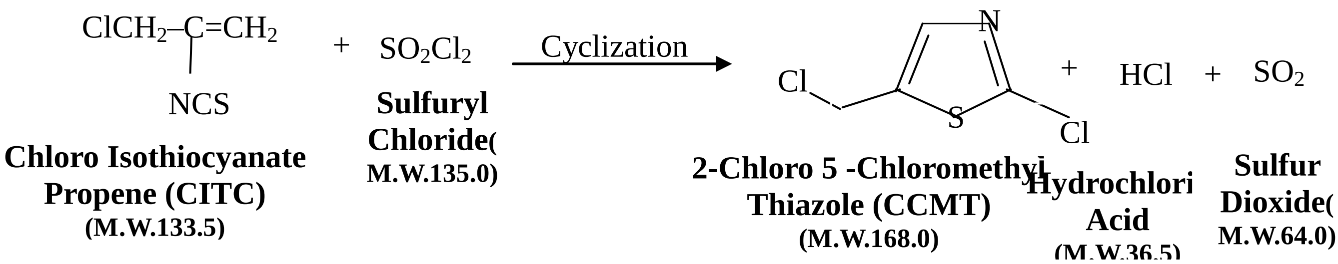
1,2,3 Tri Chloro Propane (M.W.147.5) + **Sodium Hydroxide (M.W.40.0)** → **Dichloro Propene (M.W.111.0)** + **Sodium Chloride (M.W.58.5** + **Water (M.W.18.0)**

Step 3 :-

$$ClCH_2{-}CCl{=}CH_2 \quad + \quad KSCN \longrightarrow ClCH_2{-}N{=}C{=}S \quad + \quad KCl$$

Dichloro Propene (M.W.111.0) + **Potassium Thiocyanate (M.W.97.0)** → **Chloro Isothiocyanate Propene (CITC)** + **Potassium Chloride (M.W. 74.5)**

Step 4 :-



Mass Balance:

239	Material / Mass Balance of CCMT (2-Chloro 5-Chloromethyl Thiazole) (All Quantities are in kg)				
	IN-PUT			OUT-PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Allyl Chloride	1150		CCMT	1000
2	30% Hydrochloric Acid Solution	1350		Recovered Solvent MDC	3825
3	Catalyst -1 (Ferric Chloride)	15		Solvent – MDC Loss	75
4	Catalyst -2 (AIBN)	15		30% Hydrochloric Acid Solution	850
5	Chlorine Gas	1100		20 % Sodium Sulphite Soln	3750
6	Caustic Flakes	350		Aqueous Layer for ETP -1	2243
7	Potassium Thiocyanate Salt	960		Pottasium Chloride Liquor for Recovery	4320
8	Sulfuryl Chloride	970		Stripping Loss	85
9	Sodium Carbonate	1400		Mother Liquor / Filtrate for Recycle	1537
10	Solvent – MDC	3950		Distillation Residue	30
11	Caustic Soda Lye	1440			
12	Soda Ash Wash	1000			
13	Water for Reaction	840			
14	Water for 30 % Hydrochloric Acid formation	590			
15	Water for Dilution & Washings	2585			
	TOTAL	**17715**		**TOTAL**	**17715**

240) N- Nitro Imino Imidazolidine (NII)

Manufacturing Process:

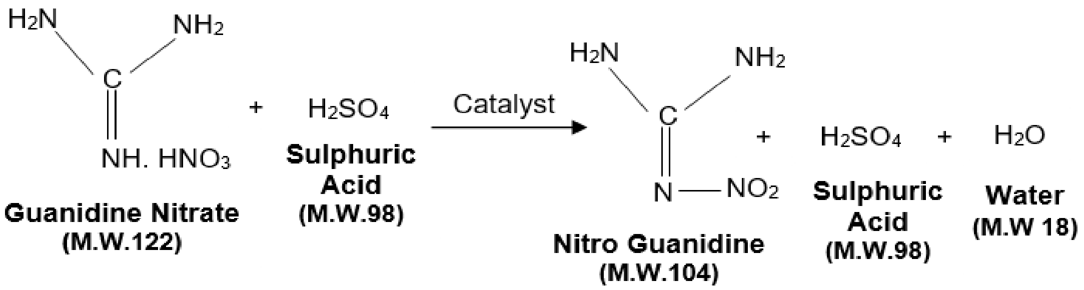
Step 1: - When Guanidine Nitrate is reacted with concentrated Sulphuric Acid in presence of Catalyst it gives Nitro Guanidine.

Step 2: - Nitro Guanidine is further hydrolysed with Caustic (NaOH) in presence of Sulphuric Acid as well as Deformer & finally undergoes Cyclization reaction with Ethylene Diamine. It gives 2–

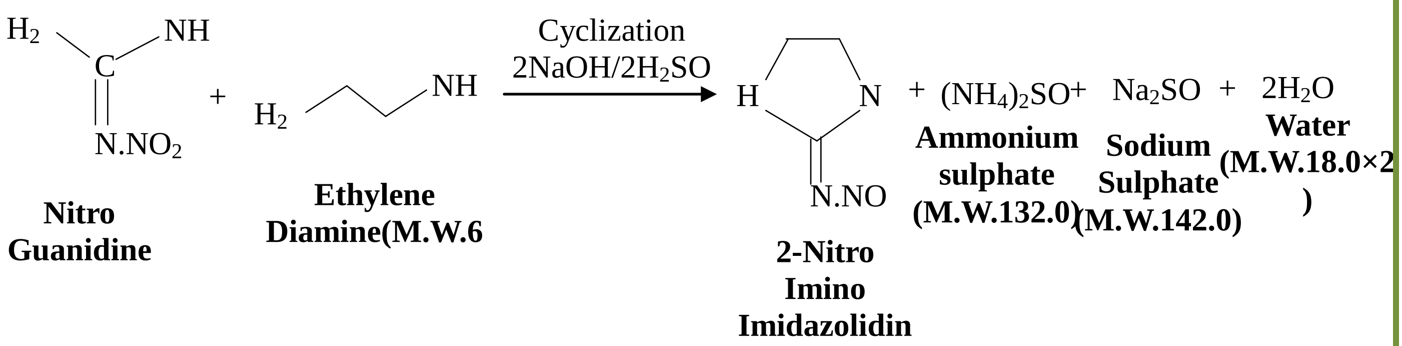
Nitro Imino Imidazolidine (NII) as a final product.

Chemical Reactions:

Step 1: -



Step:2



Mass Balance:

240	Material / Mass Balance of 2-Nitro Imino Imidazolidine (NII) All Quantities are in kg)			
	IN – PUT		**OUT – PUT**	
Sr.No.	**Raw Materials / Items**	**Kg/Batch**	**Product / By product**	**Kg/Batch**
1	Guanidine Nitrate	1175	2–Nitro Imino Imidazolidine (NII)	1000
2	EDA (Ethylene Diamine)	710	Sodium Sulphate Solution	2605
3	Sulphuric Acid	1175	Ammonium Sulphate Salt	1270
4	Caustic Lye	3090	Water Washing Recycle	715
5	Water for Drowning	300	Aqueous Layer to ETP	1925
6	Deformer	350		
7	Water for Washing	715		
	TOTAL	**7515**	**TOTAL**	**7515**

241) 3- Methyl 4- Nitroimino perhydro 1, 3, 5 Oxidiazine (MNIO)

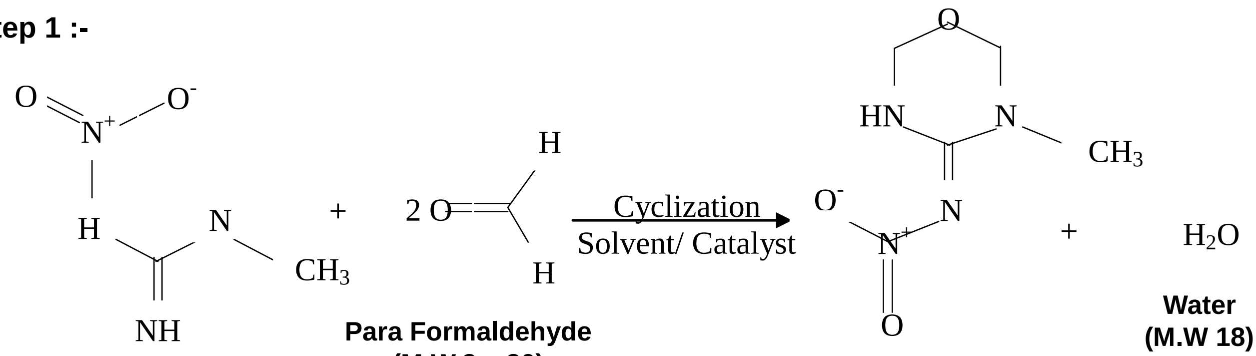
Brief Manufacturing Process: -

N-Methyl N-Nitro Guanidine (NMG) undergoes Cyclization by the reaction of Para Formaldehyde (PFA) in presence of Formic Acid, Methane Sulphonic Acid and Catalyst to form Oxadiazine derivatives as an intermediate.

Further organic mass containing Formic Acid is taken for distillation to recover formic Acid. After it is diluted with water, neutralized with caustic Soda Lye, cool it to form crystal & filtered it to get Oxadiazine Compound.

Chemical Reactions: -

Step 1 :-



Para Formaldehyde (M.W.2 x 30)

Water (M.W 18)

N-Methyl Nitro Guanidine (M.W.118.0)

3- Methyl 4- Nitroimino perhydro 1,3,5 Oxidiazine (MNIO) M. W. – 160.0

Mass Balance:

241	**Material / Mass Balance of MNIO (3 – Methyl 4 – Nitroimiono 1,3,5 Oxidiazine) (All Quantities are in kg)**				
	IN-PUT			**OUT-PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Formic Acid	2880		MNIO	1000
2	N -Methyl Nitro Guanidine	778		Recovered Formic Acid	2775
3	Para Formaldehyde	396		Formic Acid Loss	105
4	Solvent-DMF	3000		Recovered Solvent - DMF	2910
5	Methane Sulphonic Acid	44		DMF Loss	90
6	Caustic Soda Lye 48 %	390		Mother Liquor to recycle	1054
7	Catalyst	12		Aqueous Layer for ETP	566
8	Water for Crystallization	1000			
	TOTAL	**8500**		**TOTAL**	**8500**

242)TransfluthrinAcid Chloride:

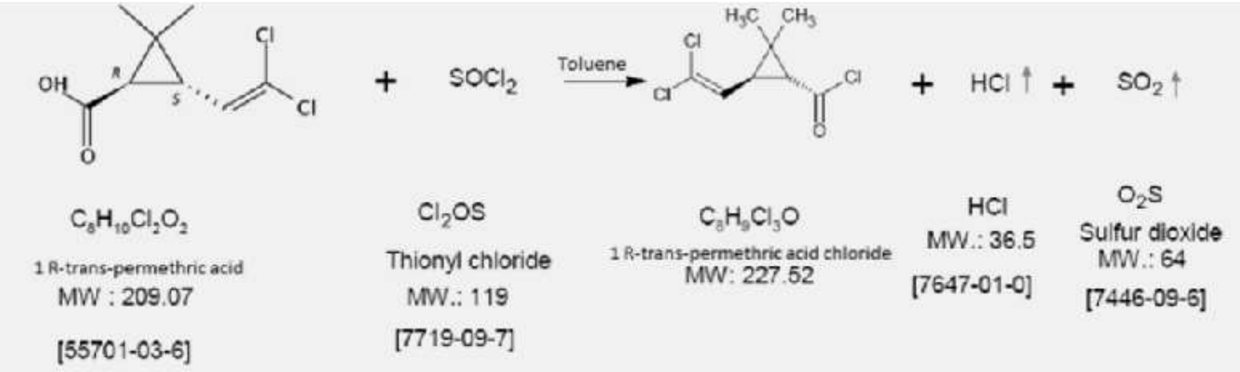
Brief Manufacturing Process:

1-R Trans-Cypermethric Acid (RTCMA) Acid undergoes chlorination reaction with Thionyl chloride in presence of Solvent -Toluene as well as Catalyst DMF to form R- Trans-Cypermethric Acid Chloride, Hydrochloric Acid and Sulfur Dioxide gases are generated during chlorination reaction which are scrubbed on Water as well as Dilute Caustic Solution to form 30 % Hydrochloric Acid Solution as well as 20 % Sodium Sulphite Solution respectively.

Toluene used as Solvent. Sulphur Dioxideis scrubbed with Sodium Hydroxide (48%) to form Sodium Sulphite (20%) Solution is dispose as by-product. And Hydrochloric Acid is scrub with Water to formHydrochloric Solution (30%) is dispose as by-product.

After that reaction mass is taken for distillation of Toluene. Recover Toluene is reused.

Chemical Reactions:



Mass Balance:

242	Material / Mass Balance of Transfluthrin Acid Chloride (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr No	Raw Materials / Items	Kg/Batch		Product / Bi Product	Kg/Batch
1	1-R Cypermethric Acid (1-R CMA)	955		Transfluthrin Acid Chloride	1000
2	Solvent – n- Hexane	1600		Recovered Solvent – Hexane	1540
3	Thionyl Chloride	572		N- Hexane Loss	60
4	Di Methyl Formamide	6		30 % HCl Solution	595
5	Dilute Caustic Lye 14-18%	2715		20 % Sodium Sulphite Solution	3040
6	Water for Reaction & Washing	408		Distillation Residue	21
	Total	**6256**		**Total**	**6256**

243) Para Choro Phenyl Iso Valeric Acid Chloride (PCACl)

Brief Manufacturing Process: -

Step 1: -Parachloro Toluene (PCT) reacted with Chlorine in presence of a Catalyst and produced Para Chloro Benzyl Chloride (PCBC). This Para Chloro Benzyl Chloride (PCBC) reacted with

Aqueous Sodium Cyanide to give ParaChloro BenzylCyanide (PCCN). A catalyst is used in thisreaction.

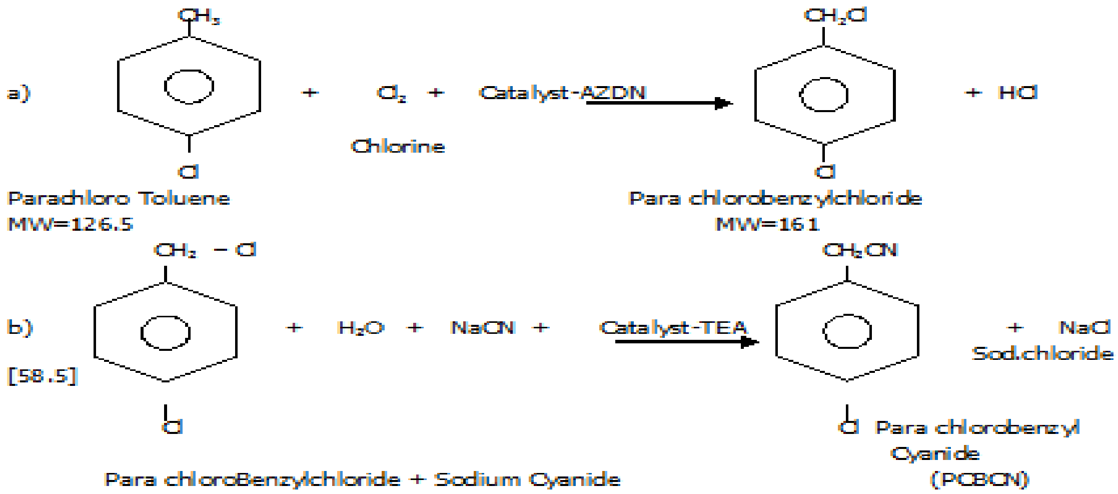
Step 2: - Para Chloro Benzyl Cyanide (PCCN) reacted with Isopropyl Bromide, Caustic Soda and a Phase Transfer Catalyst (PTC) to give 2-(4-Chlorophenyl)-Methyl Butyro Nitrile (CPIN).

Step 3: -CPIN undergoes hydrolysis reaction by Water in presence of Dilute Sulphuric Acid to getCPIA.CPIA then dissolve in n- Hexane crystalized& filtered. Material dried &packed.

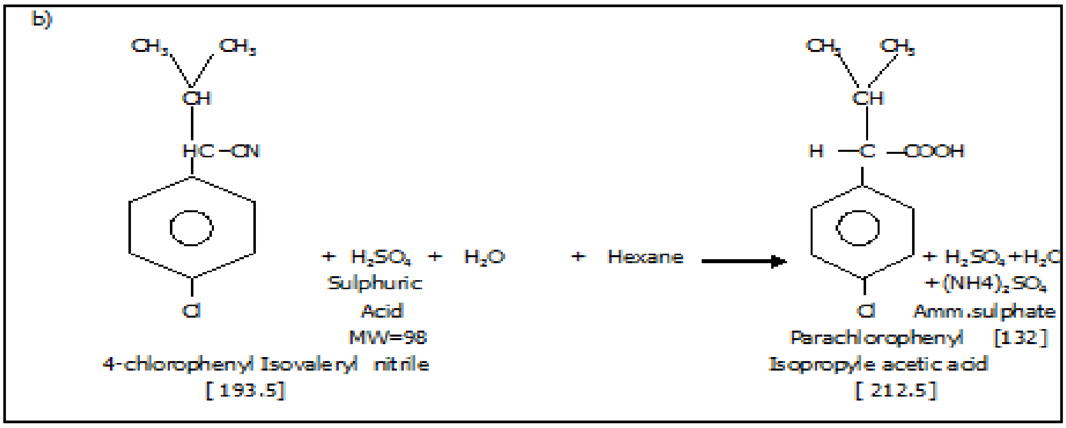
Step 4: - CPIA reacted with Thionyl Chloride in presence of n-Hexane & EDC Solvent and produced Para Chloro Phenyl Iso Valeryl Chloride.

Chemical Reactions: -

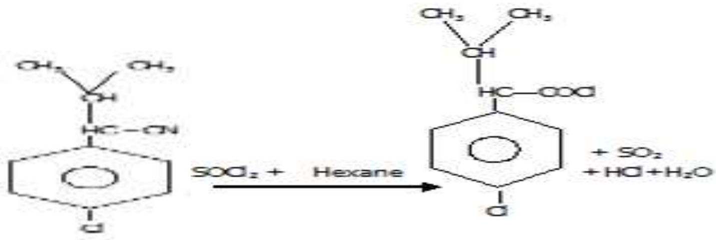
Step 1:-



Step 2: -



Step 3: -



Mass Balance:

243	Material / Mass Balance of P- Chloro Isoveralic Chloride (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Para Chloro Toluene	745		P- Chloro Isoveralic Chloride	**1000**
2	Chlorine	426		Recovered n-Hexane	3520
3	Catalyst	4		n-Hexane Loss	100
4	Sodium Cyanide	293		30% Hydrochloric Acid Soln	1880
5	Catalyst TEA	16		20 % Sulphuric Acid	2697
6	C.S. Lye 48%	479		Spent Sulphuric Acid	2070
7	Isopropyl Bromide	619		Iso Propyl Bromide	24
8	Catalyst TEBA	17		Detoxified Sodium Cyanide mass	1417
9	Caustic Soda Flakes	264		Sodium Bromide Soln	1853
10	Sulphuric Acid	1461		Sodium Chloride C.S. Lye	118
11	n-Hexane-1	1620		Aqueous Layer to ETP	1739
12	n-Hexane-2	2000		Residue	157
13	Water	4947			
14	DMF Catalyst	10			
15	Thionyl Chloride	568			
16	Water for 30% Hydrochloric Acid Soln	406			
17	15% Caustic Soln	2700			
	TOTAL	**16575**		**TOTAL**	**16575**

244) Propargyl Chloride

Brief Manufacturing Process: -

Propargyl Alcohol undergoes chlorination reaction by Thionyl Chloride in presence of Catalyst (DMF) as well as Solvent Ethylene Di Chloride (EDC) to give Propargyl Chloride

Solvent EDC is recovered after completion of reaction & Crude Propargyl Chloride mass is finally distilled out under Vacuum to get as Pure Products.

During the chlorination, Hydrochloric Acid as well as Sulphur Dioxide gases are generated which are scrubbed to water as well as Dilute Caustic Solution to 30 % Hydrochloric Acid solution & 20 % Sodium Sulphite Solution as Bi Products respectively.

Chemical Reactions: -

$$HC\equiv C\text{-}CH_2\text{-}OH + SOCl_2 \xrightarrow{EDC\ /DMF} HC\equiv C\text{-}CH_2\text{-}Cl + HCl + SO_2$$

Propargyl Acid M.W. 56.0	Thionyl Chloride M.W. 119.0	Propargyl Chloride M.W.74.5	Hydrochloric Acid M.W. 36.5	Sulphur Dioxide M.W. 64.0

Mass Balance:

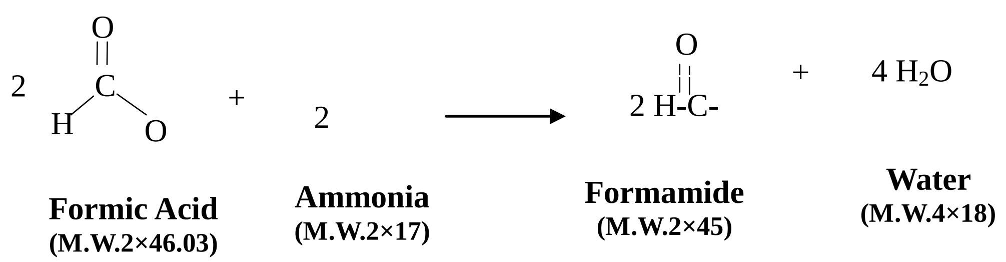
244	Material / Mass Balance of Propargyl Chloride (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Propargyl Acid	760		Propargyl Chloride	**1000**
2	Solvent Ethylene Di Chloride (EDC)	2000		Recovered Solvent - EDC	1955
3	Catalyst	15		Solvent EDC Loss	45
4	Thionyl Chloride	1690		30% Hydrochloric Acid	1650
5	Water for 30% Hydrochloric Acid	1150		20 % Sodium Sulphite Soln	8505
6	Dilute Caustic (15%) for 20% Sodium Sulphite Solution	7560		Distillation Residue	20
	TOTAL	**13175**		**TOTAL**	**13175**

245) 1, 2, 4 Triazole

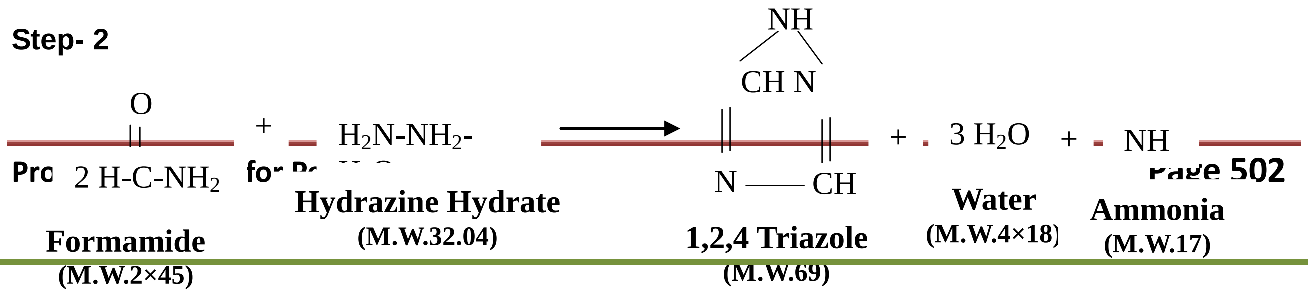
Brief Manufacturing Process: -

Formic Acid is reacted with Dry Ammonia Gas to form Formamide which on reaction with Hydrazine Hydrate gives the final Product 1,2,4 Triazole. During the reaction Ammonia & Water molecules are formed in stoichiometric quantities.

Step 1: -



Step- 2



Mass Balance:

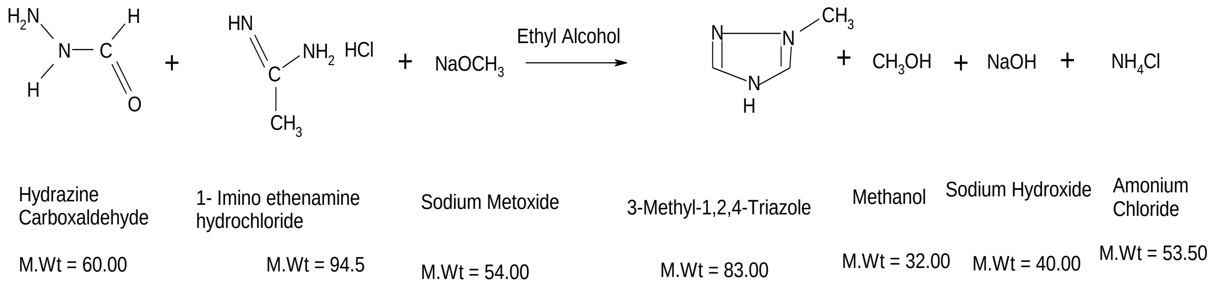
245	Material / Mass Balance of 1,2,4 Triazole (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Formic Acid 85%	2000		1,2,4 Triazole	**1000**
2	Dry Ammonia Gas	900		Recovered Formic Acid	366
3	Hydrazine Hydrate 80%	1000		Recovered Hydrazine Hydrate	75
4	Water	2315		Recovered Liq Ammonia	3759
5				Water Distillate	1015
	TOTAL	**6215**		**TOTAL**	**6215**

246) 3- Methyl 1,2,4 –Triazole

Process Description: Hydrazine Carboxaldehyde is reacted with 1- Imino Ethanamine Hydrochloride in presence of Sodium Methoxide as well as Solvent – Ethanol form 3- Methyl 1,2,4 Triazole.

Step-1

Chemical Reaction:



Material Balance

246	Material/Mass Balance of 3-Methyl 1,2,3 Triazole (All Quantities are in kg)				
IN- PUT				OUT- PUT	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	Hydrazine Carboxaldehyde	733		3- Methyl 1,2,4 Triazole	1000
2	1-Imino Ethanamine HCl	1150		Methanol	390
3	Sodium Methoxide	660		Sodium Hydroxide	490
4	Solvent - Ethanol	2400		Ammonium Chloride	655
5	Water	545		Recovered Solvent - Ethanol	2360
6				Solvent Loss- Ethanol	40
7				Aqueous Effluent to ETP	530
8				Distillation Residue	23
	Total	**5488**			**5488**

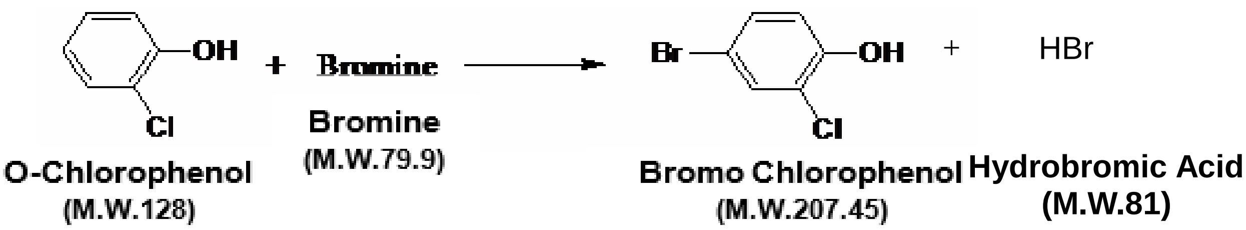
247) 4- Bromo 2- Chloro Phenol

Brief Manufacturing Process: -

When Ortho Chloro Phenol undergoes Bromination reaction with Bromine in presence of Solvent-MDC it gives our crude product as 4- Bromo 2- Chlorophenol (BCP). Finally, his product on fractional distillation results to pure product as 4- Bromo 2- Chloro Phenol.

Chemical Reactions: -

Step 1: -



247	Material / Mass Balance of 4- Bromo 2- Chloro Phenol All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Ortho-Chloro Phenol	640		4- Bromo 2- Chloro Phenol	**1000**
2	Liquid Bromine	800		Hydrobromic Acid Solution	905
3	Solvent- MDC	2000		MDC Recovered	1950
4	2 % Soda Ash solution	500		MDC Loss	50
5	Water for 45 % Hydrobromic Solution	500		Aqueous Waste	1023
6	Water for Washing	500		Distillation Residue	12
	TOTAL	**4940**		**TOTAL**	**4940**

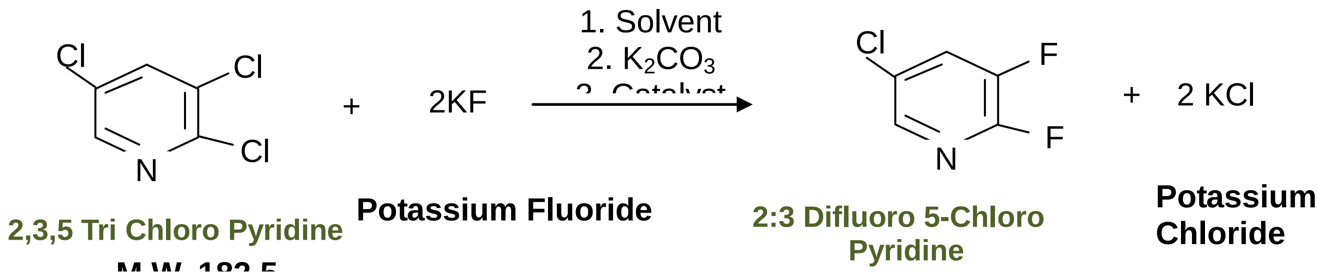
248) 5- Chloro 2,3 Di Fluoro Pyridine (CDFP)
Brief Manufacturing Process:

Step 1:

2,3,5 Trichloro Pyridine is reacted with Potassium Fluoride in presence of Potassium Carbonate, Solvent Toluene as well as THFDP, Catalyst to form crude 2:3 Di Fluoro 5-Chloro Pyridine.

Crude product is washed with 2 % Soda Ash solution and finally product is distilled out under high vacuum.

Chemical Reactions:

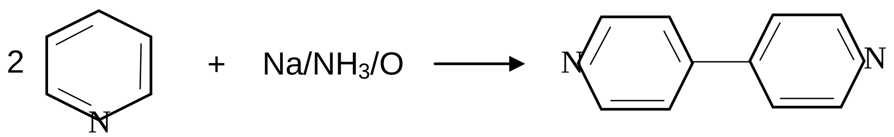


248	Material / Mass Balance of Chloro Di Fluoro Pyridine (CDFP) All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2,3,5 Trichloro Pyridine	1570		Chloro Di Fluoro Pyridine	1000
2	Potassium Carbonate	130		Recovered Solvent THFDP	1460
3	Potassium Fluoride	1220		Solvent Loss	70
4	Solvent - Toluene	172		Toluene Recovered	160
5	Catalyst -1 & 2	138		Toluene Loss	12
6	Solvent- THF DP	1530		Water Distillate	21
7	Water for Washing	670		Mix Salt Solution	1700
8				Aqueous Layer for ETP	1007
	Total	**5430**		**Total**	**5430**

249)4, 4' Bi Pyridine

BriefManufacturingProcess: -

Chemical Reaction: -



Pyridine (M.W.79.0×2

4, 4'Bi Pyridine (M.W.156.0)

Mass Balance: -

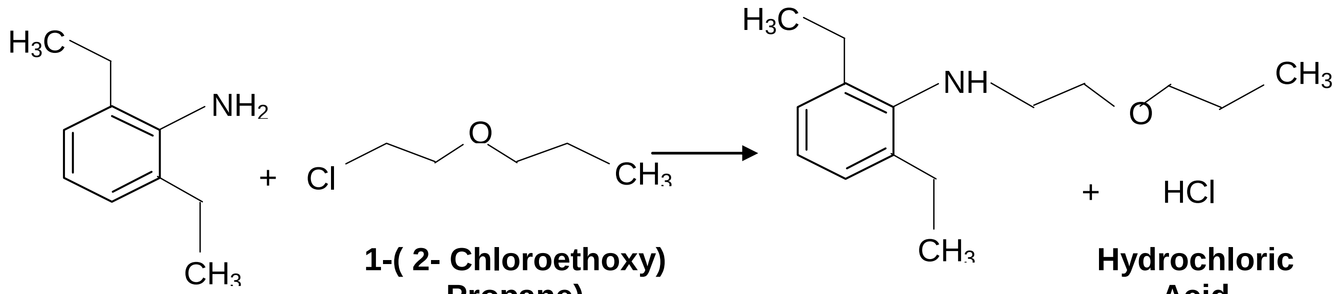
249	Material / Mass Balance of 4,4' Bi Pyridine (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Pyridine	1065		**4,4' Bi Pyridine**	**1000**
2	Sodium	155		Aq. layer	550
3	Ammonia Gas	115			
4	Oxygen	215			
	TOTAL	**1550**		**TOTAL**	**1550**

250)2, 6 Diethyl –N- (Propoxy) Aniline

Brief Manufacturing Process: -

2,6 Diethyl Aniline (DEA) is reacted with Chloro Propoxy Ethane to give intermediate N Propoxy Ethyl 2,6 Diethyl Aniline Hydrochloride at 130^{o} C. After reaction, reaction mass is neutralized with Caustic at room temperature up to pH 7.0 Aqueous layer containing Sodium Chloride is separated out and organic layer2, 6 Diethyl –N- (Propoxy) Aniline.

Chemical Reactions: -



2,6-Diethyl Aniline — **1-(2- Chloroethoxy) Propane)** — **2, 6 Diethyl –N- (Propoxy) Aniline (M.W.225.0)** — **Hydrochloric Acid**

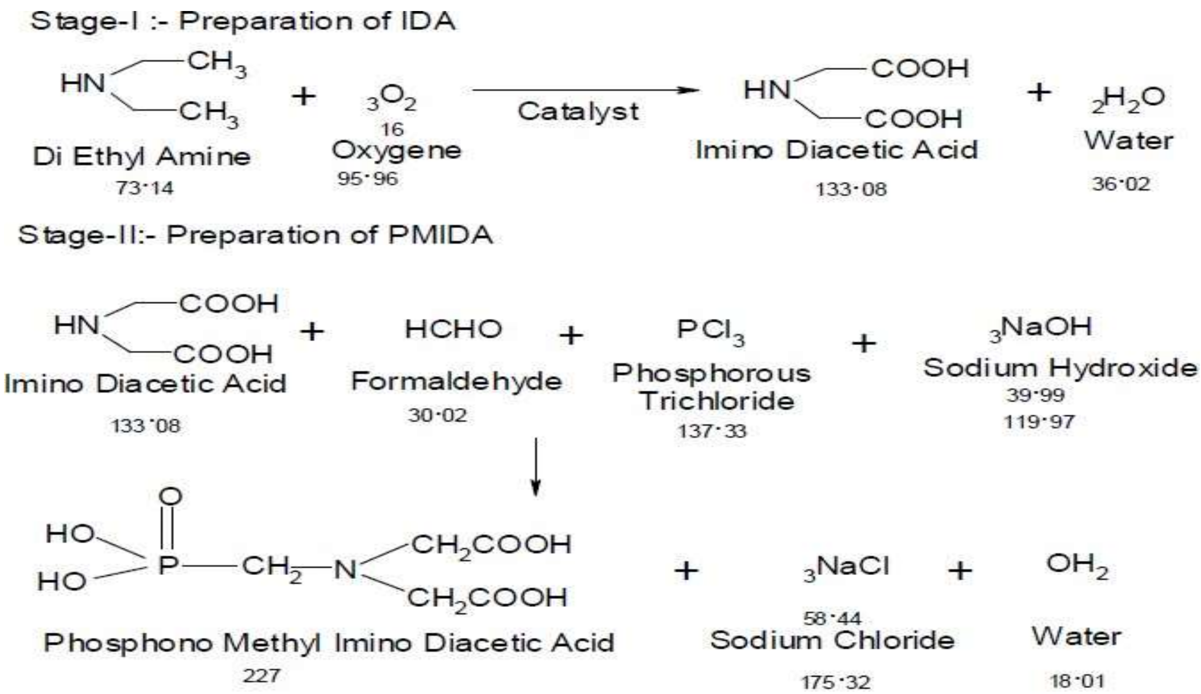
250	**Material / Mass Balance of 2, 6 Diethyl –N- ([illegible] s are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2,6 Diethyl Aniline (2,6-DEA)	695		**2, 6 Diethyl –N- (Propoxy) Aniline)**	**1000**
2	1-(2-Chloroethoxy) Propane	620		Hydrochloric Acid Soln	570
3	Solvent - Toluene	2000		Toluene Recovered	1960
4	Water for Hydrochloric Acid Soln	400		Toluene Loss	40
5	2 % Soda Bicarbonate Soln	500		2,6 Diethyl Aniline (DEA)	36
6	Water for Washing	500		1-(2-Chloroethoxy) Propane	31
7				Waste Water to ETP	1078
	Total	**4715**		**Total**	**4715**

251)PhosphonoMethyl Amino Diacetic Acid (PMIDA)

PMIDA by DEA Route: -
Manufacturing Process

Diethyl amine, on oxidation gives Imino Diacetic Acid (IDA), which further reacts with Formaldehyde and Phosphorus Trichloride in presence of Sodium Hydroxide gives Phosphono Methyl Imino Diacetic Acid (PMIDA).

Chemical Reaction:



251-A	Material / Mass Balance of PMIDA All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Name of Item	Kg/Batch		Name of Items	Kg/Batch
1	DEA	521		PMIDA	1000
2	Water	521		Waste Water	2376
3	C S Lye 47 %	829		Hydrogen Gas	24
4	30 % Hydrochloric Acids Solution	1190		Evaporation Loss	24
5	Formaldehyde	147			
6	Phosphorus Acid	216			
	Total	**3424**		**Total**	**3424**

PMIDA by MCA Route: -

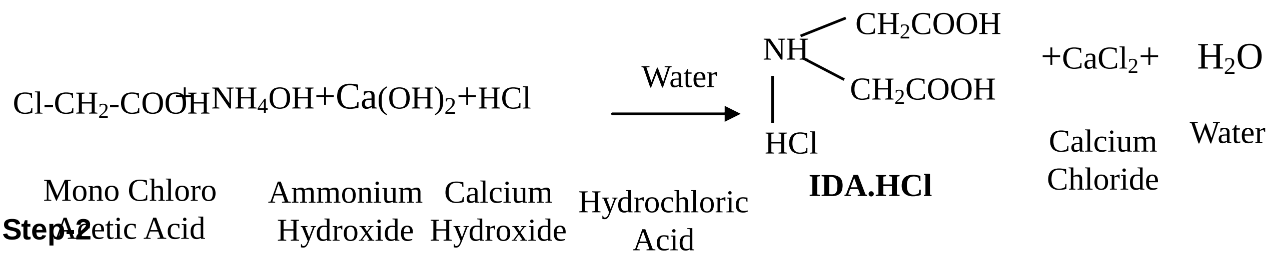
Brief Manufacturing Process:

Step-1

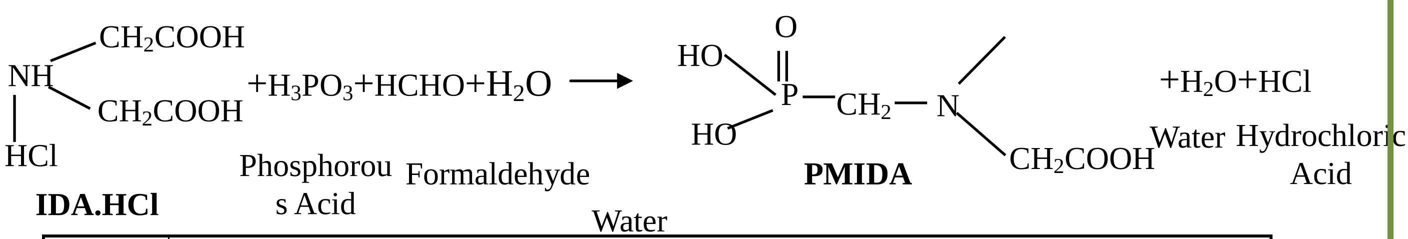
Mono Chloro Acetic Acid is reacted with Ammonia in presence of Calcium Hydroxide forming Hydrochloric Acid Salt of Imino Di Acetic Acid (IDA) and carrying out the reaction at 45°C under atmospheric condition. Hydrochloric Acid (HCl) is mixed to make slurry of Imino Di Acetic Acid (IDA). Imino Diacetic Acid (IDA) if further reacted with Formaldehyde as well as Ortho Phosphorous Acid at elevated temperature to form an intermediate, Phosphino Methyl Amino Diacetic Acid (PMIDA).

Chemical Reactions:

Step-1:



Step-2



251-B	Material / Mass Balance of PMIDA All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Name of Item**	**Kg/Batch**		**Name of Items**	**Kg/Batch**
1	81% MCA	1682		PMIDA	1000
2	23 % Liq. Ammonia	743		Calcium Chloride	62
3	Calcium Hydroxide or Lime	1079		ML	3852
4	Dilute Hydrochloric Acid	121		Distilled Water	3377
5	30% Hydrochloric AcidSolution	2502		Water	183
6	60% OPA Solution	738			
7	37% Formaldehyde	459			
8	Water	1150			
	Total	**8474**		**Total**	**8474**

252)2, -Chloro-4-(4-Chlorophenoxy) Phenacyl Bromide.

Brief Manufacturing Process: -

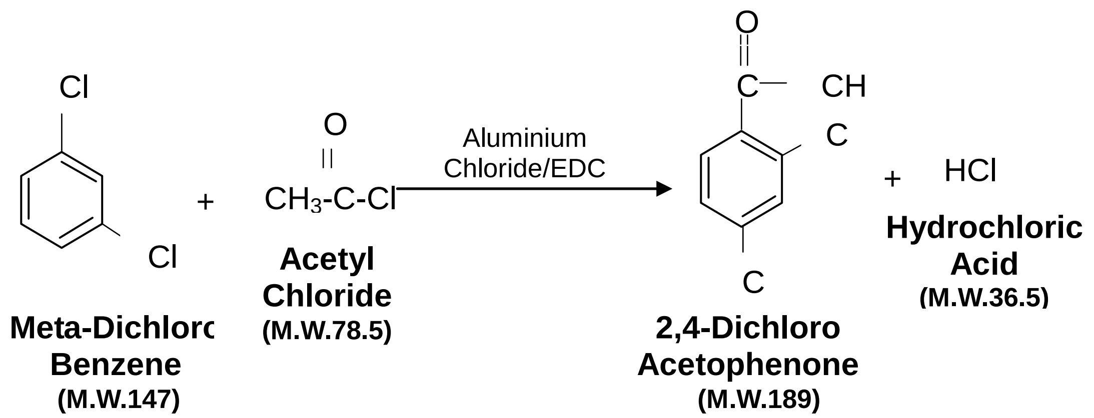
Step 1: -Meta-Dichloro Benzene reacted with Acetyl Chloride in presence of AluminiumChloride and solvent Ethylene Dichloride. This process gives product 2,4-Dichloro Acetophenone.

Step 2: -2,4-Dichloro Acetophenone further reacted with 4-Chloro Phenol in presence of Potassium Hydroxide and solvent DMF. This process gives product 2-Chloro-4-(4-Chlorohenoxy) Acetophenone.

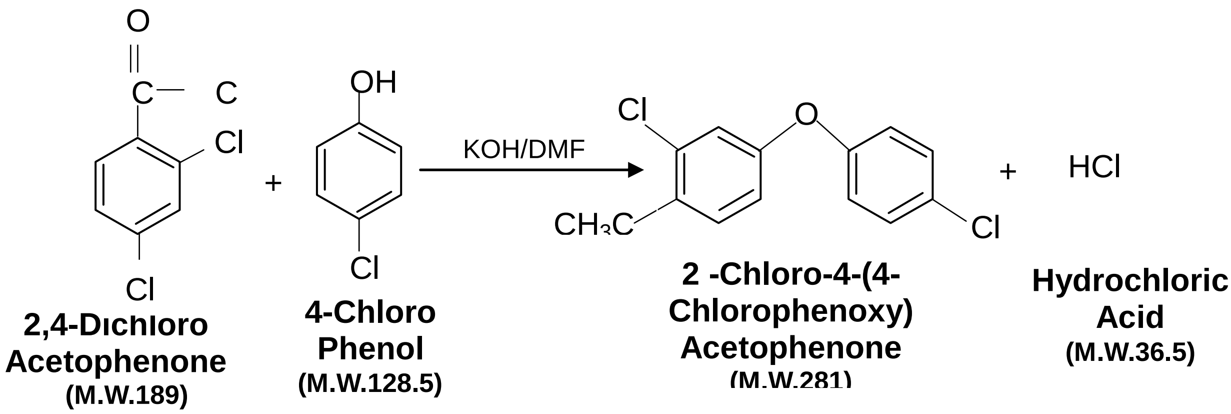
Step 3: -2, -Chloro-4-(4-Chlorophenoxy) Acetophenone further reacted with Bromine in presence of catalyst and solvent Ethylene Dichloride. This process gives product 2, -Chloro-4-(4-Chlorophenoxy) Phenacyl Bromide.

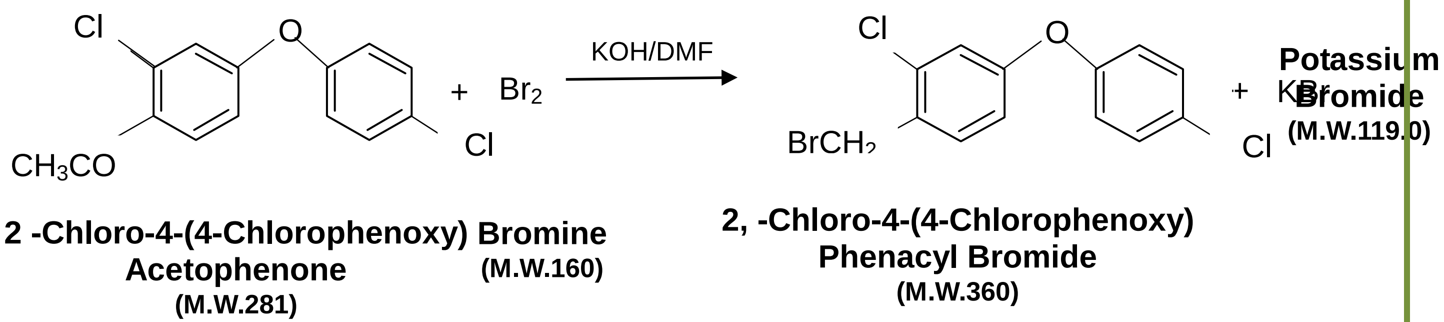
Chemical Reactions: -

Step 1: -



Step 2: -





252	**Material / Mass Balance of 2, -Chloro-4-(4-Chlorophenoxy) Phenacyl Bromide(All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Meta-Dichlorobenzene	450		2, -Chloro-4-(4-Chlorophenoxy) Phenacyl Bromide	**1000**
2	Acetyl Chloride	260		Recovered EDC	2910
3	Aluminium Chloride	470		Loss EDC	90
4	Solvent - EDC	3000		20-25 % Aluminium Chloride Soln	1960
5	4 - Chloro Phenol	410		30% Hydrochloric Acid	700

6	Dimethyl Formamide	2100		Recovered Dimethyl Formamide	2040
7	Potassium Hydroxide	190		Loss Dimethyl Formamide	60
8	Catalyst	12		Potassium Bromide Salt	360
9	Bromine	410		Tarry Waste	15
10	Water for Hydrochloric Acid Solution	490		Aqueous Layer to ETP	657
11	Water for Aluminium Chloride & Washing	2000			
	TOTAL	**9792**		**TOTAL**	**9792**

253)2,4 DichloroValerophenone

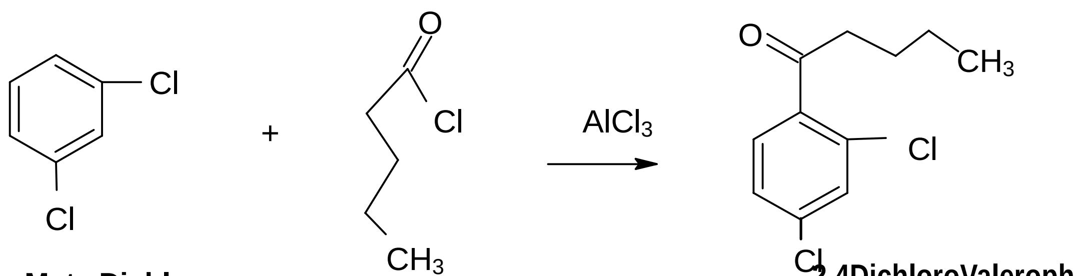
Brief Manufacturing Process:

Valeryl Chloride is charged slowly into Aluminum Chloride and MDCB mixture and heated to elevated temperature to complete the reaction.

Reaction mass is quenched in water to separate organic mass and aqueous layer containing Aluminum chloride. Organic mass is distilled to get pure 2,4Dichloro Valero phenone.

ChemicalReaction:

253	**Material / Mass Balance 2,4 Di Chloro Valerophenone for 1.0 MT**				
	In Put /Ton			**Out Put /Ton**	
Sr. No.	**Name of Item**	**Kg/Batch**		**Name of Items**	**Kg/Batch**
1	Meta Dichloro Benzene	700		**2,4 Di Chloro Valerophenone**	1000
2	Aluminum Chloride	950		Hydrochloric Acid Solution	600
3	Valeryl Chloride	610		23-28 % Aluminum Solution	3550
4	Water for Scrubber	250		Residue to Incineration	80
5	Water for Reaction & Washing	2300			
6	Water for Hydrochloric Acid	420			
	Total	**5230**		**Total**	**5230**



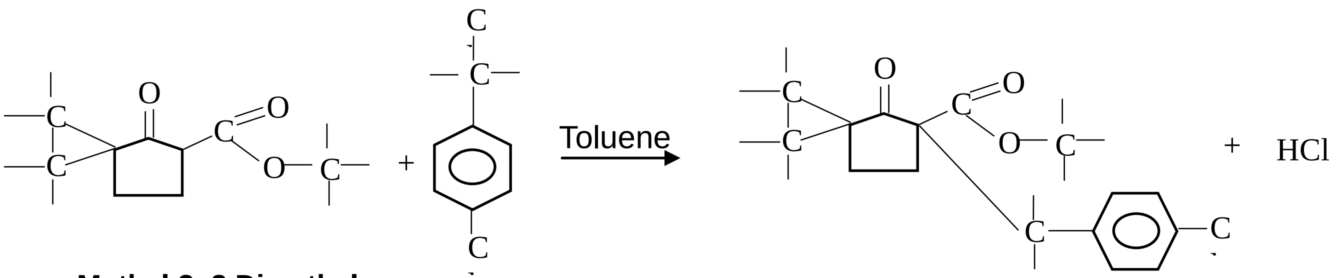
Meta Dichloro Benzene **ValerylC hloride** **2,4DichloroValeroph enone**

254) 1-(4-Chloro Benzyl) Methyl-3, 3-Dimethyl-2-Oxo Cyclopentane Carboxylate

Brief Manufacturing Process: -

Methyl-3,3, -Dimethyl-2-Oxo-Cyclopentane Carboxylate reacts with 4-Chloro Benzyl Chloride in presence of Solvent and Catalyst to give 1-(4-Chloro Benzyl) Methyl-3,3-Methyl-2-Oxo Cyclopentane Carboxylate.

Chemical Reaction: -



Methyl 3, 3 Dimethyl 2 Oxo Cyclopentane Carboxylate $C_9H_{14}O_3$ (M.W.170)

4 Chloro Benzyl Chloride $C_7H_6Cl_2$ (M.W.161)

1-(4-Chloro Benzyl) Methyl-3, 3-Methyl-2-Oxo Cyclopentane Carboxylate $C_{16}H_{18}O_3Cl$ (M.W.293.5)

Hydrochloric Acid (M.W.36.5)

Mass Balance: -

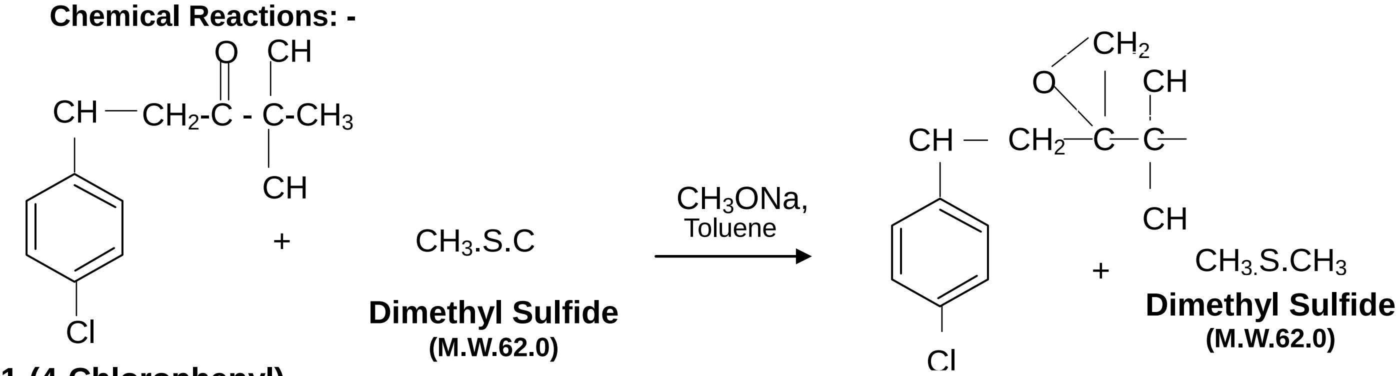
254	**Material / Mass Balance of 1-(4-Chloro Benzyl) Methyl-3,3-Methyl-2-Oxo Cyclopentane Carboxylate (All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Methyl-3,3, -Dimethyl-2-Oxo-Cyclopentane Carboxylate	610		1-(4-Chloro Benzyl) Methyl-3,3-Methyl-2-Oxo Cyclopentane Carboxylate	**1000**
2	4-Chloro Benzyl Chloride	575		Recovered Solvent	1970
3	Catalyst	20		Solvent Loss	30
4	Solvent Toluene	2000		30% Hydrochloric Acid Soln	415
5	Water	500		Aq. layer	290
	TOTAL	**3705**		**TOTAL**	**3705**

255) Tebu- Ketal / 2-[2-(4-Chlorophenyl) Ethyl]-2-(1,1-DiMethyl Ethyl) Oxirane

Brief Manufacturing Process: -

When **1**-(4-Chlorophenyl)-4,4-Dimethyl-3-Pentenone reacted with Dimethyl Sulfide in presence of Sodium Methoxide & Solvent Toluene. After completion of the reaction, the temperature is raised till 80°C to recover Dimethyl Sulfide and leaving Product Oxirane as 2-[2-(4-Chlorophenyl) Ethyl]-2-(1,1-Dimethyl Ethyl) Oxirane.

Chemical Reactions: -



1-(4-Chlorophenyl)-4,4-Dimethyl-3-Pentenone(M.W.224.5)

Dimethyl Sulfide (M.W.62.0)

2-[2-(4-Chlorophenyl) Ethyl]-2-(1,1-Dimethyl Ethyl) Oxirane

Dimethyl Sulfide (M.W.62.0)

+ NaOH **Sodium Hydroxide (M.W.40.0)**

255	**Material / Mass Balance of 2-[2-(4-Chlorophenyl) Ethyl]-2-(1,1-DiMethyl Ethyl) Oxirane (All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	1-(4-Chlorophenyl)4-4 Dimethyl -3- Pentanoate	1010		2-[2-(4-Chlorophenyl) Ethyl]-2-(1,1-DiMethyl Ethyl) Oxirane	**1000**
2	Sodium Methoxide	250		Recovered Toluene	1970
3	Dimethyl Sulphide	290		Toluene Loss	30
4	Toluene	2000		Recovered Dimethyl Sulphide - Recycle to next batch	290
5	Water	500		Sodium Hydroxide	168
6				Effluent to ETP	572
				Tarry Waste	20
	TOTAL	**4050**		**TOTAL**	**4050**

256) Methyl -2- [2- {(6- Chloro Pyrimidine -4 –yl)} Oxy Phenyl] -3- Methoxyprop -2- Ethanoate.
Brief Manufacturing Process: -

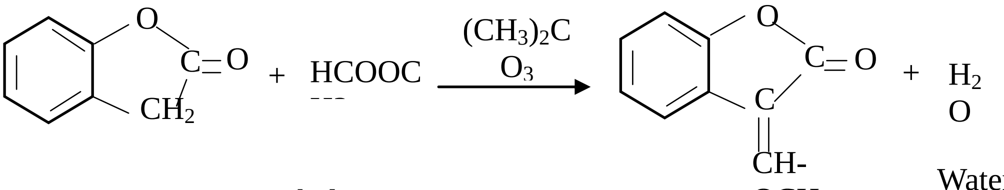
Step 1: - 2-Caumaranone is reacted with Methyl Format in presence of Di methyl Carbonate and Sodium Hydride as well as Solvent -Toluene to form 3-Methylmethylidene-1-Benzofuran-2-One.

Step 2: - 3-Methylmethylidene-1-Benzofuran-2-Onereacted with Sodium Methoxide in presence of Solvent – EDC to form Sodium -2- [1,3 Dimethoxy -3- Oxoprop -1- en -2- yl] Phenolate.

Step 3: -Sodium -2- [1,3 Dimethoxy -3- Oxoprop -1- en -2- yl] Phenolate is reacted with 4,6 –Dichloro Pyrimidine in presence of Solvent – Toluene to give Methyl -2- [2- {(6- Chloro Pyrimidine -4 –yl)} Oxy Phenyl] -3- Methoxyprop -2- Ethanoate.

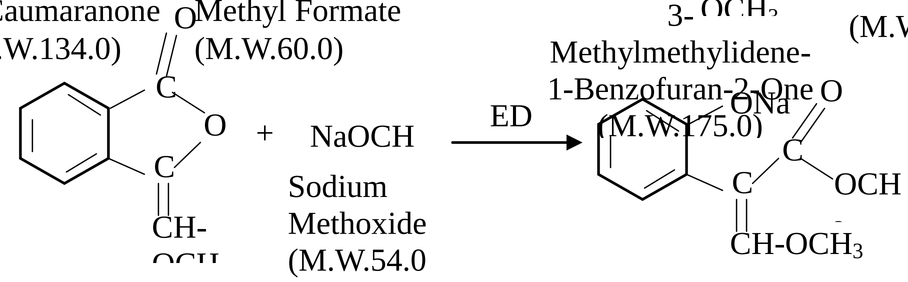
Chemical Reactions: -

Step 1: -



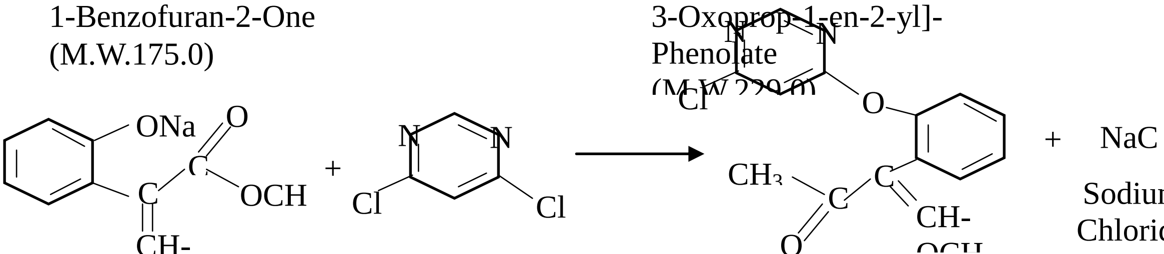
2-Caumaranone (M.W.134.0) Methyl Formate (M.W.60.0) 3-Methylmethylidene-1-Benzofuran-2-One (M.W.175.0) Water (M.W.18.0)

Step 2: -



3-Methylmethylidene-1-Benzofuran-2-One (M.W.175.0) Sodium Methoxide (M.W.54.0) Sodium-2- [1, 3-Dimethoxy-3-Oxoprop-1-en-2-yl]-Phenolate (M.W.229.0)

Step 3:-



Sodium-2-[1, 3-Dimethoxy-3-Oxoprop-1-en-2-yl]-Phenolate (M.W.229.0) 2, 4-Dichloro Pyrimidine Methyl-2- [2-(6-Chloro Pyrimidine-4-yl) Oxyphenyl-3-Methoxyprop-2-Ethanoate Sodium Chloride (M.W.58.5

256	Material / Mass Balance of Methyl-2- [2-(6-Chloro Pyrimidine-4-yl) Oxyphenyl-3-Methoxyprop-2-Enoate All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By Product	Kg/Batch
1	2-Caumaranone	454		Methyl-2- [2-(6-Chloro Pyrimidine-4-yl) Oxyphenyl-3-Methoxyprop-2-Enoate	1000
2	Methyl Formate	200		Recovered Solvent – Toluene	1370
3	Di Methyl Carbonate	230		Solvent Loss (Toluene)	30
4	Sodium Hydride	80		Sodium Chloride	190
5	Solvent – Toluene	1400		Sodium Carbonate	330
6	Sodium Methoxide	180		Recovered Solvent – EDC	1160
7	Solvent – EDC	1200		Solvent Loss (EDC)	40
8	2, 4- Di Chloro Pyrimidine	440		Potassium Chloride	180

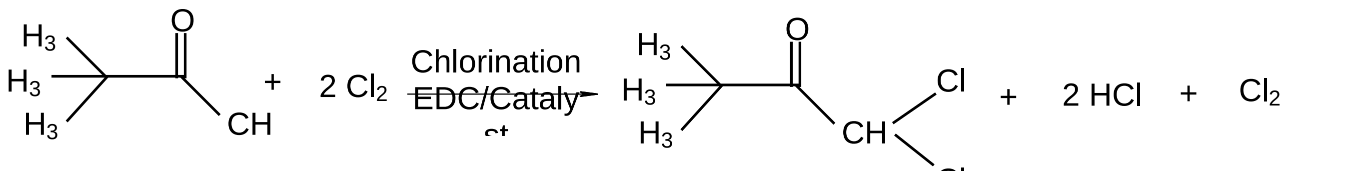
9	Water	1100		Aqueous Layer to ETP	964
10				Distillation Residue	20
	TOTAL	**5284**		**TOTAL**	**5284**

257) 1,1-Dichloro Pinacholane:
Brief Manufacturing Process: -

Pinacolin undergoes Chlorination reaction by Chlorine in presence of Solvent Ethylene Dichloride. This reaction gives out 1,1-Dichloro Pinacolin.

Chemical Reactions: -

Step 1: -



Pinacolin (M.W.100.16) **Chlorine (M.W.2×71)** **1,1-Dichloro Pinacolin (M.W.169.05)** **Hydrochloric Acid (M.W.2×36.5)** **Chlorine (M.W.71)**

Step 2: -

Cl_2 + NaOH ⟶ NaOC + HCl

Chlorine (M.W.71) **Sodium Hydroxide (M.W.40)** **Sodium Hypochlorite (M.W.74.44)** **Hydrochloric Acid (M.W.36.5)**

Mass Balance:

257	**Material / Mass Balance of 1,1-Dichloro Pinacolin All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr.No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Pinacolin	620		1,1-Dichloro Pinacolin	**1000**
2	Solvent EDC	2000		Recovered Solvent	1960
3	Chlorine	880		Loss Solvent	40
4	Catalyst	10		10% Sodium Hypochlorite Solution	156
5	15% Sodium Hydroxide Solution	100		30% Hydrochloric Acid Solution	1510
6	Water for 30% Hydrochloric Acid Soln	1056			

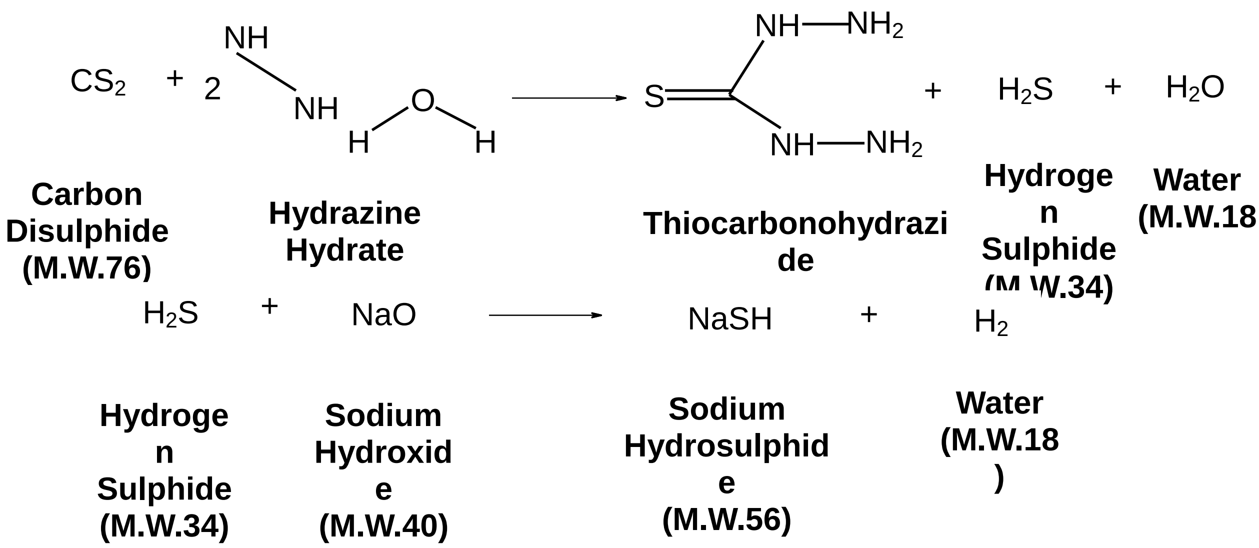
	TOTAL	4666		TOTAL	4666

258) Thicarbono Hydrazine:
Brief Manufacturing Process: -

Carbon Disulphide reacted with Hydrazine Hydrate in presence of Catalyst and Caustic Lye. During this reaction Hydrogen Sulphide is liberated which is reacted with Caustic Lye to produce NaSH Solution as a By-Product. This reaction gives out Thiocarbonohydrazide as a final product.

Chemical Reactions: -

Step 1: -



258	Material / Mass Balance of Thiocarbo Hydrazine All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Carbon Disulfide	752		Thiocarbo Hydrazine	**1000**
2	Solvent Ethyl Acetate	2000		Recovered Ethyl Acetate	2140
3	Hydrazine Mono Hydrate	990		Loss Ethyl Acetate	60
4	Catalyst	10		Aqueous layer to ETP	552
	TOTAL	**3752**		**TOTAL**	**3752**

259) 2-Hydroxy-4-Methyl Benzo Thiazole (HMBT)
Brief Manufacturing Process: -

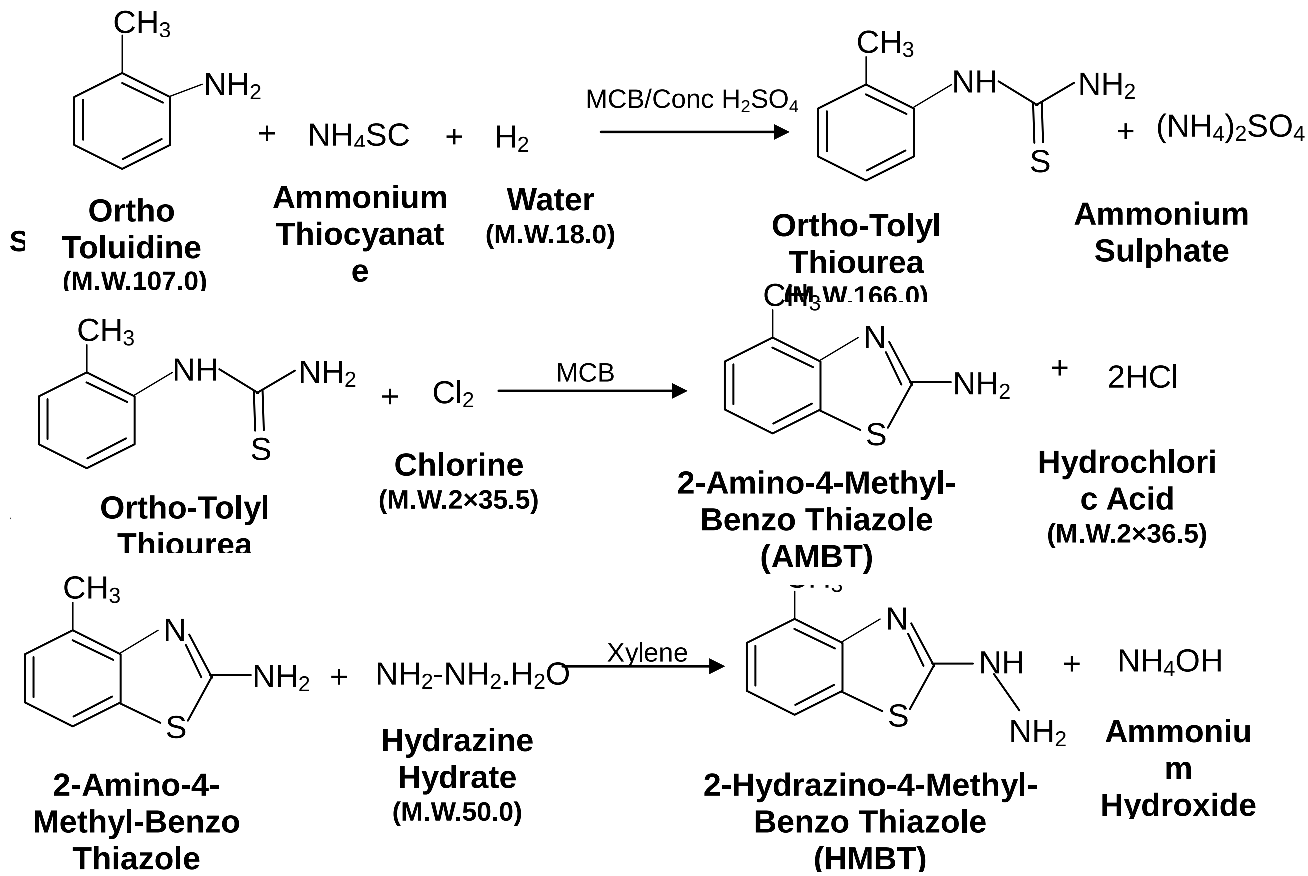
Step 1: - Ortho Toluidine when reacted with Ammonium Thiocyanate in presence of Solvent Monochloro Benzene as well as Concentrated Sulphuric Acid it gives Ortho-Tolyl Thiourea.

Step 2: - Ortho-Tolyl Thiourea further undergoes Cyclization process in presence of Chlorine as well as Solvent Monochlorobenzene at room temperature. It gives 2-Amino-4-Methyl-Benzo Thiazole (AMBT).

Step 3: - Amino-4-Methyl-Benzo Thiazole (AMBT) further reacted with Hydrazine Hydrate in presence of Solvent Xylene to gives out 2-Hydrazino-4-Methyl-Benzo Thiazole (HMBT) as a final product.

Chemical Reactions: -

Step 1: -



259	Material / Mass Balance of Ortho-Tolyl Thiourea(STAGE-1) All Quantities are in kg)				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Ortho Toluidine	953		Ortho-Tolyl Thiourea	**1317**
2	Monochloro Benzene (MCB)	2200		Recovered Monochloro Benzene	2150
3	Ammonium Thiocyanate	790		Monochloro Benzene Loss	50
4	Sulphuric Acid	460		Ammonium Sulphate	544
5	Water	2000		Water	2342
	TOTAL	**6403**		**TOTAL**	**6403**

259	Material / Mass Balance of AMBT (STAGE-2) All Quantities are in kg)				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Ortho-Tolyl Thiourea	1317		2-Amino-4-Methyl Benzothiazole	**1224**

2	Chlorine	662		Recovered Monochloro Benzene	1170
3	Monochloro Benzene (MCB)	1200		Monochloro Benzene Loss	30
4	Water for 30% Hydrochloric Acid Solution	757		30% Hydrochloric Acid Solution	1082
5	Water for Reaction	1200		Aqueous Layer to ETP	1630
	TOTAL	**5136**		**TOTAL**	**5136**

259	**Material / Mass Balance of 2- Hydrazino-4-Methyl Benzo Thiazole (HMBT) (STAGE-3) All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2-Amino-4-Methyl Benzothiazole (AMBT)	1224		2-Hydrazino-4-Methyl Benzo Thiazole (HMBT)	**1000**
2	Hydrazine Hydrate	410		Recovered Xylene	1450
3	30% Hydrochloric Acid	910		Xylene Loss	50
4	Xylene	1500		Aqueous Layer to ETP	1526
5				Distillation Residue	18
	TOTAL	**4044**		**TOTAL**	**4044**

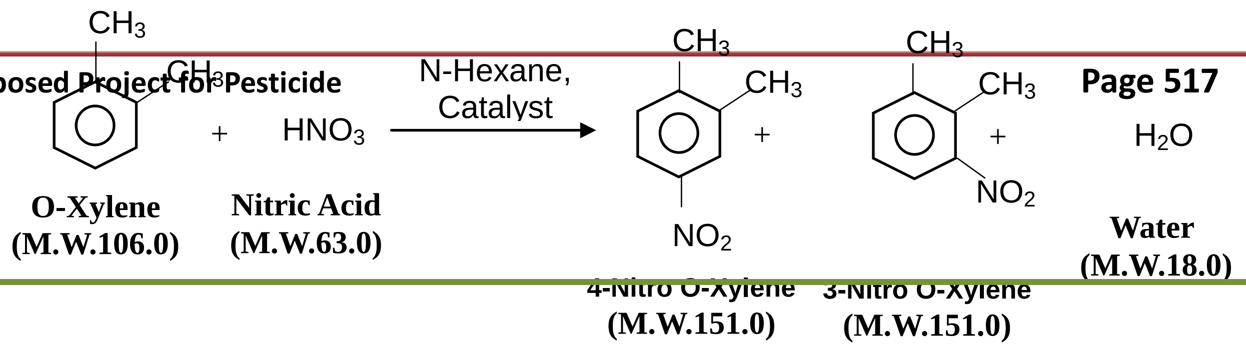
260) 4-Nitro-O-Xylene/3-Nitro O-Xylene

Brief ManufacturingProcess:

In a stirred reactor n-hexane / or suitable Solvent (N-Hexane and Catalyst are stirred at room temperature). The jacket ofreactor is supplied with cooling / chilled water. Then to it O-Xylene and nitric acid is added continuously over the period of6 to 8 hours. The addition is done slowly with careful control of temperature. The addition is completed in 6 to 8 hours andthen stirred further for 8 hours. The reaction mixture is filtered, the Catalyst is recovered. The reaction mixture is washed with water. The aqueous layer contains dilute nitric acid.

The organic layer is subjected to fractional distillation initially under atmospheric pressure to recover N-Hexane, which isrecycled to reaction zone. Then the fractional distillation under vacuum is carried out to recover un-converted O-Xylene,which is recycled to reaction zone. The 3-NOX is first distilled out and recovered as product. The material in the distillationstill is finally recovered using short path distillation unit to recover 4-NOX product. At the bottom of short path distillationheavies are collected, which are send for disposal.

Chemical Reaction:



260	Material / Mass Balance of 4-Nitro O-Xylene/3-Nitro O-Xylene(All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product/ Byproduct	Kg/Batch
1	**O-Xylene**	4800		**4-Nitro O-Xylene**	**1000**
2	**Dilute Nitric Acid**	1960		**3-Nitro O-Xylene**	**1000**
3	N-Hexane	2000		Recovered Catalyst to Recycle	240
4	Catalyst	240		Recovered N-Hexane	1800
5	Water	420		Spent Acid	1620
6				Recovered O-Xylene	3256
7				Distillation Residue	504
	Total	**9420**		**Total**	**9420**

Group- 15: Advance Specific Pesticide Intermediates

261) Lambda Cyhalothric Acid Chloride:

Brief Manufacturing Process:

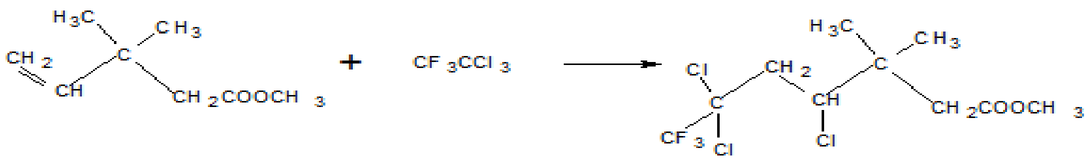
3,3-Dimethyl -4-Pentenoic Acid Methyl Ester Methyl reacted with tri chloro tri fluoro ethane (TCTFE) in presence of tertiary butyl alcohol solvent (TBA) to from Methyl Ester of Di Methyl Trichloro Tri Fluoro Heptonate (Haptanoate)

Haptanoate is further reacted with Sodium / Potassium Salt of Tertiary Butyl alcohol to give me ester of Dichloro Trifluoro Propynyl Dimethyl Cyclopropane Carboxylate (Sat Methyl Ester) This on reaction with Caustic Soda gives Methyl Ester & then Na Salt of Chloro Difluoro Propenyl Dimethyl Cylcopropenyl Carboxylic Acid (TFP Acid) which on Hydrochloric Acid treatment gives Chloro Difluoro Propeny Dimethyl Cyclo Propane Carboxyllic Acid.

This acid on chlorination by Thionyl Chloride gives Chloro Trifluoro Propenyl, Dimethyl Cyclopropane Carboxylic Acid Chloride as the final product.

Chemical Reactions: -

Step 1: -

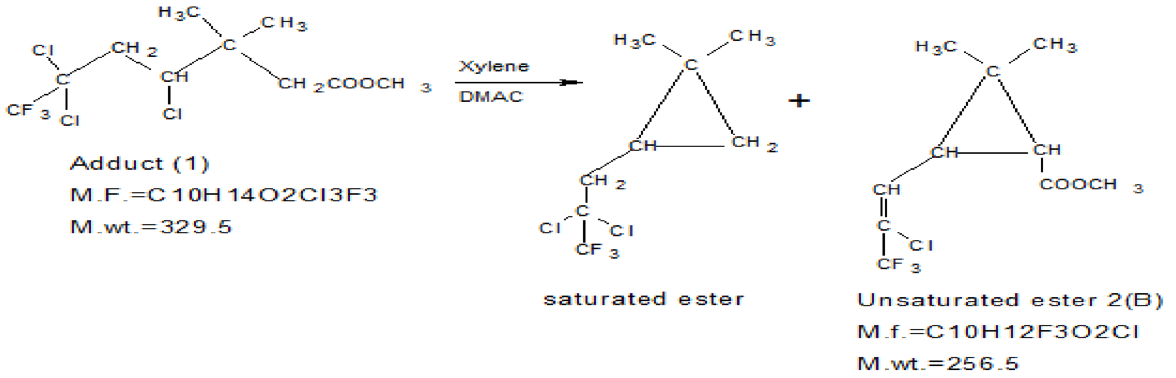


3,3-dimethyl-4-pentenoic caid methyl ester
M.F.=C8H14O2
M.wt.=142

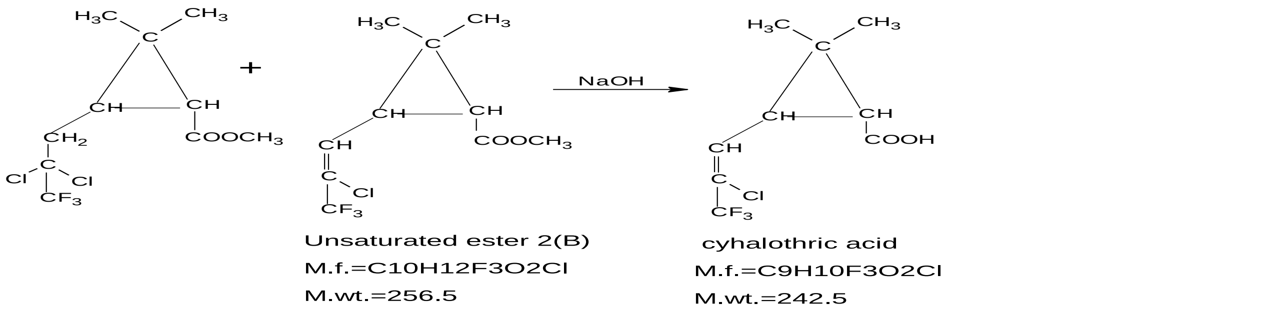
trifluoro trichloro ethane
M.F.=C2F3Cl3
M.wt.=187.5

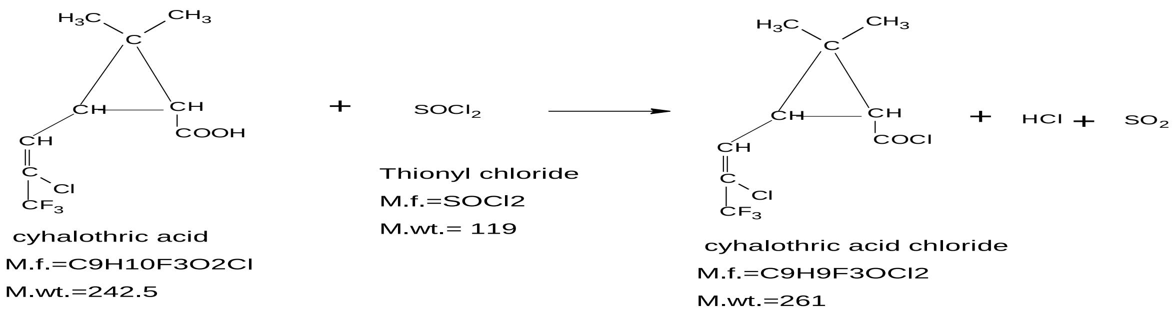
Adduct (1)
M.F.=C10H14O2Cl3F3
M.wt.=329.5

Step 2: -



Step 3:





Mass Balance:

261	Material / Mass Balance of Lambda Acid Chloride (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Tri Chloro Tri Fluoro Ethane	1350		Lambda Acid Chloride	**1000**
2	Methyl Pentanoate	1110		Recovered Solvent – TBA	11078

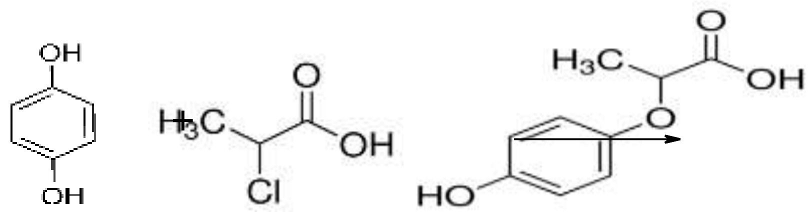
3	Catalyst -1	11		Solvent Loss - TBA	150
4	Catalyst -2	15		Recovered n- Hexane	7550
5	30 % HCl Solution	3552		n- Hexane loss	380
6	Tertiary Butyl Alcohol - TBA	12478		Recovered Methanol	1300
7	Na- Metal	210		Methanol- Loss	100
8	Solvent n- Hexane	7930		30 % HCl Solution	552
9	Di Methyl Formamide	221		20 % Sodium Sulphite Solution	2984
10	Sulfuric Acid 98 %	44		Recovered Methyl Pentanoate	20
11	Caustic Lye 46 - 48 %	3233		Aqueous Layer to ETP	8984
12	Solvent Methanol	1400		Distillation Residue	26
13	Thionyl Chloride	570			
14	Water for Reaction & Washing	2000			
	Total	**34124**		**Total**	**34124**

262) 2-(4- Hydroxy Phenoxy) Propionic Acid (4HPPA)

Brief Manufacturing Process: -

Step 1: -Para Hydro Quinone when reacted with 2-Chloro Propionic Acid it gives one intermediate product as 2(4-Hydoxy Phenoxy) Propionic Acid.

Chemical Reactions: -



Para Hydro Quinone (M.W.110)

2-Chloro Propionic Acid (M.W.108.0)

2(4-Hydroxy Phenoxy) Propionic Acid (M.W.182)

262	**Material / Mass Balance of 4HPPA(All Quantities are in kg)**				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Hydroquinone	930		**4HPPA**	**1000**
2	Caustic Soda Lye	2370		Recovered Solvent- MIBK.	2400
3	Solvent – MIBK	2500		Solvent Loss	100
4	R – Chloro Propionic Acid	862		Salt Solution for ETP	5594

5	30% HCl Solution	1438		Mother Liquor for Recycle	444
6	Water for Reaction	312			
7	Water for Washing	1126			
	TOTAL	**9538**		**TOTAL**	**9538**

263) Phenyl Methyl / Ethyl Glyoxylate Ester (PEG/PMG Ester)

Brief Manufacturing Process: -

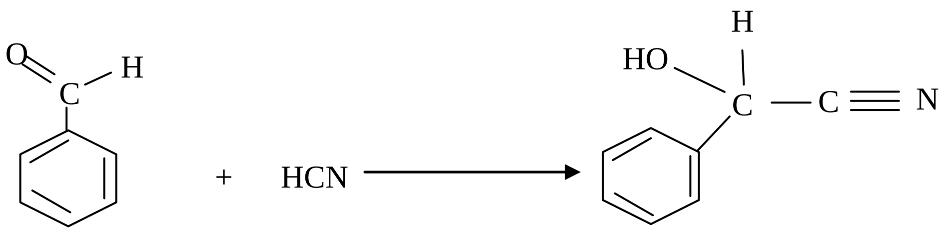
Step 1: - Benzaldehyde is reacted with Hydrogen Cyanide in Presence of Solvent Toluene to get Mandelonitrile (MN). Hydrogen Cyanide is generated In- Situ by the reaction of Sodium Cyanide Solution with 30 % Hydrochloric Acid in Closed System.

Step 2: - Mandelonitrile is then undergoes trans- esterification reaction with Methanol/ Ethanol in presence of 30 % Hydrochloric Acid Solution to give an intermediate, as Methyl / Ethyl Mandelate (MM/ EM).

Step 3: - Methyl/ Ethyl Mandelate (MM/ EM) on Oxidation by Sodium Hypochlorite, in presence of Phase- Transfer Catalyst gives an Ester as Methyl/ Ethyl Phenyl Glyoxylate (MPG/ EPG).

Chemical Reactions: -

Step 1: -

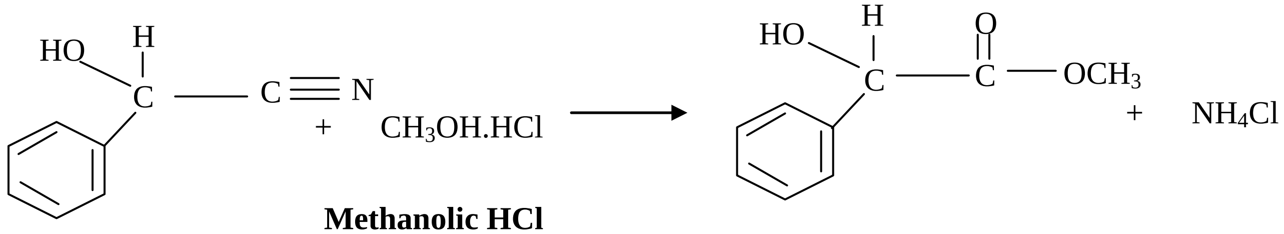


Benzaldehyde M.W. 106.0

Hydrogen Cyanide M.W. 27.0

Mandelonitrile (MN) M.W. 133.0

Step 2: -



Mandelonitrile (MN) M.W. 133.0

Methanolic HCl M.W. 32 + 36.5

Methyl Mandelate M.W. 166.0

Ammonium Chloride M.W. 53.5

Step 3: -

Methyl Mandelate M.W. 166.0

Sodium Hypochlorite M.W. 74.5

Methyl Phenyl Glyoxalate (MPG) Ester M.W. 164.0

Mass Balance:

263	Material / Mass Balance of PEG / PMG Ester (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Benzaldehyde	870		PEG / PMG Ester	**1000**
2	Hydrogen Cyanide	440		Recovered Methanol	1005
3	30% Hydrochloric Acid Solution	1000		Methanol Loss	60
4	Water for Reaction	1250		Solid Ammonium Chloride	460
5	8-10% Sodium Hypochloride Solution	4985		Aqueous Layer to ETP	7756
6	Methanolic. Hydrochloric Acid	1756		Organic Residue	20
	TOTAL	**10301**		**TOTAL**	**10301**

264) Triazinone/ (4-Amino-6-Tert Butyl-3-Mercapto-1,2,4-Triazin-5(4H)-One)
Brief Manufacturing Process: -

Step 1: Charge Pinacolin and start apply chilling up to 5 °C. Purge Chlorine slowly by maintaining temperature between 5-10 °C. The reaction is exothermic and controlledbyexternalcooling.Temperatureofreactionmassisraisedto40°C and evolved Hydrogen Chloride gas to be scrubbed in water and recover 30 % HCl as a by- product. Vent of water scrubber is connected to common Caustic scrubber. Purge remaining chlorine by maintaining temperature between 65°C.

Step 2: - Charge Hydrazine Hydrate and Catalyst. Apply chilling and cool up to 5 ^{O}C then charge gradually CS_2at 5 ^{O}C. Make 25% Caustic Lye solution for H_2S gas to common caustic scrubber. After charging of CS2 start addition of 48% CS Lye by maintaining temperature up to 10 ^{O}C. During cooking hydrogen Sulphide is liberated which is scrubbed in aqueous alkali. Charge remaining CS_2at 25 ^{O}C and cooking at 60 ^{O}C. Cool to 30 ^{O}C and filter the solid. Generated H_2S gas is then reacted with caustic lye to produce 30% NaSH solution as a by-product and water. ML obtained during the filtration is filled in drums & sent to TSDF for incineration.

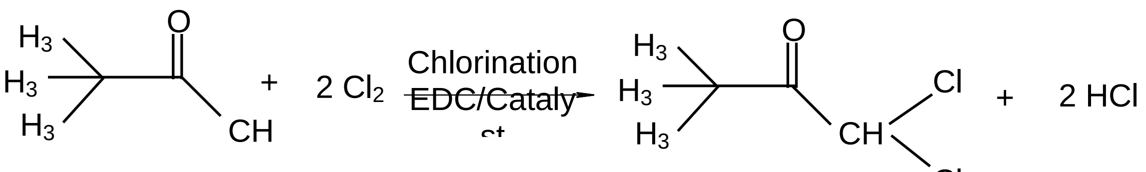
Step3: -

(A) Charge water and 48% Caustic Soda Lye under stirring and heat it to 40°C. AddDichloropinacolinslowlybymaintainingtemperaturebetween30°C.Coolreaction mixture. Add Sodium Hypochlorite solution slowly by maintaining temperature 50°C.

(B) Chargewater,conc.H_2SO_4andTCHsolidunderstirring.Heatthereactionmass to 80°C. Start addition of Keto acid solution at temperature 80°C. After completion of Keto Acid addition add conc. H_2SO_4. Maintain the reaction mass at temperature 70-75°. Cool the reaction mass to 10°C and filter, wash with water and dryit.

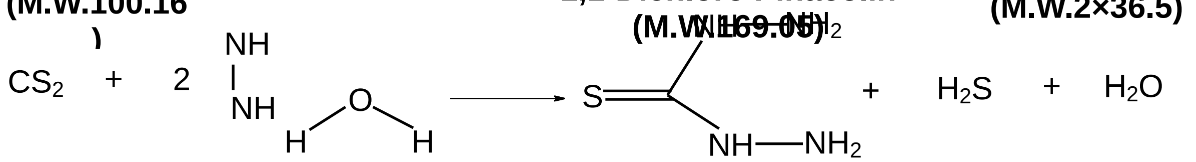
Chemical Reactions: -

Step 1: -



Pinacolin (M.W.100.16) **Chlorine (M.W.2×71)** **1,1-Dichloro Pinacolin (M.W.169.05)** **Hydrochloric Acid (M.W.2×36.5)**

Step 2: -

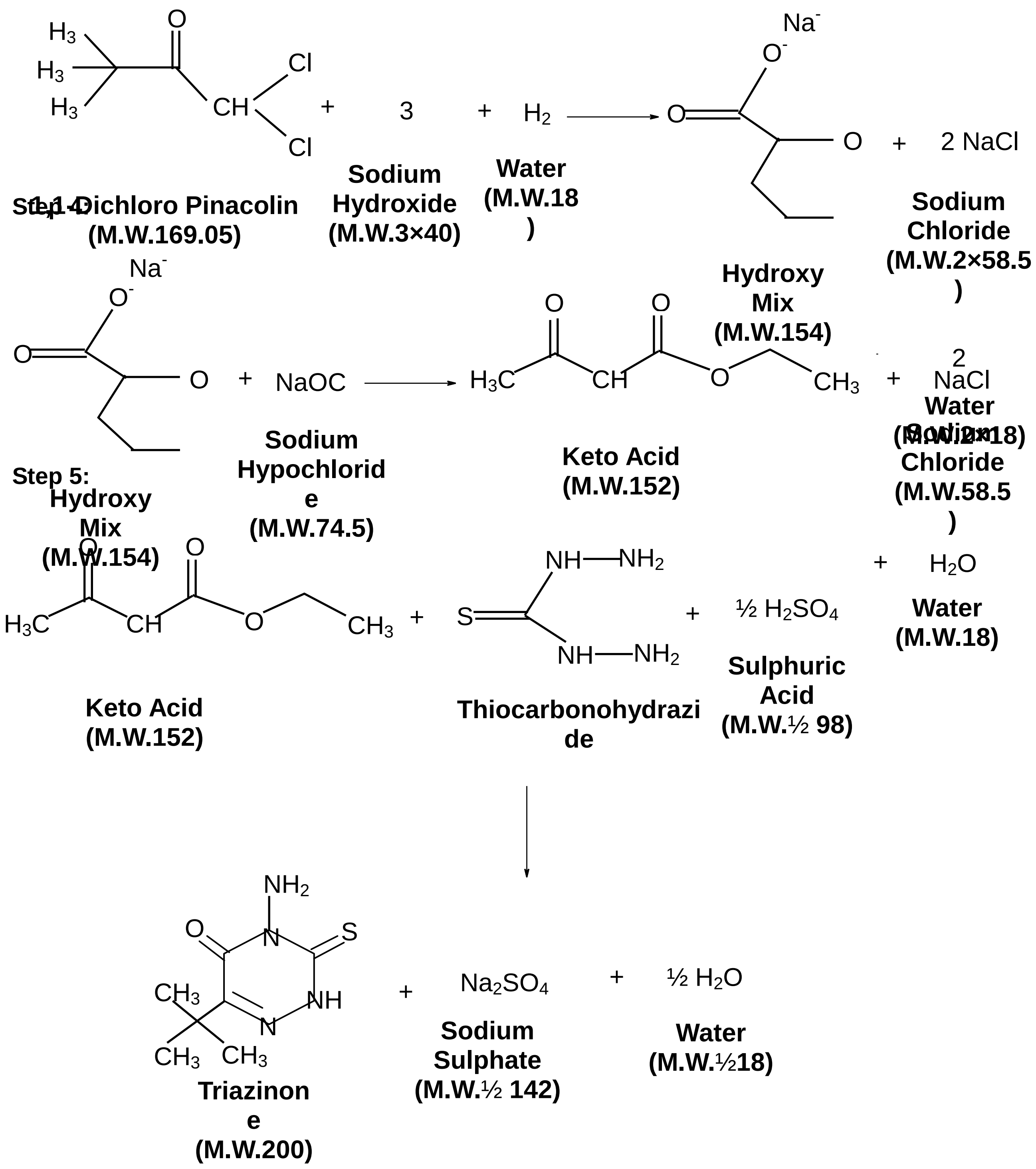


Carbon Disulphide (M.W.76) **Hydrazine Hydrate** **Thiocarbonohydrazide** **Hydrogen Sulphide (M.W.34)** **Water (M.W.18**

$$H_2S \quad + \quad NaO \longrightarrow NaSH \quad + \quad H_2$$

Hydrogen Sulphide (M.W.34) **Sodium Hydroxide (M.W.40)** **Sodium Hydrosulphide (M.W.56)** **Water (M.W.18)**

Step 3: -



264	Material / Mass Balance of Triazinone All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Pinacolin	610		Triazinone	1000
2	Chlorine Gas	870		30% Hydrochloric Acid Soln	1859

3	Hydrazine Hydrate	750		30% Sodium HydrosulfideSoln	1300
4	Catalyst-1	1		Wash ML	5471
5	Catalyst -2	18		Water Distillate	2100
6	Carbon Disulphide	537		Waste to Incineration	1200
7	48% Caustic Lye	1800		Moisture in Drying	150
8	Sodium Hypochloride	4500			
9	Sulphuric Acid	758			
10	Water	3236			
	TOTAL	**13080**		**TOTAL**	**13080**

265) Di-Ethyl Thio Phosphoryl Chloride/ O, O Di Ethyl Thio Phosphoryl Chloride (DETCl)

Brief Manufacturing Process: -

$PSCl_3$ on low temperature reacts with Absolute alcohol gives monoester.

The monoester thus formed reacts with absolute alcohol and sodium hydroxide and crude ester is separated out.

The crude Ester thus separated is subjected to fractional distillation to achieve desired purity.

Mono Ester is prepared by continuous feeding of $PSCl_3$. Ethanol in reactor at lower temperature followed by washing of Mono Ester Water to remove the Acidity. The aqueous layer separated is sent to recovery column after neutralization while the mono ester is sent to next stage called Di-Ester.

The Di-Ester is manufactured by reaction of Mono Ester with Ethanol and Sodium Hydroxide at lower temperature. The Sodium Chloride formed are washed with water and sent to Alcohol recovery column while crude Di-Ester is sent for the further purification by vacuum distillation.

The crude Di-Ester contains the mainly Mono Ester and Tri-Ester which is purified by distillation at 10 mm. vacuum and max. 100^{o}c. The distilled product is stored in storage tank.

Chemical Reactions: -

Step 1: -

$$PSCl_3 + CH_3\text{-}CH_2\text{-}OH \xrightarrow{\text{Solvent}} (CH_3\text{-}CH_3O)PSCl_2 + HCl$$

Thiophosphoryl Chloride (M.W.169.4)	Ethanol (M.W.46)	Trimethyl Phosphite (M.W.124.08)	Hydrochloric Acid (M.W.36.5)

Step 2: -

$$HCl + NaOH \longrightarrow NaCl + H_2O$$

Hydrochloric Acid (M.W.36.5)	Sodium Hydroxide (M.W.40)	Sodium Chloride (M.W.58.5)	Water (M.W.18 `

Step 3: -

$(CH_3\text{-}CH_3O)\ PSCl_2$ + $CH_3\text{-}CH_2\text{-}$ + NaOH ⟶ $(CH_3\text{-}CH_3O)_2PSCl$ + NaCl + H_2O

Trimethyl Phosphite (M.W.124.0)	Ethanol (M.W.46.	Sodium Hydroxid e	Diethyl Thiophosphor yl Chloride (M.W.188.5)	Sodium Chloride (M.W.58.	Water (M.W.18.

265	Material/MassBalanceofDETClAllQuantitiesareinkg)				
	IN– PUT			OUT– PUT	
Sr. No.	Raw Materials/Items	Kg/Batch		Product/Byproduct	Kg/Batch
1	Thiophosphoryl chloride	1400		Di-Ethyl Thio Phosphoryl Chloride	1000
2	Ethanol	6570		Recovered Ethanol	5570
3	Caustic Flakes	460		Sodium Chloride Salt	1024
4	Caustic Lye (47%)	580		Water	6004
5	Benzene	80		Effluent	1016
6	Water	6610		Losses	1086
	Total	**15700**		**Total**	**15700**

GROUP:16- Amino Diphenyl Ether / Phenoxy Compounds/ Specialty Phenols/ Specialty Chloro Phenol/ Amino Benzoic Esters / Aliphatic Esters/ Amino Compounds / Hydrogenation Compounds

266) 2- Amino Di Phenyl Ether

Brief Manufacturing Process:

Step: 1

Phenol is reacted with 2-Nitro Chlorobenzene in Presence of Sodium Hydroxide to get intermediate as 2-Nitro- Diphenyl Ether.

After the reaction solvent 1, 2 Dichlorobenzene is charged for the extraction for the product and Sodium Chloride salt which is formed during the reaction it is isolated by filtration

Organic mass along with intermediate is forwarded to next step.

Step: 2

2-Nitro- Diphenyl Ether is undergoes reduction reaction by Iron Powder as well as Acetic Acid to produce the root product as 2-Amino- Diphenyl Ether

Iron Hydroxide which is formed during the reduction reaction is isolated from the mass by filtration.

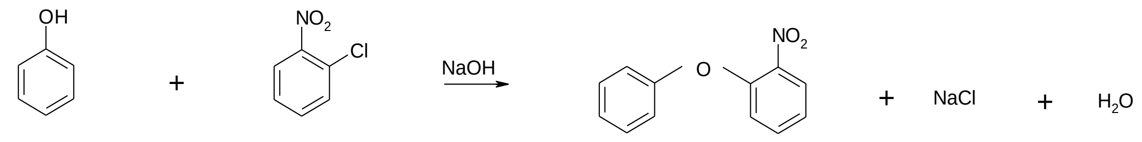
And organic mass is taken for further step

Step: 3

Organic mass is subjected to distillation to strip of the solvent to get the crude product 2-Amino- Diphenyl Ether which is finally distilled out to get the pure product as 2-Amino- Diphenyl Ether

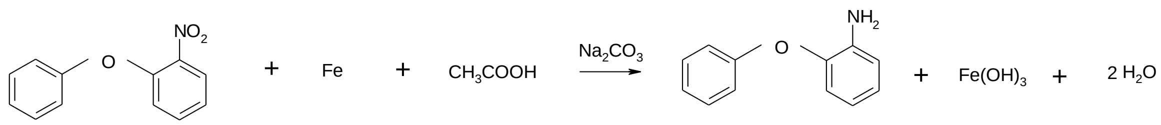
Chemical Reaction:

Step-1



Phenol	2- Nitro Chlorobenzene	2-Nitro Diphenyl Ether	Sodium Chloride	Water
M.Wt. = 94.0	M.Wt. = 157.5	M.Wt. = 215	M.Wt. = 58.5	M.Wt. = 18

Step-2



2-Nitro Diphenyl Ether	Iron Powder	Acetic Acid	2-Amino Diphenyl Ether	Iron Hydroxide	Water
M.Wt. = 215	M.Wt. = 56	M.Wt. = 60	M.Wt. = 185	M.Wt. = 107	M.Wt. = 18

Mass Balance:

266	Material / Mass Balance of 2- Amino Diphenyl Ether All Quantities are in kg)					
Input				Output		
Sr. No	**Raw Materials / Items**	**Kg/Batch**		**Product/By Products**	**Kg/Batch**
1	Phenol	592		2- Amino Diphenyl Ether	1000
2	2-Nitro Chlorobenzene	992		Recovered Solvent (1,2-Dichloro Benzene/DCT)	1170
3	Sodium Hydroxide	257		Solvent Loss	30
4	Solvent:1,2-Dichloro benzene/DCT	1200		Water Distillate	288
5	Iron (Fe) Powder	962		Sodium Chloride	376
6	Acetic Acid	20		Iron Sludge	1960
7	Soda Ash	15		Distillation Residue	14
8	Water	800		-	-
	Total	**4838**		**Total**	**4838**

267) 4-Amino 4'- Methyl Di Phenyl Ether

Brief Manufacturing Process:

Step: 1

4 - Methyl Phenol is reacted with 4-Nitro Chloro Benzene in presence of Sodium Hydroxide to get intermediate as 4-Nitro-4’-Methyl Diphenyl Ether

After the reaction solvent 1, 2 Dichlorobenzene is charged for the extraction for the product and

Sodium Chloride salt which is formed during the reaction it is isolated by filtration
Organic mass along with intermediate is forwarded to next step.

Step: 2

4-Nitro-4’-Methyl Diphenyl Ether undergoes reduction reaction by iron powder as well as Acetic Acid to produce the root product as 4-Amino-4’-Methyl Diphenyl Ether

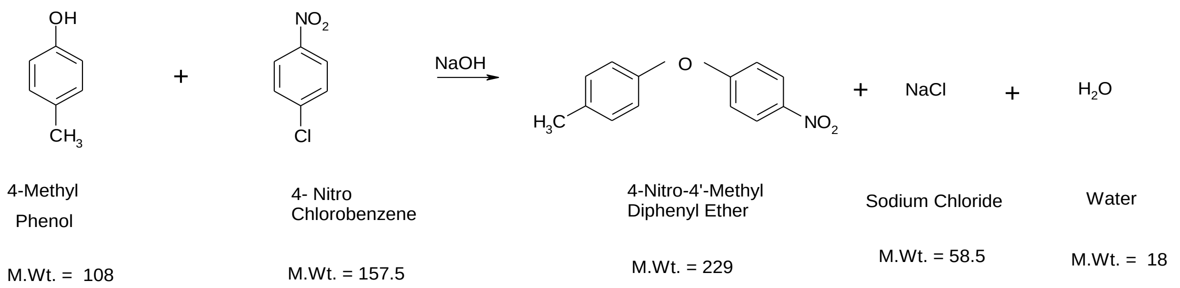
Iron Hydroxide which is formed during the reduction reaction is isolated from the mass by filtration.And organic mass is taken for further step.

Step: 3

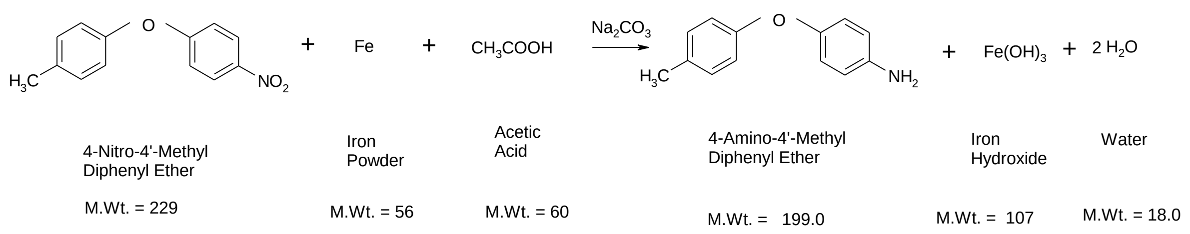
Organic mass is subjected to distillation to strip of the solvent to get the crude product as 4-Amino-4’-Methyl Diphenyl ether which is finally distilled out to get the pure product 4-Amino-4’-Methyl Diphenyl Ether.

Chemical Reaction:

STEP-1



STEP-2



Mass Balance

267	Material / Mass Balance of 4-Amino-4'- Methyl Diphenyl Ether All Quantities are in kg)				
Input				Output	
Sr. No	Raw Materials / Items	Kg/Batch		Product/By Products	Kg/Batch
1	4-Methyl Phenol	690		4 – Amino-4'-MethylDiphenyl Ether	1000
2	4-Nitro Chlorobenzene	1005		Recovered Solvent (1,2-Dichloro benzene/DCT)	1370

3	Sodium Hydroxide	261		Solvent Loss	30
4	Solvent:1,2-Dichloro benzene/DCT	1400		Water Distillate	526
5	Iron (Fe) Powder	1120		Sodium Chloride	382
6	Acetic Acid	25		Iron Sludge	2090
7	Soda Ash	19		Distillation Residue	22
8	Water	900			
	Total	**5420**		**Total**	**5420**

268) 2- Amino 2', 4, 4’- Tri Chloro Di Phenyl Ether

Brief Manufacturing Process:

Step: 1

2, 4 Dichloro Phenol is reacted with 2,5 Dichloro Nitrobenzene in presence of Sodium Hydroxide to get intermediate as 2-Nitro-2,4,4-Trichloro Diphenyl Ether

After the reaction Solvent 1, 2 Dichlorobenzene is charged for the extraction for the product and Sodium Chloride salt which is formed during the reaction it is isolated by filtration. Organic mass along with intermediate is forwarded to next step.

Step: 2

2-Nitro-2,4,4-Trichloro Diphenyl Ether undergoes reduction reaction by Iron Powder as well as Acetic Acid to produce the root product as 2-Amino-2,4,4-Trichloro Diphenyl Ether

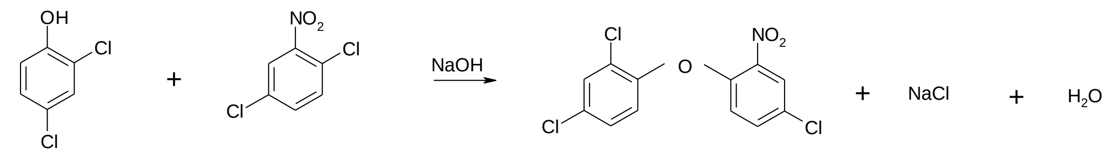
Iron Hydroxide which is formed during the reduction reaction is isolated from the mass by filtration.And organic mass is taken for further step

Step: 3

Organic mass is subjected to distillation to strip of the solvent to get the crude product as 2-Amino-2,4,4-Trichloro Diphenyl Ether which is finally distilled out to get the pure product as2-Amino-2,4,4-Trichloro Diphenyl Ether

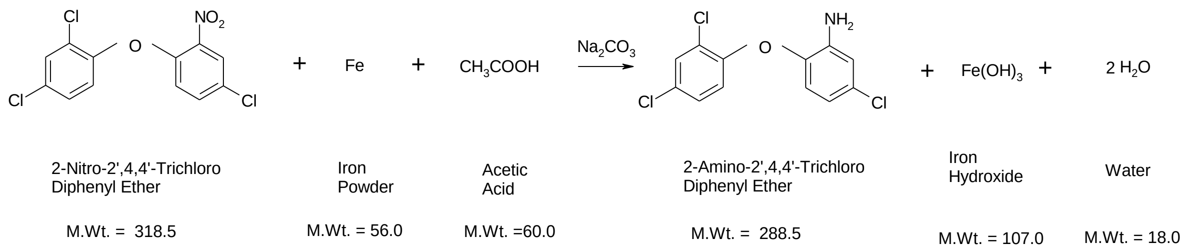
Chemical Reaction:

Step-1



2,4-Dichloro Phenol	2,5-Dichloro Nitrobenzene	2-Nitro-2',4,4'-Trichloro Diphenyl Ether	Sodium Chloride	Water
M.Wt. = 163.0	M.Wt. = 192.0	M.Wt. = 318.5	M.Wt. =58.5	M.Wt. =18

Step-2



268	Material / Mass Balance of 2- Amino-2',4,4'- Trichloro Diphenyl Ether All Quantities are in kg)				
	Input			Output	
Sr. No	**Raw Materials / Items**	**Kg/Batch**		**Product/By Products**	**Kg/Batch**
1	2,4-Dichloro Phenol	645		2- Amino-2',4,4'- Trichloro Diphenyl Ether	1000
2	2,5-Dichloro Nitrobenzene	760		Recovered Solvent	1172
3	Sodium Hydroxide	162		Solvent Loss	28
4	Solvent: 1,2-Dichlorobenzene/DCT	1200		Water Distillate	342
5	Iron (Fe) Powder	730		Sodium Chloride	236
6	Acetic Acid	20		Iron Sludge	1540
7	Soda Ash	15		Distillation Residue	14
8	Water	800		-	-
	Total	**4332**		**Total**	**4332**

269)2- Amino -4'- Chloro -4 -Trifluoromethyl Di Phenyl Ether

Brief Manufacturing Process:

Step: 1

4-Chloro Phenol is reacted with 3-Nitro-4-Chloro Benzotrifluoride in presence of Sodium Hydroxide to get intermediate as 2- Nitro -4'- Chloro -4 -Trifluoromethyl Di Phenyl Ether

After the reaction solvent 1, 2 Dichlorobenzene is charged for the extraction for the product and Sodium Chloride salt which is formed during the reaction it is isolated by filtration

Organic mass along with intermediate is forwarded to next step.

Step: 2

2- Nitro -4'- Chloro -4 -Trifluoromethyl Di Phenyl Ether undergoes reduction reaction by Iron Powder as well as acetic acid to produce the root product as 2- Amino - 4'- Chloro -4 -Trifluoromethyl Di Phenyl Ether

Iron Hydroxide which is formed during the reduction reaction is isolated from the mass by filtration.

And organic mass is taken for further step

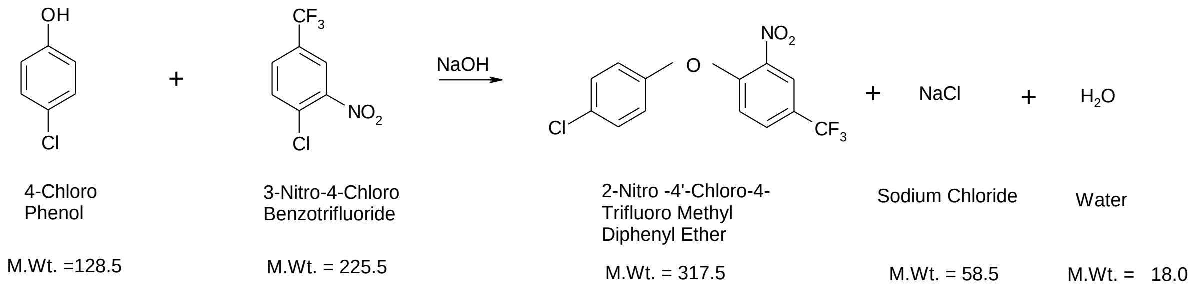
Step: 3

Organic mass is subjected to distillation to strip of the solvent to get the crude product 2- Amino -4'-

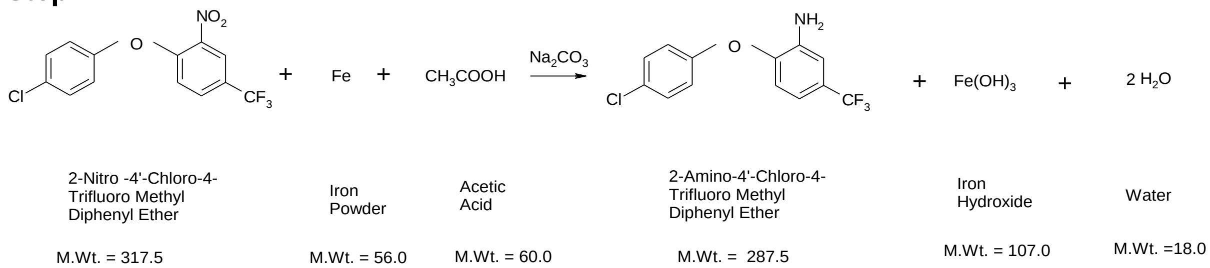
Chloro -4 -Trifluoromethyl Di Phenyl Ether which is finally distilled out to get the pure product as 2-Amino -4'- Chloro -4 -Trifluoromethyl Di Phenyl Ether

Chemical Reaction:

Step-1



Step-2



Mass Balance/Material Balance (All quantities are in Kg)

269	Material / Mass Balance of 2- Amino -4'- Chloro -4 -Trifluoromethyl Diphenyl Ether All Quantities are in kg)				
Input				Output	
Sr. No	Raw Materials / Items	Kg/Batch		Product/By Products	Kg/Batch
1	4-Chloro Phenol	525		2- Amino -4'- Chloro -4 - Trifluoromethyl Diphenyl Ether	1000
2	3-Nitro-4-Chloro Benzotrifluoride	921		Recovered Solvent	1174
3	Sodium Hydroxide	165		Solvent Loss	26
4	Solvent:1,2-Dichloro benzene/DCT	1200		Water Distillate	359
5	Iron (Fe) Powder	730		Sodium Chloride	240
6	Acetic Acid	20		Iron Sludge	1560
7	Soda Ash	15		Distillation Residue	17
8	Water	800		-	-
	Total	**4376**		**Total**	**4376**

270)2-Chloro-4-(4-Chlorophenoxy) Acetophenone / 4-Acetyl-3,4'-Dichloro Diphenyl Ether

Brief Manufacturing Process:

3,4'-Dichloro Diphenyl Ether undergoes Acylation reaction by Acetyl Chloride in presence of Anhydrous Aluminium Chloride and Solvent- EDC to form the final product as 4-Acetyl-3,4'-Dichloro Diphenyl Ether

Chemical Reaction:

3,4'-Dichloro Diphenyl Ether — M.Wt=239

Acetyl Chloride — M.Wt=78.5

4-Acetyl-3,4'-Dichloro Diphenyl Ether — M.Wt=281

Hydrochloric Acid — M.Wt=36.5

270	Material / Mass Balance of 2-Chloro-4-(4-Chlorophenoxy) Acetophenone/4-Acetyl-3,4'-Dichloro Diphenyl Ether All Quantities are in kg)				
	Input			Output	
Sr. No	Raw Materials / Items	Kg/Batch		Product/By Products	Qty/Batch
1	3,4'-Dichloro Diphenyl Ether	1250		2-Chloro-4-(4-Chlorophenoxy) Acetophenone	1000
2	Acetyl Chloride	537		Recovered Solvent: EDC	1930
3	Aluminium Trichloride	960		EDC Loss	70
4	Solvent: EDC	2000		20% Aluminium Chloride Soln	4800
5	Water	4500		30% Hydrochloric Acid	640
6				Aqueous Layer to ETP	791
7				Distillation Residue	16
	Total	**9247**		**Total**	**9247**

271) 2-Acetyl-2',4,4'-Trichloro Diphenyl Ether

Brief Manufacturing Process:

Step:1

2',4,4'-Trichloro Diphenyl Ether undergoes Acylation by Acetyl Chloride in presence of Anhydrous Aluminium Tri chloride and solvent as EDC to form the final product as 2-Acetyl-2',4,4'-Trichloro Diphenyl Ether

Chemical Reaction:
Step-1

2',4,4'-Trichloro Diphenyl Ether — M.Wt=273.5

Acetyl Chloride — M.Wt=78.5

2-Acetyl-2,4,4'-Trchloro Diphenyl Ether — M.Wt=315.50

Hydrochloric Acid — M.Wt=36.5

Mass Balance

271	**Material / Mass Balance of 2-Acetyl-2',4,4'-Trichloro Diphenyl Ether All Quantities are in kg)**				
Input				**Output**	
Sr. No	**Raw Materials / Items**	**Kg/Batch**		**Product/By Products**	**Kg/Batch**
1	2',4,4'-Trichloro Diphenyl Ether	1240		2-Acetyl-2',4,4'-Trichloro Diphenyl Ether	1000
2	Acetyl Chloride	516		Recovered Solvent: Mix xylene	1935
3	Aluminium Trichloride	920		Solvent Loss	65
4	Solvent: Ethylene Dichloride	2000		20% Aluminium Trichloride solution	4600
5	Water	4300		30% Hydrochloric acid	552
6				Aqueous Layer to ETP	800
7				Distillation Residue	24
	Total	**8976**		**Total**	**8976**

272)5 Chloro-6-(2,3 Dichloro Phenoxy)-2-Methyl Thio -1H Benzimidazole(Triclabendazole) Brief Manufacturing Process:

Step -1

Tri Chloro Phenoxy Nitro Aniline undergoes reduction in presence of Iron Powder water and Acetic Acid the reaction mass is extracted by Chlorobenzene and Ferrous Hydroxide salt is isolated Organic mass is forwarded to next step

Step :2

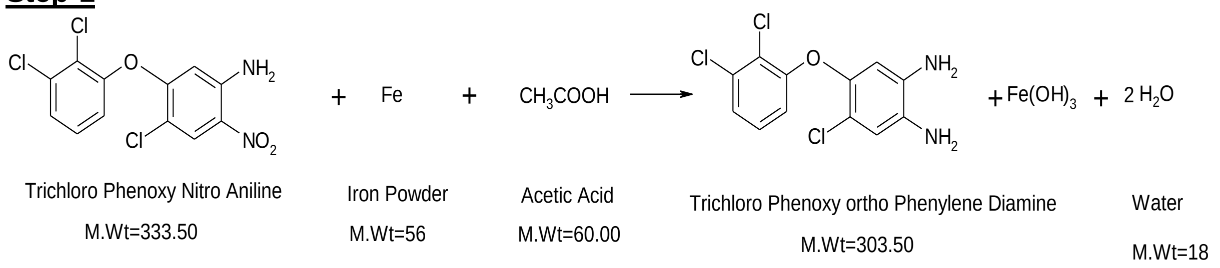
Tri Chloro Phenoxy o-Phenylene Diamine is subjected to cyclization by Carbon Disulphide to form Tri Chloro Phenoxy Benzimidazole in presence of solvent as Methanol

Step: 3

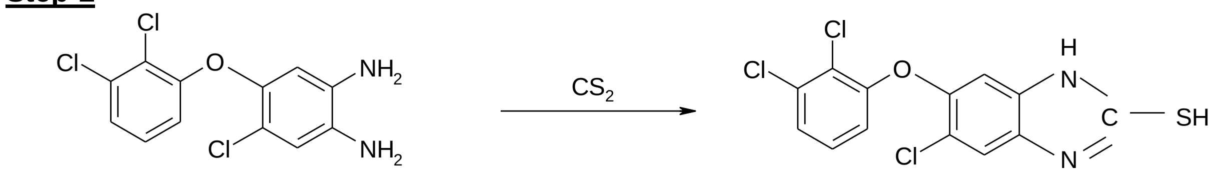
Tri Chloro Phenoxy Benzimidazole undergoes Methylation by Dimethyl Sulphate in presence of Sodium Hydroxide to from Triclabendazole i.e. – 5-Chloro-6-(2,3 Dichloro Phenoxy)-2-(Methyl Thaio-1H-Benzimidazole) Toluene is used as a solvent.

Chemical Reaction:

<u>Step-1</u>



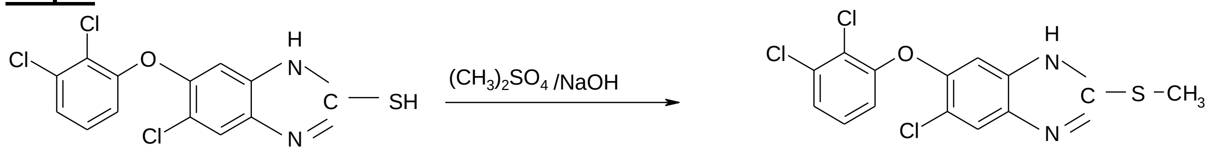
Step-2



Trichloro Phenoxy ortho Phenylene Diamine
M.Wt=303.50

Trichloro Phenoxy Benzenemedazole
M.Wt=345.50

Step-3



Trichloro Phenoxy Benzenemedazole
M.Wt=345.50

Triclabendazole
M.Wt=359.50

Mass Balance:

272	**Material / Mass Balance of 5 Chloro-6-(2,3 Dichloro Phenoxy)-2-Methyl thio -1H Benzimidazole/Triclabendazole All Quantities are in kg)**				
Input				**Output**	
Sr. No	**Raw Materials / Items**	**Kg/Batch**		**Product/By Products**	**Kg/Batch**
1	Trichloro Phenoxy Nitro aniline	1140		Triclabendazole	1000
2	Iron	452		Recovered Solvent: Chlorobenzene	2060
3	Acetic Acid	20		Solvent Loss: Chlorobenzene	40
4	Soda Ash	15		Recovered Solvent: Methanol	2355
5	Solvent: Chlorobenzene	2100		Solvent Loss: Methanol	45
6	Carbon Disulfide	275		Recovered Solvent: Toluene	1760
7	Solvent: Methanol	2400		Solvent Loss: Toluene	40
8	Sodium Hydroxide	280		Distillate water	155
9	Dimethyl Sulfate	430		Iron Sludge	1075
10	Water	3274		20% Sodium Sulfate Solution	2425
11	Solvent: Toluene	1800		30% Sodium bi sulfide Solution	650
12				Aqueous Layer to ETP	565
13				Distillation Residue	16
	Total	**12186**		**Total**	**12186**

273) 2, 4 Di Chloro Phenol
Brief Manufacturing Process:

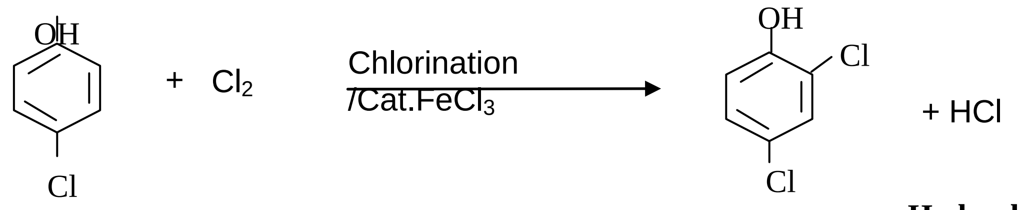
Para Chloro Phenol (4- Chloro Hydroxy Benzene) undergoes chlorination reaction by Chlorine gas in presence of Catalystas Anhydrous Ferric Chloride gives 2,4 Di Chloro Phenol.

Crude 2,4 Di Chloro Phenol is taken for Distillation to get as Pure Products.

Excess quantity of Para Chloro Phenol isused in Reaction Mass which serves as Solvent, which is recovered by distillation after completion of reaction.

During the chlorination, Hydrochloric Acid gas is generated which is scrubbed to water to get 30 % Hydrochloric Acid solution as Bi Product.

Chemical Reactions:



ParaChloroPhenol M.W. 128.5 **Chlorine M.W. 71.0** **2,4 Di Chloro Phenol M.W. 163** **Hydrochloric Acid M.W. 36.5**

273	Material / Mass Balance of 2,4 Di Chloro Phenol All Quantities are in kg)				
Input				Output	
Sr. No	Raw Materials / Items	Kg/Batch		Product/By Products	Kg/Batch
1	Para Chloro Phenol	2250		2,4 Di Chloro Phenol	1000
2	Anhydrous Ferric Chloride	12		Recovered Para Chloro Phenol	1440
3	Chlorine Gas	440		Para Chloro Phenol Loss	26
4	Water for 30% HCl Formation	520		30% Hydrochloric Acid	735
5	Water for Washings	200		ETP Water	408
6	1% Soda Ash Solution	200		Distillation Residue	13
	Total	**3622**		**Total**	**3622**

274) 2, 5 Dichloro Phenol

Brief Manufacturing Process:

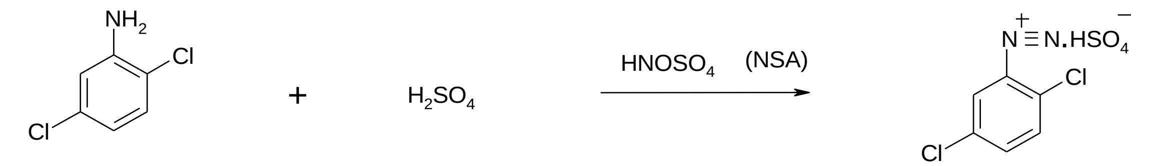
Step: 1

2,5 Dichloro Aniline is diazotized with Nitrosyl Sulfuric Acid (NSA) in presence of Sulfuric Acid to get diazotized mass of 2,5 Dichloro Aniline.

Step: 2

This diazotized mass is hydrolyzed in presence of water & mixed Xylene solvent to get crude product. Finally, this crude product is further purified by high vacuum distillation.

Chemical Reaction:
Step-1

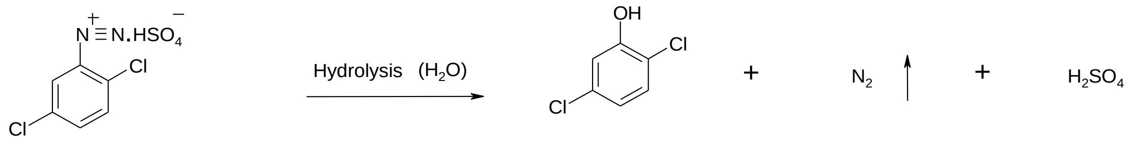


2,5-Dichloro Aniline — M.Wt. = 162.0

Sulfuric Acid — M.Wt. = 98.00

Diazonium Salt of 2,5-Dichloro Aniline — M.Wt. = 271.00

Step-2



Diazonium Salt of 2,5-Dichloro Aniline — M.Wt. = 271.00

2,5 Dichloro Phenol — M.Wt. = 163.0

Nitrogen — M.Wt. = 28

Sulfuric Acid — M.Wt. = 98.00

Material Balance:

274	**Material / Mass Balance of 2,5 - Dichloro Phenol All Quantities are in kg)**				
Input				**Output**	
Sr. No	**Raw Materials / Items**	**Kg/Batch**		**Product/By Products**	**Kg/Batch**
1	2,5 - Dichloro Aniline	1060		2,5 - Dichloro Phenol	1000
2	98% Sulfuric Acid	1200		Recovered Solvent: Mixed Xylene	2150
3	Nitrosyl Sulfuric Acid (40 %)	2085		Solvent Loss: Mixed Xylene	50
4	Solvent: Mixed Xylene	2200		Dilute Sulfuric Acid	3750
5	Water	1800		Aqueous Layer to ETP	1183
6				Nitrogen Gas	185
7				Distillation Residue	27
	Total	**8345**		**Total**	**8345**

275) 3 Methyl Phenol (m-cresol)

Brief Manufacturing Process:

Step: 1

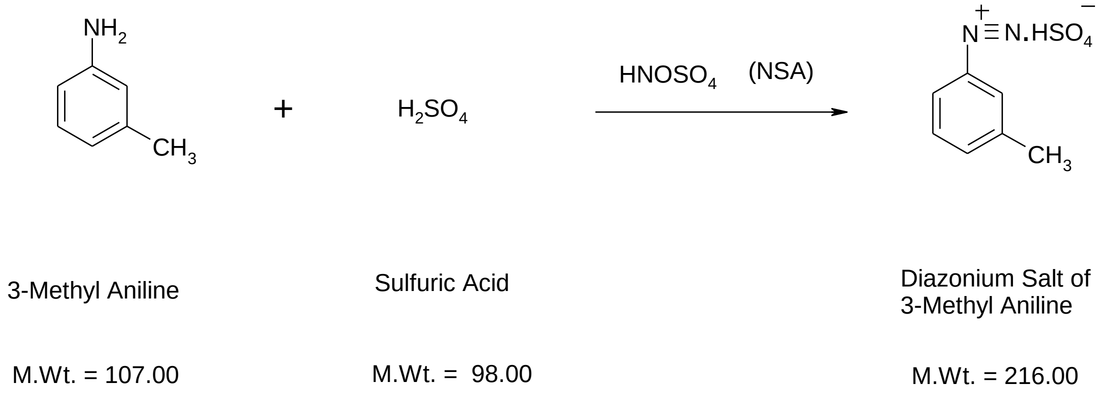
3 Methyl Aniline is diazotized with Nitrosyl Sulfuric Acid (NSA) in presence of Sulfuric Acid to get diazotized mass of 3 Methyl Aniline

Step: 2

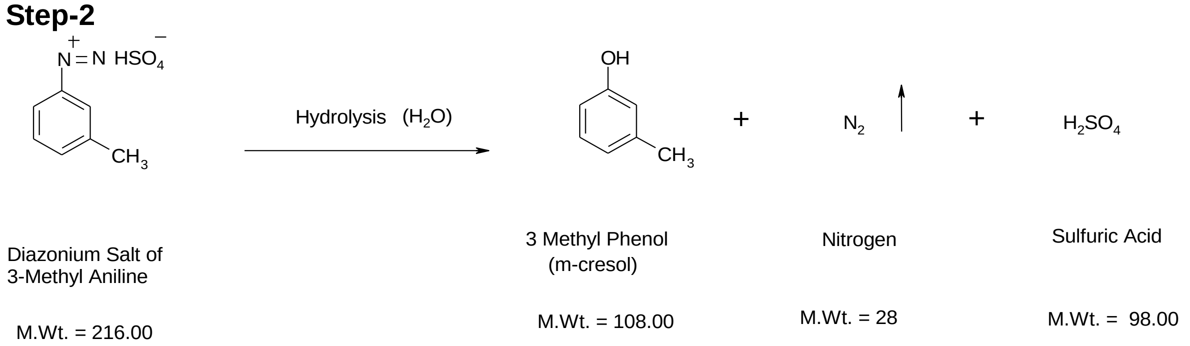
This diazotized mass is hydrolyzed in presence of water & mixed Xylene solvent to get crude product. Finally, this crude product is further purified by high vacuum distillation

Chemical Reaction:

Step-1



Step-2



Material Balance/Mass Balance (All Quantities are in Kg)

275	Material / Mass Balance of 3 - Methyl Phenol (Meta- Cresol) All Quantities are in kg)				
Input				Output	
Sr. No	Raw Materials / Items	Kg/Batch		Product/By Products	Kg/Batch
1	3 - Methyl Anilne	1056		3-Methyl Phenol (Meta- Cresol)	1000
2	98% Sulfuric Acid	1350		Recovered Solvent: Mixed Xylene	1965
3	Nitrosyl Sulfuric Acid (40 %)	3195		Solvent Loss: Mixed Xylene	45
4	Solvent: Mixed Xylene	2000		Dilute Sulfuric Acid	4840
5	Water	1523		E.T.P. Water	957
	-	-		Nitrogen Gas	280
	-	-		Distillate Residue	37
	Total	**9124**		**Total**	**9124**

276) 3-Nitro Phenol

Brief Manufacturing Process:

Step: 1

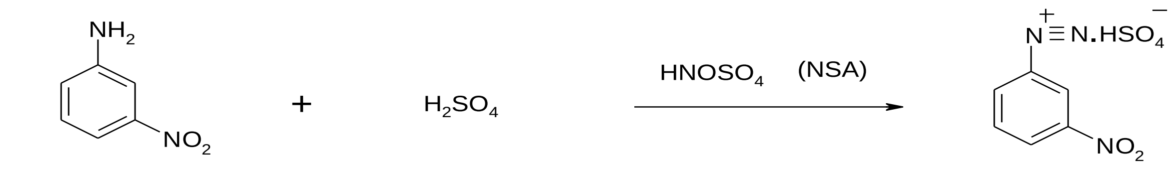
3-Nitro Aniline is diazotized with Nitrosyl Sulfuric Acid (NSA) in presence of Sulfuric Acid to get diazotized mass of 3-Nitro Aniline.

Step: 2

This diazotized mass is hydrolyzed in presence of water & mixed Xylene solvent to get crude product. Finally, this crude product is further purified by high vacuum distillation.

Chemical Reaction:

Step-1

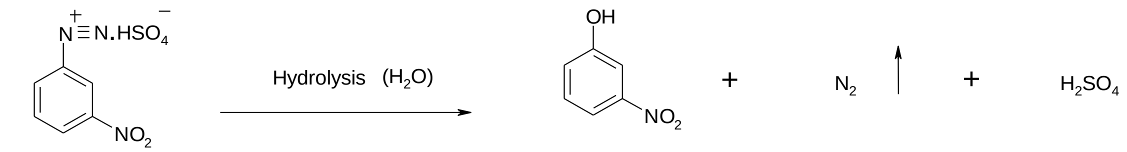


3-Nitro Aniline — M.Wt. = 138.00

Sulfuric Acid — M.Wt. = 98.00

Diazonium Salt of 3-Nitro Aniline — M.Wt. = 247.00

Step-2



Diazonium Salt of 3-Nitro Aniline — M.Wt. = 247.00

3-Nitro Phenol — M.Wt. = 139.00

Nitrogen — M.Wt. = 28

Sulfuric Acid — M.Wt. = 98.00

Material Balance:

276	Material / Mass Balance of 3 - Nitro Phenol (All Quantities are in kg)				
Input				Output	
Sr. No	**Raw Materials / Items**	**Kg/Batch**		**Product/By Products**	**Kg/Batch**
1	3-Nitro Aniline	1105		3 - Nitro Phenol	1000
2	98% Sulfuric Acid	1400		Recovered Solvent: Mixed Xylene	1860
3	Nitrosyl Sulfuric Acid(40%)	2542		Solvent Loss: Mixed Xylene	40
4	Solvent: Mixed Xylene	1900		Dilute Sulfuric Acid	4780
5	Water	1540		Aqueous Layer to ETP	550
6				Nitrogen Gas	224
7				Distillation Residue	33
	Total	**8487**		**Total**	**8487**

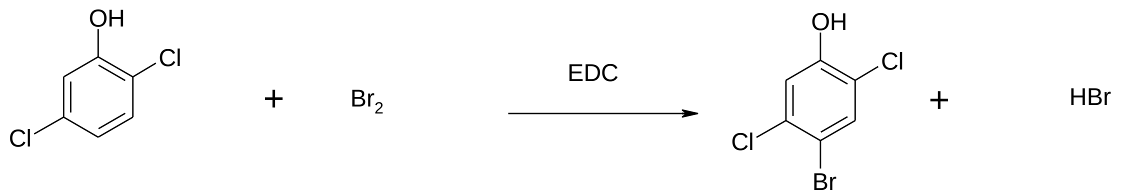
277) 4-Bromo 2,5 Dichloro Phenol

Brief Manufacturing Process:

Step: 1

2,5 Dichloro phenol is subjected to Bromination reaction by liquid bromine in presence of EDC Solvent to give the final product as 4-bromo 2,5 Dichloro Phenol

Chemical Reaction:
Step-1



2,5-Dichloro Phenol | Bromine | 4-Bromo 2,5-Dichloro Phenol | Hydrobromic Acid

M.Wt. = 163.00 | M.Wt=160.00 | M.Wt=242.00 | M.Wt=81.00

277	Material / Mass Balance of 4-Bromo-2,5-Dichloro Phenol (All Quantities are in kg)				
Input				**Output**	
Sr. No	**Raw Materials / Items**	**Kg/Batch**		**Product/By Products**	**Kg/Batch**
1	2,5-Dichloro Phenol	702		4-Bromo-2,5-Dichloro Phenol	1000
2	Bromine	690		Recovered Ethylene Dichloride	1170
3	Ethylene Dichloride	1200		Ethylene Dichloride Loss	30
4	Water	863		28% Hydrobromic Acid	1245
				Distillation Residue	10
	Total	**3455**		**Total**	**3455**

278) 4-fluoro phenol

Brief Manufacturing Process:

Step: 1

4-fluoro Aniline is diazotized with Nitrosyl Sulfuric Acid (NSA) in presence of Sulfuric Acid to get diazotized mass of 4-fluoro Aniline

Step: 2

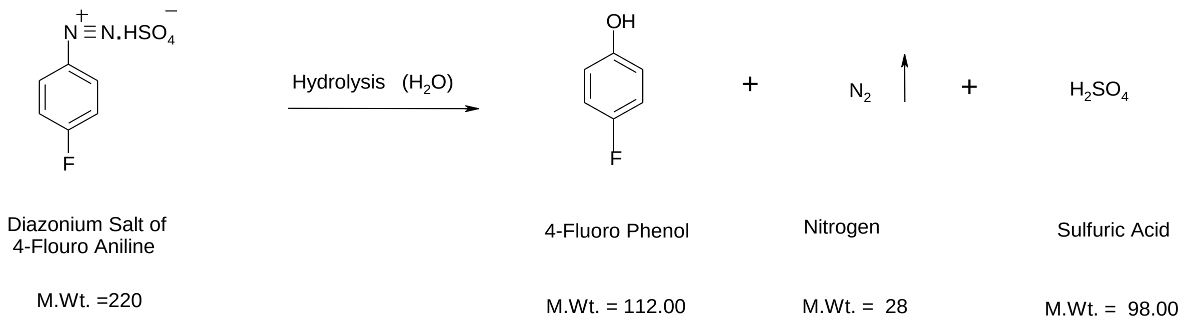
This diazotized mass is hydrolyzed in presence of water & mixed Xylene solvent to get crude product. Finally, this crude product is further purified by high vacuum distillation.

Chemical Reaction:
Step-1

4-Fluoro Aniline | Sulfuric Acid | Diazonium Salt of 4-Fluoro Aniline

M.Wt. = 111.00 | M.Wt. = 98.00 | M.Wt. =220

Step-2



Material Balance:

278	Material / Mass Balance of 4-Fluoro Phenol (All Quantities are in kg)				
Input				Output	
Sr. No	Raw Materials / Items	Kg/Batch		Product/By Products	Kg/Batch
1	4-Fluoro Aniline	1075		4-Fluoro Phenol	1000
2	98% Sulfuric Acid	885		Recovered Solvent: Mixed Xylene	2170
3	Nitrosyl Sulfuric Acid (40 %)	3075		Solvent Loss: Mixed Xylene	30
4	Solvent: Mixed Xylene	2200		Dilute Sulfuric Acid	4343
5	Water	1850		Aqueous Layer to ETP	1260
	-	-		Nitrogen Gas	270
	-	-		Distillation Residue	12
	Total	**9085**		**Total**	**9085**

279) O-Cyano phenol

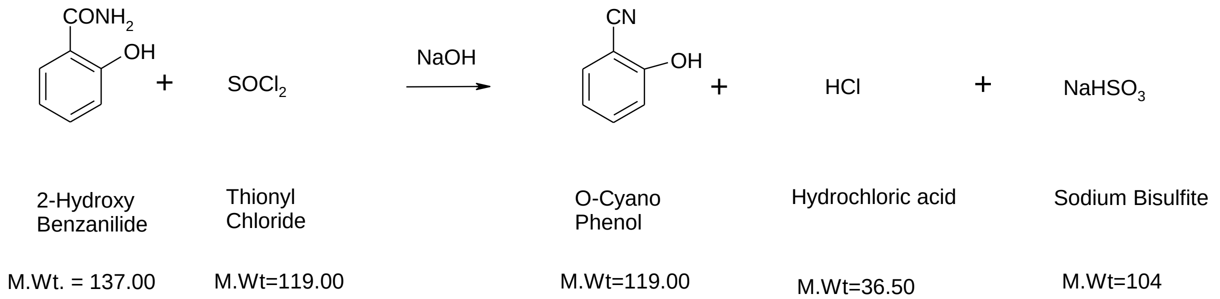
Brief Manufacturing Process:

Step: 1

2-hydroxy Benzanilide undergoes dehydration reaction by means of Thionyl chloride in presence of solvent chloro benzene to give the final product as o-Cyano phenol

Chemical Reaction:

Step-1



Material Balance

279	Material / Mass Balance of O-Cyano Phenol (All Quantities are in kg)

Input				Output	
Sr. No	**Raw Materials / Items**	**Kg/Batch**		**Product/By Products**	**Kg/Batch**
1	2-Hydroxy Benzanilide	1313		O-Cyano Phenol	1000
2	Thionyl Chloride	1142		Recovered Solvent: Monochloro Benzene	1360
3	Solvent: Monochloro Benzene	1400		Solvent Loss: Monochloro Benzene	40
4	Water	5265		30% Hydrochloric Acid	2336
5	Sodium Hydroxide	400		20% Sodium Sulfite Solution	4535
	-	-		Aqueous Layer to ETP	225
	-	-		Distillation Residue	24
	Total	**9520**		**Total**	**9520**

280) Ortho Nitro Phenol (ONP)

Brief Manufacturing Process:

Step -1

Ortho Nitro Chloro Benzene (2-Chloro Nitrobenzene) is reacted with Sodium Hydroxide in aqueous media at elevated temperature to get the crude product Ortho Nitro Phenol (ONP).

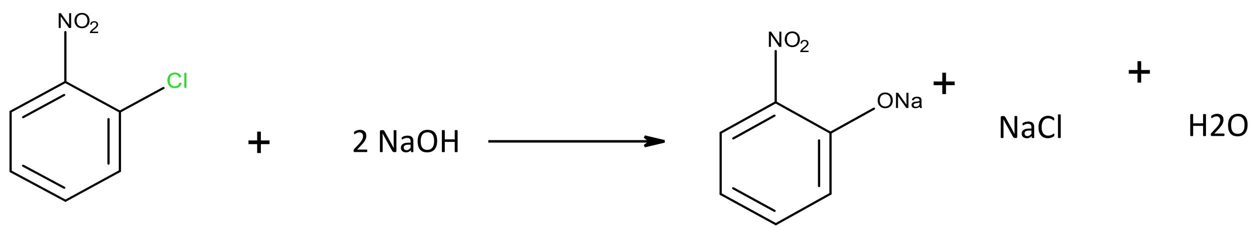
Step—2

After completion of reaction mass is neutralised by using 50 % Sulphuric Acid and organic Mass of ONP is separated out from aqueous layer. Aqueous layer is sent to ETP for further treatment. Organic Mass is taken for distillation under high vacuum to get the pure Product as Ortho Nitro Phenol.

H_2O

Chemical Reactions:

Step -1



Ortho Nitro Chloro Benzene (2-Chloro Nitrobenzene) M.W. = 157.5

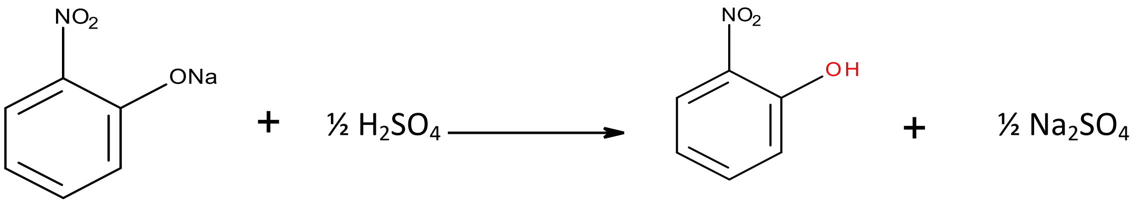
Sodium Hydroxide M.W. = 40.0

ONP Na-Salt M.W. = 161.0

Sodium Chloride M.W. = 58.5

Water M.W. = 18.0

Step—2



ONP Na-Salt M.W. = 161.0

Sulphuric Acid M.W. = 98.0

Ortho Nitro Phenol M.W. = 139.0

Sodium Sulphate M.W. = 142.0

Material Balance / Mass Balance (All quantities are in Kg.)

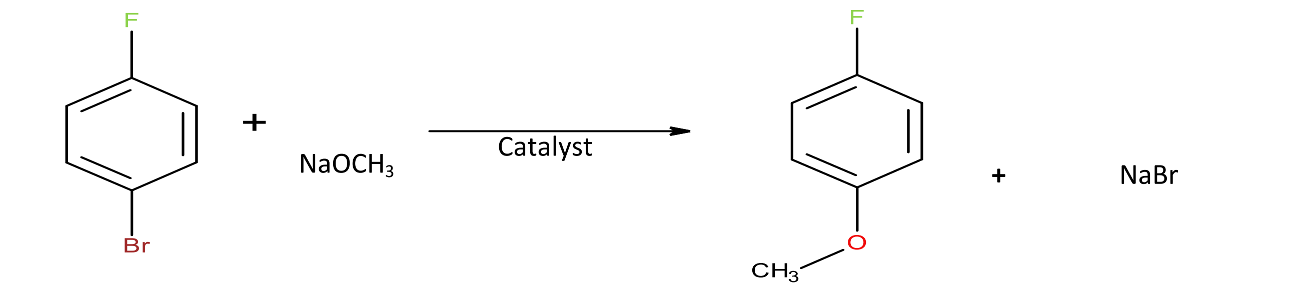
280	Material / Mass Balance of Ortho Nitro Phenol (All Quantities are in kg)				
INPUT				OUTPUT	
Sr. No.	Raw Material/item	Kg/Batch		Product/Bi Product	Kg/Batch
1	Ortho Nitro Chloro Benzene	1360		Ortho Nitro Phenol	1000
2	Sodium Hydroxide Flakes	726		Distillation Residue	28
3	Water	2176		Aqueous layer to ETP	5012
4	Sulphuric Acid (50%)	1778			
	Total	**6040**		**Total**	**6040**

281)4-Fluoro Anisole / Para Fluoro Anisole

Brief Manufacturing Process:

4-Bromo Fluoro Benzene is reacted with 20% Sodium Methoxide Solution in presence of Solvent Methanol and Catalyst at elevated temperature. After completion of reaction; Methanol is recovered by distillation and water is added to concern treated mass & then whole mass is filtered. Filtrate taken for layer separation. Aqueous Sodium Bromide (NaBr) Solution subjected for Bromine Recovery and Organic layer taken for distillation to get Pure Product by distillation under vacuum.

Chemical Reaction:



1-Bromo-4-Fluoro Benzene M.W. = 175 | Sodium Methoxide M.W. = 54 | 4-Fluoro Anisole M.W. = 126 | Sodium Bromide M.W. = 103

Material Balance / Mass Balance (All quantities are in Kg.)

281	Material / Mass Balance of 4-Fluoro Anisole (All Quantities are in kg)				
	INPUT			OUTPUT	
Sr. No.	Raw Material/item	Kg/Batch		Product/Bi Product	Kg/Batch
1	4-Bromo Fluoro Benzene	1445		4-Fluoro Anisole	1000
2	20% Sodium Methoxide Solution	2185		Recovered Methanol	2648
3	Catalyst	70		Methanol Loss	100
4	Methanol	1000		Recovered Catalyst	70
5	Water	1500		Sodium Bromide (NaBr Soln)	2382
	Total	**6200**		**Total**	**6200**

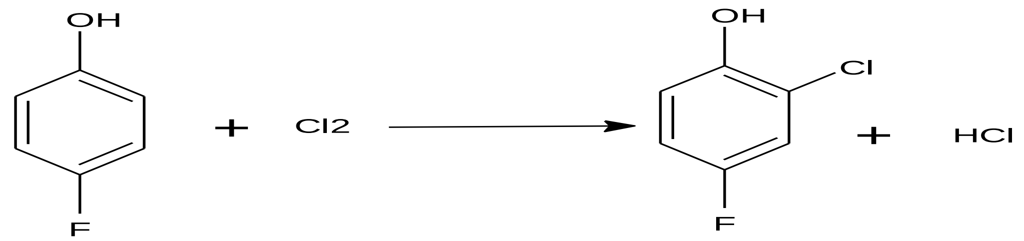
282)2-Chloro-4-Fluorophenol

Brief Manufacturing Process:

4-Fluoro Phenol reacted with Chlorine gas. Hydrogen Chloridegas is generated as by product, which is scrubbed to in Water to get 28-30% HCl solution.

Crude mass is taken for distillation under high vaccum to get pure product as Pure 2-Chloro-4-Flurorphenol.

Chemical Reaction:



4-Fluoro PhenolM.W. 112.0

Chlorine M.W. 71.0

2-Chloro-4-FlurorphenolM. W. 146.5

Hydrochloric AcidM.W. 36.5

282	**Material / Mass Balance of 2-Chloro-4-Fluorophenol (All Quantities are in kg)**				
	INPUT			**OUTPUT**	
Sr. No.	**Raw Material/item**	**Kg/Batch**		**Product/Bi Product**	**Kg/Batch**
1	4-Fluorophenol	850		2-Chloro-4-Fluorophenol	1000
2	Chlorine Gas	540		Hydrochloric Acid (28-30%) Solution	1044
3	Water	710		Sodium Hypochlorite (8-10%)	30
4	Dilute Caustic	20		Distillation Residue	46
	Total	**2120**		**Total**	**2120**

283)3-Amino 4-Methyl Benzoic Acid Isopropyl Ester

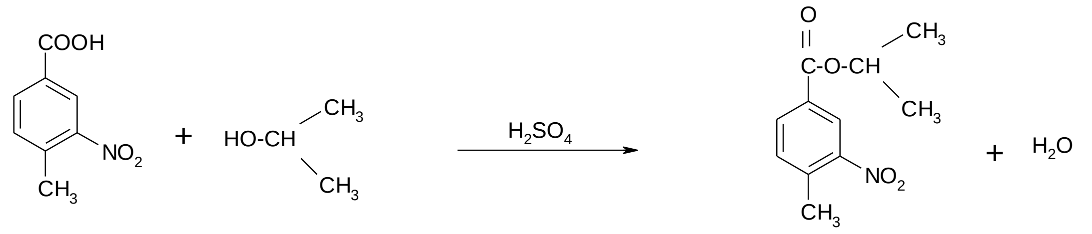
Brief Manufacturing Process:

Step -1:
3 – Nitro -4- methyl Benzoic Acid is reacted with Iso Propyl Alcohol in presence of Sulphuric Acid to form 3- Nitro -4- Methyl Benzoic Acid Iso Propyl Ester.

Step -2:
3- Nitro -4- Methyl Benzoic Acid Iso Propyl Ester undergoes reduction by Acetic Acid and Iron power to form 3- Amino -4- Methyl Benzoic Acid Iso Propyl Ester. Finally, Product is extracted using Solvent – 1, 2 Dichloro Benzene (ODCB) and Iron Hydroxide salt which is formed during reaction is isolated from mass by filtration.

Chemical Reaction:

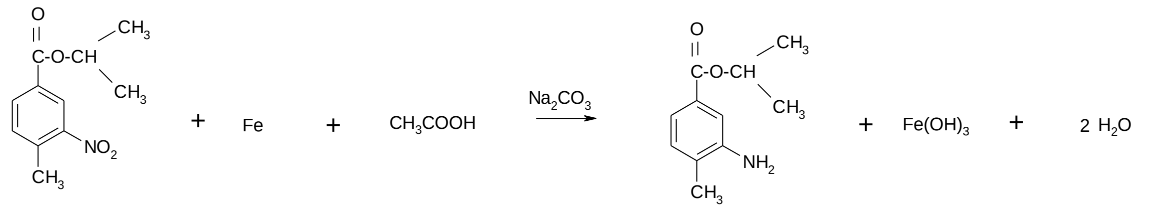
Step-1



3-Nitro-4-Methyl Benzoic Acid | Iso Propyl Alcohol | 3-Nitro-4-Methyl Benzoic Acid Iso Propyl Ester | Water

M.Wt. = 181.0 | M.Wt=60.00 | M.Wt. = 223.0 | M.Wt. = 18.0

Step-2



3-Nitro-4-Methyl Benzoic Acid Iso Propyl Ester | Iron Powder | Acetic Acid | 3-Amino-4-Methyl Benzoic Acid Iso Propyl ester | Iron Hydroxide | Water

M.Wt. = 223.0 | M.Wt. = 56.0 | M.Wt. =60.0 | M.Wt. = 193.0 | M.Wt. = 106 | M.Wt. = 18.0

Material Balance

283	Material / Mass Balance of 3- Amino -4- Methyl Benzoic Acid Iso Propyl Ester (All Quantities are in kg)				
	IN- PUT			OUT- PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / Bi Product	Kg/Batch
1	3- Nitro -4- Methyl Benzoic Acid	970		3- Amino -4- Methyl Benzoic Acid Iso Propyl Ester	1000
2	Iso Propyl Alcohol	322		Spent Sulfuric Acid (60 - 70 %)	485
3	Sulfuric Acid	340		Iron Hydroxide Salt	1620
4	Iron Powder	940		Recovered Solvent - ODCB	1575
5	Acetic Acid	28		Solvent Loss - ODCB	25
6	Sodium Carbonate	22		Aqueous Layer to ETP	657
7	Solvent - ODCB	1600		Distillation Residue	10
8	Water	1150			
	Total	**5372**			**5372**

284) 3-Amino 4-Methyl Benzoic Acid (2' - Chloro Ethyl Ester).

Brief Manufacturing Process:

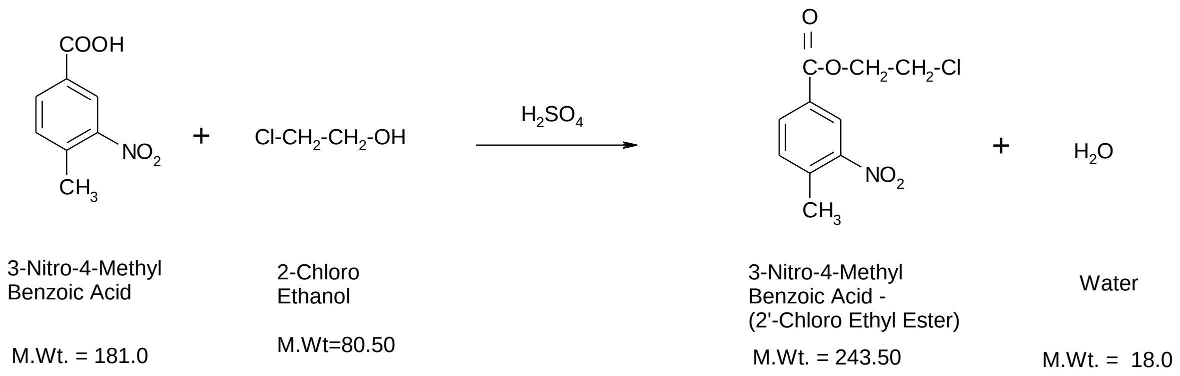
Step -1:
3 – Nitro -4- methyl Benzoic Acid is reacted with 2- Chloro Ethanol in presence of Sulfuric Acid to form 3- Nitro -4- Methyl Benzoic Acid (2’- Chloro Ethyl) Ester.

Step -2:

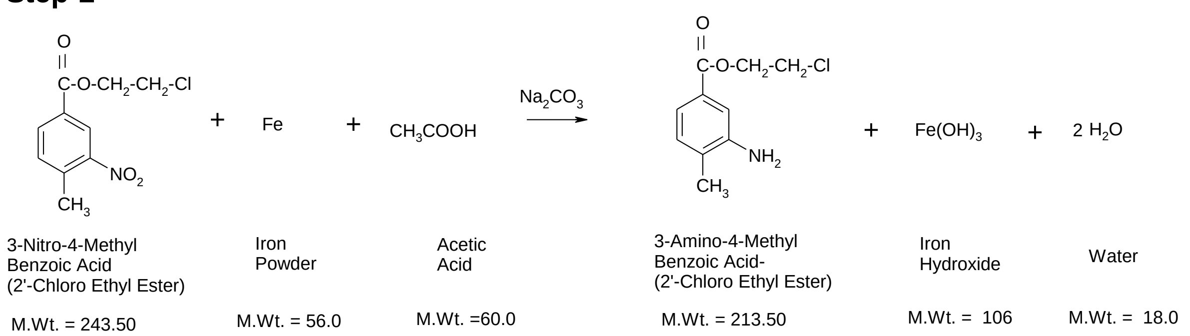
3- Nitro -4- Methyl Benzoic Acid (2- Chloro Ethyl Ester) undergoes reduction by Acetic Acid and Iron power to form 3- Amino -4- Methyl Benzoic Acid (2-Chloro Ethyl) Ester. Finally, Product is extracted using Solvent – 1, 2 Dichloro Benzene (ODCB) and Iron Hydroxide salt which is formed during reaction is isolated from mass by filtration.

Chemical Reaction:

Step-1



Step-2



Material Balance

284	**Material / Mass Balance of 3- Amino -4- Methyl Benzoic Acid (2'- Chloro Ethyl) Ester (All Quantities are in kg)**				
	IN- PUT			**OUT- PUT**	
Sr No	**Raw Materials / Items**	**Kg/Batch**		**Product / Bi Product**	**Kg/Batch**
1	3- Nitro -4- Methyl Benzoic Acid	930		3- Amino -4- Methyl Benzoic Acid (2'- Chloro Ethyl) Ester	1000
2	2- Chloro Ethanol	415		Spent Sulfuric Acid (60 -70 %)	594
3	Sulfuric Acid	400		Iron Hydroxide Salt	1558
4	Iron Powder	900		Recovered Solvent - ODCB	1750
5	Acetic Acid	28		Solvent Loss - ODCB	50
6	Sodium Carbonate	22		Aqueous Layer to ETP	763
7	Solvent - ODCB	1800		Distillation Residue	10
8	Water	1230			
	Total	**5725**			**5725**

285) 3-Amino Benzotrifluoride

Brief Manufacturing Process:

Step-1

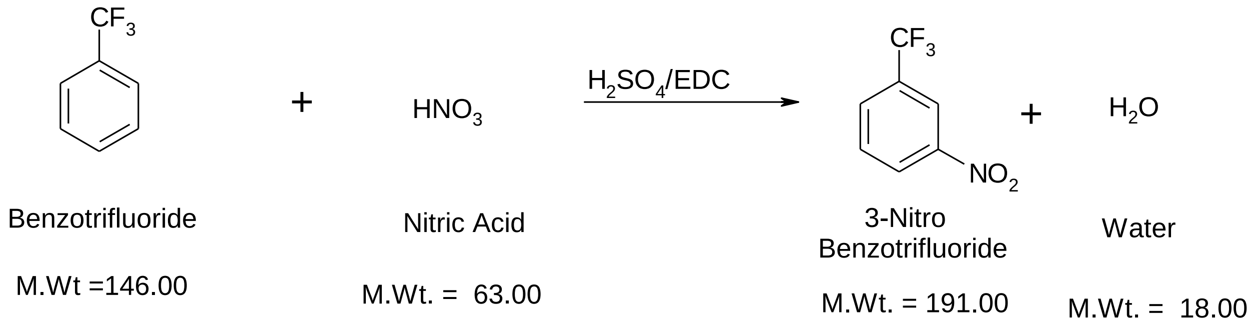
Benzotrifluoride undergoes Nitration reaction by Nitric Acid in presence of sulfuric Acid as well as Solvent EDC to give 3-Nitro Benzotrifluoride.

Step-2

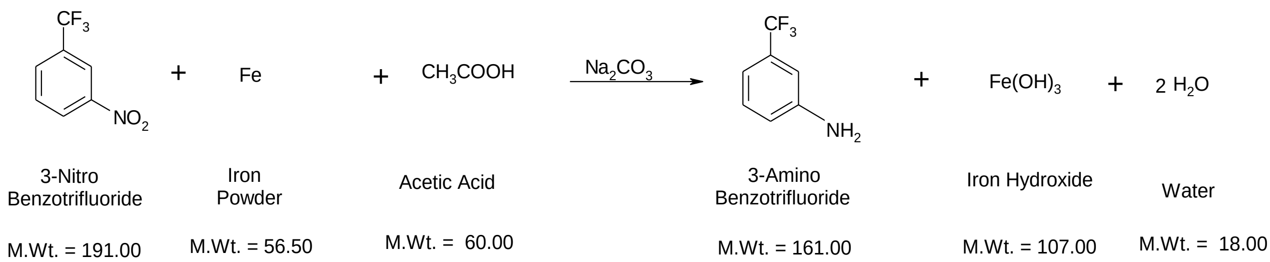
3-Nitro Benzotrifluoride undergoes reduction by Iron Powder as well as Acetic Acid to give Crude product 3-Amino Benzotrifluoride. After the reaction Iron Hydroxide is isolated by filtration. Finally, solvent is recovered by distillation to get the final product.

Chemical reaction:

Step-1



Step-2



Mass Balance:

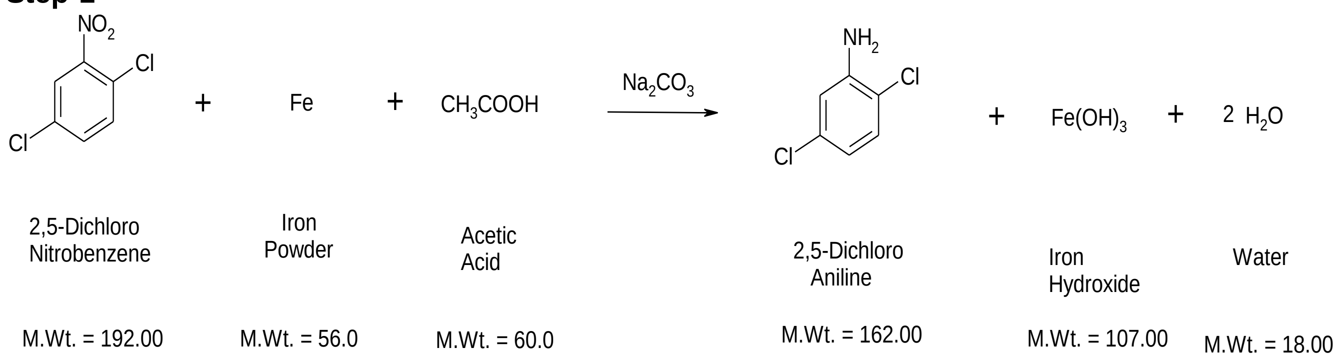
285	Material / Mass Balance of 3-Amino-Benzotrifluoride (All Quantities are in kg)				
	Input			Output	
Sr. No	Raw Materials / Items	Kg/Batch		Product/By Products	Kg/Batch
1	Benzotrifluoride	900		3-Amino-Benzotrifluoride	1000
2	98% Nitric Acid	396		Recovered Solvent - Ethylene Dichloride	1575
3	98% Sulfuric Acid	620		Solvent Loss	25
4	Solvent: Ethylene Dichloride	1600		Distillate Water	660
5	Water	1230		Sodium Sulfate (Na2SO4)	915
6	Iron (Fe)	880		Iron Sludge	1670
7	Acetic Acid	20		Distillation Residue	25

8	Soda Ash	674		Aqueous Layer to ETP	450
	Total	**6320**		**Total**	**6320**

286) 2,5-Dichloro Aniline
Brief Manufacturing Process:
Step-1

2,5-Dichloro Nitrobenzene undergoes reduction by Iron Powder as well as Acetic Acid to give Crude product 2,5-Dichloro Aniline. After the reaction add 1,2-Dichloro Benzene & Iron Hydroxide is isolated by filtration. Finally, solvent is recovered by distillation to get the final product.

Chemical reaction:
Step-1



Mass Balance:

286	Material / Mass Balance of 2,5-Dichloro Aniline (All Quantities are in kg)				
	Input			Output	
Sr. No	Raw Materials / Items	Kg/Batch		Product/By Products	Kg/Batch
1	2,5-Dichloro Nitro Benzene	1420		2,5-Dichloro Aniline	1000
2	Solvent: 1,2-DichloroBenzene	1600		Recovered Solvent (1,2-DichloroBenzene)	1535
3	Iron (Fe)	930		Solvent Loss	65
4	Acetic Acid	20		Iron Hydroxide	1740
5	Soda Ash	15		Aqueous Layer to ETP	427
6	Water	800		Distillate Residue	18
	Total	**4785**		**Total**	**4785**

287) Ortho Phenylene Diamine /Meta Phenylene Diamine/Para Phenylene Diamine

Brief Manufacturing Process:

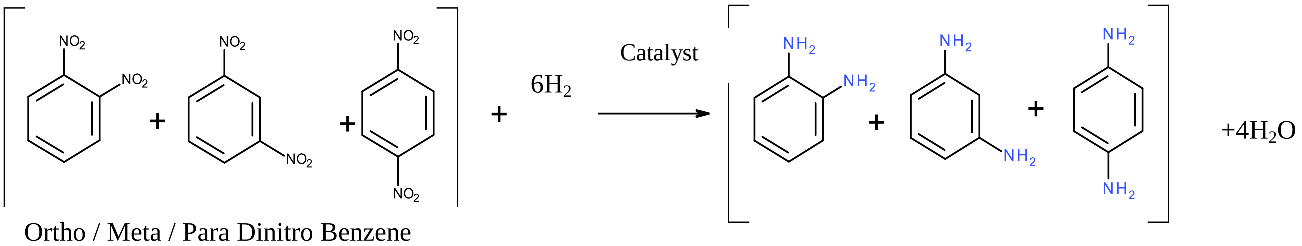
Ortho / Meta / Para Dinitro Benzene when undergoes hydrogenation reaction in presence of Toluene-solvent as well as catalyst it gives the mixture of crude Phenylene Diamine.

Catalyst is separated out from reaction mass by filtration. Solvent –Toluene is recovered from reaction mass by distillation and reused for fresh batches.

Finally, products are separated by means of fractional distillation as Ortho / Meta / Para Phenylene

Diamine.

Chemical Reaction:



Ortho / Meta / Para Dinitro Benzene
M.W 168

Hydrogen
M.W 6×2

23% Ortho /65% Meta / 11.75% Para
Phenylene Diamine (M.W 108)

Material Balance/Mass Balance (All Quantities are in Kgs.):

287	**Material / Mass Balance of Orto/Meta/Para Phenylene Diamine (All Quantities are in kg)**				
	INPUT			**OUTPUT**	
Sr. No.	**Raw Material / Item**	**Kg/Batch**		**Product / By- Product**	**Kg/Batch**
1	Orto/Meta/Para Di Nitro Benzene	1700		Orto/Meta/Para Phenylene Diamine	1000
2	Solvent- Toluene	800		Recovered Solvent - Toluene	750
3	Catalyst- Raney Nickel	17		Solvent Loss - Toluene	50
4	Hydrogen Gas	63		Recovered Catalyst- Raney Nickel	17
5				Excess Hydrogen to Vent	3
6				Aqueous Layer to ETP	735
7				Distillation Residue	25
	Total	**2580**		**Total**	**2580**

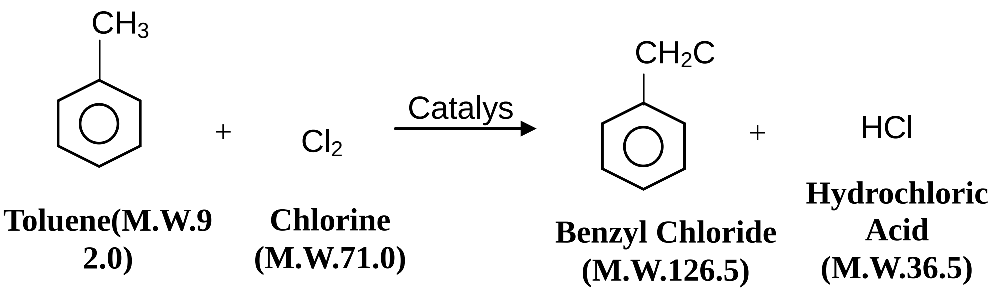
288) Benzaldehyde

Brief ManufacturingProcess:

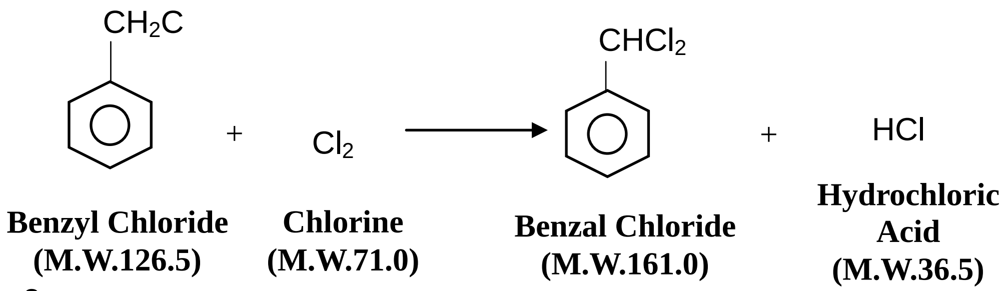
Chlorination of Toluene will give Benzyl Chloride and again; chlorination of benzyl chloride will give Benzal Chloride. The un-reacted Benzyl Chloride will be distilled by fractional distillation. The crude Benzyl Chloride will be distilled by fractionating column. The pure Benzal Chloride will be hydrolyzed by water at 120-1250c during the hydrolysis Hydrochloric Acid will be evolved which will be absorbed by water in absorber.

Chemical Reactions:

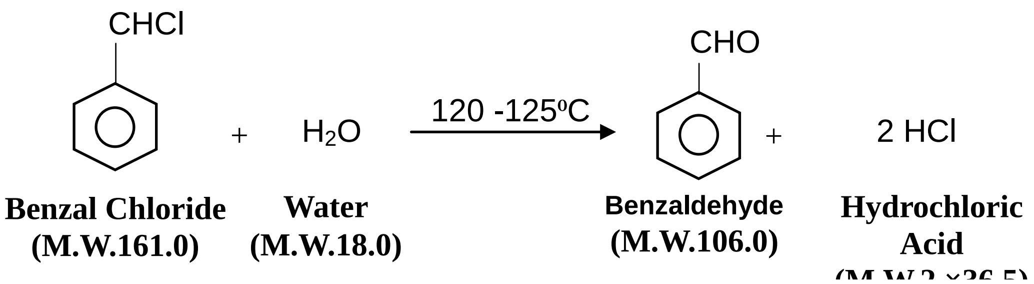
Step 1:



Step 2:



Step 3:



Mass Balance: -

288	Material / Mass Balance of Benzaldehyde(All Quantities are in kg)				
	IN – PUT			**OUT – PUT**	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product/ Byproduct**	**Kg/Batch**
1	Toluene	480		Benzaldehyde	**1000**
2	Chlorine Gas	820		30% Hydrochloric Acid Soln	2933
3	Soda Ash (10% Soln)	500		10% Sodium Hypochlorite Soln	87
4	Benzyl Chloride	501		Recovered Toluene	40
5	Water for 30% Hydrochloric Acid Soln	2053		Recovered BCl_2	50
6	Water for Reaction	190		Sodium Benzoate (10% Soln)	500
7	Caustic Lye for Sodium Hypochlorite Soln	74		Distillation Residue	8
	Total	**4618**		**Total**	**4618**

ANNEXURE: 4

QUANTITY OF WASTEWATER TO BE GENERATED AND SCHEME FOR THEIR MANAGEMENT/DISPOSAL

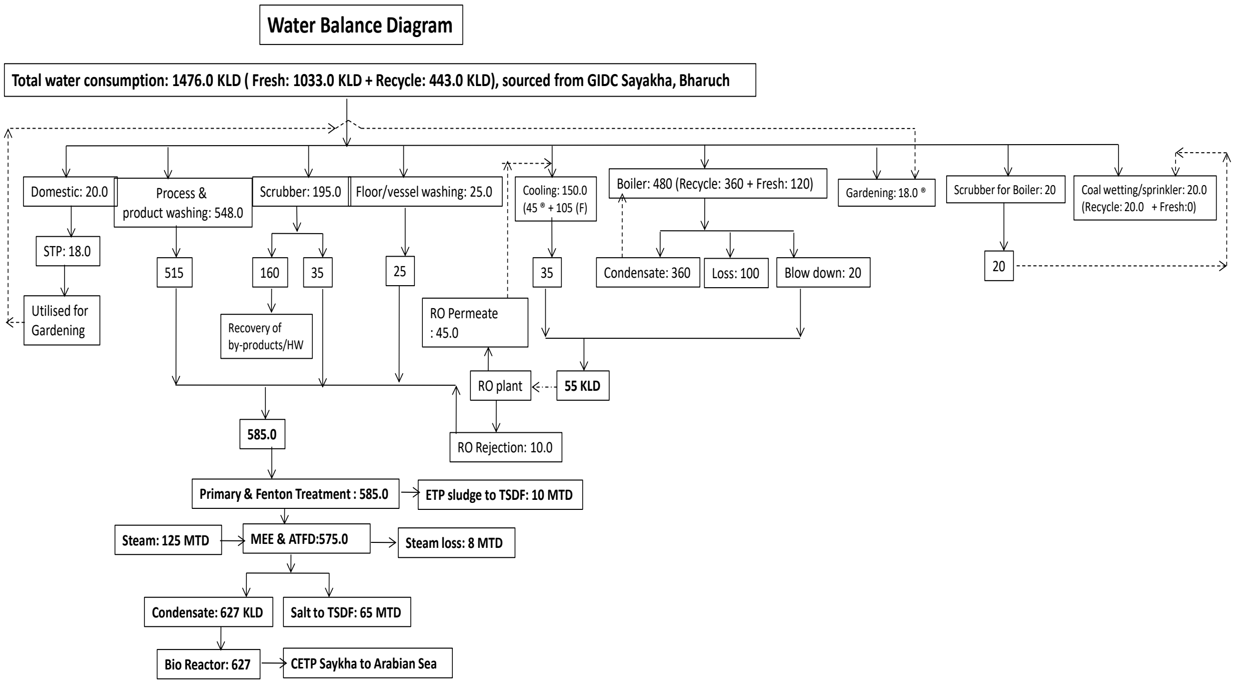
- Quantity of Wastewater Generation and Its Management :

Sr. No.	Particulars	Waste water generation, KLD	Remarks
A.	**Domestic**	**18.0**	
B.	**Industrial**		
1.	Processing & washing	515.0	
2.	Boiler	20.0	360 KLD condensate recycled
3.	Cooling	35.0	45 KLD of RO treated water will be recycled
4.	Floor/container washing	25.0	
5.	Scrubber for process gas	35.0	
6.	Scrubber for boiler	20.0	
	Total Industrial	**650.0**	
	Grand Total (A+B+C)	**668.0**	
	Recycle	**83.0**	
a.	**Net effluent**	**585.0**	
b.	**Steam for MEE/ATFD**	**125.0**	
c.	**Sludge from ETP & salt from MEE**	**75.0**	
d.	**Steam loss**	**8.0**	
	Net discharge to CETP	**627.0**	

Note:

- For the proposed plant, total fresh water requirement will be 1033 KLD. From the proposed plant, total 585 KLD of industrial waste water will be generated, which will be treated in primary ETP & Fenton treatment process. After primary & Fenton treatment, 575 KLD of effluent will be taken to MEE & ATFD. About 125 KLD of steam will be used for MEE & ATFD. Thus, total 627 KLD of condensate will be generated, which will be treated in secondary & tertiary ETP and discharge into CETP Saykha for further treatment and disposal.
- Domestic waste water (18.0 m^3/day) will be treated in STP and STP treated will be utilized for plantation.

WATER BALANCE DIAGRAM



DETAILS OF EFFLUENT TREATMENT PLANT

1. Design Criteria :

- Product : Agro chemical & speciality chemicals
- Source of Effluent : Process, washing, cooling, boiler, scrubber
- Design Flow of Effluent : 627.0 KLD Max
- Design Parameters : As under
- **Effluent Characteristics:**

Sr. No.	Effluent Parameter	Effluent from process	Untreated effluent from cooling tower and boiler blow down
1	pH	4.5	7
2	Color pt. Co	800	200
3	Suspended solids, mg/l	500	200
4	Total dissolved solids, mg/l	8000	7000
5	Oil and grease, mg/l	10.0	2.0
6	NH_3-N, mg/l	250	10
7	BOD, mg/l	8000	800
8	COD, mg/l	80,000	300
9	Heavy metal, mg/l	5	0
10	Phenolic Compounds, mg/l	100	0
11	**Quantity, KLD**	**585.0**	**55.0**

Details of Effluent Treatment Plant: -

M/s. Heranba Unit – VI (Saykha) have an Effluent Treatment Plant (ETP) consisting of primary & secondary and advance treatment units for Tertiary System.

The details of ETP are as follows.

For Low & Medium COD Stream 55.0 kL /day

Wastewater generated from various utilities such as **20.0 kL / Day** from Boiler Blow down water & **35.0 kL/ Day** from Cooling Tower is collected to one 60 kL Collection Tank, from where this waste water is subjected to Reverse Osmosis (R O) system.

R O Reject **10.0k / Day** is collected separately & forwarded to Effluent Treatment Plant whereby it is mixed up with concentrated waste water & subjected to further stages as described below.

R O Permeate **45.0 kL / Day** which is mainly very low TDS water is recycled back for Cooling Tower.

Treatment of Concentrated Effluent:

Total 585.0 kL/Day (**515.0** kL/Day Process Effluent + **35.0 kL/Day** from Scrubber + **25.0** kL/Day from Floor/ Equipment Washings + **10.0** kL**/**Day RO Reject)

First of all, Total **585.0 kLD** wastewater shall be collected in three Collection Tanks having capacities as **200.0 kL** each. From Collection tank waste water shall be forwarded to Equalization cum Neutralization tank-01 (ENT-01) where the continuous addition and stirring of Alkali solution is done to maintain neutral pH of wastewater from Lime Dosing Tank (LDT-01) as per requirement by gravity. Mixer is provided at bottom of the ENT-01 to keep all suspended solids in suspension and for proper mixing.

Then after, neutralized wastewater shall be pumped to Flash Mixer (FM-01). Alum and Polyelectrolyte shall be dosed from Alum Dosing Tank (ADT-01) and Polyelectrolyte Dosing Tank (PEDT-01) respectively into FM-01 to carry out coagulation by using a Flash Mixer. Then after, coagulated wastewater shall be settled in Primary Clarifier-01 (PCL-01) where solids are settled at bottom and clear supernatant from PCL-01 shall be passed to Fenton treatment system. In Fenton treatment first Add $FeSO_4$ as Catalyst. Then H_2O_2 Solution is added for destruction of phenolic compound. This reaction takes about 6-8 hrs. For through mixing, air is provided through twin lobe air blower. After reaction is complete treated effluent is neutralized by addition of Lime power/Soda Ash. Natural effluent is then pumped to through filter press for removal for sludge. Clear filtrate from filter press or Candle Filter shall be subjected to MEE System.

MEE Condensate will then be subjected to Bio Reactor System and MEE concentrate will passed through ATFD system. ATFD condensategoes to Bio Reactor System with MEE condensate and MEE salt will sent to TSDF Site.

Final Treated Waste Water from Bio Reactor shall be collected in Storage Tank (Guard Pond) and finally disposed of toDrainage system of **Common Effluent Treatment Plant of Saykha Industrial Estate for further treatment.**

The dewatered sludge is collected and packed in HDPE/plastic bags and stored in proper sludge storage area.

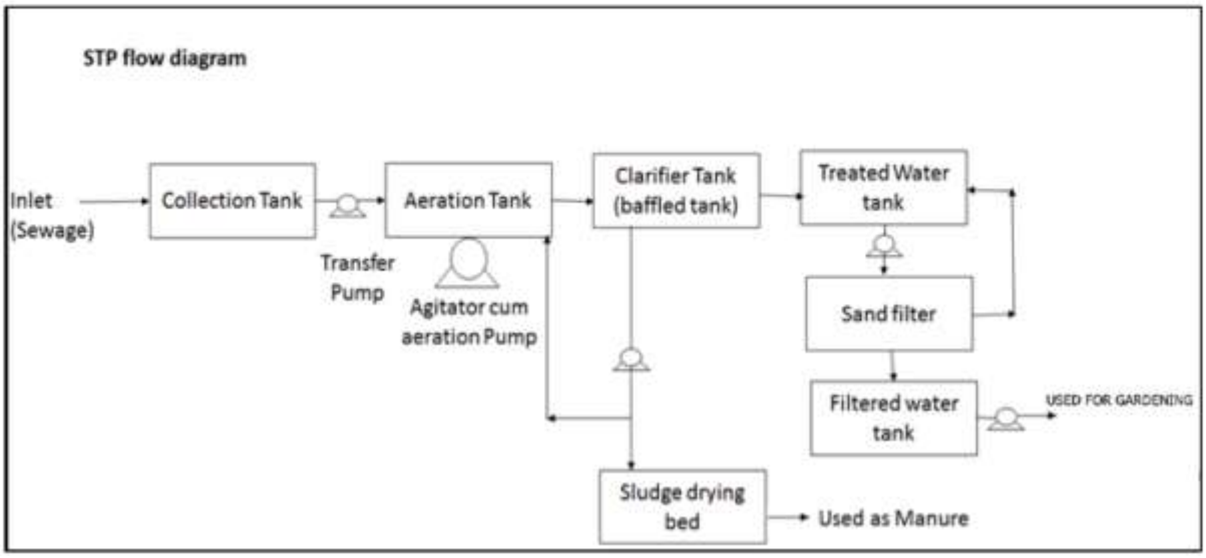
Sludge settled in PCL-01 and excess sludge from SCL-01 shall be collected in Sludge Sump (SS-01) where mixer is provided to prevent and settling. Then sludge shall be sent to Filter Press (FP-01) for dewatering. Then dry cake shall be stored in HWSA before final disposal to TSDF. Leachate from Filter Press shall be sent back to ENT-01 for further treatment.

SIZE OF TANKS

Sr. No.	Name of unit	Capacity	No.	MOC/ Remark
Stream-I 55.0 KLD (Low COD- Dilute Stream) [Boiler 20.0 KLD + Cooling Tower 35.0 KLD]				
1	Collection cum Neutralization Tank-2 (CNT-02)	30.0 kL	2	Collection cum Neutralization Tank-2 (CNT-02)
2	R O System	60.0 kL	1	RO System
3	R O Reject Collection Tank	10.0 kL	1	RO Reject Collection Tank
4	Collection Tank for R O permeate	45.0 kL	1	Collection Tank for R O permeate
Stream-II 585.0 KLD (High COD- Concentrated Stream) [Process 515.0KLD +Scrubber 35.0 KLD + Washings 25.0 KLD + R O Reject – 10.0 KLD]				
1	Collection Tank (CLT-01)	10.0 x 10.0 (2.5+0.5)	2	RCC M25+A/A Bk. Lining
2	Equalization cum Neutralization tank (ENT-01)	8.0 x 8.0 (2.5+0.5)	2	RCC M25+A/A Bk. Lining
3	Flash Mixer (FM-01)	4.0 x 4.0 (1.0+0.5)	1	RCC M25
4	Primary Clarifier (PCL-01)	2.0 Dia (3.5 +0.5)	1	MSEP
5	Aeration Tank (AT-1)	.0 x 9.0 (6.0+0.5)	1	RCC M25
6	Secondary Clarifier (SCL-01)	4.0 Dia (3.0 +0.5)	1	MSEP
7	Treated Effluent Sump (TES-01)	.5 x 6.5 (5.0+0.5)	1	RCC M25
8	Sludge Sump (SS-01)	.0 x 3.0 (3.0+0.5)	1	RCC M25
9	Filter Press-01 (FP-01)	41 m^3/D	1	MSEP
10	Lime Dosing Tank (LDT-01)	5000 Lit	1	HDPE
11	Alum Dosing Tank (ADT-01)	5000 Lit	1	HDPE
12	Poly Dosing Tank (PEDT-01)	2500 Lit	1	HDPE
13	Nutrient Dosing Tank (NDT-01)	2000 Lit	1	HDPE
14	MEE Feed Tank (MFT-01)	.0 x 4.0 (3.0+0.5)	1	RCC M25
15	Multi Effect Evaporator (MEE-01) with Solid Dryer (SD-01)	2 Nos x 300 M^3/D	1	SSTi
16	Condensate Storage Tank (CST-01)	8.0 x 8.0(5.0+0.5)	1	RCC M25
17	Agitated Thin Film Dryer (ATFD)	2 No x 45	2	SS-316
18	SBT Based Bio Reactor System	2 x 250 KLD	2	RCC Bay & Media, Culture
19	Final treated Waste Water Storage Tank (CST-01)	8.0 x 6.0(5.0+0.5)	1	HDPE Tank (Spiral)

DETAILS OF SEWAGE TREATMENT PLANT (STP)

The domestic wastewater streams shall be treated in a modern packaged sewage treatment unit with capacity of 20.0 KLD. Treated water i.e. 18.0 KLD will be reused for Gardening purpose and sludge generated will be used as manure within plant premises.


STP flow diagram
Inlet
(Sewage)
Collection Tank
Transfer
Pump
Aeration Tank
Agitator cum
aeration Pump
Clarifier Tank
(baffled tank)
Treated Water
tank
Sand filter
Filtered water
tank
USED FOR GARDENING
Sludge drying
bed
Used as Manure

ANNEXURE: 5

PLOT ALLOTMENT LETTER ISSUED BY THE GIDC

Gujarat Industrial Development Corporation
(A Govt. of Gujarat Undertaking)
Office of the Regional Manager
Office of the Regional Manager, Gujarat Industrial Development Corporation,Commercial Plot No.320-2, Asian Trade Centre, Near Asian Paint Chowkadi,GIDC,Ankleshwar-393002 , Phone - (02646) 221351,221451,221403 , Mail Id - rmank@gidcgujarat.org , website: www.gidc.gujarat.gov.in

No. GIDC/RM/ANK/TRF/FTO/SAY1/100 **Date : 08/09/2021**

Office Order

Sub: Transfer of Industrial Plot No. **T-108 + T-109** at **Saykha** Industrial Estate

A Industrial Plot No. **T-108 + T-109** admeasuring about **57248.29** Sq.mt. in **Saykha** estate. was allotted to **BERGER NIPPON PAINT AUTOMOTIVE COATINGS PRIVATE LIMITED (1)BERGER NIPPON PAINT AUTOMOTIVE COATINGS PVT LTD :100.00 %.** The Lease Deed / Conveyance Deed / Licence Agreement was executed on **19/04/2019.** The Lessee had applied to the Corporation for transfer of the said Industrial Plot in favour of **HERANBA INDUSTRIES LIMITED Public Limited Company** directors / shareholders **(1)MR RAGHURAM K SHETTY :29.61 %(2)MR RAUNAK R SHETTY :1.59 %(3)MR SADASHIV K SHETTY :18.00 %(4)MRS SUJATA S SHETTY :8.07 %(5)MRS VANITA R SHETTY :5.04 %(6)OTHERS SHARE HOLDERS OF COMPANY :37.69 %.** Certain terms and conditions have been stipulated by the Regional Manager, Ankleshwar as per Provisional Transfer Order no. **GIDC/RM/ANK/TRF/PTO/SAY1/123** dtd. **03/09/2021**

Lessee has paid all dues of the Corporation up to Date. Lesse has also paid the Corporation's share in Transfer fee amounting to Rs.**42558381.00 calculated @30.00% with GST**, NU Penalty amounting to Rs.**(Nil)** and additional transfer fees amounting to Rs.**(Nil)** @ Rs.**2420.00** per Sq.mt. The **Deed of Supplementary Agreement** has therefore been executed on **08/09/2021** between the Corporations, transferor & transferee. The plot now therefore stands transferred in the name of **HERANBA INDUSTRIES LIMITED Public Limited Company MR SADASHIV K SHETTY, MR RAGHURAM K SHETTY, MRS SUJATA S SHETTY, MRS VANITA R SHETTY, MR RAUNAK R SHETTY, OTHERS SHARE HOLDERS OF COMPANY** with effect from **08/09/2021** for establishment of **INSECTICIDES , HERBICIDES, FUNGICIDES** industry. This transfer permission shall not be considered as valid under the building bye-laws of the Corporation, if any unauthorized construction is carried out by Transferee. If any unauthorized construction is carried out, the same shall not be considered that Corporation has regularized the same. Transferee shall have to remove/demolish non violative construction or shall have to get approved from the Competent Authority. The water requirement as per transfer application is **90000** KLD per year only.

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Digitally signed by DS GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION 434
Date: 2021.09.08 19:06:35
Reason: D B VASAVA , REGIONAL MANAGER
Location: Ankleshwar

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Thanking you,

Yours faithfully,

Regional Manager,
G.I.D.C., Ankleshwar.

To,

1. **HERANBA INDUSTRIES LIMITED**
   101/102 , KANCHANANGA FACTORY LANE, BORIVALI WEST MUMBAI-400092.
   Along with a copy of Deed of Supplementary Agreement

2. **BERGER NIPPON PAINT AUTOMOTIVE COATINGS PRIVATE LIMITED**
   A-99/3, OKHLA INDUSTRIAL AREA PHASE-II, NEW DELHI 110020 .

Copy To :

1. The Executive Engineer, GIDC, Bharuch.
2. Accounts Officer, GIDC, Ankleshwar.
3. Deputy Executive Engineer, GIDC, Bharuch.
4. EDP, GIDC, Ankleshwar.

Signature Not Verified
Digitally signed by DS GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION 424
Date: 2021.09.08 19:06:35 IST
Reason: D B VASAVA , REGIONAL MANAGER
Location: Ankleshwar

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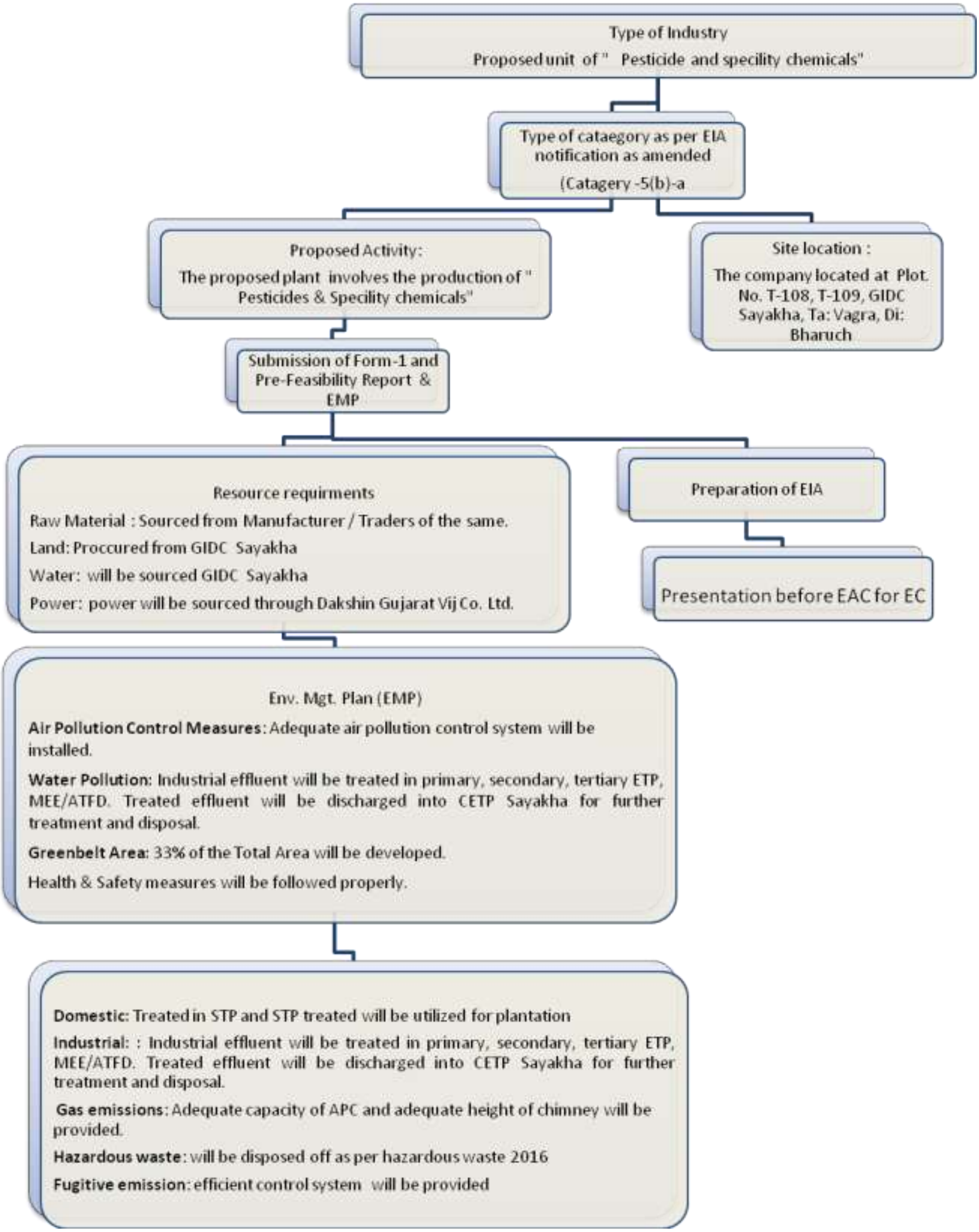
ANNEXURE: 6

SCHEMATIC REPRESENTATION OF THE FEASIBILITY DRAWING



ANNEXURE: 7

DETAILS OF AIR POLLUTION & ITS CONTROL MEASURES

Flue Gas Emission

- For the proposed plant, 1 no. 20 TPH capacity of coal/briquettes fired steam boiler, 1 no. 15 lakhs k cal/hr capacity of coal/briquettes fired thermic fluid heater, 1000 KVA capacity of HSD fired 2 nos. of D G set (Standby) will be installed. Adequate capacity of ESP followed by wet scrubber with 55 meters height of chimney will be provided to coal/briquettes fired steam boiler. Adequate capacity of Multi Cyclone Separator followed by bag filter and wet scrubber with 33 meters height of chimney will be provided to coal/briquettes fired thermic fluid heater.11 meters height of chimney with acoustic enclosure will be provided to D G sets.
- A standard Coal handling system with screening, coal crushing and conveying system will be installed for the proposed plant. There will be a coal crusher plant with impact blade crusher, screen, conveyor & elevator and reject of the screen will be recycled with two roll crusher and elevator.
- A standard fly ash handling system will be installed for the proposed plant. The fly ash collected in Economizer and APH shall be designed to collect fly ash in dry form in the silo. From the silo, fly ash shall be dispatched to trucks. After burning, less than 6 mm coal in AFBC type boiler furnace will convert in to ash (fly ash particle size which is 100% less than 300 microns) and this will carry over with flue gas through super heater, economizer, air – heater (APH) and finally /will be precipitated in ESP zone. The ash collected in the hoppers of ESP will be discharged in the silo by gravity. Level in the silo will be controlled by level controllers provided on silo. Whenever the level exceeds, the pneumatic valve opens and ash shall be conveyed to ash hopper through pipes with the help of compressed dry air at a pressure of 5 kg/cm2.Unit will provide the Dense Phase pneumatic ash conveying system under the ash discharge points of economizer, APH, and all ESP fields. At the discharge point of ash silo, ash conditioner shall be put where water spay shall be done for duct free loading of trucks/lorry under the ash silo. Finally ash shall be taken by contractor for brick making/filling of low lying area

.

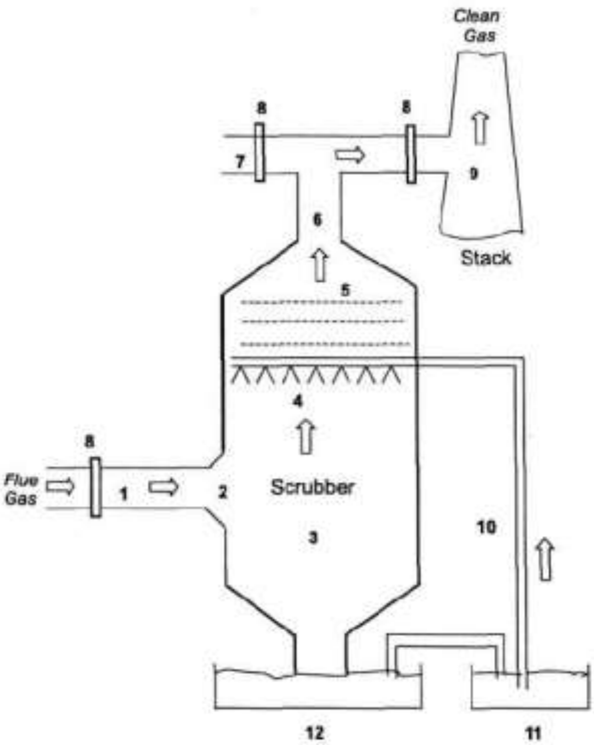
Details of air pollution and its control measures

S. No.	Particulars	Details
	Flue gas emission	
1.0	**Capacity of steam boiler, TPH**	**20**
1.1	Fuel to be used	Imported coal/Briquettes
1.2	Consumption of fuel in MTD	65.5
1.3	APC to be provided	ESP followed Wet scrubber
1.4	Dia/Height of Chimney	900 mm/55 meter
2.0	**Capacity of Thermic fluid heater, Lakhs K Cal/Hr**	**15**
2.1	Fuel to be used	Imported coal/briquettes
2.2	Consumption of fuel in MTD	22
2.3	APC to be provided	Multicyclone separator followed by bag filter and wet scrubber
2.4	Dia/Height of Chimney	900 mm/33 meter
3.0	**Capacity of D G set, KVA**	**1000**
3.1	Fuel to be used	HSD
3.2	Consumption of fuel in kg/h	200
3.3	APC to be provided	Exhaust
3.4	Dia/Height of Chimney	200 mm/11 meter
4.0	**Capacity of D G set, KVA**	**1000**
4.1	Fuel to be used	HSD
4.2	Consumption of fuel in kg/h	200
4.3	APC to be provided	Exhaust
4.4	Dia/Height of Chimney	200 mm/11 meter
3.0	**Expected Emission**	**PM: <150 mg/Nm3** **SOx: <100 ppm** **NOx: < 50 ppm**

Details of Electro static Precipitator attached to proposed coal fired steam boiler (20 TPH):		
ESP (ELECTROSTATIC PRECIPITATOR)		
Application	-	To Collect Fly Ash Particle from Boiler Flue Gas
Type	-	Horizontal Flow, Dry Type, Single Pass
Fuel	-	Imported coal
No. of ESP	No	One
No. of Gas Path per Precipitator	No	One
No. of Gas Fields in series in direction of Gas flow	Nos	Four
No. of Electrical Fields per Boiler	Nos	Four
Flue Gas Flow Rate	M^3/Sec	8.45
Flue Gas Temperature at ESP	°C	150
Inlet Dust Concentration	gm/NM^3	38.5
Outlet Dust Concentration	mgm/ NM^3	100
Gas Velocity at Electrode Zone on Total Area	M/Sec	0.48 / 0.51
Plate Area	M^2	2061.1
Specific Collection Area	M^2/M^3/Sec	120.88

Velocity through ESP	M/Sec	0.53
Treatment Time	Sec	24.6
Migration Velocity	Cm/Sec	5.50
Aspect Ratio	-	1.29
Overall Dust Collection Efficiency with all fields in service	%	98.5
Design Static Pressure	mmWC	-250
Type of Rapping	-	EMIGI Type
Pressure Drop across ESP (Flange to Flange)	mmWC	25 – 30
Ash Hopper Outlet Flange Elevation	M	2.5
No. of Hoppers in ESP	Nos	Four
COLLECTING ELECTRODE SPECIFICATIONS		
Material	-	CRCA Sheet (IS 513 Grade – "D")
Thickness	SWG	18
EMITTING ELECTRODE SPECIFICTIONS		
Type	-	Spike Type
Material	-	ERW Tubes & Carbon Steel Studs
GAS DISTRIBUTION SYSTEM		
No. of Screen	Nos	Three at Inlet / One at Outlet
Type	-	Perforated Formed Sheet
Location	-	ESP Inlet & Outlet

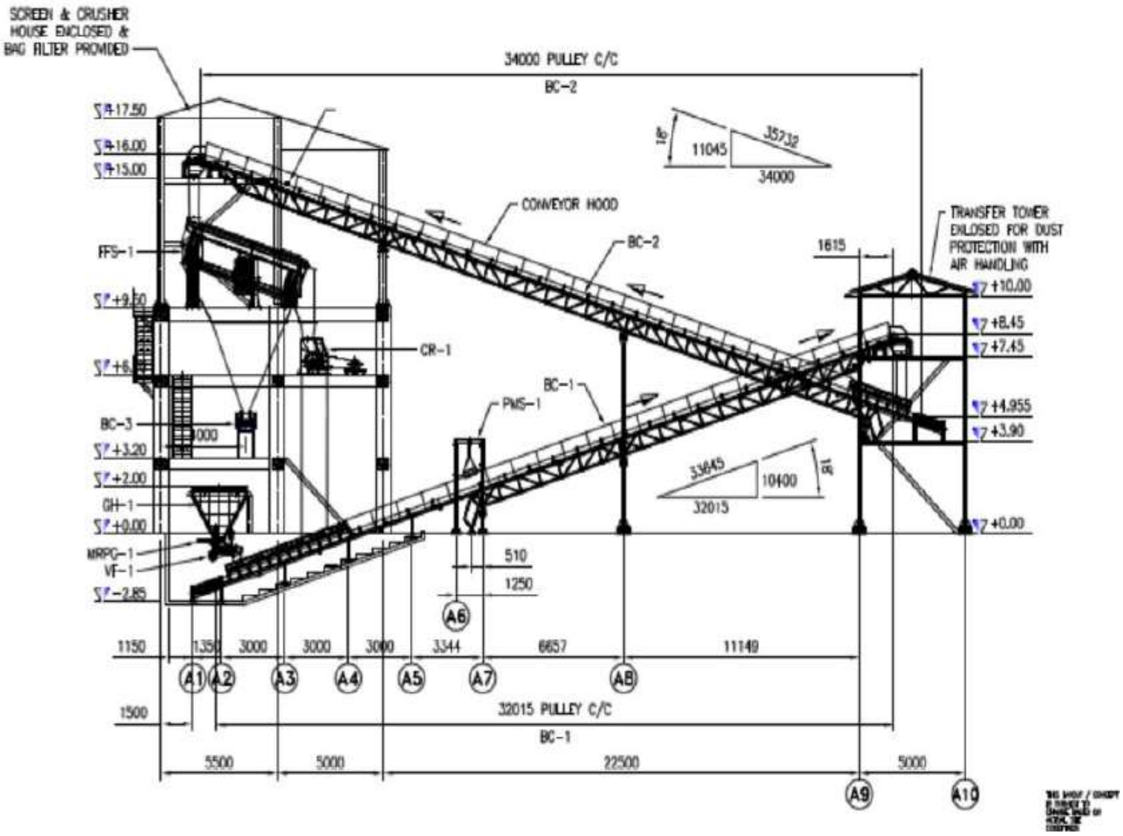
Details of wet scrubber attached to steam boiler	
Gas volume	5000 cfm
Gas temperature	160 to 230 ^{o}C
Wet scrubber mmwg	4 to 6 inches
Scrubber type	Cyclomex with buffel wet scrubber
Total stage	single
Total shell height	14 feet
Total Diameter	6 feet
MOC	SS 304, 4 mm thickness
Inner pipe	SS 304



COAL HANDLING SYSTEM

A standard Coal handling system with screening, coal crushing and conveying system will be installed. There is a coal crusher plant will be provided with impact blade crusher, screen, conveyor & elevator and reject of the screen will be recycled with two roll crusher and elevator. Total area of the covered coal yard is 250 m^2 and about 500 tons of coal can be stored in this yard.

Coal Handling System



Following measures has been taken during coal transportation, handling and storage and shall be continued for the proposed plant.

- Water sprinkler system shall be used to control the fugitive dusts.
- Greenbelt shall be provided in and around the premises area, around the coal stack yard and along the roads to minimize the generation of fugitive coal dust.
- For transportation, loading & unloading of goods, closed conveyor belt system shall be provided.

- To control the fugitive dusts from coal handling, adequate moisture content shall be provided.
- Enclosures for transport vehicles/storage vessel, spraying of water on road & ground is/shall be effectively implemented to control the coal dust problem. During the operation phase proper EMP shall be in place for handling of Coal.
- The trucks used for transporting the goods will be covered by the tarpaulin and overloading in trucks shall not be allowed, to prevent the dusting and spillage of goods from the truck.
- Regular Air monitoring and inspection of the environmental management practices shall be carried out and the necessary documents & records shall be maintained.
- A fire hydrant system line is/shall be provided for immediate response to the unlikely spontaneous combustion in the stored fuel.

Lime Charging for SO_2 Control

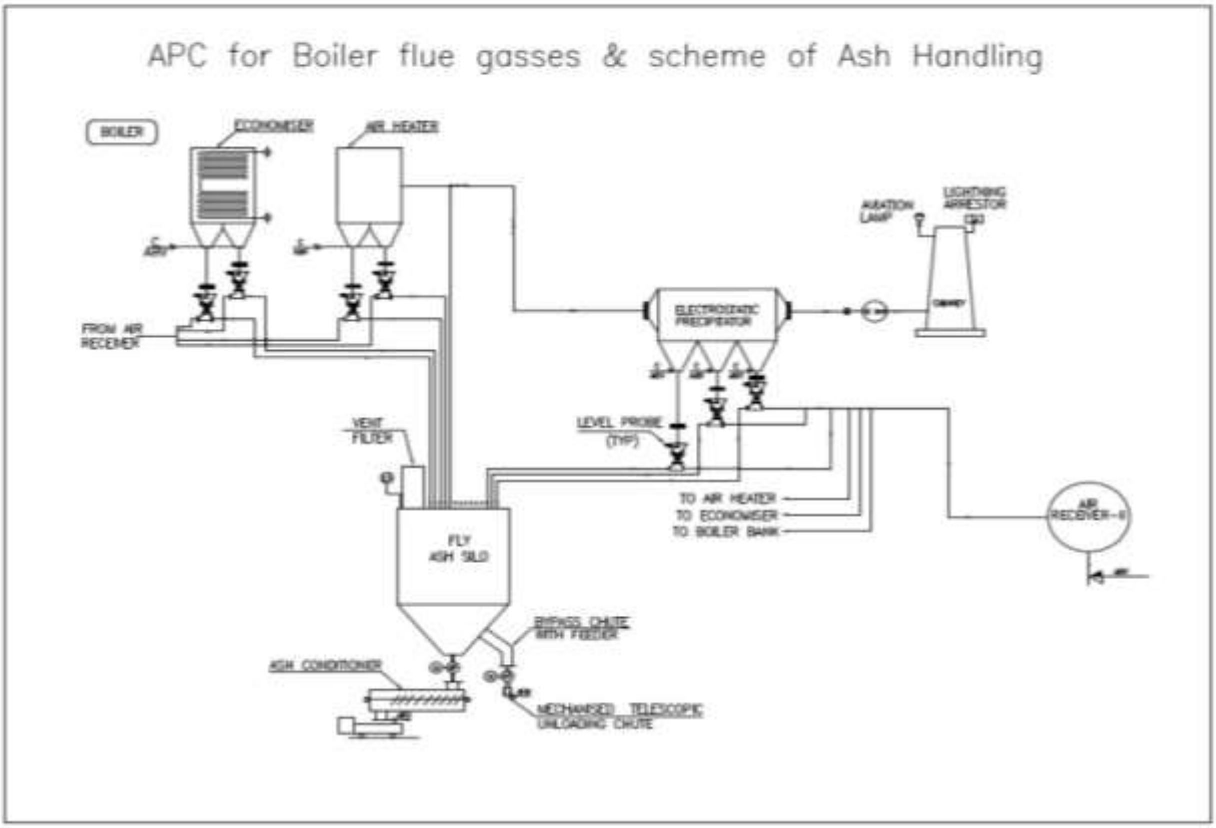
In the proposed plant, proponent shall use imported coal with low sulfur content. However as a safety measure, it is proposed to have boiler designed for feeding/charging lime stone for SO_2

control. Feeding arrangement of lime stone shall be provided along with separate bunker in line with boiler fuel feeding so that suitable quantity of lime stone can be added if and when required.

Fly Ash Handling System

A standard fly ash handling system shall be installed. The fly ash collected in Economizer and APH shall be designed to collect fly ash in dry form in the silo. From the silo, fly ash shall be dispatched to trucks.

APC for Boiler Flue gases and scheme of Ash Handling



Process Gas Emission

From the proposed manufacturing process HCl, Cl_2, SO_2, H_2S, Br_2, HBr and Ammonia gas will be generated. For the scrubbing of HCl, Cl_2, HBr & Br_2 two state water followed by alkali scrubber will be provided. To scrub Ammonia gas, two stage water followed by acid scrubber will be installed. To scrub H_2S and SO2 gas two stage alkali scrubber will be installed. 20 meters height of chimney will be provided

Details of air pollution control measures for proposed plant

	Process gas emission	For proposed project
1.0	**Type of pollutant**	**HCl, Cl_2, HBr, Br_2**
1.1	Source of pollutant	Reaction
1.2	APC to be provided	Two stage water followed by alkali scrubber
1.3	Height of vent	11 meter
1.4	Expected emission	HCl: < 20 mg/Nm^3 HBr: < 15 mg/Nm^3 Cl_2: < 9 mg/Nm^3

		Br_2: < 5 mg/Nm^3
2.0	**Type of pollutant**	**NH_3**
2.1	Source of pollutant	Reaction
2.2	APC to be provided	Two stage Water followed by acid scrubber
2.3	Height of vent	11 meter
2.4	Expected emission	NH_3: < 175 mg/Nm^3
3.0	**Type of pollutant**	**H_2S, SO2**
3.1	Source of pollutant	Reaction
3.2	APC to be provided	Two stage alkali scrubber
3.3	Height of vent	11 meter
3.4	Expected emission	H_2S: < 25 mg/Nm^3 SO2: < 40 mg/Nm^3
4.0	**Type of pollutant**	**Acid mist**
4.1	Source of pollutant	Acid storage tanks
4.2	APC to be provided	Two stage alkali scrubber
4.3	Height of vent	11 meter
4.4	Expected emission	Acid mist: <5 mg/Nm^3

Specification of HCl, Cl_2, HBr, Br_2 Gas scrubbing system:

1. Specifications of Falling Film Graphite HCl Scrubber:

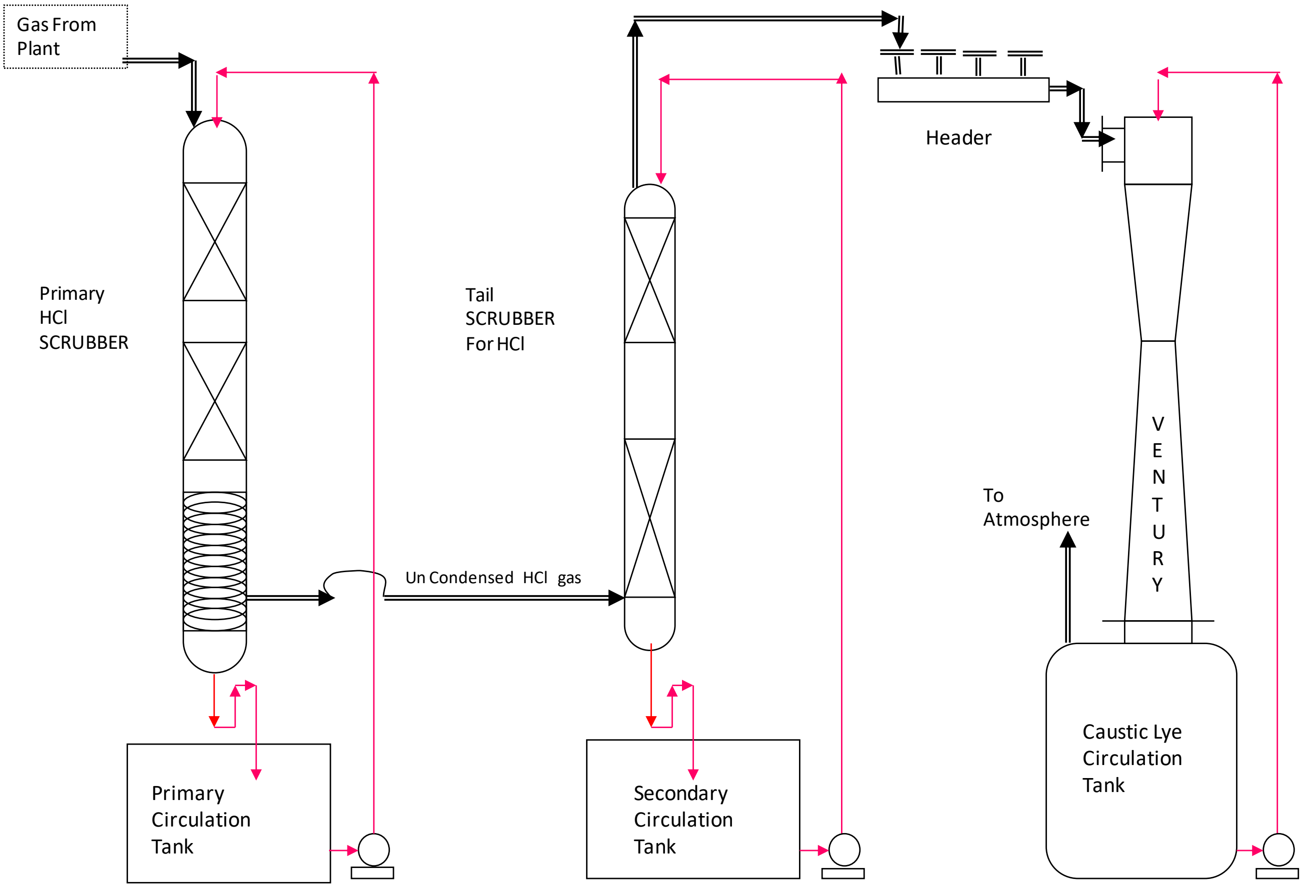
Type	: Parallel flow falling film type
Tube side	: HCl gas,
Shell side	: cooling water
Scrubbing media	: water
Heat of solution kcal/h	: 10000 kcal/hr.
Cooling water required at 40 approach	: 2.5 m^3/h
No of tubes required	: 65 tubes, 20 dia x 2.5 m length
HTA required	: 10 m2
Diameter of scrubber	: 350 mm
Overall length	: 3000 mm
MOC tubes	: Glass
MOC shell	: HDPE/Graphite

Specifications of tails tower

Scrubbing media	: Water, 58 kg /h, to be fed to main scrubber
Tower dia	: 350 mm
Packed length	: 1500 mm
Overall length	: 2000 mm
MOC	: FRP
Packing dia	: 40 mm PP
Outlet HCl	: 0.0025 kg/hr.

Specifications of Alkali Ventury

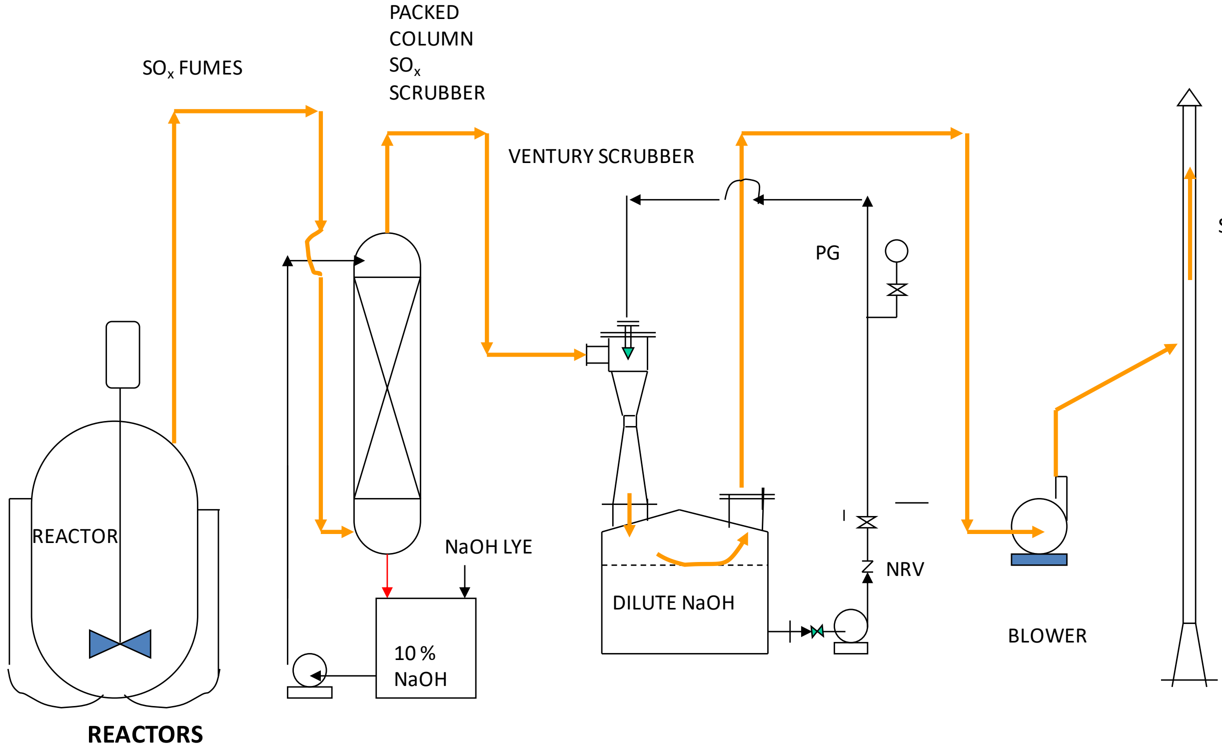
Scrubbing media	: 10 % dilute alkali
Size of Ventury	: 150 dia x 1250 mm ht.
MOC	: FRP
Alkali circulation tank	: 2000 liter HDPE
Circulation pump	: 2.5 m^3/hr. S/S
Vent diameter	: 150 mm
Height of vent	: 11 meters



HCl SCRUBBER SYSTEM

2. Specification of, SO_2 Gas scrubbing system

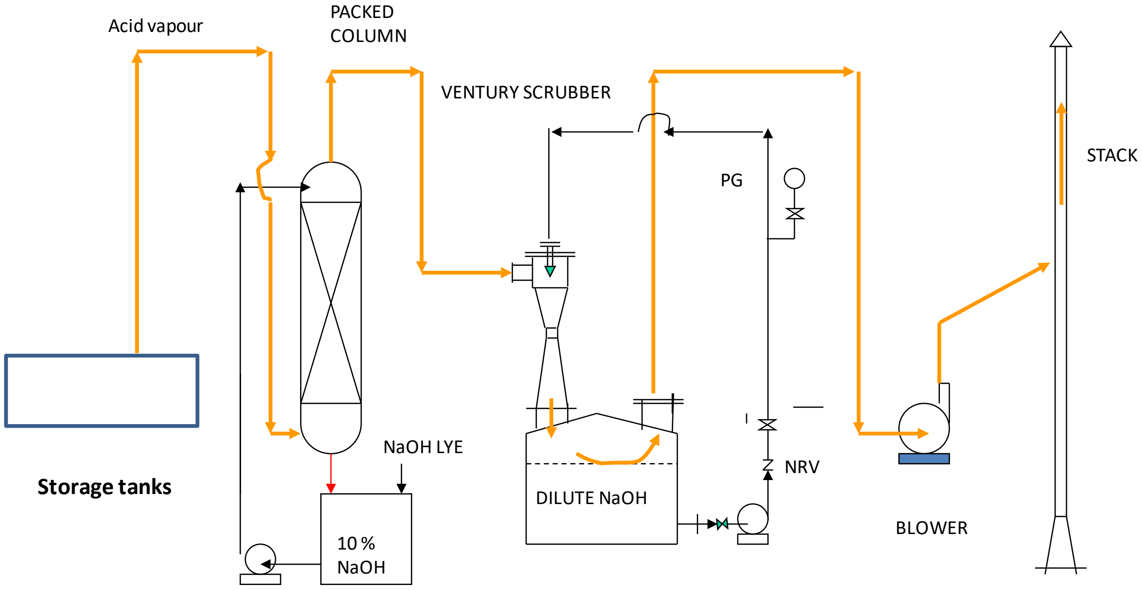
Sr. No.	Name of the Equipment	Capacity
1	Scrubber size	420 mm dia x 5000 mm
2	MOC of scrubber	HDPE
3	Type of packing	PP Racing ring
4	Height of packing	3500 mm
5	Alkali Circulation tank	5 m3, HDPE
6	Alkali circulation pump	3 HP
7	ventury scrubber	300 dia x 3000
8	Alkali circulation tank	1 m^3
9	Alkali circulation pump	10 m^3/h
10	Height of vent	11 meter
11	Dia of vent	150 mm



TWO STAGE SO_x SCRUBBING SYSTEM

3. Specification of Scrubber attached to Acid Storage tank:

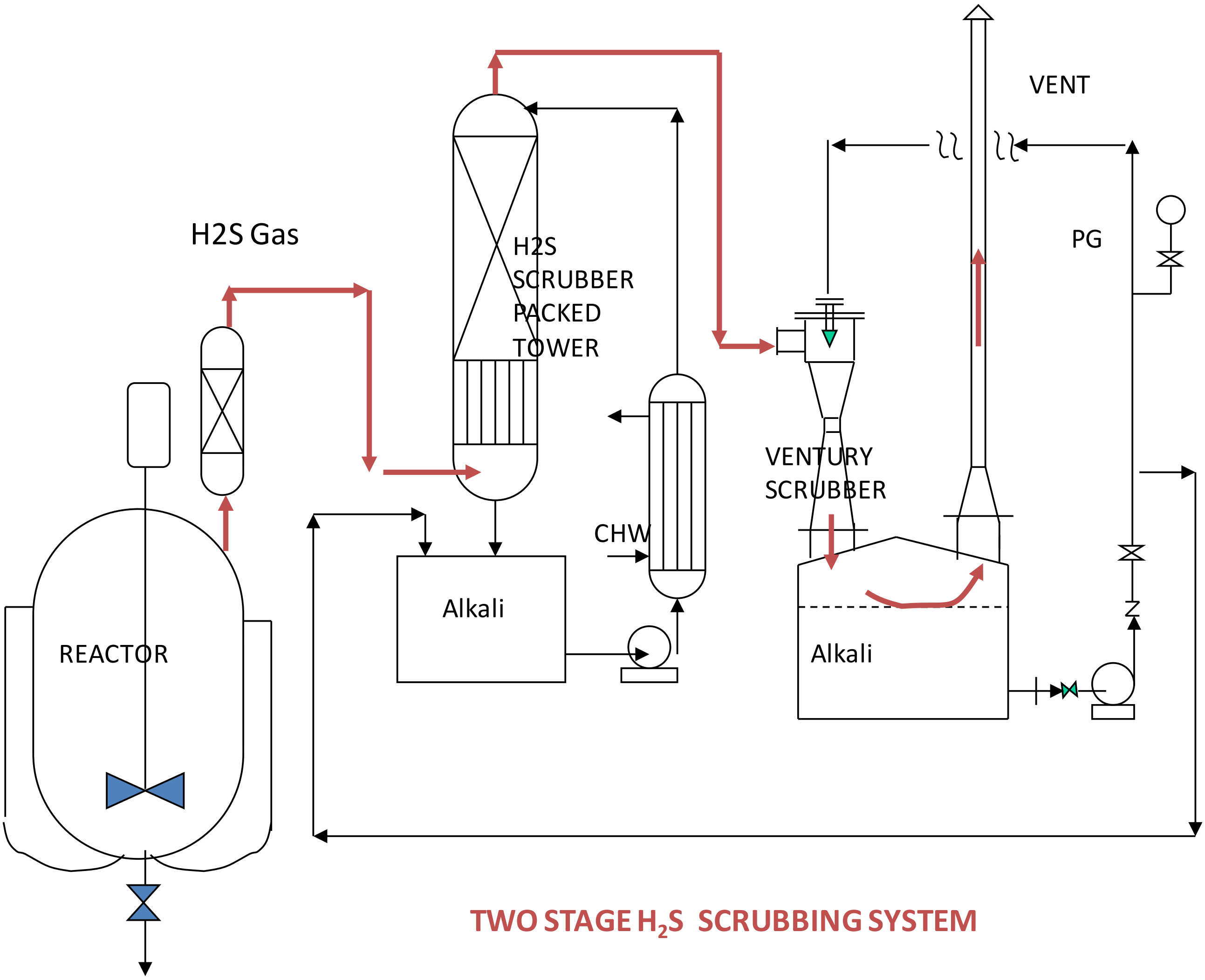
No	Details of Scrubber	Size
1	Packed height in meters	2 mt.
2.	Dia in meters	0.3
3.	Circulating liquid	Dilute caustic
4.	Size of tank	100 liters, HDPE
5.	Capacity of the pump ,m^3/h	3 HP
6.	Capacity of the blower, Nm^3/h	1500
7.	Vent diameter in mm	200
8.	Height of the vent from ground	11 mt
9.	Sampling arrangement	provided



TWO STAGE SCRUBBING SYSTEM FOR ACID STORAGE TANKS

4. Specification of H_2S Gas scrubbing system

Sr. No.	Name of the Equipment	Capacity
1	Height of scrubber (Packed column)	2 meter
2	Size of scrubber	600 mm
	MOC of scrubber	HDPE
3	Type of packing	PP Racing ring
4	Height of packing	1500 mm
5	Alkali Circulation tank	2 m3, HDPE
6	Alkali circulation pump	3 HP
7	ventury scrubber	300 dia x 3000
8	Alkali circulation tank	1 m^3
9	Alkali circulation pump	10 m^3/h
10	Height of vent	11 meter
11	Dia of vent	150 mm



TWO STAGE H_2S SCRUBBING SYSTEM