FORM-I

For

PROPOSED AGROCHEMICALS MANUFACTURING UNIT

of

M/s. CRYSTAL CROP PROTECTION PVT. LTD.

Plot No. D2/CH-14, Dahej - II, GIDC Industrial Estate,

Tal: Vagra, Dist: Bharuch, Gujarat

APPENDIX I

FORM 1

(I) Basic Information

Sr. No.	Item	Details
1.	Name of the Project/s	Crystal Crop Protection Pvt. Ltd.
2.	S.No. in the Schedule	5 (b)
3.	Proposed capacity/area/length/tonnage to be handled/command area/lease area/number of wells to be drilled	Proposed Agrochemicals: 3425 MT/Year No bore well to be drilled within the premises.
4.	New/Expansion/Modernization	New
5.	Existing capacity/area etc.	N.A.
6.	Category of project i.e. 'A' or 'B'	'A'
7.	Does it attract the general condition? If yes, please specify.	N.A.
8.	Does it attract the specific condition? If yes, please specify.	N.A.
9.	Location	Dahej-II, GIDC Industrial Area, Dahej, Tal: Vagra, Dist: Bharuch, Gujarat
	Plot/Survey/Khasra No.	Plot. No. D2/CH-14
	Village	GIDC, Dahej - II
	Tehsil	Vagra
	District	Bharuch
	State	Gujarat
10.	Nearest railway station/airport along with distance in kms.	Nearest Railway Station : Bharuch: 45 km Nearest Airport: Baroda: 90 km
11.	Nearest Town, city, District Headquarters along with distance in kms.	Nearest Town: Bharuch : 45 km, Nearest District Head Quarter: Bharuch : 45 km
12.	Village Panchayats, Zilla Parishad, Municipal corporation, Local body (Complete postal addresses with telephone nos. to be given)	Village: Dahej, Tal: Vagra, Dist: Bharuch, Gujarat.
13.	Name of the applicant	Crystal Crop Protection Pvt. Ltd.
14.	Registered address	Plot. No. D2/CH-14, Dahej – II, GIDC Industrial Estate, Tal: Vagra, Dist: Bharuch, Gujarat.
15.	Address for correspondence:	Crystal Crop Protection Pvt Ltd B-95, Wazirpur Industrial Area, New Delhi-110052
	Name	Mr. Virendra Kumar Chaudhary

	Designation (Owner/Partner/CEO)	Vice President (Technical)
	Address	B-95, Wazirpur Industrial Area, New Delhi-110052.
	Pin Code	110052
	E-Mail	virendra.chaudhary@crystalcrop.com
	Telephone No.	011-27006800, 49007100, +918295500178
	Fax No.	011-49007200
16.	Details of Alternative Sites examined, if any location of these sites should be shown on a topo sheet.	No
17.	Interlinked Projects	No
18.	Whether separate application of interlinked project has been submitted?	Not applicable
19.	If Yes, date of submission	Not applicable
20.	If no., reason	Not applicable
21.	Whether the proposal involves approval/clearance under: If yes, details of the same and their status to be given. (a) The Forest (Conservation) Act, 1980? (b) The Wildlife (Protection) Act, 1972? (c) The C.R.Z Notification, 1991?	Not applicable, as the project is located in notified industrial estate.
22.	Whether there is any Government order/policy relevant/relating to the site?	No
23.	Forest land involved (hectares)	No
24.	Whether there is any litigation pending against the project and/or land in which the project is propose to be set up? (a) Name of the Court (b) Case No. (c) Orders/directions of the Court, if any and its relevance with the proposed project.	No

(II) Activity

1. Construction, operation or decommissioning of the Project involving actions, which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.)

Sr. No.	Information/Checklist confirmation	Yes /No?	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
1.1	Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan)	No	Proposed Project is within Dahej-II GIDC Estate
1.2	Clearance of existing land, vegetation and buildings?	Yes	Minor site clearance activities shall be carried out to clear shrubs and weed.
1.3	Creation of new land uses?	No	--
1.4	Pre-construction investigations e.g. bore houses, soil testing?	No	--
1.5	Construction works?	Yes	Approved plan for construction is attached as **Annexure: 1.**
1.6	Demolition works?	No	--
1.7	Temporary sites used for construction workers or housing of construction workers?	No	--
1.8	Above ground buildings, structures or Earthworks including linear structures, cut and fill or excavations	Yes	Approved plan for construction is attached as **Annexure: 1.**
1.9	Underground works including mining or tunneling?	No	--
1.10	Reclamation works?	No	--
1.11	Dredging?	No	--
1.12	Offshore structures?	No	--
1.13	Production and manufacturing	Yes	List of Products and manufacturing process attached as **Annexure: 2.**
1.14	Facilities for storage of goods or materials?	Yes	Dedicated storage area for storage of Raw Materials and finished products, solvents, etc. shall be provided.
1.15	Facilities for treatment or disposal of solid waste or liquid effluents?	Yes	Effluent Treatment Plant will be installed to treat effluent so as to achieve the GPCB norms. Details of water consumption & effluent generation with segregation of effluent streams are attached as **Annexure: 3.** Details of proposed Effluent Treatment Plant are attached as **Annexure: 4.** Details of Hazardous waste generation and disposal is attached as **Annexure: 5.**

1.16	Facilities for long term housing of operational workers?	No	
1.17	New road, rail or sea traffic during construction or operation?	No	--
1.18	New road, rail, air waterborne or other airports etc?	No	--
1.19	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	No	--
1.20	New or diverted transmission lines or pipelines?	No	--
1.21	Impoundment, damming, converting, realignment or other changes to the hydrology of watercourses or aquifers?	No	--
1.22	Stream crossings?	No	--
1.23	Abstraction or transfers or the water form ground or surface waters?	Yes	No ground water shall be used. The requirement of raw water shall be met through GIDC Water Supply.
1.24	Changes in water bodies or the land surface affecting drainage or run-off?	No	--
1.25	Transport of personnel or materials for construction, operation or decommissioning?	No	--
1.26	Long-term dismantling or decommissioning or restoration works?	No	There is no dismantling of any sort. Not applicable.
1.27	Ongoing activity during decommissioning which could have an impact on the environment?	No	No Impact on the Environment
1.28	Influx of people to an area in either temporarily or permanently?	No	
1.29	Introduction of alien species?	No	
1.30	Loss of native species of genetic diversity?	No	
1.31	Any other actions?	No	

2. Use of Natural resources for construction or operation of the Project (such as land, water, materials or energy, especially any resources which are non-renewable or in short supply):

Sr. No	Information/checklist confirmation	Yes/ No?	Details there of (with approximate quantities/rates, wherever possible) with source of information data
2.1	Land especially undeveloped or agriculture land (ha)	No	
2.2	Water (expected source & competing users) unit: KLD	Yes	Water requirement will meet through the GIDC Water Supply. Detailed water balance is given as **Annexure – 3.**
2.3	Minerals (MT)	No	Not applicable

2.4	Construction material -stone, aggregates, sand / soil (expected source MT)	Yes	Company shall use Sand, stone, Cement and Structural Steel for Construction as required.
2.5	Forests and timber (source - MT)	No	No wood shall be used as construction material or as a fuel.
2.6	Energy including electricity and fuels source, competing users Unit: fuel (MT), energy (MW)	Yes	Power required from GEB is 1000 KVA Fuel FO/LDO 80 liter/hour, Agro Waste/Briquettes-250 kg/hour
2.7	Any other natural resources (use appropriates standard units)	No	--

3. Use, storage, transport, handling or production of substances or materials, which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health.

Sr. No.	Information / Checklist confirmation	Yes/ No?	Details thereof (with approximate quantities / rates wherever possible) with source of information data
3.1	Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)	Yes	Please refer **Annexure : 6.**
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)	No	Not applicable as site is located in Dahej-II Industrial Area, Dahej.
3.3	Affect the welfare of people e.g. by changing living conditions?	No	Not applicable as site is located in Dahej-II Industrial Area, Dahej.
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.,	No	Not applicable as site is located in Dahej-II Industrial Area, Dahej.
3.5	Any other causes	No	

4. Production of solid wastes during construction or operation or decommissioning MT/month)

Sr. No.	Information/Checklist confirmation	Yes/ No?	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
4.1	Spoil, overburden or mine wastes	No	--
4.2	Municipal waste (domestic and or commercial wastes)	No	--
4.3	Hazardous wastes (as per Hazardous Waste Management Rules)	Yes	Please refer **Annexure: 5**
4.4	Other industrial process wastes	Yes	Please refer **Annexure: 5**
4.5	Surplus product	Yes	Please refer **Annexure:2**
4.6	Sewage sludge or other sludge from effluent treatment	Yes	Please refer **Annexure: 5**

4.7	Construction or demolition wastes	No	Construction waste shall be utilized for leveling & land filling in the premises.
4.8	Redundant machinery or equipment	No	--
4.9	Contaminated soils or other materials	No	--
4.10	Agricultural wastes	No	--
4.11	Other solid wastes	No	Please refer **Annexure: 5**

5. Release of pollutants or any hazardous, toxic or noxious substances to air (Kg/hr)

Sr. No.	Information/Checklist confirmation	Yes/ No?	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
5.1	Emissions from combustion of fossil fuels From stationary or mobile sources	Yes	Details of flue & process gas emission are attached as **Annexure: 7**
5.2	Emissions from production processes	Yes	Reactors shall be connected to common scrubber system. Details of emission levels from process are attached as **Annexure: 7.** Details of Air Pollution Control measures are attached as **Annexure: 7**
5.3	Emissions from materials handling including storage or transport	Yes	All liquid raw materials shall be procured in bulk tankers and shall be transferred through a closed circuit pipe lines by pumps. Solid raw material shall be handled in closed charging rooms with proper ventilation and charged through close pipeline into reactors.
5.4	Emissions from construction activities including plant and equipment	No	Utmost care will be taken during construction activity and water sprinklers shall be utilized whenever necessary.
5.5	Dust or odours from handling of materials including construction materials, sewage and waste	No	All the waste shall be stored in designated places and shall be transported to TSDF or Incineration Site in their own approved closed vehicles.
5.6	Emissions from incineration of waste	No	
5.7	Emissions from burning of waste in open air (e.g. slash materials, construction debris)	No	
5.8	Emissions from any other sources	No	

6. Generation of Noise and Vibration, and Emissions of Light and Heat:

Sr. No.	Information/Checklist confirmation	Yes/ No?	Details there of (with approximate Quantities /rates, wherever possible) With source of source of information data
6.1	From operation of equipment e.g. engines, ventilation plant, crushers	Yes	There are few activities due to which noise would be generated. The equipments resulting in noise generation are machinery of plant and Diesel generator. Adequate noise control measures will be provided whenever required. Proper and timely oiling, lubrication and preventive maintenance will be carried out for the machineries & equipments to reduce noise generation. Use of PPE like ear plugs and ear muffs will be made compulsory near the high noise generating machines. Noise monitoring shall be done regularly in plant area. The D.G. Set will be installed in a closed room and provided with acoustic enclosure. The unit will carry out plantation in the proposed greenbelt within the premises which will prevent the noise pollution in surrounding area.
6.2	From industrial or similar processes	Yes	All machinery / equipment shall be well maintained, shall have proper foundation with anti vibrating pads wherever applicable and noise levels will be within permissible limits. Acoustic enclosures shall be provided for DG set.
6.3	From construction or demolition	No	
6.4	From blasting or piling	No	
6.5	From construction or operational traffic	No	
6.6	From lighting or cooling systems	No	
6.7	From any other sources	No	Acoustic enclosures shall be provided for DG set.

7. Risks of contamination of land or water from releases of pollutants into the ground or into sewers, surface waters, groundwater, coastal waters or the sea:

Sr. No	Information/Checklist confirmation	Yes/ No?	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
7.1	From handling, storage, use or spillage of hazardous materials	Yes	All the raw material shall be stored separately in designated storage area and safely. Bund walls shall be provided around raw materials storage tanks for containing any liquid spillage. Other materials shall be stored in bags / drums on pallets with concrete flooring and no spillage is likely to occur. Please refer **Annexure : 6.**

7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)	No	
7.3	By deposition of pollutants emitted to air into the land or into water	No	Adequate EMS will be provided and the factory is located in Dahej-II Industrial Area, Dahej.
7.4	From any other sources	No	Not applicable
7.5	Is there a risk of long term build up of pollution in the environment from these sources?	No	Full- fledged Environmental Management System (EMS) will be installed. i.e. ETP, Air Pollution Control systems, Hazardous Waste Handling and Management as per norms, etc. which will eliminates the possibility of building up of pollution.

8. Risks of accident during construction or operation of the Project, which could affect human health or the environment:

Sr. No	Information/Checklist confirmation	Yes/ No?	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous substances	Yes	The risk assessment will be carried out and all mitigative measures shall be taken to avoid accidents.
8.2	From any other causes	No	Not applicable
8.3	Could the project be affected by natural disasters causing environmental damage (e.g. floods, earthquakes, landslides, cloudburst etc)?	No	--

9. Factors which should be considered (such as consequential development) which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality

Sr. No.	Information/Checklist confirmation	Yes/ No?	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
9.1	Lead to development of supporting. laities, ancillary development or development stimulated by the project which could have impact on the environment e.g.: * Supporting infrastructure (roads, power supply, waste or waste water treatment, etc.) • housing development • extractive industries • supply industries • other	Yes	Site is located in Dahej-II Industrial Area, Dahej, having the entire required infrastructure. This industrial zone is having existing road infrastructure, power supply are to be utilized. Local people will be employed and no housing is required. Please refer **Annexure – 8.**

9.2	Lead to after-use of the site, which could have an impact on the environment	No	--
9.3	Set a precedent for later developments	No	Not applicable
9.4	Have cumulative effects due to proximity to Other existing or planned projects with similar effects	No	The ETP of the company shall be designed such that the treated effluent conforms to the statutory requirement.

(III) Environmental Sensitivity

Sr. No	Information/Checklist confirmation	Name / Identity	Aerial distance (within 25 km). Proposed Project Location Boundary.
1	Areas protected under international conventions national or local legislation for their ecological, landscape, cultural or other related value	Yes	Site is located in Dahej-II Industrial Area, Dahej, Tal. Vagra, Dist. Bharuch, Gujarat.
2	Areas which are important or sensitive for Ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	Yes	Site is located in Dahej-II Industrial Area, Dahej, Dist. Bharuch, Gujarat.
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	Yes	Site is located in Dahej-II Industrial Area, Dahej, Tal: Vagra, Dist. Bharuch, Gujarat.
4	Inland, coastal, marine or underground waters	Yes	Arabian Sea: 25 Km River Narmada: 7 Km
5	State, National boundaries	No	--
6	Routes or facilities used by the public for to recreation or other tourist, pilgrim areas.	No	Not applicable
7	Defense installations	No	NIL
8	Densely populated or built-up area	Yes	Bharuch city: 4 Lakh population
9	Areas occupied by sensitive man-made land community facilities)	No	
10	Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture, fisheries, tourism, tourism, minerals)	Yes	The project being in industrial area does not affect agricultural land.
11	Areas already subjected to pollution or environmental damage. (those where existing legal environmental standards are exceeded)	Yes	Site is located in Dahej-II Industrial Area, Dahej, Tal: Vagra, Dist. Bharuch, Gujarat.
12	Are as susceptible to natural hazard which could cause the project to present environmental problems (earthquakes, subsidence ,landslides, flooding erosion, or extreme or adverse climatic conditions)	-	N.A.

I hereby given undertaking that, the data and information given in the application and enclosures are true to the best of my knowledge and belief and I am aware that if any part of the data and information submitted is found to be false or misleading at any stage the project will be rejected and clearance give, if any to the project will be revoked at our risk and cost.

Date: 11.12.2015
Place: Dahej

Virendra Kumar Chaudhary
Vice President (Technical)

Signature of applicant with full name & Address
(Project Proponent/Authorized Signatory)

NOTE:

1. The projects involving clearance under Coastal Regulation Zone Notification, 1991 shall submit with the application a C.R.Z. map duly demarcated by one of the authorized agencies, showing the project activities, w.r.t. C.R.Z. (at the stage of TOR) and the recommendations of the State Coastal Zone Management Authority (at the stage of EC). Simultaneous action shall also be taken to obtain the requisite clearance under the provisions of the C.R.Z. Notification, 1991 for the activities to be located in the CRZ.

2. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden thereon (at the stage of EC).

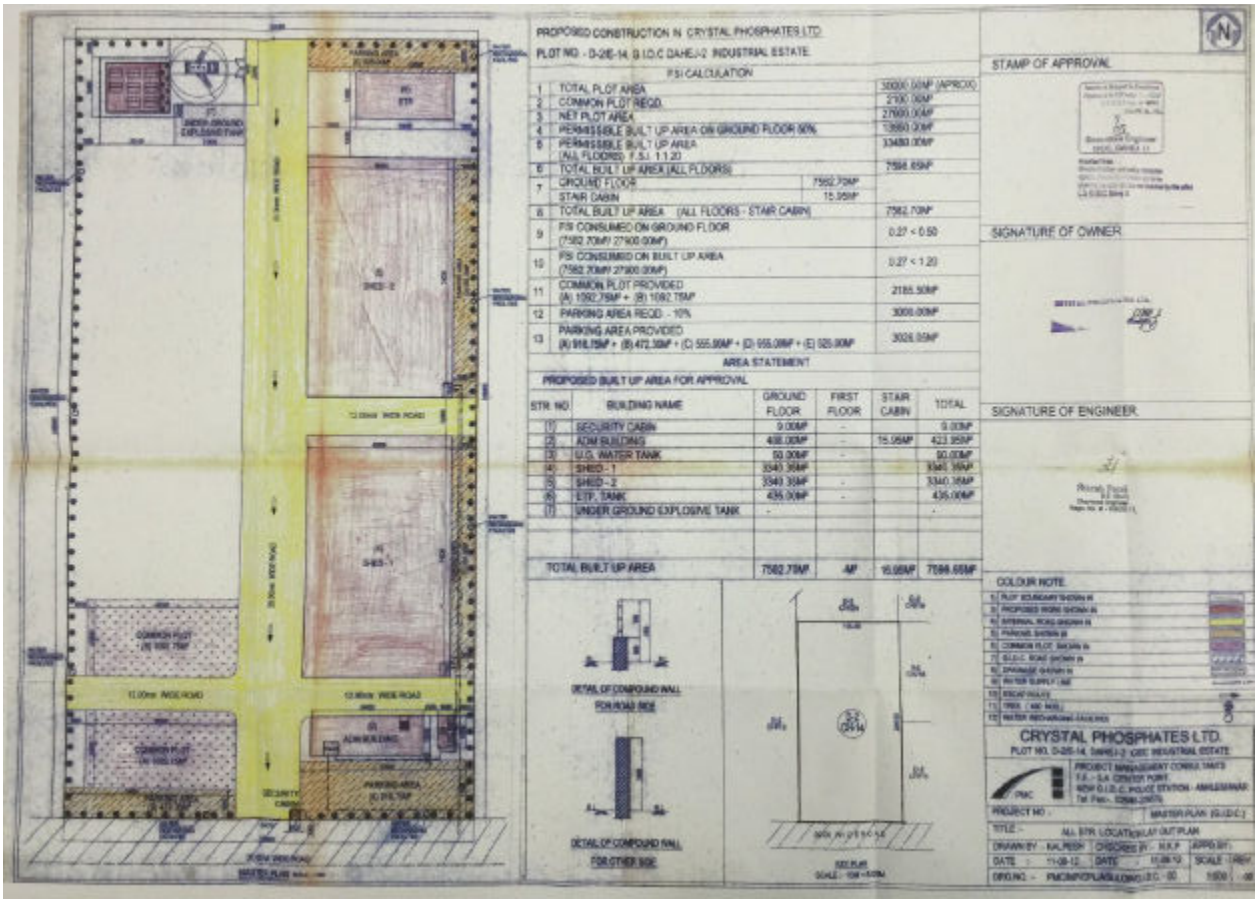
3. All correspondence with the Ministry of Environment & Forests including submission of application for TOR/Environmental Clearance, subsequent clarifications, as may be required from time to time, participation in the EAC Meeting on behalf of the project proponent shall be made by the authorized signatory only. The authorized signatory should also submit a document in support of his claim of being an authorized signatory for the specific project.

ANNEXURES

1	**PLANT LAYOUT**
2	**LIST OF PRODUCTS WITH PRODUCTION CAPACITY AND RAW MATERIALS**
2A	**BRIEF MANUFACTRING PROCESS, CHEMICAL REACTION AND MASS BALANCE WITH FLOW DIAGRAM**
3	**WATER CONSUMPTION AND EFFLUENT GENERATION WITH SEGREGATION OF EFFLUENT STREAMS**
4	**DETAILS OF PROPOSED EFFLUENT TREATMENT PLANT**
5	**DETAILS OF HAZARDOUS SOLID WASTE MANAGEMENT AND DISPOSAL**
6	**DETAILS HAZARDOUS CHEMICAL STORAGE FACILITY**
7	**DETAILS OF AIR POLLUTION CONTROL MEASURES**
8	**SOCIO - ECONOMIC IMPACTS**
9	**PROPOSED TERMS OF REFERENCES**

ANNEXURE: 1

PLANT LAYOUT



ANNEXURE: 2

LIST OF PRODUCTS WITH PRODUCTION CAPACITY

Sr. No.	Products	Class	Quantity (MT/Year)
A	**Agro chemicals**		
1	Boscalid	Fungicide	30
2	Cyproconazole	Fungicide	20
3	Difenaconazole	Fungicide	20
4	Flutriafol	Fungicide	30
5	Epoxiconazole	Fungicide	40
6	Hexaconazole	Fungicide	200
7	Kresoxim methyl	Fungicide	30
8	Mancozeb	Fungicide	400
9	Metalaxyl	Fungicide	100
10	Pencycuron	Fungicide	30
11	Propiconazole	Fungicide	100
12	Propineb	Fungicide	30
13	Prothioconazole	Fungicide	25
14	Thiophnate methyl	Fungicide	100
15	Tricyclazole	Fungicide	100
16	Bispyribac Sodium	Herbicide	100
17	Clodinofob-propargyl	Herbicide	100
18	Dicamba	Herbicide	20
19	Diuron	Herbicide	20
20	Imezathapyr	Herbicide	100
21	Metribuzine	Herbicide	100
22	Oxyfluorfen	Herbicide	100
23	Pendimethalin	Herbicide	400
24	Penoxsulam	Herbicide	40
25	Propanil	Herbicide	40
26	Propaquizafop	Herbicide	100
27	Quizalofop ethyl	Herbicide	100
28	Terbuthylazine	Herbicide	50
29	Alphamethrin	Insecticide	50
30	Diafenthiuron technical	Insecticide	100
31	Fenpyroximate	Insecticide	100
32	Flubendiamide	Insecticide	250
33	Profenofos	Insecticide	100
34	Thiamethoxam	Insecticide	200
35	Triazophos	Insecticide	200
Total			**3425**

LIST OF BY-PRODUCTS WITH PRODUCTION CAPACITY

Sr. No.	By-Products	Quantity (MT/Year)
1	20% Aluminium Chloride	141
2	Potassium Chloride	35
3	Potassium Bromide	56
4	Sodium Nitrite	33
5	Hydrogen Bromide	40

LIST OF RAW MATERIALS

S. No	Name of Raw Materials	Quantity (MT/Year)
Boscalid (30 MT/Year)		
1	CAN	17.0
2	Thionyl chloride	15.4
3	Toluene	90.0
4	ACBP	18.7
5	Water	75.0
Cyproconazole (20 MT/Year)		
1	1-(4-Chlorophenyl)-2-cyclopropyl-propanone	15.3
2	Catalyst	4.0
3	DMF	50.0
4	1,2,4-Triazole	4.8
5	Water	15.0
Difenaconazole (20 MT/Year)		
1	1,2,4 –Triazole	8.6
2	DMSO	39.3
3	Toluene	216.3
4	Bromoketal	36.7
5	IPE	16.7
6	PE	3.3
Flutriafol (30 MT/Year)		
1	Oxirane	22.5
2	1,2,4-Triazole	6.7
3	KOH	5.4
4	TBAB	3.1
5	DMF	112.5
Epoxiconazole (40 MT/Year)		
1	Fluoro benzene	12.8
2	Chloro acetyl chloride	15.0
3	Aluminium chloride	16.0
4	EDC	52.0
5	Potassium hydroxide	22.2
6	1,2,4-Triazole	9.12
7	DMF	72.0
8	2-Chloro benzyl chloride	21.2
9	Dimethyl sulphide	8.1
10	Water	97.6
Hexaconazole(200 MT/Year)		

1	Dimethyl sulfate	96.0
2	Sodium sulfide	5.3
3	DCVP	151.9
4	Potassium Hydroxide	62.6
5	1,2.4 Triazole	49.3
6	Potassium carbonate	9.3
7	DMF	242.6
Kresoxim methyl (30 MT/Year)		
1	MPMP glyoxylic acid methyl ester	24.6
2	O-Methyl hydroxyl amine hydrochloride	6.0
3	Soda ash	1.8
4	Toluene	90.0
Mancozeb (400 MT/Year)		
1	Carbon disulphide	228.8
2	EDA	82.4
3	Water	1106.0
4	NaOH (48%)	232.0
5	$MnSO_4$	760.0
6	$ZnSO_4$	66.4
7	RVD	49.6
8	SLS	13.2
9	HMT	160.0
Metalaxyl (100 MT/Year)		
1	Methoxy acetyl chloride	30.0
2	MDMPA	74.0
3	Hexane	82.0
4	Caustic soda	3.0
Pencycuron (30 MT/Year)		
1	PIC	10.9
2	4-ClBCPA	19.2
3	Toluene	90.0
Propiconazole (100 MT/Year)		
1	DMSO	180.0
2	Potassium hydroxide	23.75
3	Triazole	26.5
4	Bromoketal	121.0
Propineb (30 MT/Year)		
1	Bisthiocarbamate	28.1
2	Zinc sulphate	16.8
3	Water	51.0
Prothioconazole (25 MT/Year)		
1	2-(1-Chloro-cycloprop-1-yl)-1-(2chloro-	25.0

	phenyl)-2-hydroxy-3-(1,2,4triazolidine-5-thiono-1-yl)-propane	
2	Toluene	480.5
3	Iron chloride solution	278.0
Thiophnate methyl (100 MT/Year)		
1	EDC	200.0
2	Sodium Thiocyanate	42.6
3	Methyl chloroformate	39.6
4	OPDA	34.9
Tricyclazole (100 MT/Year)		
1	HMBT	96.0
2	Formic acid	53.0
3	Caustic lye	4.0
Bispyribac Sodium (100 MT/Year)		
1	2,6 DihydroxyBenzoilc Acid	438.5
2	4,6 Diethoxy 2, Methyl Sulfonyl Pyrimidine	148.0
3	TBAB	5.5
4	Caustic Soda	41.0
5	Toluene	2193.0
6	*n*-Butanol	78945.0
7	Ethyl Acetate	219.5
Clodinofob-propargyl (100 MT/Year)		
1	DMF	188.0
2	DHPPA	60.0
3	K_2CO_3	100.0
4	DFCP	54.0
5	Propargyl chloride	28.0
6	HCL	0.0
7	Methanol	114
Dicamba (20 MT/Year)		
1	3,6 Dichloro Methoxy Benzoate	24.0
2	NaOH	6.0
3	TBAB	0.8
4	HCl	16.4
Diuron (20 MT/Year) per ton		
1	3,4-DCA	19.4
2	Sodium cyanate	12.9
3	Acetic acid	14.2
4	Hydrochloric acid	12.9
5	Xylene	3.42
6	Dimethyl amine	10.3

Imezathapyr (100 MT/Year)		
1	Di-ethyl-5-ethylpyridine dicarboxylate	97.0
2	2 Amino 2,3 dimethyl Butane amide	60.0
3	Sodium Ethoxide	66.0
4	Toluene	320.0
5	HCL 30%	117.0
6	Ethanol	493.0
Metribuzine (100 MT/Year)		
1	Sulfuric acid	122.1
2	Triazinone	99.0
3	Dimethyl sulfate	63.0
4	Soda ash	186.5
Oxyfluorfen (100 MT/Year)		
1	3,4-Dichloro benzotrifluoride	61.4
2	Resorcinol	31.7
3	Sodium hydroxide	23.3
4	Dimethyl sulphoxide	110.0
5	Ethyl bromide	30.6
6	Nitric acid	18.0
7	Toluene	100.0
8	EDC	80.0
9	Water	80.0
Pendimethalin (400 MT/Year)		
1	DEK	344.0
2	4 NO_X	207.2
3	Hydrogen	11.2
4	Caustic lye	166.0
5	Promoter	4.8
6	Hydrogen	3.2
7	EDC	414.4
8	Hexane	414.4
9	Nitric acid	316.8
10	Sulfuric acid	149.2
11	HCl	20.8
12	Soda Ash	33.2
Penoxsulam (40 MT/Year)		
1	Trizolopyrimidine amine	16.1
2	Benzene Sulphonyl chloride	26.9
3	Pyridine	6.6
4	DMSO	80.0
Propanil (40 MT/Year)		
1	3,4-DCA	29.9

2	Propionic acid	16.2
Propaquizafop (100 MT/Year)		
1	(R)-2-(4-((6-chloroquinoxalin-2-yl)oxy)phenoxy)propanoic acid	77.6
2	Propan-2-one O-(2-hydroxyethyl) oxime	26.4
3	Thionyl chloride	26.9
4	Pyridine	17.8
5	Toluene	388.0
6	DMF	310.4
Quizalofop ethyl (100 MT/Year)		
1	DMF	170.0
2	DichloroQuinoxaline	58.0
3	K_2CO_3	50.0
4	Ethyl 2-(4-hydroxyphenoxy) propionate	62.0
5	HCl	0.88
6	Methanol	104.0
Terbuthylazine (50 MT/Year)		
1	Toluene	234.0
2	Cynuric chloride	42.0
3	Tertiary Butyl Amine	16.9
4	25 % NaOH	72.8
5	Mono ethyl amine	14.7
Alphamethrin (50 MT/Year)		
1	Alphacypermethrin acid chloride	38.3
2	m-Phenoxybenzaldehyde	32.7
3	Sodium cyanide	10.0
4	Hexane	12.5
5	TEBA	0.9
6	Soda ash	0.9
7	Water	28.5
Diafenthiuron technical (100 MT/Year)		
1	Xylene	123.6
2	DIPBA	82.5
3	NaSCN	26.7
4	HCl	38.4
5	Water	105.0
6	*t*-Butyl amine	21.9
Fenpyroximate (100 MT/Year)		
1	TBB	75.5
2	DMPPO	64.7
3	KOH	17.2
4	DMF	400.0

5	MDC	450.0
6	Water	300.0
Flubendiamide (250 MT/Year)		
1	3-Iodo-2-((2-methyl-1-(methylthio)propan-2-yl)carbamoyl)benzoic acid	154.5
2	4-(Perfluoropropan-2-yl)aniline	102.5
3	MDC	617.5
4	TEA	39.7
5	Thionyl chloride	46.7
6	mCPBA	142.0
7	THF	835.0
Profenofos (100 MT/Year)		
1	o-Chloro phenol	39.8
2	Liquid bromine	48.5
3	DETCl	56.6
4	TMA (30% aq. solution)	70.9
5	n-Propyl bromide	36.2
6	Water	466.0
7	NaOH	21.5
Thiamethoxam (200 MT/Year)		
1	MMTO	115.6
2	CCMT	128.0
3	K_2CO_3	40.0
4	CAN	480.0
5	Water	300.0
Triazophos (200 MT/Year)		
1	PHT	77.0
2	Na_2CO_3	38.0
3	DETCl	98.0
4	CuCl	1.4
5	KCl	1.4
6	KHP	1.0
7	H_3PO_4	5.0
8	NaCl	0.4
9	o-Xylene	80.0
10	Water	240

ANNEXURE: 2A

BRIEF MANUFACTRING PROCESS, CHEMICAL REACTION AND MASS BALANCE WITH FLOW DIAGRAM

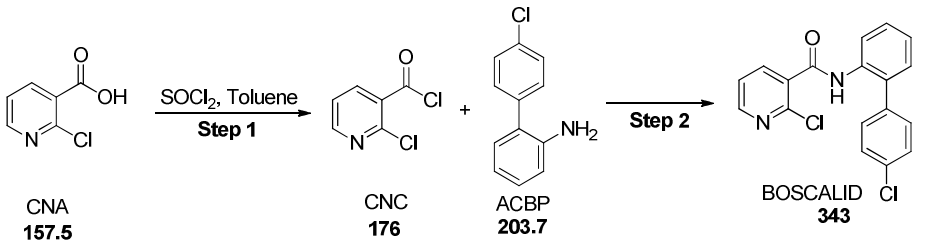
1. Boscalid

Manufacturing Process

First step, 2-Chloro-3-nicotinic acid (CNA) is taken in toluene and is reacted with Thionyl chloride, evolved gases are removed by nitrogen purging.

Second step, 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 desired product.

Chemical Reaction



CNA **157.5** | CNC **176** | ACBP **203.7** | BOSCALID **343**

Mass Balance

MATERIAL BALANCE-Boscalid Batch size (Final output): 1000 Kg							
Sr. No	**Name of material**	**Input Qty. (Kg)**	**Product Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	CAN	566	1000			Toluene loss	**7203**
2	Thionyl chloride	513		Toluene	Waste water	150	
3	ACBP	624		2850	2627		
4	Toluene	3000			Filtrate		
5	Water	2500			426	Drying loss	
						150	
			1000.0	**2850.0**	**3053.0**	**300.0**	
	Total	**7203**					**7203**

2. Cyproconazole

Manufacturing Process

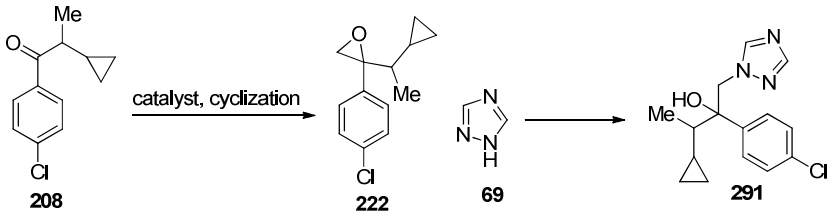
Step – 1

1-(4-Chlorophenyl)-2-Cyclopropyl-propanone undergoes cyclization reaction in presence of DMF as solvent and catalyst to give Intermediate as **A**.

Step – 2

Intermediate **A** finally reacts with 1, 2, 4-triazole in presence of solvent and catalyst to give final product Cyproconazole.

Chemical Reaction



Mass Balance

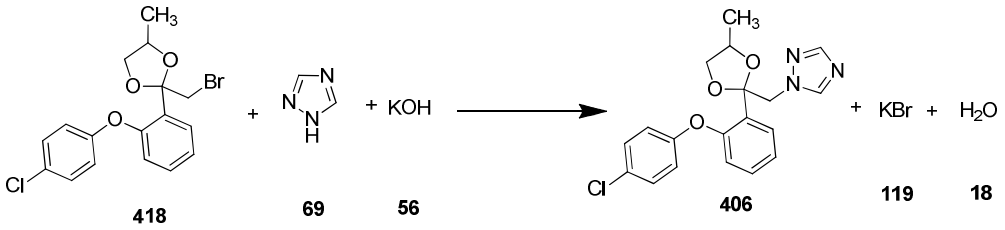
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg / Batch**		**Product / Byproduct**	**Qty. / Batch**
1)	1 – (4-Chlorophenyl) – 2 – Cyclopropyl – Propanone	765		Cyproconazole	1010
2)	Catalyst	20		Recovered Solvent – DMF	2450
3)	Solvent DMF	2500		Solvent Loss (DMF)	50
4)	1,2,4 – Triazole	240		Aqueous to ETP	765
5)	Water	750			
	Total	**4275**		**Total**	**4275**

3. Difenaconazole

Manufacturing Process

1, 2, 4-triazole, toluene, DMSO, water, potassium hydroxide is charged and water is removed azeotropically. Toluene is also removed partially and then bromo ketal is charged and temperature is increased. Reaction mass is maintained at elevated temperature for few hours. Toluene and DMSO is distilled out. Charged Toluene and washed with water. Aqueous phase is discarded and Toluene is distilled out to get crude material. Difenaconazole is distilled out and from distilled material; Difenaconazole is crystallized to get crystalline powder.

Chemical Reaction



Mass Balance

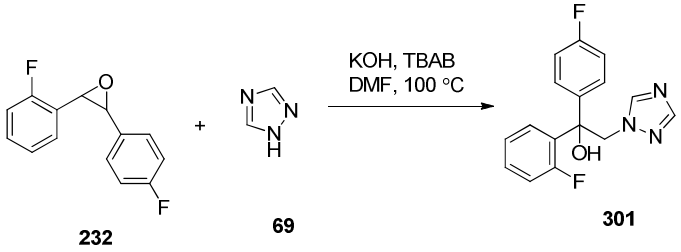
MATERIAL BALANCE-Difenaconazole Batch size (Final output): 1000 Kg							
Sr. No	**Name of material**	**Input Qty. (Kg)**	**Product Out put Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	1,2,4-Triazole	428				Toluene loss	
2	Water	2411		Toluene	Waste water	162	
3	DMSO	1967	1000	10655.0	3390	DMSO loss	**18456**
4	Toluene	10817		DMSO		25	
5	Bromoketal	1833		1942.0	Filtrate	Drying loss	
6	IPE	833			1000	282	
7	PE	167					
			1000.0	**12597.0**	**4390.0**	**469.0**	
	Total	**18456**					**18456**

4. Flutriafol

Manufacturing Process

1,2,4 1*H*-triazole, potassium hydroxide and 1,2,4-triazole is charged in DMF and Oxirane is added at elevated temperature to form Flutriafol. After completion of reaction, organic phase is separated by filtration. Hydroxide sludge is washed with DMF and collected with organic filtrate. Sludge is transferred to solid waste DMF is distilled out from reaction mass first at atmospheric distillation and then by vacuum distillation. Flutriafol is isolated from molten mass with help of water. Slurry is filtered, centrifuged and dried.

Chemical Reaction



232 69 301

Mass Balance

MATERIAL BALANCE-Flutriafol Batch size (Final output): 1000 Kg							
S.No	**Name of material**	**Input Qty. (Kg)**	**Product Out put Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	Oxirane	750				DMF loss	
2	1,2,4-Triazole	223		DMF	Waste water	180	
3	KOH	181		3570.0	2170	Drying loss	
4	TBAB	104	1000			88	**7008**
5	DMF	3750					
6	Water	2000					
			1000.0	**3570.0**	**2170**	**268.0**	
	Total	**7008**					**7008**

5. Epoxiconazole

Manufacturing Process

Step -1

Fluorobenzene is reacted with chloro acetyl chloride in presence of aluminum chloride and ethylene dichloride to get 4-fluoro phenacyl chloride.

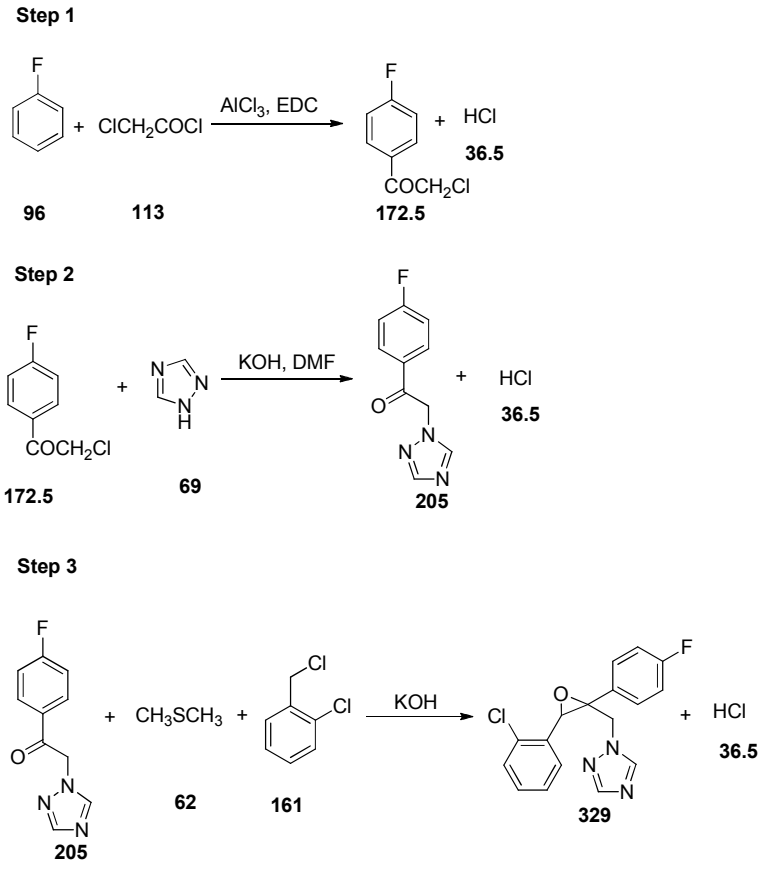
Step -2

4-Fluoro phenacyl chloride reacted with 1,2,4-triazole in presence of potassium hydroxide and DMF to give 2-(1*H*-1,2,4-triazole-1-yl)-4-fluoro acetophenone.

Step -3

2-(1*H*-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 EPOXICONAZOLE.

Chemical Reaction



Mass Balance

	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg / Batch**		**Product / Byproduct**	**Qty. / 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**

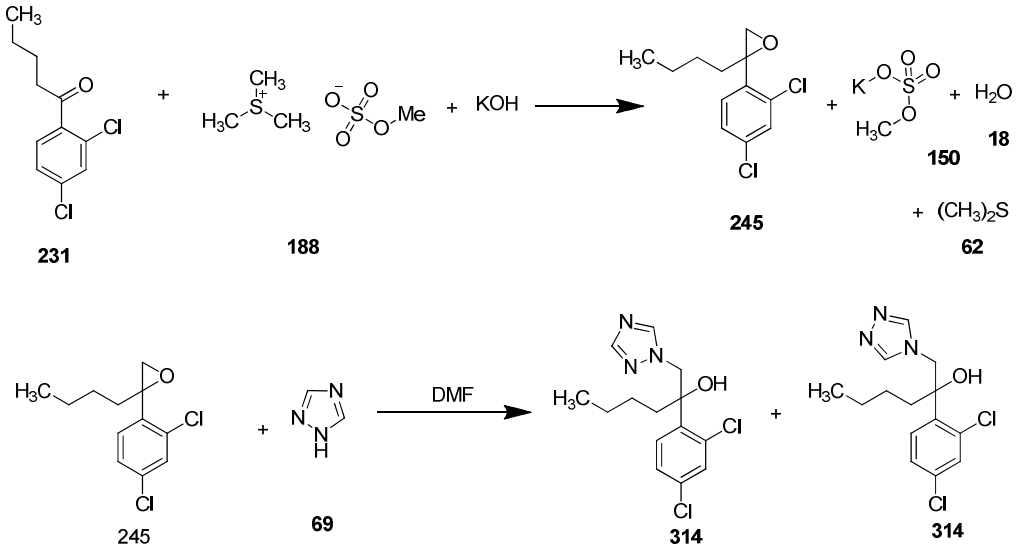
6. Hexaconazole

Manufacturing Process

Preparation of Trimethylsulfonium sulfate

Dimethyl sulfate is charged in dimethyl sulfide at 33 °C to form Trimethylsulfonium sulfate. 2, 4 Dichlorovalerophenone is reacted with Trimethylsulfonium sulfate in presence of potassium hydroxide to form Oxirane. Solvent dimethyl sulfide is recovered by distillation and product (Oxirane) is separated from potassium hydrogen sulfate. Water is added to dissolve salt and back extracted with methylene dichloride and then, aqueous layer is transferred to ETP.1,2,4 1*H*-triazole and potassium hydroxide is charged in DMF and previously prepared Oxirane is added at elevated temperature to form Hexaconazole. After completion of reaction, organic phase is separated by filtration. Carbonate sludge is washed with DMF and collected with organic filtrate. Sludge is transferred to solid waste DMF is distilled out from reaction mass first at atmospheric distillation and then by vacuum distillation. Hexaconazole is isolated from molten mass with help of water. Slurry is filtered, centrifuged and dried.

Chemical Reaction



Mass Balance

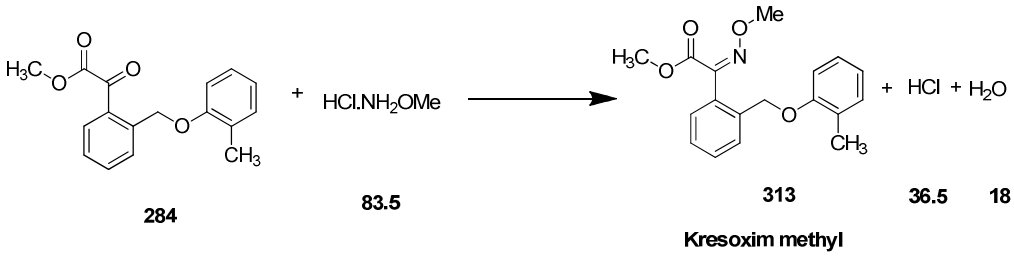
MATERIAL BALANCE-Hexaconazole Batch size (Final output): 1000 Kg							
S.No	**Name of material**	**Input Qty. (Kg)**	**Product Out put Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	Dimethyl sulfate	482				DMF loss	
2	Sodium sulfide	26		DMF	Waste water	12	
3	DCVP	760		1198.0	9278		
4	Pot. Hydroxide	310	1000				**11488**
5	1,2,4-Triazole	245					
6	Pot. carbonate	45					
7	DMF	1210					
8	Water	8410					
			1000.0	**1198.0**	**9278.0**	**12.0**	
	Total	**11488**					**11488**

7. Kresoxim methyl

Manufacturing Process

2-[(Methylpheoxy) methyl phenyl glyoxylic acid methyl ester and *o*-methyl hydroxyl amine hydrochloride is charged into toluene and oxime formation was carried out. Reaction pH is slowly adjusted with the help of Soda ash solution and toluene is distilled off to precipitate Kresoxim Methyl as desired product is filtered, centrifuged and dried.

Chemical Reaction



284 83.5 313 36.5 18

Kresoxim methyl

Mass Balance

MATERIAL BALANCE-Kresoxim methyl			Batch size (Final output): 1000 Kg				
S.No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	MPM glyoxylic acid methyl ester	825	1000			Toluene loss	**8219**
2	o-Methyl hydroxyl amine hydrochloride	200		Toluene	Waste water	20	
3	Water	4127		2980.0	4195		
4	Soda ash	67				Residue	
5	Toluene	3000				24	
			1000.0	**2980.0**	**4195.0**	**44.0**	
	Total	**8219**					**8219**

8. Mancozeb

Manufacturing Process

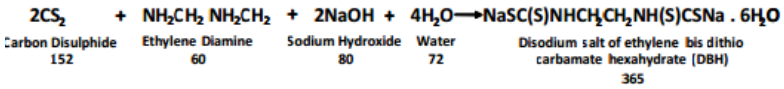
Step 1: Carbon disulphide and ethylene Diamine and sodium hydroxide are reacted in the presence of water to form the di sodium salt of ethylene bisdithio carbamate hexa hydrate (DBH).

Step 2: Di sodium salt of ethylene bisdithio carbamate hexa hydrate is reacted with manganese sulphate to form manganese salt of bisdithio carbamate.

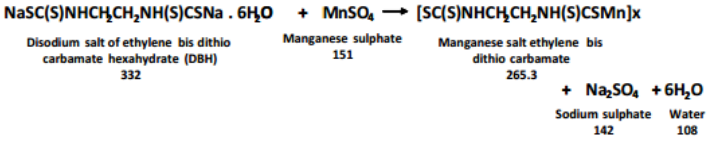
Step 3: The manganese salt further reacts with zinc sulphate to convert into Mancozeb. Slurry is initially spray dried and subsequently vacuum dried for Mancozeb powder formulation.

Chemical Reaction

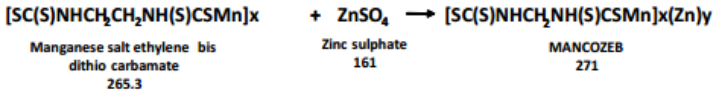
Step 1:



Step 2:



Step 3:



Mass Balance

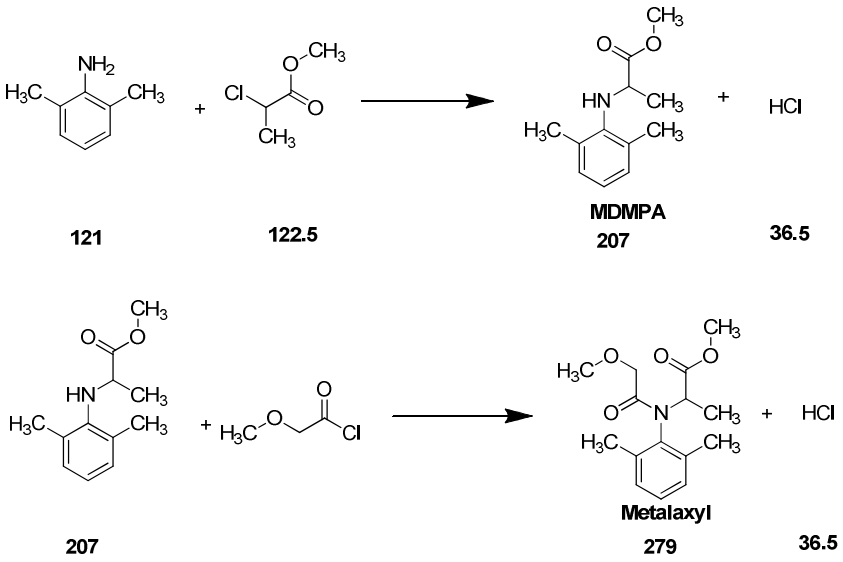
MATERIAL BALANCE-Mancozeb Batch size (Final output): 1000 Kg							
S.No	**Name of material**	**Input Qty. (Kg)**	**Product output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	Carbon disulphide	572				CS_2loss	
2	EDA	206		CS_2	Waste water	518.0	
3	Water	2765	1000	54	2000	Inorganic salt	
4	Sod. Hydroxide (48%)	310				290	**4196**
5	$MnSO_4$	245				Filtration loss	
6	$ZnSO_4$	45				334	
7	HMT	20					
8	SLS	33					
			1000.0	**54.0**	**2000.0**	**1142.0**	
	Total	**4196**					**4196**

9. Metalaxyl

Manufacturing Process

2, 6 Xylidine is reacted with 2- chloro methyl propionate in presence of sodium iodide as catalyst. When reaction is completed, reaction mass is neutralized with soda ash and aqueous phase is sent to ETP. Organic mass is taken up for distillation. First unreacted 2, 6 Xylidine is distilled out which is recycled in next batch. Vacuum is applied and MDMPA (Methyl-2-[(2, 6-dimethyl phenyl) amino] propionate) is distilled out, which is used for next reaction. Residue is taken out and sent for incineration. MDMPA (Methyl-2-[(2, 6-dimethyl phenyl) amino] propionate) is charged in *n*-hexane and Methoxy acetyl chloride is charged slowly at reflux temperature. HCl formed is taken out by applying mild vacuum and scrubbed by water and caustic soda lye. Residual acid is neutralized by alkali and aqueous phase is separated out. Product is filtered out, centrifuged and dried. Hexane is recovered from mother liquor.

Chemical Reaction



Mass Balance

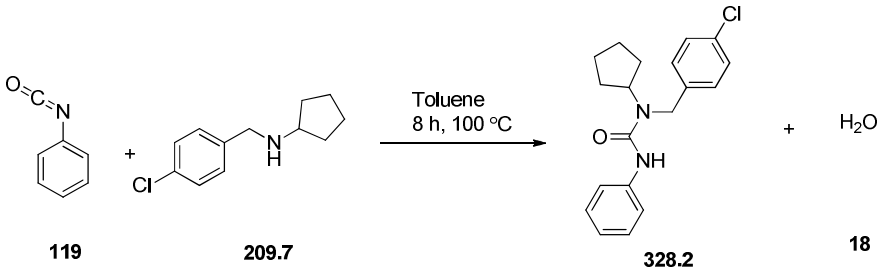
MATERIAL BALANCE-Metalaxyl Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Out put Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	Methoxy acetyl chloride	300				Hexane loss	
2	MDMPA	743	1000	Hexane	Waste water	6	
3	Hexane	816		810.0	230	Drying loss	**2210**
4	Water	321				34	
5	Caustic soda	29				HCl (30%)	
						130	
			1000.0	**810.0**	**230.0**	**170.0**	
	Total	**2210**					**2210**

10. Pencycuron

Manufacturing Process

Phenyl isocyanate and amine was heated in toluene at 100 °C for 8h. After completion of reaction water was distilled azeotropically and then toluene is also distilled off completely. Molten mass was crystallized in water. Suspension was filtered off and dried completely to get desired product.

Chemical Reaction



119 209.7 328.2 18

Mass Balance

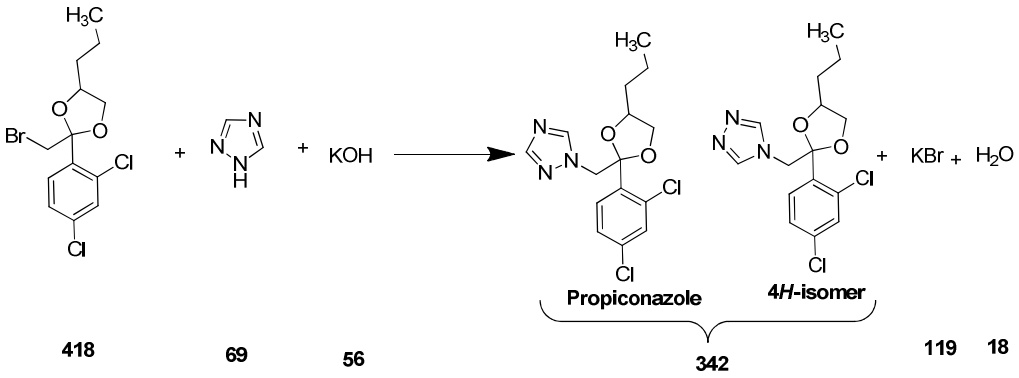
MATERIAL BALANCE-Pencycuron Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Out put Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	Phenyl isocyanate	362.6				Toluene loss	
2	4-ClBCPA	638.9	1000	Toluene	Waste water	83	
3	Toluene	1813		1730.0	1460	Drying loss	**4314.5**
4	Water	1500				41.5	
			1000.0	**1730.0**	**1460.0**	**124.5**	
	Total	**4314.5**					**4314.5**

11. Propiconazole

Manufacturing Process

1, 2, 4-1*H*-Triazole and potassium hydroxide is charged in DMSO to form potassium salt of 1,2 4-1*H*-triazole. 2-Bromo-methyl-2-[(2, 4 dichlorophenyl)-4-propyl]-1, 3-dioxolan (Bromoketal) is gradually added to DMSO containing potassium salt of Triazole. Temperature is raised and maintained for few hours to complete the reaction. After completion of reaction solvent is removed by distillation. Residue is washed with water and then crude Propiconazole is distilled to get technical grade Propiconazole. Residue is transferred to ETP.

Chemical Reaction



Mass Balance

MATERIAL BALANCE-Propiconazole Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	DMSO	1800	1000			DMSO loss	**5512**
2	Pot. Hydroxide	237		Bromoketal	Waste water	20	
3	1,2,4-Triazole	265		1210	1480	Residue	
4	Bromoketal	1210		DMSO		22	
5	Water	2000		1780			
			1000.0	**2990.0**	**1480.0**	**42.0**	
	Total	**5512**					**5512**

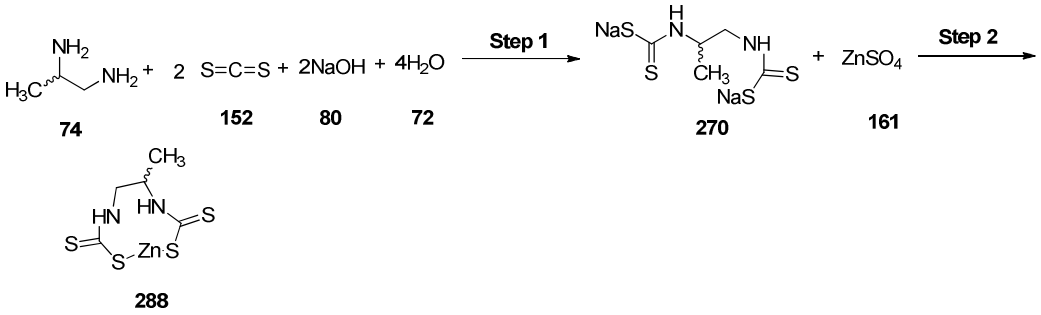
12. Propineb

Manufacturing Process

Step 1: Carbon disulphide and ethylene Diamine and sodium hydroxide are reacted in the presence of water to form the di sodium salt of ethylene bisdithio carbamate hexa hydrate (DBH).

Step 2: Di sodium salt of ethylene bisdithio carbamate hexa hydrate is reacted with zinc sulphate to form zinc chelate complex of bisdithio carbamate.

Chemical Reaction



Mass Balance

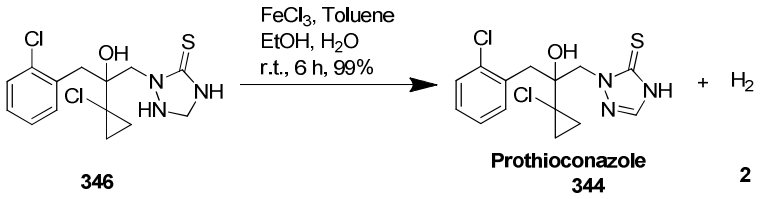
MATERIAL BALANCE-Propineb Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	Bisthiocarbamate	937	1000				**3196**
2	Zinc sulphate	559			Waste water		
3	Water	1700			2100	Drying loss	
						96	
			1000.0		**2100**	**96**	
	Total	**3196**					**3196**

13. Prothioconazole

Manufacturing Process

At room temperature, a mixture of 2-(1-chloro-cycloprop-1-yl)-1-(2-chloro-phenyl)2- hydroxy-3-(1,2,4-triazolidine-5-thiono-1-yl)-propane, toluene and ethanol were mixed with stirring solution of 0.5 molar aqueous iron (III) chloride which has been acidify slightly with hydrochloric acid. The reaction mixture is stirred at room temperature for 6h, and the phases are then separated. The organic phase is washed twice with water and saturated aqueous sodium chloride solution, dried over sodium sulphate and concentrated under reduced pressure. This gives solid product 2-(1-chloro-cycloprop-1-yl)-1-(2-chloro-phenyl)-3-(4, 5-dihydro-1, 2, 4-triazole-5-thiono-1-yl)-propan-2-ol.

Chemical Reaction



346 Prothioconazole 344 2

Mass Balance

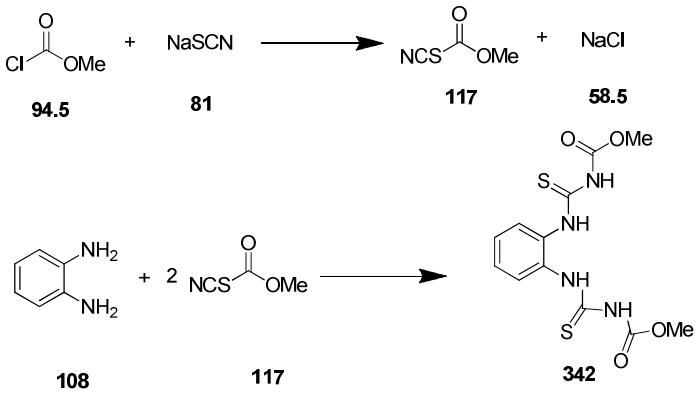
MATERIAL BALANCE-Prothioconazole Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	2-(1-chloro-cycloprop-1-yl)-1-(2-chloro-phenyl)-2-hydroxy-3-(1,2,4-triazolidine-5-thiono-1-yl)-propane	1000	1000			Toluene loss	**53555**
2	Toluene	19222		Toluene	Waste water	357	
3	Iron chloride solution	11111		18865	10800		
4	Water	22222			Aqu. layer		
					22533		
			1000.0	**18865.0**	**33333.0**	**357.0**	
	Total	**53555**					**53555**

14. Thiophnate methyl

Manufacturing Process

Sodium Thiocyanate is charged in to Dichloro ethane and reacted with methyl chloroformate to form Methoxy carbonyl isothiocyanate. *o*-Pheneylene Diamine is charged to Methoxy carbonyl isothioocyante in dichloro ethane and temperature is raised up to reflux. Reaction is completed in 3 to 4 hours. Reaction mass is cooled to 50 °C and then filtered. Hot water washing is applied to remove solvent. Product is dried, pulverizes and packed as per requirement. Mother liquor and washing is to be collected and solvent dichloro ethane is to be recovered first by atmospheric distillation and then by vacuum distillation.

Chemical Reaction



Mass Balance

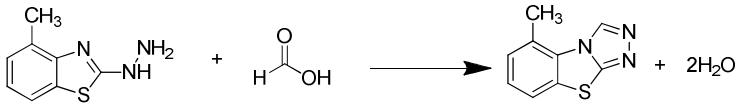
MATERIAL BALANCE-Thiophanate methyl			Batch size (Final output): 1000 Kg				
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	EDC	2000	1000			EDC loss	**7275**
2	Sodium Thiocyanate	425		EDC	Waste water	25	
3	Methyl chloroformate	400		1975	4090	Drying loss	
4	OPDA	350				185	
5	Water	4100					
			1000.0	**1975.0**	**4090.0**	**210.0**	
	Total	**7275**					**7275**

15. Tricyclazole

Manufacturing Process

2-Hydrazino-4-methyl benzothiazol is charged in formic acid at 90-100 °C for 4hours. Temperature is raised to complete the reaction. After completion of reaction formic acid is distilled out along with some water. After most of formic acid is distilled out water is charged in to the reactor and residual acid is neutralized with caustic soda lye slurry is filtered out, centrifuged and dried. Filtrate is sent to ETP.

Chemical Reaction



HMBT
179

46

Tricyclazole
189

36

Mass Balance

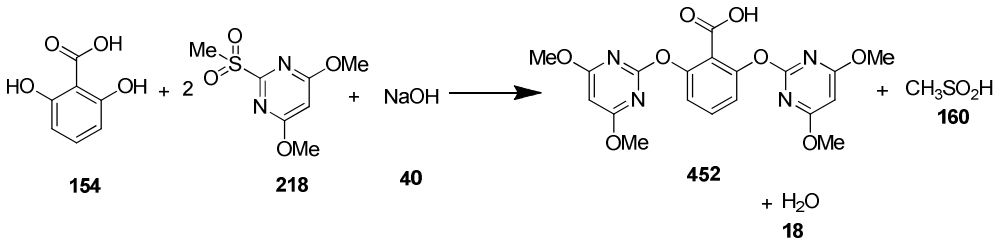
MATERIAL BALANCE-Tricyclazole		Batch size (Final output): 1000 Kg					
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	HMBT	960	1000				**5930**
2	Formic acid	530		Formic acid	Waste water		
3	Caustic lye	40		290	4600	Drying loss	
4	Water	4400				40	
			1000.0	**290.0**	**4600.0**	**40.0**	
	Total	**5930**					**5930**

16. Bispyribac sodium

Manufacturing Process

Toluene, TBAB, caustic soda and 2, 6-dihydroxy benzoic acid is charged in reactor and followed by addition of 4, 6-dimethoxy-2-methoxy Sulfonyl Pyrimidine. The reaction mass is heated for several hours to complete the reaction. After completion of reaction, crude reaction mass is cooled and filtered. Crude is crystallized using *n*-Butanol, ethyl acetate and water. After filtration wet cake is dried to get Bispyribac Sodium as desired product.

Chemical Reaction



154 218 40 452

Mass Balance

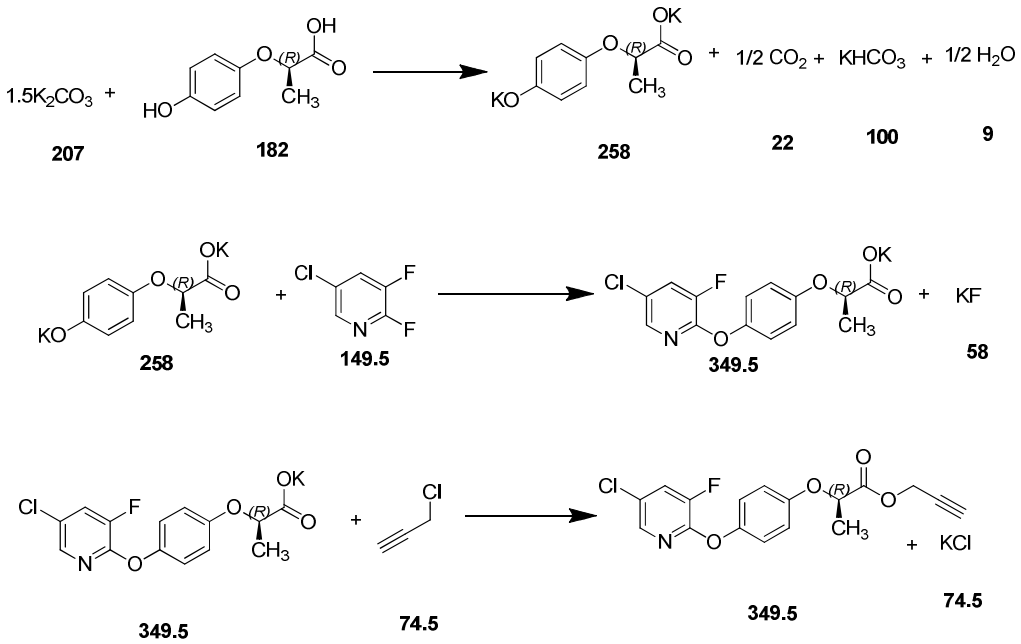
MATERIAL BALANCE-Bispyribac Sodium Batch size (Final output): 1000 Kg							
S.No	**Name of material**	**Input Qty. (Kg)**	**Product Out put Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	2,6-dihydroxy benzoic acid	4386	1000			Toluene loss	**126947**
2	4,6-diethoxy-2-methyl Sulfonyl pyrimidine	1482		Toluene	Waste water	390	
3	TBAB	53		21540	22630	DMSO loss	
4	Caustic soda	412				300	
5	Toluene	21930				Mixture of butanol and ethyl acetate	
6	n-Butanol	78947				81087	
7	Ethyl acetate	2193					
8	Water	17544					
			1000.0	**21540.0**	**22630.0**	**81777.0**	
	Total	**126947**					**126947**

17. Clodinofob-propargyl

Manufacturing Process

The R-(+)-2-(4-hydroxy-phenoxy)-Propionic acid is dissolved in dimethyl Formamide and then charge potassium carbonate and 2, 3-difluoro-5-chloro pyridine (DFCP). The mass is heated and stirred for several hours to complete the reaction. To the resulting intermediate R-(+)-2-[4-(5-chloro-3-fluoro-pyridin-2-yloxy)-phenoxy]-Propionic acid potassium salt Propargyl chloride in toluene is charged in the reaction mass. Temperature is raised to complete the reaction. Reaction mass is filtered to remove inorganic salt. DMF and toluene is distilled off from organic mass to get crude Clodinafop Propargyl. Further purification is done to get technical grade Clodinafop Propargyl. Solvent is recovered from mother liquor.

Chemical Reaction



Mass Balance

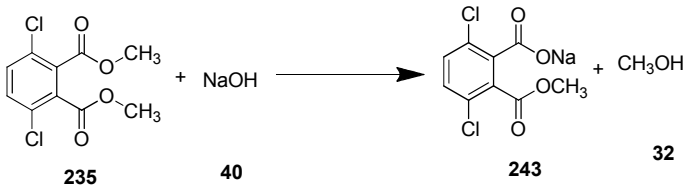
MATERIAL BALANCE-Clodinofob-propargyl Batch size (Final output): 1000 Kg							
S.No	**Name of material**	**Input Qty. (Kg)**	**Product Out put Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	DMF	1889				DMF loss	
2	DHPPA	603		DMF	ML reuse	78	
3	K_2CO_3	997		1811	1500	Solid waste	
4	DFCP	531	1000			1239	**5628**
5	Propargyl chloride	289					
6	HCl	10					
7	Methanol	1148					
8	Water	161					
			1000.0	**1811.0**	**1500.0**	**1317.0**	
	Total	**5628**					**5628**

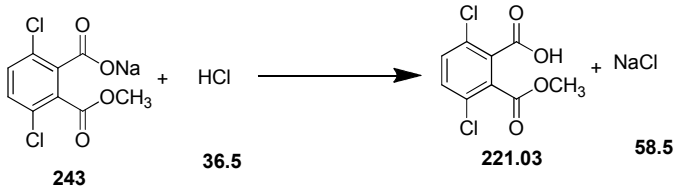
18. Dicamba

Manufacturing Process

3, 6-Dichloro-methoxy benzoate is charged in water. Into this TBAB and sodium hydroxide is charged and temperature is raised to carry out hydrolysis. Methanol is recovered and aqueous phase is separated out. Steam is applied to remove organic impurity and then finally molten mass is charged into water and acidification is carried out to get DICAMBA.

Chemical Reaction





Mass Balance

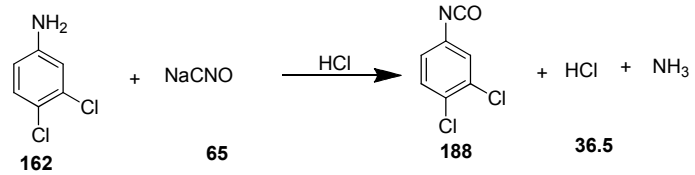
MATERIAL BALANCE-Dicamba Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	3,6-Dichloromethoxy benzoate	1205	1000				**11339**
2	NaOH	308			Waste water		
3	TBAB	31			9835	Drying loss	
4	Water	8974				503	
5	HCl	821					
			1000.0	**0.0**	**9836.0**	**503.0**	
	Total	**11339**					**11339**

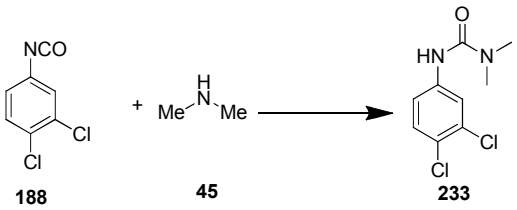
19. Diuron

Manufacturing Process

Charge HCl in mono chloro benzene and added 3,4 DCA slowly and stirred for few hours. Into this NaCNO was added and again stirred for few hours. In this reaction mixture dimethyl amine gas was purged and heated at 120 °C. Solvent was distilled out first at atmospheric condition and then apply vacuum to remove traces of solvent from reaction mass. Finally, product is distilled out under vacuum; small quantity of residue will be taken out and sent for incineration.

Chemical Reaction





Mass Balance

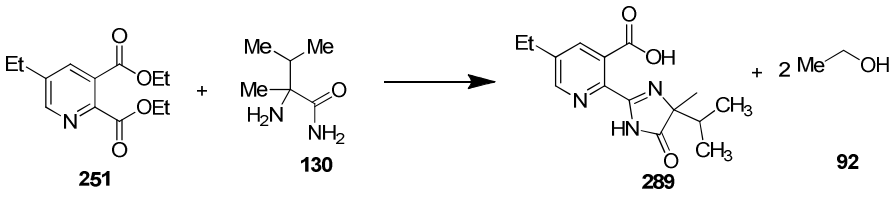
MATERIAL BALANCE-Diuron Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	3,4-DCPI	807				Xylene loss	
2	Xylene	1500	1000	Xylene	Waste water	40	**4540**
3	Dimethyl amine	193		1460	2040		
4	Water	2040					
			1000.0	**1460.0**	**2040.0**	**40.0**	
	Total	**4540**					**4540**

20. Imezathapyr

Manufacturing Process

Charge 2-amino-2, 3-dimethyl butane amide, ethyl-5-ethyl Pyridine dicarboxylate and sodium ethoxide in Toluene. Reaction mixture was warmed at 50 °C. Ethanol was distilled from reaction mixture. Temperature was raised from 50 to 110 °C after removal of ethanol from reaction mixture. Temperature was then maintained at 110 °C for few hours. On completion of reaction, charge water to reaction mass. pH 3.5 was adjusted with hydrochloric acid. Cooled the reaction mass to 30 °C. Filter the crude Imezathapyr and crystallized in ethanol.

Chemical Reaction



Mass Balance

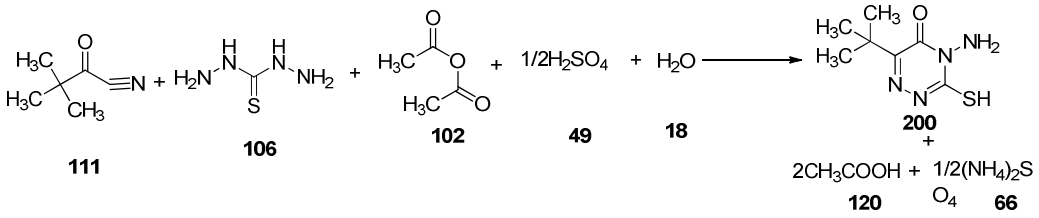
MATERIAL BALANCE-Imezathapyr Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	Diethyl-5-ethylpyridine dicarboxylate	970	1000	Ethanol		Ethanol loss	**15229**
2	2-Amino-2,3-dimethyl butane amide	603		800	Waste water	91	
3	Sodium ethoxide	658		Toluene		Toluene loss	
4	Toluene	3202		3175		27	
5	HCl 30%	1175		Ethanol		Residue	
6	Ethanol	4926		4835		235	
7	Water	3695				Inorganic salt	
						5066	
			1000.0	**8810.0**	**0.0**	**5419.0**	
	Total	**15229**					**15229**

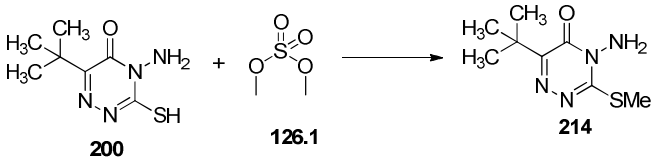
21. Metribuzin

Manufacturing Process

Triazinone is charged slowly in sulfuric acid in 4 hours. Temperature is raised to 45 °C and di methyl sulfate is charged. Temperature was maintained for 10 hours. Reaction mixture was quenching in 20% Soda ash solution upon completion of Methylation. Finally, pH was adjusted up to 10 using NaOH lye. Reaction mixture was filtered, centrifuged and dry the wet cake. Pulverize and pack suitably.

Chemical Reaction





Mass Balance

MATERIAL BALANCE-Metribuzine Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Out put Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	Sulfuric acid	1245	1000			Inorganic salt	**13308**
2	Triazinone	1000			Waste water	3582	
3	Dimethyl sulfate	636			8544	Drying loss	
4	Soda ash	1882				182	
5	Water	8545					
			1000.0	**0.0**	**8544.0**	**3764.0**	
	Total	**13308**					**13308**

22. Oxyfluorfen

Manufacturing Process

Step -1:

Resorcinol is reacted with 3, 4 - dichloro benzotrifluoride in presence of sodium hydroxide in DMSO to form 3-(2-chloro-4-(Trifluoro Methyl) phenoxy) phenol.

Step -2:

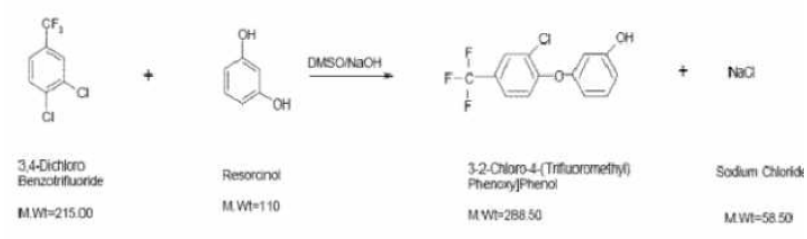
3-(2-Chloro-4-(Trifluoro Methyl) phenoxy) phenol is further reacted with ethyl bromide in presence sodium hydroxide in toluene to form 3-(2-chloro-4-(Trifluoro Methyl) phenoxy) Ethoxy benzene.

Step -3:

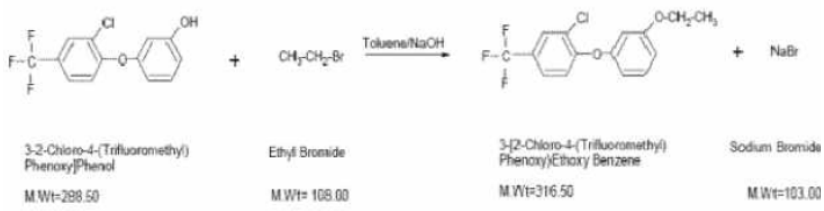
3-(2-Chloro-4-(Trifluoro Methyl) phenoxy) Ethoxy benzene is finally reacted with nitric acid in ethylene dichloride to form the desired product as Oxyfluorfen.

Chemical Reaction

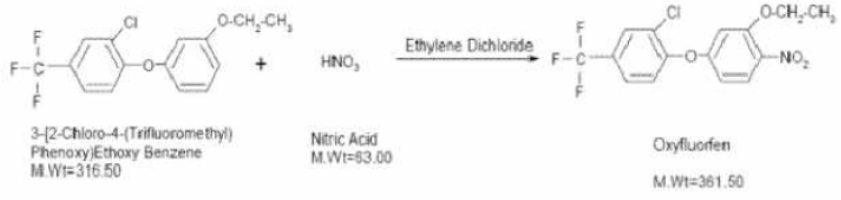
Step 1:



Step 2:



Step 3:



Mass Balance

MATERIAL BALANCE-Oxyfluorfen Batch size (Final output): 1000 Kg							
S.No	**Name of material**	**Input Qty. (Kg)**	**Product Out put Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	3,4-dichloro Benzotrifluoride	614		DMSO		DMSO loss	
2	Resorcinol	317		1055	Water	45	
3	Sodium hydroxide	233		Toluene	956	Toluene loss	
4	DMSO	1100		960		40	
5	Ethyl bromide	306		DCE		DCE loss	
6	Nitric acid	180		762		38	
7	Toluene	1000	1000			Sodium chloride	**5350**
8	DCE	800				173	
9	Water	800				Sodium bromide	
						300	
						Distillation residue	
						21	
			1000	**2777**	**956**	**617**	
	Total	**5350**					**5350**

23. Pendimethalin

Manufacturing Process

Mixture of 4 NOx (4-nitro-2-xylene), diethyl Ketone and platinum on carbon as catalyst is charged in autoclave. Hydrogen gas is purged. Hydrogenation is completed in 8-10 hours. Reaction mass was filtered to recover the platinum on carbon catalyst, which is used in next batches. Excess di ethyl Ketone is recovered by distillation.

Nitration

Mixed acid is prepared by adding nitric acid to sulfuric acid and water in reactor at below room temperature. NAX and EDC are mixed in reactor. Add slowly EDC and NAX mixture to mixed acid prepared above at room temperature. Maintain temperature for few hours to complete the reaction. When reaction is completed allow to settle the reaction mass. Separate spent acid as bottom layer. Apply water wash to organic layer and separate organic layer. Aqueous layer containing acid which is back extracted with EDC and then neutralized and transferred to ETP.

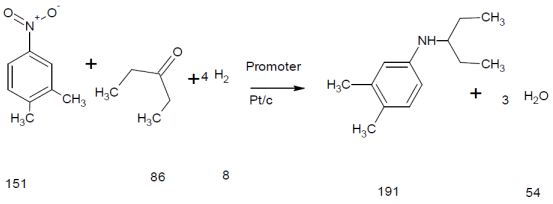
Denitrososation

To remove N-nitroso impurity, reaction mass is treated with acetone and hydrochloric acid at elevated temperature in Glass lined vessel. After completion of reaction neutralize excess hydrochloric acid with caustic lye and then washed with water. Aqueous phase was separated, distilled out EDC from organic mass first at atmospheric and then under vacuum. This will generate crude molten Pendimethalin.

Purification

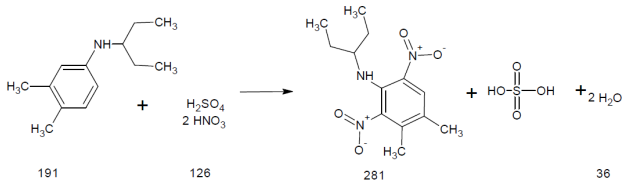
During distillation and earlier reactions tar is formed in crude molten Pendimethalin. Molten Pendimethalin is dissolved in *n*-hexane, clarified to remove tarry mass and from clear solution hexane is removed by distillation to get Pendimethalin, which is packed as per requirement.

Chemical Reaction



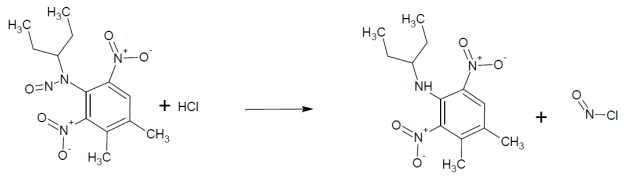
151 86 8 191 54

Nitration



191 126 281 36

Denitrososolation



310 36.5 281 65.5

Mass Balance

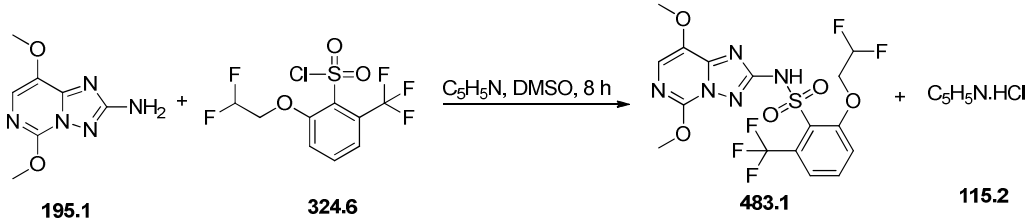
MATERIAL BALANCE-Pendimethalin Batch size (Final output): 1000 Kg							
S.No	**Name of material**	**Input Qty. (Kg)**	**Product Out put Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	DEK	860	1000			Hexane loss	**9358**
2	4NOX	518		DEK	Waste water	16	
3	Hydrogen	28		518	4691	EDC loss	
4	Caustic lye	415		Hexane	Spent acid	10	
5	Promoter	12		1020	860	Drying loss	
6	Hydrogen	8		EDC		104	
7	EDC	1036		1026		Sodium nitrite	
8	Hexane	1036				83	
9	Nitric acid	792				Inorganic salt	
10	Sulfuric acid	373				30	
11	HCl	52					
12	Soda ash	83					
13	Water	4145					
			1000	**2564.0**	**5551.0**	**243**	
	Total	**9358**					**9358**

24. Penoxsulam

Manufacturing Process

To the mixture of Trizolopyrimidine amine, DMSO and pyridine was added substituted benzene Sulphonyl chloride and 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 Reaction



195.1 324.6 483.1 115.2

Mass Balance

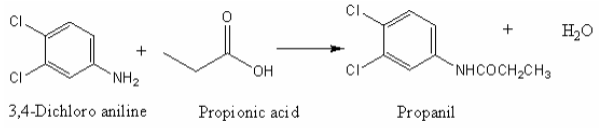
MATERIAL BALANCE-Penoxsulam Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	Trizolopyrimidine amine	404				DMSO loss	
2	Sulphonyl chloride	672		DMSO	Waste water	90	
3	Pyridine	164	1000	1930	1160	Drying loss	**4260**
4	DMSO	2020				80	
5	Water	1000					
			1000	**1930**	**1160**	**170**	
	Total	**4260**					**4260**

25. Propanil

Manufacturing Process

Propanil tech manufacture is a single step process. It involves reaction of 3, 4-dichloroaniline (DCA) with Propionic acid at 140-150°C. Water is formed during the course of reaction. Excess Propionic acid and azeotropic water are removed. The residual mass thus obtained in molten state is Propanil technical.

Chemical Reaction



Mass Balance

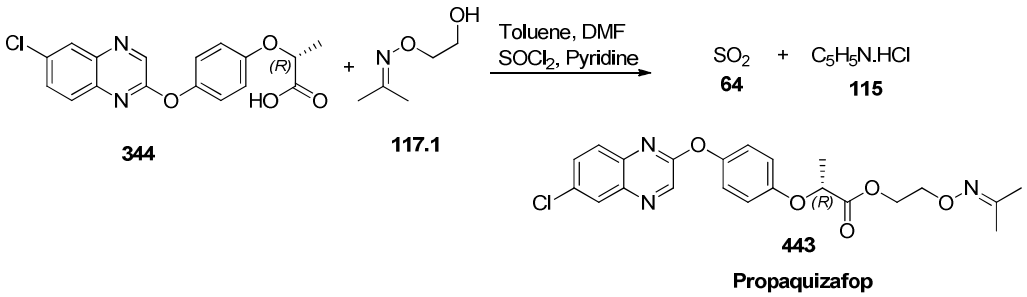
MATERIAL BALANCE-Propanil Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	3,4-DCA	747					
2	Propionic acid	404		Reaction water			
				82.99			
				Organic impurity			
			1000	68.01			**1151**
			1000	**151**			
	Total	**1151**					**1151**

26. Propaquizafop

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 Reaction



Mass Balance

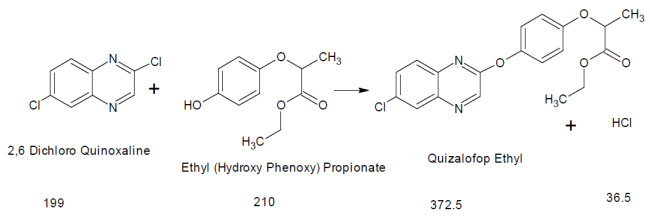
MATERIAL BALANCE-Propaquizafop Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	Carboxylic acid	777	1000			Toluene loss	**10482**
2	Alcohol	265		Toluene	Waste water	148	
3	Thionyl chloride	269		2960	2300	DMF loss	
4	Pyridine	178		DMF		195	
5	DMF	3885		3690		Drying loss	
6	Toluene	3108				189	
7	Water	2000					
			1000	**6650.0**	**2300**	**532**	
	Total	**10482**					**10482**

27. Quizalofop ethyl

Manufacturing Process

Charge 2,6-dichloro quinaoxaline and potassium carbonate in dimethyl formamide and charge ethyl(Hydroxy phenoxy) propionate. Temperature was raise to complete the reaction. After completion of reaction, inorganic salt was filtered off. Adjust pH 4.0 with the help of hydrochloric acid to precipitate inorganic salt from filtrate. Clarify to remove salt. Distill solvent from organic phase. Crystallize crude using Methanol and water, filter, centrifuge and dry the product.

Chemical Reaction



Mass Balance

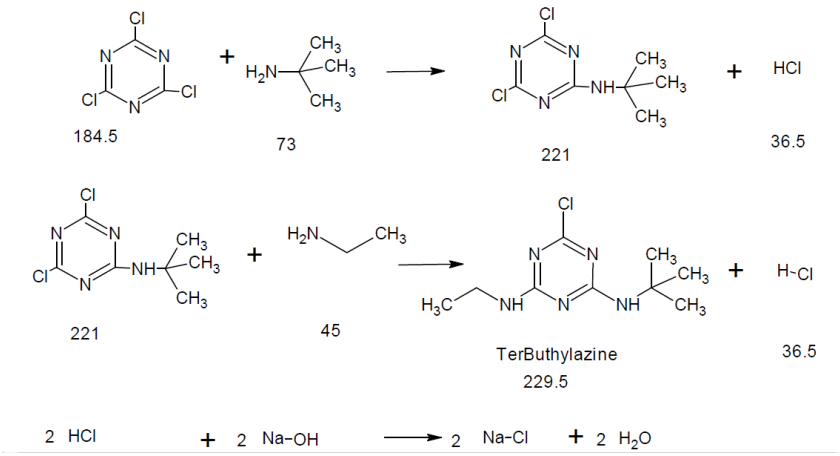
MATERIAL BALANCE-Quizalofop ethyl Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	DMF	1694	1000			DMF loss	**4665**
2	Dichloroquinoxaline	585		DMF	Water (reuse)	24	
3	K_2CO_3	500		1670	1255	Drying loss	
4	Ethyl-2-(4-hydroxyphenoxy)propionate	618				151	
5	HCl	9				Inorganic salt	
6	Methanol	1047				565	
7	Water	212					
			1000	**1670.0**	**1255.0**	**740.0**	
	Total	**4665**					**4665**

28. Terbuthyalazine

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. *Tert*-butyl amine is charged slowly. Sodium hydroxide is charged to neutralize hydrochloric acid which is generated in the reaction. Ethyl amine is charged slowly. Sodium hydroxide is charged to neutralize hydrochloric acid which is generated in the reaction. Aqueous phase is separated out, fresh water is charged and toluene is distilled out azeotropically in presence of live steam. Product is filtered off. Centrifuged, dried and pulverized and pack as per requirement.

Chemical Reaction



Mass Balance

MATERIAL BALANCE-Terbuthylazine Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	Toluene	4680				Toluene loss	
2	Cynuric chloride	840		Toluene	Waste water	10	
3	Tert-butyl amine	338	1000	4670	3053	Organic Impurity	**8809**
4	25% NaOH	1456				76	
5	Mono ethyl amine	295					
6	Water	1200					
			1000	**4670.0**	**3053.0**	**86.0**	
	Total	**8809**					**8809**

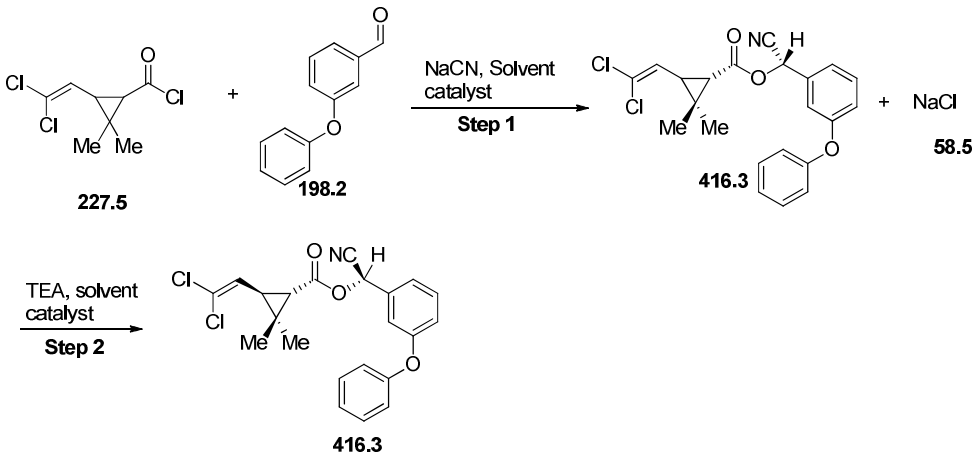
29. Alphamethrin

Manufacturing Process

Step 1: Alpha cypermethric acid Chloride (CMAC), metaphenoxybenzaldehyde (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 Alphamethrin (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 Reaction



Mass Balance

MATERIAL BALANCE-Alphamethrin Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty.(Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	Alphacypermethrin acid chloride	766	1000	Hexane		Hexane Loss	**11576**
2	m-Phenoxybenzaldehyde	655		4275		515	
3	Sodium cyanide	200		TEA + Cypermethrin (Recycle)	Aq. for ETP		
4	Hexane	4750		960	4626		
5	TEBA	18		Low purity Cyper (By Product)			
6	Soda ash	18		200			
7	Water	3569					
8	TEA	800					
9	Hypo chloride	800					
			1000	**5435**	**4626**	**515**	
	Total	**11576**					**11576**

30. Diafenthiuron technical

Manufacturing Process

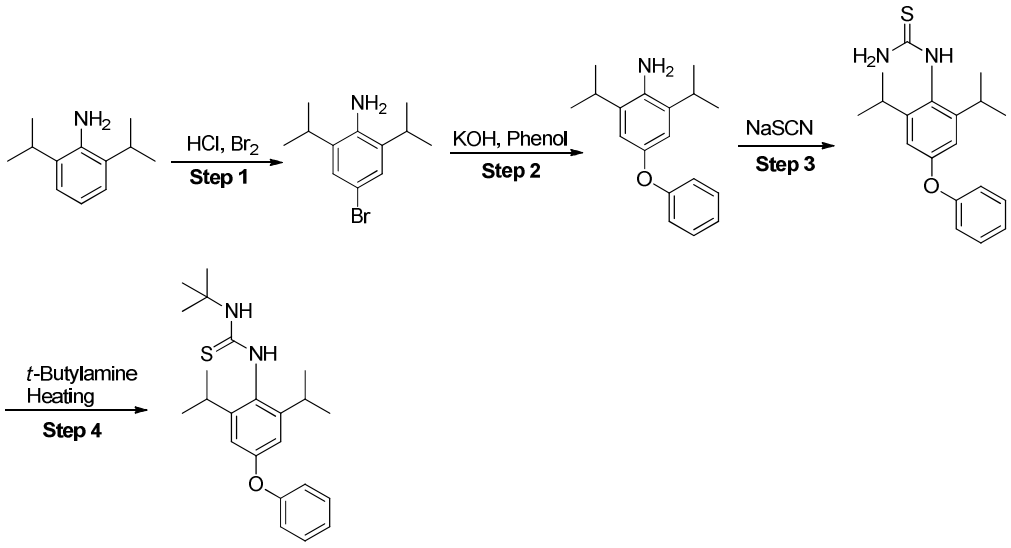
Step 1: 2, 6-Di-isopropylaniline is brominated in the para position by Bromine. The reaction is carried out at 30 °C and the solution is neutralized by caustic and the product is used for the next reaction.

Step 2: Bromo product 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 step reaction.

Step 3: Phenated product is reacted with sodiumthiocyanate to get Thiourea. 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 Thiocyanate.

Step 4: Thiocyanate is reacted with *t*-butylamine amine in solvent and crystallized to get the desired product difenthiuron as technical.

Chemical Reaction



Mass Balance

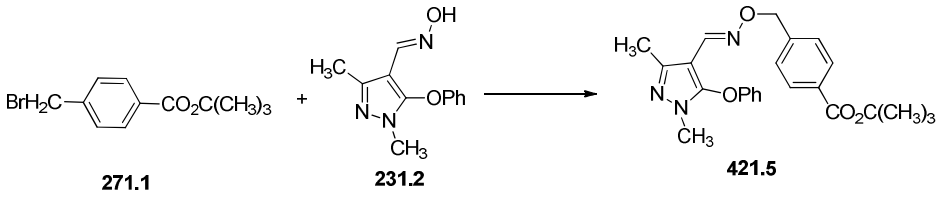
MATERIAL BALANCE-Diafenthiuron technical Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty. (Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	Xylene	1236		Reaction mass-1	Aqueous-1	Xylene loss	
2	DIPBA	825		2712	1602	78	
3	NaSCN	267		Reaction mass-2	Filtrate ML		
4	HCl (30%)	384		2160	1380		
5	Reaction mass-1	2712	1000	Xylene		Org. residues	**10233**
6	Water	1050		1158		143	
7	Reaction mass-2	2160					
8	Tert-butylamine	219					
9	Filtrate mother liquor	1380					
			1000	**6030**	**2982**	**221**	
	Total	**10233**					**10233**

31. Fenpyroximate

Manufacturing Process

Fenpyroximate is a pyrazole class of acaricide. It is manufactured by the reaction tert-butyl-4-(Bromomethyl) benzoate (TBB) with 1, 3-dimethyl-4-phenoxypyrazole oxime (DMPPO) in the presence of KOH by using dimethyl formamide as 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 Reaction



Mass Balance

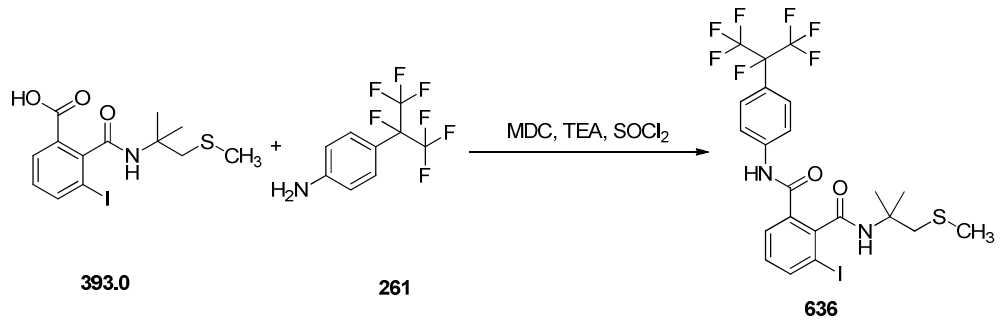
MATERIAL BALANCE-Fenpyroximate Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty.(Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	TBB	755		DMF	HBr	DMF loss	
2	DMPPO	647		3810	192	190	
3	KOH	172		MDC	Water	MDC loss	
4	DMF	4000		4275	3000	225	
5	MDC	4500				Org. Impurities	
6	Water	3000	1000			382	**13074**
			1000	**8085**	**3192**	**797**	
	Total	**13074**					**13074**

32. Flubendiamide

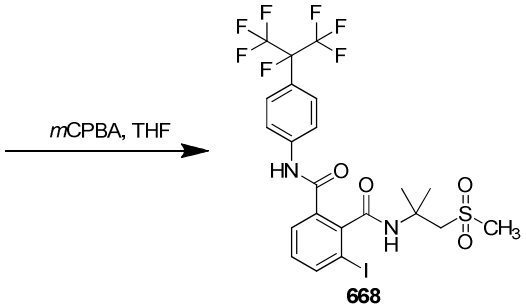
Manufacturing Process

Iodo benzoic acid and TEA was dissolved in MDC. Into this Thionyl chloride was added and stirred the mixture for few hours. After completion of reaction MDC and Thionyl chloride was distilled completely. Crude mixture was again dissolved in MDC and Flubendiamide was added and stirred for 4h. After completion of reaction MDC was distilled out. Crude mixture was dissolved in THF and *m*CPBA was added portion wise and stirred for 2h. After completion of reaction THF is distilled out. Crude reaction mixture was dissolved in 10% $NaHCO_3$ solution white ppt was filtered off. Residue was washed with water and dried completely to get desired product as white powder.

Chemical Reaction



393.0 261 636



668

Mass Balance

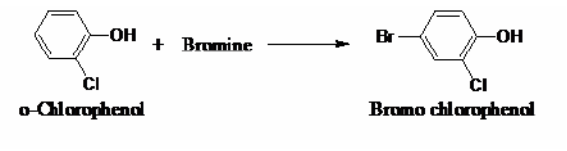
MATERIAL BALANCE-Flubendiamide		Batch size (Final output): 1000 Kg					
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty.(Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	Acid	618		THF		MDC loss	
2	Amine	410		3175		122	
3	Thionyl chloride	187		MDC	Waste water	THF loss	
4	TEA	159		2350	2800	165	
5	MDC	2472	1000			Drying loss	**9754**
6	mCPBA	568				142	
7	THF	3340					
8	10% $NaHCO_3$	2000					
			1000	**5525**	**2800**	**429**	
	Total	**9754**					**9754**

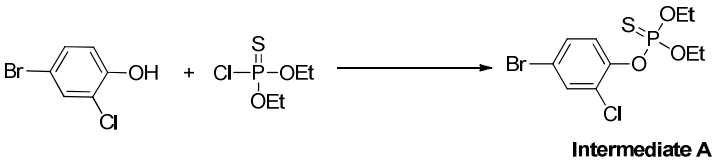
33. Profenophos

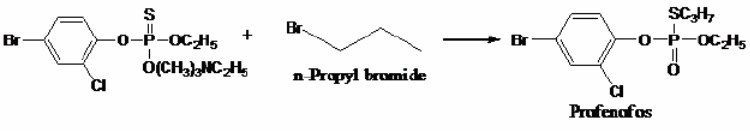
Manufacturing Process

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 Profenofos technical.

Chemical Reaction







Mass Balance

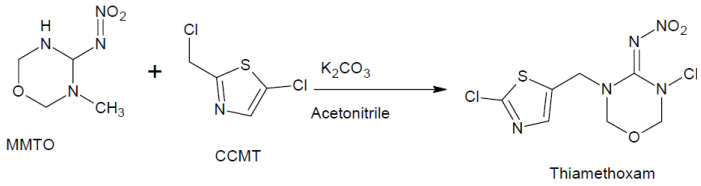
MATERIAL BALANCE-Profenofos Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty.(Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	o-Chloro phenol	398	1000		Hydro Bromic acid		**7397**
2	Liquid bromine	485			206		
3	DETCl	566			TMA	Organic Impurity	
4	TMA	709			212.2	448.9	
5	Propyl bromide	363			Aqueous waste	Sodium bromide	
6	Water	4661			5268	261.9	
7	Sodium hydroxide	215					
			1000		**5686.2**	**710.8**	
	Total	**7397**					**7397**

34. Thiamethoxam

Manufacturing Process

The Intermediate 3-methyl-4-nitroimino-1,2,3,6-tetrahydro-1,3,5-oxadiazine (MMTO) is taken in Acetonitrile and is reacted with 3-chloro-5-chloro methylthiazole (CCMT) in presence of K_2CO_3 under reflux. After completing the reaction, the mass is cooled and the product is crystallized, filtered. The mother liquor is collected and is sent for solvent recovery. The solid product is washed with water and dried to get the desired product.

Chemical Reaction



Mass Balance

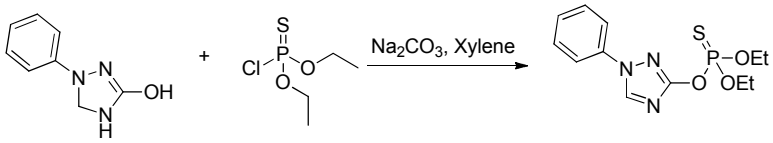
MATERIAL BALANCE-Thiamethoxam Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty.(Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	CCMT	840		Reaction mass		DMF loss	
2	MNIO	800		3325		760	
3	K_2CO_3	760		Crude Thiamethoxam	Aq. effluent		
4	DMF	925		1750	3650		
5	Reaction mass	3325		Methanol			
6	Water	1775	1090	1375			**11950**
7	Crude Thiamethoxam	1750					
8	80% MeOH	1775					
			1090	**6450**	**3650**	**760**	
	Total	**11950**					**11950**

35. Triazophos

Manufacturing Process

Triazophos isorganophosphorous type insecticide/nematicide/acaricide. It is manufactured by condensation of o, o-diethylthiophosphoryl chloride (DETCl) with 3-hydroxy-1-phenyl Triazole (PHT) in presence Na_2CO_3 using Xylene as solvent during reaction stage. The technical Triazophos thus obtained is formulated to 60-62% concentration.

Chemical Reaction



Mass Balance

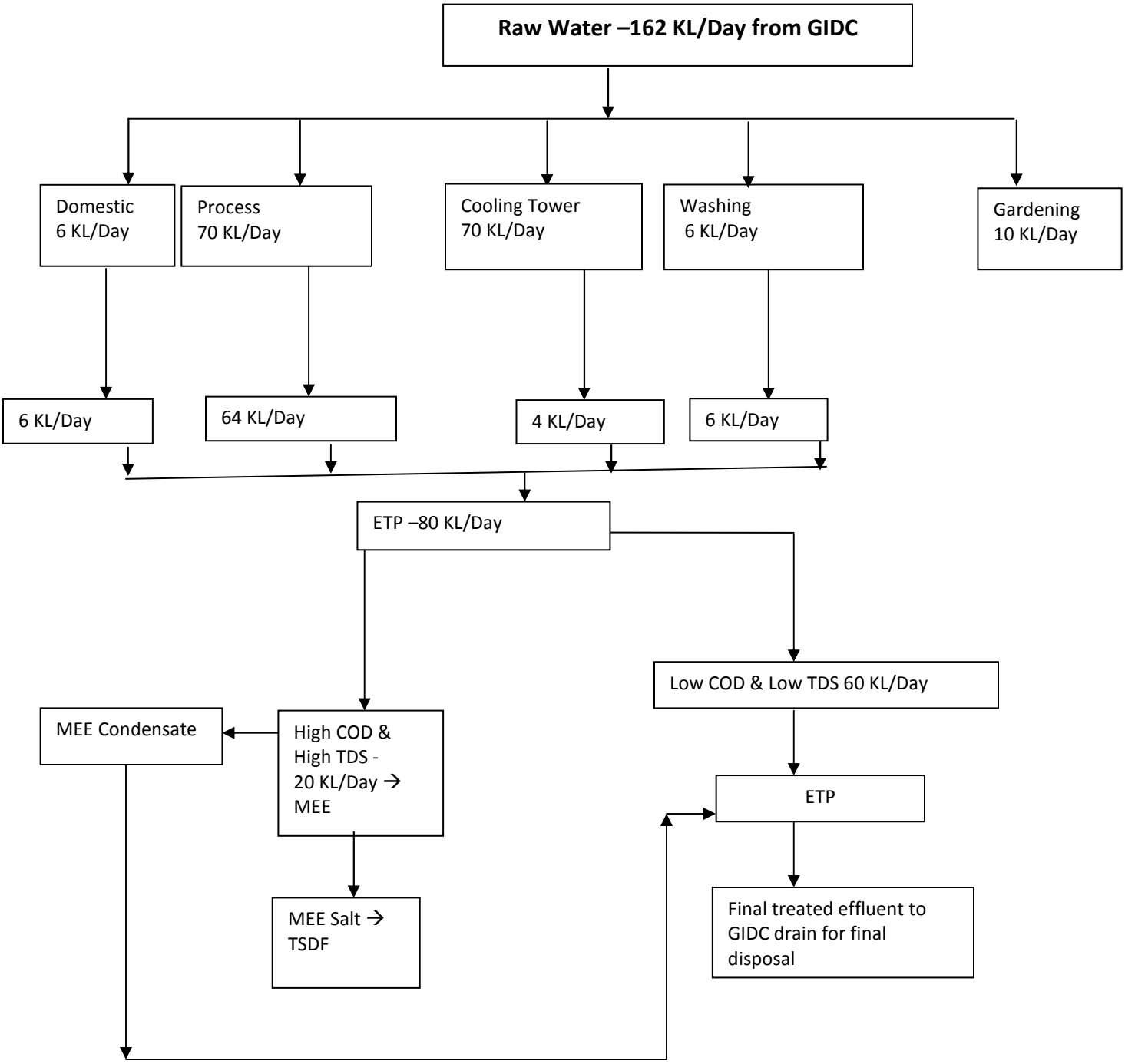
MATERIAL BALANCE-Triazophos Batch size (Final output): 1000 Kg							
S. No	**Name of material**	**Input Qty. (Kg)**	**Product Output Qty.(Kg)**	**Recovery**	**Losses**		**Total**
					Liquid	**Others**	
1	PHT	385				Solid waste	
2	Na_2CO_3	190				268	
3	DETCl	490			Aq. effluent		
4	CuCl	7			1443		
5	KCl	7	1000				**2711**
6	KHP	5					
7	H_3PO_4	25					
8	NaCl	2					
9	o-Xylene	400					
10	Water	1200					
			1000		**1443**	**268**	
	Total	**2711**					**2711**

ANNEXURE: 3
WATER CONSUMPTION AND EFFLUENT GENERATION

Proposed

Sr. No.	Purpose of Water	Water Consumption m^3/Day	Waste Water Generation m^3/Day
1.	Domestic	6	6
2.	Industrial		
	Process	70	64
	Cooling Tower	70	4
	Washing	6	6
3.	Gardening	10	-
Industrial Total		**156**	**74**
Total		**162**	**80**

WATER BALANCE DIAGRAM



ANNEXURE: 4
ETP DETAILS

M/s. CRYSTAL CROP PROTECTION PVT. LTD. shall have an Effluent treatment plant consisting of primary, secondary and advance treatment units. The effluent confirming to inlet standards of GIDC drain. The details of ETP are as follows.

For Low COD and TDS Stream I (60 KLD)

First all non-toxic and biodegradable streams of wastewater shall pass through Screen Chamber (SC) where floating material shall be removed with help of Screen (S-01). Then effluent shall be collected in Collection cum Equalization-1 (CET-1). Then after, Equalized wastewater shall go to Neutralization Tank-1 (NT-1) by pump. Here caustic is added from Caustic Dosing Tank by gravity to maintain neutral pH of wastewater. Mixer is provided after NT-1 to keep all suspended solids in suspension and to provide proper mixing.

Then after, neutralized wastewater shall go to Flash Mixer-1 (FM-1) by gravity. Alum and Polyelectrolyte shall be dosed from Alum Dosing Tank (ADT) and Polyelectrolyte Dosing Tank (PEDT) respectively by gravity into FM to carry out coagulation by using a Flash Mixer.

Then after, coagulated wastewater shall be settled in Primary Tube Settler (PTS).Clear supernatant from PTS shall be passed in Aeration Tank (AT). Here, condensate from MEE shall be mixed with effluent. In AT biodegradation of organic matter of the wastewater shall be carried out by bacteria (suspended growth) in the AT and for that oxygen shall be supplied by 2 nos. of air blowers (B-01) through diffusers. Air blowers also keep MLSS in suspension. Nutrients will be added from NDTs to Aeration Tank for growth of Bacteria.

Then after, waste water shall go to Secondary Settling Tank (SST) from AT. Here, the suspended solids shall be settled. Sludge shall be removed from bottom of SST and pumped to AT to maintain MLSS and excess activated sludge shall be sent to Sludge Sump (SS).

Then, wastewater from Secondary settling tank (SST) shall be passed through Pressure Sand Filter and Active Carbon Filter and collected in Treated Effluent Sump. Clear supernatant from SST shall be collected in Treated Effluent Sump before sent to GIDC drain for deep sea disposal.

Sludge settled in PTS and excess sludge from SST shall be collected in Sludge Sump then sludge shall be pumped to Filter Press where, dewatering shall be carried out before storage in HWSA and ultimate disposal to TSDF. Leachate from FP shall be sent back to CET-1 for further treatment.

For High COD and high TDS Stream II (20 KLD)

All High COD & TDS streams of wastewater shall be collected in Collection cum Equalization-2 (CET-2). Then after, Equalized wastewater shall go to Neutralization Tank-2 (NT-2) by pump. Mixer is provided after NT-1 to keep all suspended solids in suspension and to provide proper mixing where caustic shall be added from Caustic Dosing tank to maintain neutral pH of waste water. Then after, neutralized wastewater shall be pumped to Flash Mixer-2 (FM-2) where Alum and poly shall be added from Alum Dosing Tank and Poly Dosing Tank respectively. Then after, coagulated wastewater shall be settled in Primary Settling Tank (PST). Sludge settles in PST shall be sent to Sludge sump (SS) and then pumped to Filter Press (FP) for dewatering.

Clear effluent from PST shall be collected in Holding Tank (HT) before pumped to strippers. Effluent from stripper shall be then collected in MEE Feed Tank before pumped to Multiple Effect Evaporator. Condensate from MEE shall be sent back to Aeration Tank (AT) for further treatment and solids from Dryer (ATFT) shall be collected and stored in HWSA for disposal in TSDF.

Detail of Units for Effluent Treatment Plant

S.N.	Name of unit	Size (m x m x m)	No.	MOC/ Remark
Steam I -Low COD and TDS Stream (60 KLD)				
1	Screen Chamber (SC)	3.0 x 0.5 (0.05 LD+0.5 FB)	1	RCC M25+A/A Bk. Lining
2	Collation cum Equalization Tank-1 (CET-1)	4.0 x 4.0 x (2.5LD+0.5 FB)	1	RCC M25+A/A Bk. Lining
3	Neutralization Tank-1 (NT-1)	4.0 x 4.0 x (2.5LD+0.5 FB)	1	RCC M25+A/A Bk. Lining
4	Flash Mixer-1 (FM-1)	1.2 x 1.2 x (2.0 LD +0.5 FB)	1	RCC M25
5	Primary Tube Settler (PTS)	2.5 x 2.5 x (2.0 LD + 0.75 HB+ 0.5 FB)	1	RCC M25
6	Aeration Tank (AT)	10.0 x 7.0x (4.5 LD +0.5FB)	1	RCC M25
7	Secondary Settling Tank(SST)	3.5 x 2.5 x(2.5 LD + 0.75 HB+0.5 FB)	1	RCC M25
10	Sludge Sump (SS)	2.5 x 2.5 x (2.5 LD + 0.5)	1	RCC M25
11	Filter Press (FP)	20 M3 / day	1	PP
12	Pressure Sand Filter (PSF)	5 m3/hr	1	MOC = FRP
13	Activated Carbon Filter (ACF)	5 m3/hr	1	MOC = FRP
14	Treated Effluent Sump(TES)	4.8 x2.5 x (2.5 LD+0.5 FB)	1	RCC M25
Stream II High COD and TDS Stream(20 KLD)				
1	Collation cum Equalization Tank-2 (CET-2)	3.5 x 3.5 x (2.5LD+0.5 FB)	1	RCC M25+A/A Bk. Lining
2	Neutralization Tank-2 (NT-2)	3.5 x 3.5 x (2.5LD+0.5 FB)	1	RCC M25+A/A Bk. Lining
3	Flash Mixer-2(FM-2)	1.0 x 1.0 x (1.5LD+0.5 FB)	1	RCC M25
4	Primary Settling Tank (PST)	2.5 x 1.5 x (2.0LD+0.5 FB)	1	RCC M25
5	Holding Tank (HT)	3.5 x 3.5 x (2.5LD+0.5 FB)	1	RCC M25
6	Strippers	20 m3/day	1	SS
7	MEE Feed Tank (MFT)	3.0 x 3.0 x (2.5LD+0.5 FB)	1	RCC M25
	Four Stages Multiple Effect Evaporators with ATFT (MEE ,ATFT)	20 m3/day	1	SS

RCC M25 = REINFORCED CEMENT CONCRETE (M 25 GRADE)
PCC = PLAIN CEMENT CONCREAT
SS = STAINLESS STEEL
PP = POPYPROPELINE

EXPECTED CHARACTERISTICS OF WASTEWATER BEFORE & AFTER TREATMENT

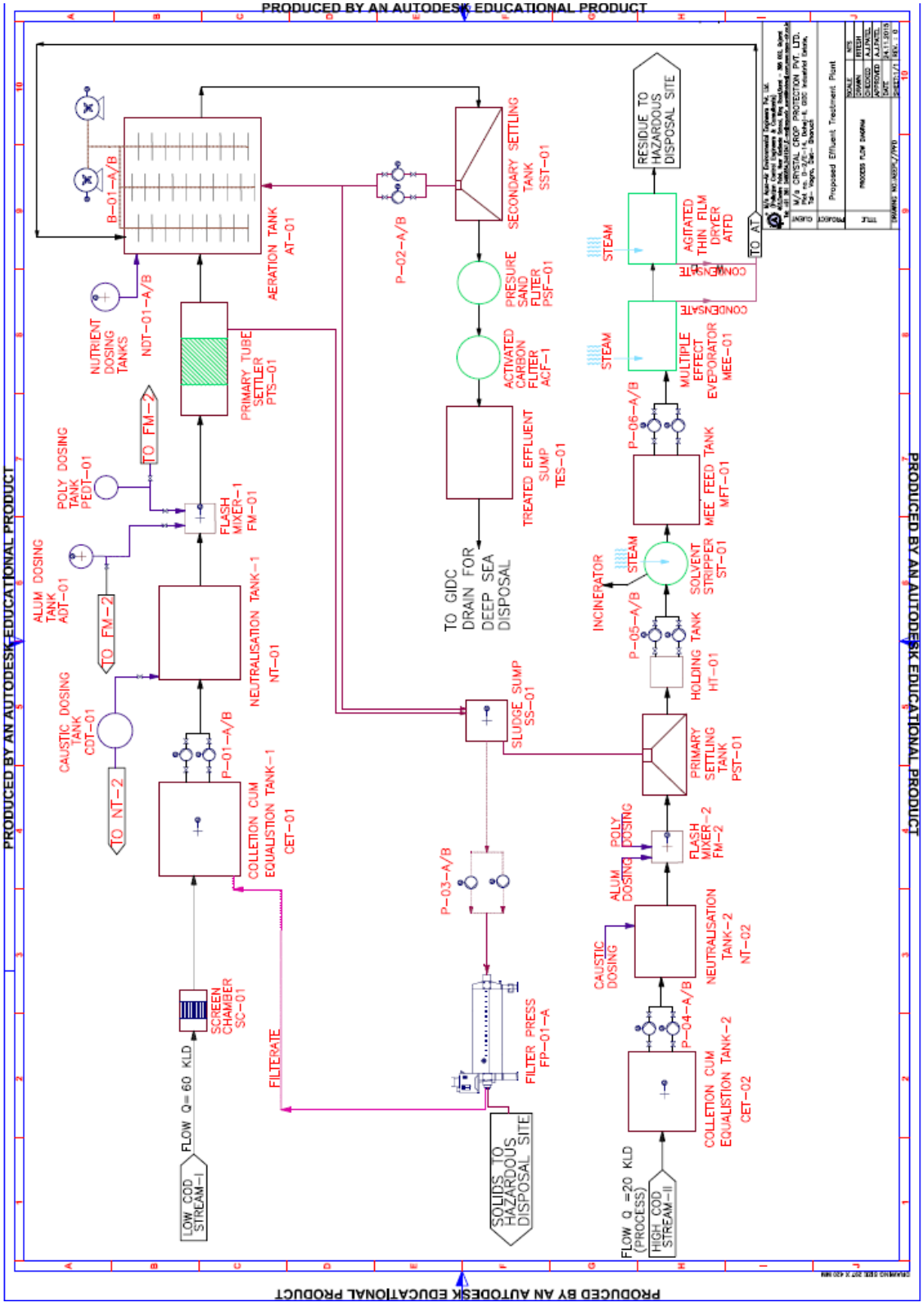
Low COD Stream

Sr. No.	Parameter	Characteristics	
		Untreated	Treated
1.	pH	2 to10	6.5 - 8.5
2.	SS	250	100
3.	TDS	2500	2200
4.	COD	7000	240
5.	BOD	3000	90
6.	Ammonical Nitrogen	50	40

High COD & High TDS

Sr. No.	Parameter	Characteristics
		Untreated
1.	pH	2 to10
2.	SS	500
3.	TDS	30000
4.	COD	35000
5.	BOD	5000
6.	Ammonical Nitrogen	200

Flow Diagram:



ANNEXURE: 5

DETAILS OF HAZARDOUS SOLID WASTE MANAGEMENT AND DISPOSAL

S.NO.	WASTE DETAILS	WASTE CATEGORY	QUANTITY MT/Year	MODE OF DISPOSAL
1.	ETP Sludge	34.3	300	Collection, Storage, Transportation and Disposal at Nearest TSDF for Secured Landfill
2.	Process Sludge	26.1	250	Collection, Storage, Transportation and Disposal at Nearest TSDF or sell to Cement Industry
3.	Distillation Residue	36.4	180	Collection, Storage, Transportation and Co-processing in Cement Industries or incineration at Common Incineration facility
4.	MEE Salt	34.3	350	Collection, Storage, Transportation and Disposal at Nearest TSDF
5.	Used Oil	5.1	0.5	Collection, Storage, Transportation & recycle to GPCB authorized recycler
6.	Discarded Drums/Bags/Containers	33.3	10	Decontamination, Storage & sent to actual recycler
7.	35% HCl	D2	45	Collection, Storage, Transportation & Sell to end user
8.	Inorganic Salt	-	1050	Collection, Storage, Transportation and Disposal at Nearest TSDF
9.	Spent Sulphuric Acid	D2	350	Collection, Storage, Transportation & Sell to end user

ANNEXURE: 6

DETAILS HAZARDOUS CHEMICAL STORAGE FACILITY

Sr. No.	Name of the Hazardous Substance	Maximum Storage (KL)	Mode of Storage	State & Operating pressure & temperature	Possible type of Hazards
1	Thionyl Chloride	10	Tank	NTP	Corrosive
2	Toluene	20	Tank	NTP	Flammable
3	DMF	20	Tank	NTP	Flammable
4	Oxirane	20	Tank	NTP	Flammable
5	EDC	20	Tank	NTP	Flammable
6	EDA	20	Tank	NTP	Flammable
7	Hexane	20	Tank	NTP	Flammable
8	n-Butanol	20	Tank	NTP	Flammable
9	Ethyl Acetate	20	Tank	NTP	Flammable
10	Methanol	20	Tank	NTP	Flammable
11	Xylene	20	Tank	NTP	Flammable
12	Dimethyl amine	20	Tank	NTP	Flammable
13	Ethanol	20	Tank	NTP	Flammable
14	Dimethyl Sulfoxide	200 Lit	Drum	NTP	Flammable
15	Hydrogen	0.5 MT	Pipeline	10 Kg/cm^2, Ambient	Flammable
16	MDC	20	Tank	NTP	Toxic
17	TEA	200 Lit	Drum	NTP	Flammable
18	THF	200 Lit	Drum	NTP	Flammable
19	o-Chloro Phenol	200 Lit	Drum	NTP	Toxic
20	Liq. Bromine	5	Tank	NTP	Corrosive
21	Phosphoric Acid	200 Lit	Drum	NTP	Corrosive
22	Propionic Acid	200 Lit	Drum	NTP	Flammable
23	Sulfuric Acid	20	Tank	NTP	Corrosive
24	Nitric Acid	20	Tank	NTP	Corrosive
25	Acetic Acid	20	Tank	NTP	Corrosive
26	Formic Acid	200 Lit	Drum	NTP	Corrosive
27	Cynuric Acid	200 Lit	Drum	NTP	Corrosive
28	HCl	20	Tank	NTP	Corrosive

ANNEXURE: 7

DETAILS OF FLUE & PROCESS GAS EMISSION

Flue Gas Emission from Boiler

SOURCES OF GASESOUS EMISSIONS	**STACK**		
Fuel Used	F.O. / L.D.O. & Agro Waste/Briquettes		
Quantity of Fuel	FO/LDO: 80 Lit/Hr, Agro Waste/Briquettes: 250 Kg/Hr		
Type of Emissions	SO_2	NOx	SPM
Permissible Limits	262 mg/Nm^3	94 mg/Nm^3	150 mg/Nm^3
Stack Height	30 meters		
Stack Diameter at the Top	600 MM		
Air Pollution Control System	Dust Collector/Cyclone		

Details of Process Vent; Vent Attached To Process

Sr. No.	**Stack attached to**	**Stack Height**	**Air Pollution Control System**	**Parameter**	**Permissible Limit**
Proposed					
1	Process Vent – 1	11 m	Two Stage Scrubber	HCl SO_2	20 mg/Nm^3 40 mg/Nm^3
2	Process Vent – 2	11 m		HCl HBr	20 mg/Nm^3 05 mg/Nm^3
3	Process Vent – 3	11 m		SO_2	40 mg/Nm^3

ANNEXURE 8

SOCIO - ECONOMIC IMPACTS

1) EMPLOYMENT OPPORTUNITIES

The manpower requirement for the proposed project is expected to generate some permanent jobs and secondary jobs for the operation and maintenance of plant. This will increase direct / indirect employment opportunities and ancillary business development to some extent for the local population. This phase is expected to create a beneficial impact on the local socio-economic environment.

2) INDUSTRIES

Required raw materials and skilled and unskilled laborers will be utilized maximum from the local area. The increasing industrial activity will boost the commercial and economical status of the locality, to some extent.

3) PUBLIC HEALTH

The company regularly examines, inspects and tests its emission from sources to make sure that the emission is below the permissible limit. Hence, there will not be any significant change in the status of sanitation and the community health of the area, as sufficient measures have been taken and proposed under the EMP.

4) TRANSPORTATION AND COMMUNICATION

Since the existing factory is having proper linkage for the transport and communication, the development of this project will not cause any additional impact.

In brief, as a result of the proposed project there will be no adverse impact on sanitation, communication and community health, as sufficient measures have been proposed to be taken under the EMP. The proposed project is not expected to make any significant change in the existing status of the socio - economic environment of this region.

ANNEXURE – 9

PROPOSED DRAFT TERMS OF REFERENCE

1. **Project Description**

- Justification of project.
- Promoters and their back ground
- Project site location along with site map of 5 km area and site details providing various industries, surface water bodies, forests etc.
- Project cost
- Project location and Plant layout.
- Water source and utilization including proposed water balance.
- Product spectrum (proposed products along with production capacity) and process
- List of hazardous chemicals.
- Mass balance of each product
- Storage and Transportation of raw materials and products.

2. **Description of the Environment and Baseline Data Collection**

- Micrometeorological data for wind speed, direction, temperature, humidity and rainfall in 5 km area.
- Existing environmental status Vis a Vis air, water, noise, soil in 5 km area from the project site. For SPM, RSPM, SO_2, NOx.
- Ground water quality at 5 locations within 5 km.
- Complete water balance

3. **Socio Economic Data**

- Existing socio-economic status, land use pattern and infrastructure facilities available in the study area were surveyed.

4. **Impacts Identification And Mitigatory Measures**

- Identification of impacting activities from the proposed project during construction and operational phase.
- Impact on air and mitigation measures including green belt
- Impact on water environment and mitigation measures
- Soil pollution source and mitigation measures
- Noise generation and control.
- Solid waste quantification and disposal.

5. **Environmental Management Plan**

- Details of pollution control measures
- Environment management team
- Proposed schedule for environmental monitoring including post project

6. **Risk Assessment**

- Objectives and methodology of risk assessment
- Details on storage facilities
- Process safety, transportation, fire fighting systems, safety features and emergency capabilities to be adopted.
- Identification of hazards
- Consequence analysis through occurrence & evaluation of incidents
- Disaster Management Plan.

7. **Information for Control of Fugitive Emissions**
8. **Post Project Monitoring Plan for Air, Water, Soil and Noise.**
9. **Information on Rain Water Harvesting**
10. **Green Belt Development plan**