FORM-I

for

PROPOSED SPRAY DRYER IN EXISTING MANUFACTURING UNIT WITHOUT INCREASING PRODUCTION CAPACITY AND POLLUTION LOAD

of

M/s. COROMANDEL INTERNATIONAL LIMITED

PLOT NO. 735, 2102, 2104, 2112 & 2113, GIDC ESTATE, SARIGAM, TAL: UMARGAON, DIST: VALSAD, GUJARAT - 396155

Prepared By:

NABL Accredited Testing Laboratory
ISO 9001:2008 Certified Company

Aqua-Air Environmental Engineers P. Ltd.
403, Centre Point, Nr. Kadiwala School, Ring Road, Surat - 395002

APPENDIX I

(See paragraph - 6)

FORM 1

(I) Basic Information:

Sr. No.	Item	Details
1.	Name of the project/s	PROPOSED SPRAY DRYER IN EXISTING MANUFACTURING UNIT WITHOUT INCREASING PRODUCTION CAPACITY AND POLLUTION LOAD
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	Please refer **Annexure –II**
4.	New/Expansion/Modernization	Modernization
5.	Existing Capacity/Area etc.	Please refer **Annexure –II**
6.	Category of Project i.e. 'A' or 'B'	'A'
7.	Does it attract the general condition? If yes, please specify.	No
8.	Does it attract the specific condition? If yes, please specify.	No
9.	Location	
	Plot/Survey/Khasra No.	735, 2102, 2104, 2112 & 2113
	Village	GIDC Sarigam
	Tehsil	Umbergam
	District	Valsad
	State	Gujarat
10.	Nearest railway station/airport along with distance in kms.	Railway Station (Bhilad) = 7 Km Airport (Surat) = 140 Km
11.	Nearest Town, city, District Headquarters along with distance in kms.	Sarigam Panchayat Tal: Umbergam, Dist.: Valsad
12.	Village Panchayats, Zilla Parishad, Municipal Corporation, local body (complete postal address with telephone nos. to be given)	GIDC Notified area, Sarigam-396155
13.	Name of the applicant	M/s. Coromandel International Limited
14.	Registered Address	Plot No. 735, 2102, 2104, 2112 & 2113, GIDC Sarigam, Tal: Umargaon, Dist:- Valsad, Gujarat
15.	Address for correspondence:	
	Name	Mr. Himanshu Kumar Shukla
	Designation (Owner/Partner/CEO)	A.V.P. and Unit Head
	Address	Plot No. 735, 2102, 2104, 2112 & 2113, GIDC

		Sarigam, Tal: Umargaon, Dist:- Valsad, Gujarat
	Pin Code	396155
	E-mail	shuklah@coromandel.murugappa.com
	Telephone No.	Mobile: +91 7574801724
	Fax No.	NA
16.	Details of Alternative Sites examined, if any. Location of these sites should be shown on a topo sheet.	No
17.	Interlinked Projects	No interlinked project
18.	Whether separate application of interlinked project has been submitted?	NA
19.	If yes, date of submission	NA
20.	If no, reason	NA
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 GIDC, Sarigam
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

- Capacity corresponding to sectoral activity (such as production capacity for manufacturing, mining lease area and production capacity for mineral production, area for mineral exploration, length for linear transport infrastructure, generation capacity for power generation etc.,)

(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 frates, wherever possible) with source of information data
1.1	Permanent or temporary change in land use, land cover or topography including increase intensity of land use (with respect to local land use plan)	No	The plant is located in Notified Industrial zone of GIDC Sarigam. Layout of plant attached as **Annexure I**.
1.2	Clearance of existing land, vegetation and Buildings?	No	Land utilized is a part of designated industrial land and necessary clearance already obtained by developers
1.3	Creation of new land uses?	No	Notified industrial area
1.4	Pre-construction investigations e.g. bore Houses, soil testing?	No	Proposed Modernization is within the existing premises.
1.5	Construction works?	No	Proposed Modernization is within the existing premises.
1.6	Demolition works?	No	No Demolition work to be carried out because it mostly plan land in developed industrial estate.
1.7	Temporary sites used for construction works or housing of construction workers?	No	Not Required
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations	Yes	As per GIDC approved Plan in existing plot, For details refer **Annexure I**
1.9	Underground works mining or tunneling?	No	N.A
1.10	Reclamation works?	No	N.A
1.11	Dredging?	No	N.A
1.12	Off shore structures?	No	N.A
1.13	Production and manufacturing processes?	Yes	List of Product attached as **Annexure II**. Brief manufacturing process is attached as **Annexure III**.
1.14	Facilities for storage of goods or materials?	Yes	Specified storage area are provided for storage of goods, Raw materials & Finished products.
1.15	Facilities for treatment or disposal of solid waste or liquid effluents?	Yes	For detail please refer **Annexure – V & VI.**
1.16	Facilities for long term housing of operational workers?	No	Local people are employed as workers and no housing facilities are required.
1.17	New road, rail or sea traffic during Construction or operation?	No	Developed Industrial Area with infrastructure facilities.
1.18	New road, rail, air waterborne or other	No	Developed Industrial Area with

	transport infrastructure including new or altered routes and stations, ports, airports etc?		infrastructure facilities.
1.19	Closure or diversion of existing transport routes or infrastructure leading to changes in Traffic movements?	No	Developed Industrial Area with infrastructure facilities.
1.20	New or diverted transmission lines or Pipelines?	No	Developed Industrial Area with infrastructure facilities.
1.21	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	No	Developed Industrial Area with infrastructure facilities.
1.22	Stream crossings?	No	Developed Industrial Area with infrastructure facilities.
1.23	Abstraction or transfers of water form ground or surface waters?	No	No ground water shall be used. The raw water shall be supplied by GIDC.
1.24	Changes in water bodies or the land surface Affecting drainage or run-off?	No	No ground water shall be used. The water shall be supplied by GIDC. Separate rain water drains have been provided. Treated effluent is discharged to CETP Sarigam from where it goes to Arabian Sea Via Pipelines.
1.25	Transport of personnel or materials for construction, operation or decommissioning?	Yes	Transportation of personnel, raw materials and products are primarily by road only.
1.26	Long-term dismantling or decommissioning or restoration works?	No	No dismantling or decommissioning is required for the project.
1.27	Ongoing activity during decommissioning which could have an impact on the environment?	No	Not applicable.
1.28	Influx of people to an area either temporarily or permanently?	No	No new employee required.
1.29	Introduction of alien species?	No	Not applicable
1.30	Loss of native species or genetic diversity?	No	Not applicable
1.31	Any other actions?	No	No additional action

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 frates, wherever possible) with source of information data
2.1	Land especially undeveloped or agricultural land (ha)	No	Site located in notified Industrial area of GIDC Sarigam.
2.2	Water (expected source & competing	No	No new water required.

	users) unit: KLD		
2.3	Minerals (MT)	No	N / A
2.4	Construction material – stone, aggregates, and / soil (expected source – MT)	No	Not required
2.5	Forests and timber (source – MT)	No	Not applicable
2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW)	Yes	No additional energy requirements as this spray dryer is stand-by spray dryer.
2.7	Any other natural resources (use appropriate standard units)	No	Not Applicable

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 there of (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	All the hazardous materials will be stored in M.S. tanks & drums at NTP
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)	No	Not applicable
3.3	Affect the welfare of people e.g. by changing living conditions?	No	The living conditions of people is not affected as the production activities are going on within plant premises within notified industrial area.
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 the unit is set-up in GIDC industrial area away from residential area
3.5	Any other causes	No	Not applicable

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

Sr. No.	Information/Checklist confirmation	Yes/No	Details there of (with approximate quantities/rates, wherever possible) with source of information data
4.1	Spoil, overburden or mine wastes	No	Not applicable
4.2	Municipal waste (domestic and or commercial wastes)	No	Not applicable
4.3	Hazardous wastes (as per Hazardous	Yes	No additional hazardous waste to be generated.

	Waste Management Rules)		Existing list of hazardous waste is attached as **Annexure VI**. The company has a membership of approved TSDF facility for the disposal of ETP waste and incinerated ash of SEPPL, Kutch & RSPL, Panoli for co-processing.
4.4	Other industrial process wastes	Yes	No additional hazardous waste to be generated. Existing list of hazardous waste is attached as **Annexure VI**. The company has a membership of approved TSDF facility for the disposal of ETP waste and incinerated ash to SEPPL, Kutch & RSPL, Panoli for co-processing.
4.5	Surplus product	No	No additional new products to be generated. Existing list of by-products is attached as **Annexure II**, which are sold to genuine consumers. Any off-specification product is sent for incineration at approved incinerator site.
4.6	Sewage sludge or other sludge from effluent treatment	Yes	Attached **Annexure as VI**. ETP waste is sent to approve TSDF.
4.7	Construction or demolition wastes	No	Not applicable
4.8	Redundant machinery or equipment	No	Not applicable
4.9	Contaminated soils or other materials	No	Not applicable
4.10	Agricultural wastes	No	Not applicable
4.11	Other solid wastes	No	Please refer **Annexure – VI**

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

Sr. No.	**Information/Checklist confirmation**	**Yes/No**	**Details there of (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	No additional emission. Existing emission from steam Boiler, DG set from FO/HSD firing in the form of PM, RSPM, SO_2, NOx are well within GPCB norms. Scrubber system provided for incinerators. Suitable chimney height is provided. Flue gas emission is attached as **Annexure VIII**.
5.2	Emissions from production processes	Yes	Process gas scrubber details for HCl, Ammonia, etc. is attached as **Annexure VIII** Scrubber system provided to incinerators as per CPCB guidelines.
5.3	Emissions from materials handling storage or transport	No	For details Please refer **Annexure – VIII**
5.4	Emissions from construction activities including plant and equipment	No	Not applicable
5.5	Dust or odours from handling of	No	Not applicable

	materials including construction materials, sewage and waste		Domestic sewage is treated and recycled. All the reactions are carried out in closed vessels. Therefore, odour is controlled.
5.6	Emissions from incineration of waste	Yes	Incinerators are provided with scrubber system as per CPCB guidelines for the control of emission form incinerator. Refer **Annexure VI**.
5.7	Emissions from burning of waste in open air e.g. slash materials, construction debris)	No	Not applicable
5.8	Emissions from any other sources	No	There will be no other source.

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 information data with source of information data
6.1	From operation of equipment e.g. engines, ventilation plant, crushers	Yes	Noise monitoring results are shown in table attached as **Annexure IX**. All precautionary measures like acoustic enclosure for DG Sets, anti vibrating pad for blowers/foundation for equipments, etc. are provided.
6.2	From industrial or similar processes	Yes	Noise monitoring results are shown in table attached as **Annexure IX**. All precautionary measures like acoustic enclosure, anti vibrating pad/foundation for equipments, etc. are provided.
6.3	From construction or demolition	Yes	Not applicable
6.4	From blasting or piling	No	Noise monitoring results are shown in table attached as **Annexure IX**. All precautionary measures like acoustic enclosure for DG Sets, anti vibrating pad for blowers/foundation for equipments, etc. are provided.
6.5	From construction or operational traffic	Yes	There will be negligible increase in the noise level due to traffic.
6.6	From lighting or cooling systems	No	No as such generation.
6.7	From any other sources	No	Not applicable

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 there of (with approximate quantities/rates, wherever possible) with source of information data

7.1	From handling, storage, use or spillage of hazardous materials	Yes	Proper care for handling of hazardous material is taken as per the MSIHC rules & HW management Rules.
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)	No	The treated effluent after treatment in the company's own ETP and meeting GPCB norms, is sent to CETP Sarigam and finally disposal into Arabian Sea, whereas concentrated mother liquor is segregated and either incinerated in company's own incinerator or evaporated in MEE.
7.3	By deposition of pollutants emitted to air into the and or into water	No	Not Applicable
7.4	From any other sources	No	Not applicable
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	No	Full- fledged Environmental Management System (EMS) is provided, which eliminates the possibility of building up of pollution.

8. Risk of accidents during construction or operation of the Project, which could affect human health or the environment

Sr. No.	Information/Checklist confirmation	Yes/No	Details there of (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	Industry already carried out risk assessment study and all the recommendations are incorporated during construction.
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	There is no history of flood in GIDC Sarigam. The buildings are designed considering seismic zone III which is not earthquake prone area. The land is plain terrain – no scope of landslide. This area is having moderate rainfall and there is no history of cloudburst.

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 there of (with approximate quantities/rates, wherever possible) with source of information data
9.1	Lead to development of supporting. utilities, 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.)	No	Site is located in Notified Industrial area of GIDC Sarigam. This industrial zone is having existing road infrastructure, power supply, Underground drainage line, common incineration and solid waste storage facilities, which are utilized for

	• housing development • extractive industry • supply industry • other		ultimate disposal into approved TSDF site. Local people are employed.
9.2	Lead to after-use of the site, which could have an impact on the environment.	No	Not applicable
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	Not Applicable

(I) Environmental Sensitivity

Sr. No.	Areas	Name/ Identity	Aerial distance (within 5 km.) Proposed project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	No	Site is located in Notified Industrial Area of GIDC Sarigam.
2	Areas which important for are or sensitive Ecol logical reasons – Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	No	Site is located in Notified Industrial Area of GIDC Sarigam.
3	Area used by protected, important or sensitive Species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	No	Site is located in Notified Industrial Area of GIDC Sarigam.
4	Inland, coastal, marine or underground waters	Yes	Arabian Sea – 7.15 km Damanganga River – 5.15 km Kalu River – 3.20 km
5	State, National boundaries	Yes	Maharashtra State Boundary – 12 km Dadra & Nagar Haveli (UT) – 15 km
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	No	Not applicable
7	Defense installations	No	Not Applicable.
8	Densely populated or built-up area	Yes	Vapi Town – 1.50 Lakhs population at 10 km
9	Area occupied by sensitive man-made land uses Hospitals, schools, places of worship, community facilities)	No	The site is located in notified industrial area of GIDC Sarigam.

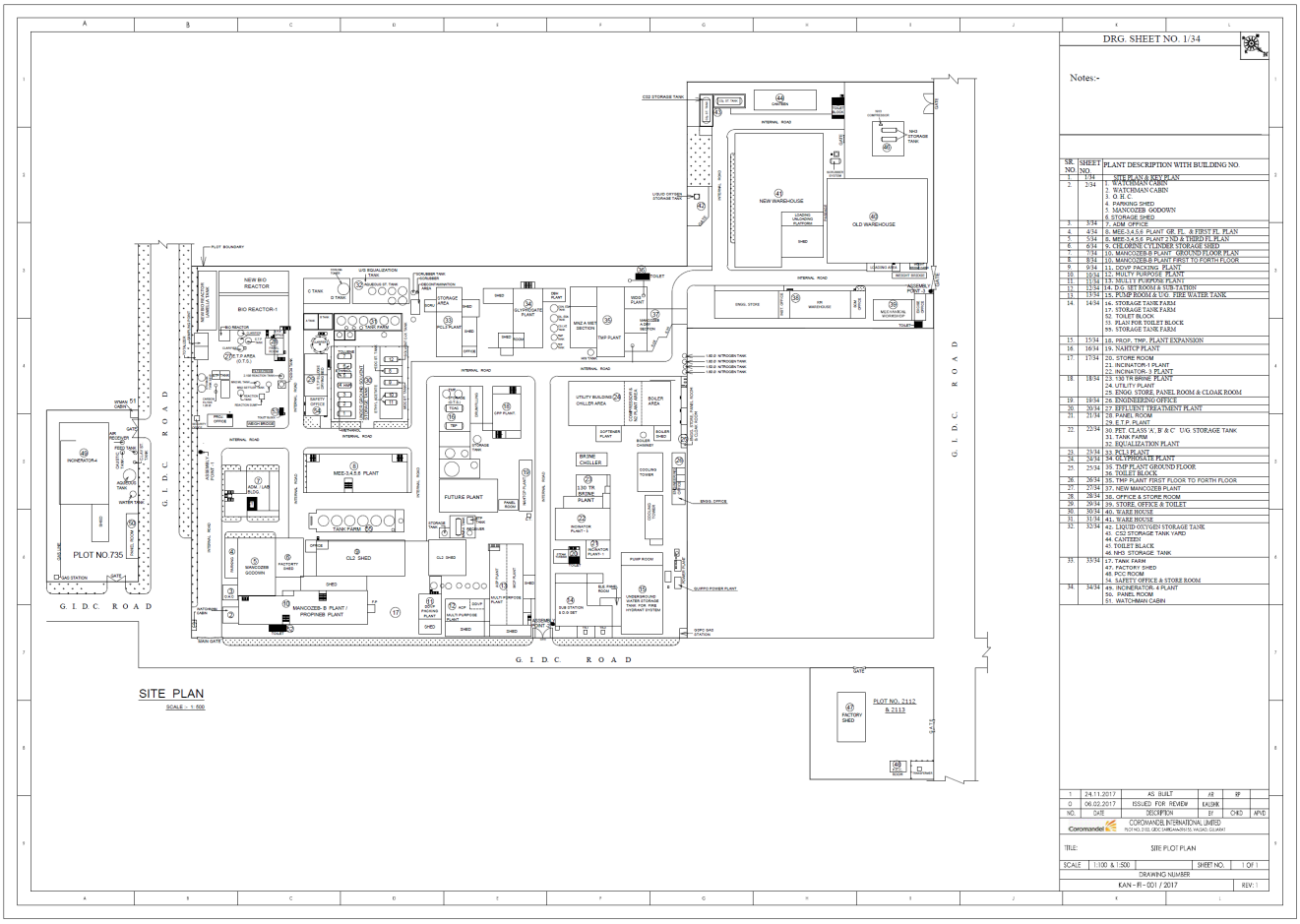
10	Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)	Yes	The project do not use any ground water. The nearest surface water source is river Damanganga & River Kalu. The project being in notified industrial area does not affect agricultural land. Daman Port is 10 km which is having fisheries and tourism activities.
11	Areas already subjected to pollution environmental damage. (those where existing legal environmental standards are exceeded) or	No	Site is located in Notified Industrial Area of GIDC Sarigam.
12	Areas susceptible to natural hazard which could cause the project to present environmental problems (earthquakes, subsidence, landslides, flooding erosion, or extreme or adverse climatic conditions)	No	The area falls under seismic zone III which is non earthquake prone area. The area is plain terrain with sandy loam soil. There is no heavy rain in the area and it is away from coastal area. So erosion of land is not applicable. The area has no history of flooding in GIDC Sarigam. The climate of area is moderate. There is no history of cloud burst.

IV). Proposed Terms of Reference for EIA studies: For detail please refer **Annexure – XII.**

LIST OF ANNEXURES

ANNEXURE-I

LAYOUT MAP OF THE PLANT



ANNEXURE-II

LIST OF PRODUCTS ALONG WITH PRODUCTION CAPACITY

Sr. No.	Products	Production Capacity, MT/Annum				Remarks
		Existing as per EC	Existing as per CCA	Additional	Total	
	Group-A					
1	Mancozeb (Tech.)	24750	38000	00	38000	Either or combination of the products will be manufactured
2	Mancozeb (Tech.) + Maneb (Tech.)	24750	38000	00	38000	
3	Mancozeb (Tech.) + Zineb (Tech.)	24750	38000	00	38000	
4	Mancozeb (Tech.) + Propineb (Tech.)	16500	22116	00	22116	
	Total Production capacity of Group A	**24750**	**38000**	**00**	**38000**	
	Group-B					
1	Diethyl Thiophosphoryl Chloride (DETC)	6600	3600	00	3600	Either or combination of the products will be manufactured
2	DMTC	18150	2160	00	2160	
3	Diafenthiuron	0	1650	00	1650	
4	Thiamethoxam	0	1650	00	1650	
5	Pymetrozine	0	1650	00	1650	
6	Diflubenzuron	0	1650	00	1650	
	Total Production capacity of Group B	**18150**	**3600**	**00**	**3600**	
	Group-C					
1	DMTC Amide	14850	4796	00	4796	
	Total Production capacity of Group C	**14850**	**4796**	**00**	**4796**	
	Group-D					
1	PMIDA	28050	3300	00	3300	Either or combination of the products will be manufactured
2	Glyphosate (Tech.)	19800	5000	00	5000	
	Total Production capacity of Group D	**28050**	**5000**	**00**	**5000**	

	Group-E					
1	Chlorpyriphos (Tech.)	3300	5000	00	5000	
	Total Production capacity of Group E	**3300**	**5000**	**00**	**5000**	
	Group-F					
1	Acephate (Tech.)	3960	7000	00	7000	
	Total Production capacity of Group F	**3960**	**7000**	**00**	**7000**	
	Group-G					
1	Monocrotophos (Tech.)	2970	7000	00	7000	Either or combination of the products will be manufactured
2	Dicrotophos (Tech)	1485	1485	00	1485	
	Total Production capacity of Group G	**2970**	**7000**	**00**	**7000**	
	Group-H					
1	DDVP (Tech.)	1650	6000	00	6000	
	Total Production capacity of Group H	**1650**	**6000**	**00**	**6000**	
	Group-I					
1	Phosphorous Trichloride (PCl_3)	52899	13000	00	13000	
	Total Production capacity of Group I	**52899**	**13000**	**00**	**13000**	
	Group-J					
1	Trimethyl Phosphite (TMP)	7260	9240	00	9240	Either or combination of the products will be manufactured
2	Triethyl Phosphite (TEP)	5940	5940	00	5940	
	Total Production capacity of Group J	**7260**	**9240**	**00**	**9240**	
	Group-K					
1	Phosphorous Sulphochloride ($PSCl_3$)	9900	2000	00	2000	
	Total Production capacity of Group K	**9900**	**2000**	**00**	**2000**	
	Group-L					
1	Methamidafos (Tech.)	6600	00	00	00	
	Total Production capacity of Group L	**6600**	**00**	**00**	**00**	
	Group-M					

1	Phosphorous Acid	13200	00	00	00	
	Total Production capacity of Group M	**13200**	**00**	**00**	**00**	
	Group-N					
1	2-(4-Hydroxy phenoxy) Propionic Acid	643.56	429	00	429	Either or combination of the products will be manufactured
2	2,3-Difluoro-5-chloro pyridine	531.36	353	00	353	
3	Clodinafop propargyl (Tech.)	990	933	00	933	
4	Triclopyr Acid (Tech.)	3300	933	00	933	
5	Triclopyr Butotyl Ester (Tech.)		933	00	933	
6	Picloram (Tech.)	3300	495	00	495	
7	Pretilachlor (Tech.)	3300	933	00	933	
8	Bispyribac Sodium (Tech.)	1320	330	00	330	
9	Azoxystrobin	0	52.8	00	52.8	
10	Boscalid	0	660	00	660	
11	Metalaxyl	0	933	00	933	
12	Proclaraz	0	933	00	933	
	Total Production capacity of Group N	**3300**	**933**	**00**	**933**	
	Group-O					
1	5-Amino-3-cyano-1-(2,6-dichloro-4-trifluoro methyl phenyl) pyrazole	861.36	861	00	861	Either or combination of the products will be manufactured
2	Fipronil (Tech.)	990	933	00	933	
3	Emmamectin Benzoate (Tech.)	495	495	00	495	
4	Difenoconazole (Tech.)	660	660	00	660	
5	Triazophos (Tech.)	990	933	00	933	
6	Glufosinate Ammonium Salt	0	933	00	933	
7	Metribuzin	0	933	00	933	
	Total Production capacity of Group O	**990**	**933**	**00**	**933**	
	Group-P					
1	2-chloro-5-chloro methyl pyridine	8226.96	00	00	00	All of the products will be manufactured
2	Nitro imino imidazolidine	4068.96	00	00	00	

3	Imidacloprid (Tech.)	4950	510	00	510	
4	Cyano Methyl Imidoate	999.96	00	00	00	
5	Acetamiprid (Tech.)	1650	480	00	480	
	Total Production capacity of Group P	**19895.76**	**990**	**00**	**990**	
	TOTAL Product Capacity	**231524.8**	**103492**	**00**	**103492**	
	BY PRODUCTS					
1	Ammonium Chloride Powder (NH4Cl)	10896	13398	00	13398	Sale
2	Sodium Chloride (NaCl)	44028	8238	00	8238	Sale
3	Sodium Sulphate (Na2SO4)	0	19779	00	19779	Sale
4	Ammonium Sulphate (NH4)2SO4	0	8370	00	8370	Sale
5	Acetic Acid (30%)	0	7000 #	00	7000 #	Sale #
6	30 % Hydrochloric Acid	55788	00	00	00	
	TOTAL By-product Capacity	**110712**	**56785**	00	**56785**	
	TOTAL PRODUCTION CAPACITY (Products & By-products)	**342236.8**	**160277**	00	**160277**	

 # Subject to rule 9 or considered in Hazardous Waste.

Note: - Unit obtained EC for production of 342236.8 MT/ Annum and we convert EC in Consent to Operate for production of 160277 MT/ Annum. Now, our EC is expired and unit is manufacturing products as per Consent to Operate.

- **SUBJECT TO RULE 9 OTHERWISE CONSIDER IN HAZARDPUS WASTE.**

LIST OF FORMULATION PRODUCTS

Sr. No.	Formulation Products	Production Capacity, MT/Annum			
		Existing as per EC	Existing as per CCA	Additional	Total
1	Mancozeb 80% WP	26400	26400	00	26400
2	Mancozeb 75% WP/WDG	28050	28050	00	28050
	LIQUID FORMULATIONS				
1	Glyphosate 41% IPA	34650	34650	00	34650
2	Glyphosate 62% IPA	26136	26136	00	26136
3	Monocrotophos 36% SL	7920	7920	00	7920
4	Acephate 75% SP	8514	8514	00	8514
5	Chloropyriphos 20% EC	15840	15840	00	15840
6	Mancozeb SC (420-600 gm/Ltr)	3300	3300	00	3300
7	Mancozeb SE (420-500 gm/lit)	3300	3300	00	3300
8	Mancozeb OS 600 gm/lit	3300	3300	00	3300
9	Mancozeb (63%)+Carbendazim(12%)	1650	1650	00	1650
10	Mancozeb (64%)+ Metalyxyl (8%)	1650	1650	00	1650
11	Mancozeb (64%)+ cymoxanil (8%)	1650	1650	00	1650
12	Glyphosate 71% ammonium salt(prills)	4620	4620	00	4620
13	Glyphosate 5% ammonium salt	6600	6600	00	6600
14	Monocrotophos 40% SL (W/V)	2640	2640	00	2640
15	Diclorovos 76% EC	1980	1980	00	1980
16	Acephate 40% SL	1650	1650	00	1650
17	Acephate 75% prills	660	660	00	660
18	Acephate 95% prills	660	660	00	660
19	Chloropyriphos 38.7% EC	1650	1650	00	1650
20	Chloropyriphos 480 gm/lit EC	1650	1650	00	1650
21	Chloropyriphos 50% EC	1650	1650	00	1650
22	Chloropyriphos 50% + Cypermethrine 5% EC	1650	1650	00	1650
23	Cypermethrine 10% EC	1650	1650	00	1650
24	Cypermethrine 25% EC	1650	1650	00	1650
25	Maneb 80% wp	8910	8910	00	8910
26	Propineb 70% wp	9240	9240	00	9240
27	Zineb 80% wp	8910	8910	00	8910
28	Triclopyr Butotyl Ester 480gm/lit	990	990	00	990
29	Methamidophos 600 gm/lit SL	5280	5280	00	5280
30	Imidacloprid 17.8% SL	8580	8580	00	8580
31	Clodinofop Propargyl 15% WP	10230	10230	00	10230
	TOTAL	**243210**	**243210**	**00**	**243210**

LIST OF RAW MATERIALS:

Sr. No.	RAW MATERIAL	Capacity in MT per Month	Raw Materials in MT/month
A1	MANCOZEB	3167	
	Ethylene diamine		652
	Carbon disulfide		1811
	Sodium hydroxide (47%)		1837
	Manganese Sulphate (27%)		6036
	Zinc Sulphate (32%)		526
	SLS		105
	HMTA		63
A2	MANEB	3167	
	Ethylene diamine		652
	Carbon disulfide		1811
	Sodium hydroxide (47%)		1837
	Manganese Sulphate (27%)		6036
	SLS		105
	HMTA		63
A3	ZINEB	3167	
	Ethylene diamine		652
	Carbon disulfide		1811
	Sodium hydroxide (47%)		1837
	Zinc chloride (50%)		2964
	SLS		105
	HMTA		63
A4	PROPINEB	1843	
	1,2 –PDA		464
	Carbon disulfide		1106
	Ammonia solution (15%)		1344
	Zinc Sulphate solution (21%)		4415
	SLS		65
	HMTA		16
B1	Diethyl Thiophosphoryl Chloride (DETC)	300	
	$PSCl_3$		420
	Ethanol		1971
	Caustic lye 47%		174

B2	DMTC	180	
	$PSCl_3$		220
	Methanol		314
	Caustic lye 47%		224
B3	Diafenthiuron	138	
	2,6 diisopropyl 4-Phenoxy Enzamine hydrochloride		121
	Sodium Thiocynate		39
	HCl		14
	Tertiary butyl Amine		28
	0-Xylene		413
			688
B4	Thiamethoxam	138	
	DMF		110
	Oxadiazine		116
	CCMT		110
	K_2CO_3		136
	TMAC		3
	Hot water		770
	Sodium hypochlorite		4
	Methanol		263
	HCl		77
B5	Pymetrozine	138	
	Acetic Hydrazide		86
	Water		385
	Triphosgene		151
	EDC		1082
	NaOH		34
	Chloroacetone		86
	THF		688
	Hydrazine hydrate		138
	HCL		138
	Ethylacetate		688
	Nicotinaldehyde		86
	Acetonitrile		688
B6	Diflubenzuron	138	
	2,6- Difluoro Benzamide		74.5
	Toluene		1139
	Oxalyl Chloride		65
C1	DMTC-AMIDE	400	

	DMTC		488
	MDC		488
	Ammonia		110
D1	GLP	417	
	PMIDA		565
	Activated carbon		17
	Oxygen		73
D2	PMIDA	275	
	Catalyst slurry		114
	Diethanol amine (DEA)		150
	NaOH (47%)		407
	HCl (30%)		686
	H_3PO_3 (70%)		184
	Formaldehyde (37%)		139
E1	CHLORPYRIFOS	417	
	Trichloro acetyl chloride (TCAC)		1247
	Acrylonitrile		452
	Catalyst		13
	Solvent		1912
	Caustic lye		1664
	Ethylene dichloride		3490
	Salt		2
	Recycle residue		31
	DETC		559
F1	Acephate	583	
	DMPAT		758
	Dimethyl Sulphate		70
	Acetic anhydride		560
	Ammonia (gas)		128
	MDC		6385
	Ethyl acetate		1369
G1	MONOCROTOPHOS	583	
	MMAA 70%		443
	Urea		67
	EDC		1266
	NaCl		89
	Chlorine		197
	Ammonia		48
	TMP		302
	EDC+TMP		403
G2	DICROTOPHOS	124	
	DMAA 70%		114

	Urea		14
	EDC		269
	NaCl		19
	Chlorine		46
	Ammonia		10
	TMP		64
	EDC+TMP		85
H1	DDVP	500	
	Chloral		321
	TMP		293
I1	PCl_3	1083	
	Phosphorus		249
	Chlorine		866
J1	TMP	770	
	Phosphorus Trichloride		1138
	Methanol		831
	Ammonia		517
	Catalyst		8
	Solvent		25
	Recycle Mixed solvent with catalyst		7350
	H_2SO_4		3
J2	TEP	495	
	Phosphorus Trichloride		619
	Ethanol		619
	Ammonia		292
	Catalyst		1
	Solvent		15
	Recycle Mixed solvent with catalyst		4158
	H_2SO_4		2
K1	$PSCl_3$	217	
	Phosphorus Trichloride		176
	Sulphur		43
L1	METHAMIDOPHOS	0	
	DMPAT		
	Toluene		
	Dimethyl Sulphate		
M1	PHOSPHOROUS ACID	0	
	Phosphorus Trichloride		
	Water		
N1	2-(4-Hydroxy phenoxy) Propionic Acid	36	
	Hydroquinone		27
	2-chloro Propionic acid		31

	NaOH flakes		10
	Methanol		82
N2	2,3-Difluoro-5-chloro pyridine	29	
	Hydrogen fluoride		118
	3-amino-2,5-dichloro pyridine		43
	Sodium nitrite		22
	MDC		82
	Ammonia		5
	Acetonitrile		160
	Potassium fluoride		39
	Cesium fluoride		7
N3	Clodinafop propargyl (Tech.)	78	
	2-(4-hydroxy phenoxy) Propionic acid		51
	Potassium carbonate		85
	Catalyst		3
	2,3-difluoro –5-chloro pyridine		42
	Propargyl chloride		25
	Acetonitrile		334
	n-Hexane		136
	Isopropyl alcohol		136
	Charcoal		3
	NaOH solution		72
N4	Triclopyr Acid (Tech.)	78	
	Na-HTCP		92
	Methyl chloro acetate		59
	Na_2CO_3		2
	$NaHCO_3$		2
	TBAB		3
	Toluene		368
	Carbon		2
	Na_2S		1
	NaOH		225
	50% H_2SO_4		33
N5	Triclopyr Butotyl Ester (Tech.)	78	
	Na-HTCP		72
	Methyl chloro acetate		46
	Na_2CO_3		2
	$NaHCO_3$		2
	TBAB		2
	Toluene		292
	Carbon		3
	Na_2S		1

	NaOH		176
	50% H_2SO_4		26
	Butyl cellosolve		31
	PTSA		1
	0.5% N_2CO_3 solution		23
N6	Picloram (Tech.)	41	
	3,4,5,6-tetra chloro picolinonitrile		69
	28% aqueous NH_4OH		347
	35% HCl		57
N7	Pretilachlor (Tech.)	78	
	2,6-Diethyl aniline		82
	n-Propoxy ethyl chloride		34
	Toluene		212
	NaOH (47%)		65
	HCl		58
	TEA		29
	Chloro acetyl chloride		28
	Carbon		1
N8	Bispyribac sodium (Tech.)	28	
	2,6-dihydroxy benzoic acid		23
	Na_2CO_3		31
	$DMSO_4$		37
	Acetone		231
	9% HCl		275
	4,6-dimethoxy-2-methyl sulfonyl pyrimidine		23
	K_2CO_3		30
	Isopropyl alcohol		281
	NaOH 9% solution		37
N9	Azoxystrobin	4	
	TRIMETHYLE ORTHO FORMATE		5.1
	ACETIC ANHYDRIDE		12.8
	2(3)BENZOFURANON		4
	MDC		6.4
	METHANOL		8.7
	TOLUENE		10.6
	POTASSIUM CARBONATE		8.9
	SODIUM METHOXIDE		0.9
	4,6 DICHLORO PYRIMIDIN		2.3
	TEDA		0.4
	KOH		0.7
	METHYLE SULFONIC ACID		0.3

	DI-METHOXY		5.6
	ACETONITRILE		15.5
	2-CYNO PHENOL		2.3
N10	Boscalid	55	
	MeOH		374.7
	4-CPA		28.1
	Na-Metal		18.4
	2-BA		24
	2-CNC		33.7
	Na_2CO_3(10%)		246.8
N11	Metalaxyl	78	
	DMA		75.3
	TBAB		10.4
	Na_2HCO_3		37
	MCP		45.9
	NaI		62.4
	DMF		37.9
	Toluene		312.2
	n-Hexane		250.7
	MMA		41.4
	$SOCl_2$		55.4
N12	Proclaraz	78	
	2,4,6-TCP		58
	NaOH		14
	EDC		219
	n-Propyl amine		102
	CDI		41
	Toluene		194
O1	5-Amino-3-cyano-1-(2,6-dichloro-4-trifluoro methyl phenyl) Pyrazole	72	
	2,6-Dichloro-4-trifluoro methyl aniline		68
	Sulphuric acid		32
	$NaNO_2$ Solution		57
	Ethyl-2,3-dicyano propionate		45
	MDC		148
	n-Hexane		247
O2	Fipronil (Tech.)Pyrazole	78	
	5-amino-3-cyano-1-(2,6-dichloro-4-trifluoro methyl phenyl) pyrazole		68
	Trifluoro methyl sulfinyl chloride		44
	Toluene		346

O3	Emmamectin Benzoate (Tech.)	41	
	Methyl amine		2
	Avermectin		44
	Methanol		54
	Acetic acid		2
	Tert butyl dimethyl silyl chloride		2
	Sodium carbonate		15
	EDC		52
	Ethyl acetate		31
	Benzoic acid		5
O4	Difenoconazole (Tech.)	55	
	2-[p-(p-chloro phenoxy)-m-chloro phenyl]-2- bromo methyl-4-methyl-1,3-dioxolane		81
	1-H-1,2,4-triazole		17
	Potassium carbonate		35
	Potassium iodide		1
	N,N-dimethyl formamide		83
	Ethyl acetate		99
	Ether		55
O5	Triazophos (Tech.)	78	
	Triazole		28
	Mix. Xylene		175.3
	Na_2CO_3		13.8
	CuCl		0.4
	KCl		0.4
	DETC		34.2
O6	Glufosinate Ammonium Salt	78	
	Acrolein		22
	Acetic Anhydrie		41
	Diethyl Methane Phosphonate		56
	NaCl		20
	HCl		962
	Ammonia solution (25%)		180
O7	Metribuzin	78	
	Sulfuric Acid		126
	Dimethylsulpate		47
	Triazinone		84
	Sodium Caronate		171
P1	Imidacloprid (Tech.)	43	
	Nitro imino imidazolidine		35
	2-Chloro-5-Chloro methyl pyridine		35

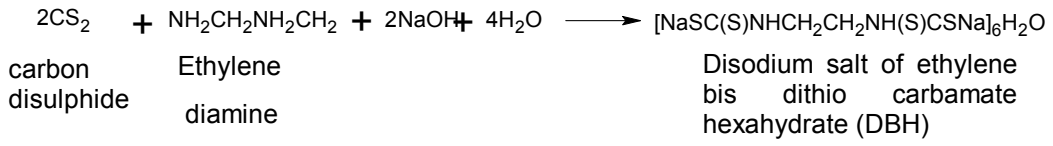
	NaOH flakes		10
	DMF		242
	HCl (30%)		4
P2	Acetamiprid (Tech.)	40	
	MMA+ methanol		310
	Catalyst		0.16
	2-Chloro-5-Chloro methyl pyridine		39.72
	Methanol		21
	Cyano methyl Imidoate		24.2
	NaOH flakes		9.6
	HCl (30%)		4

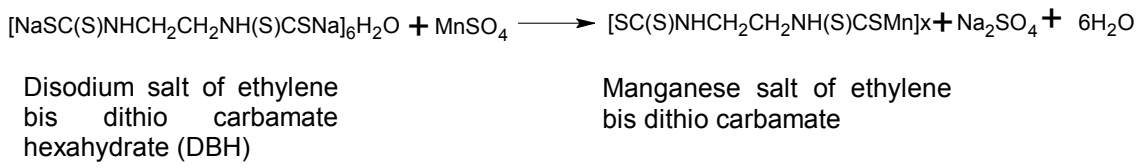
ANNEXURE-III

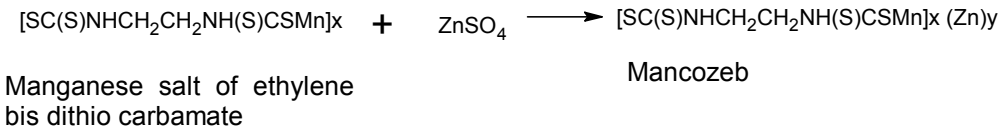
MANUFACTURING PROCESS

A1: MANCOZEB

Chemical reaction:







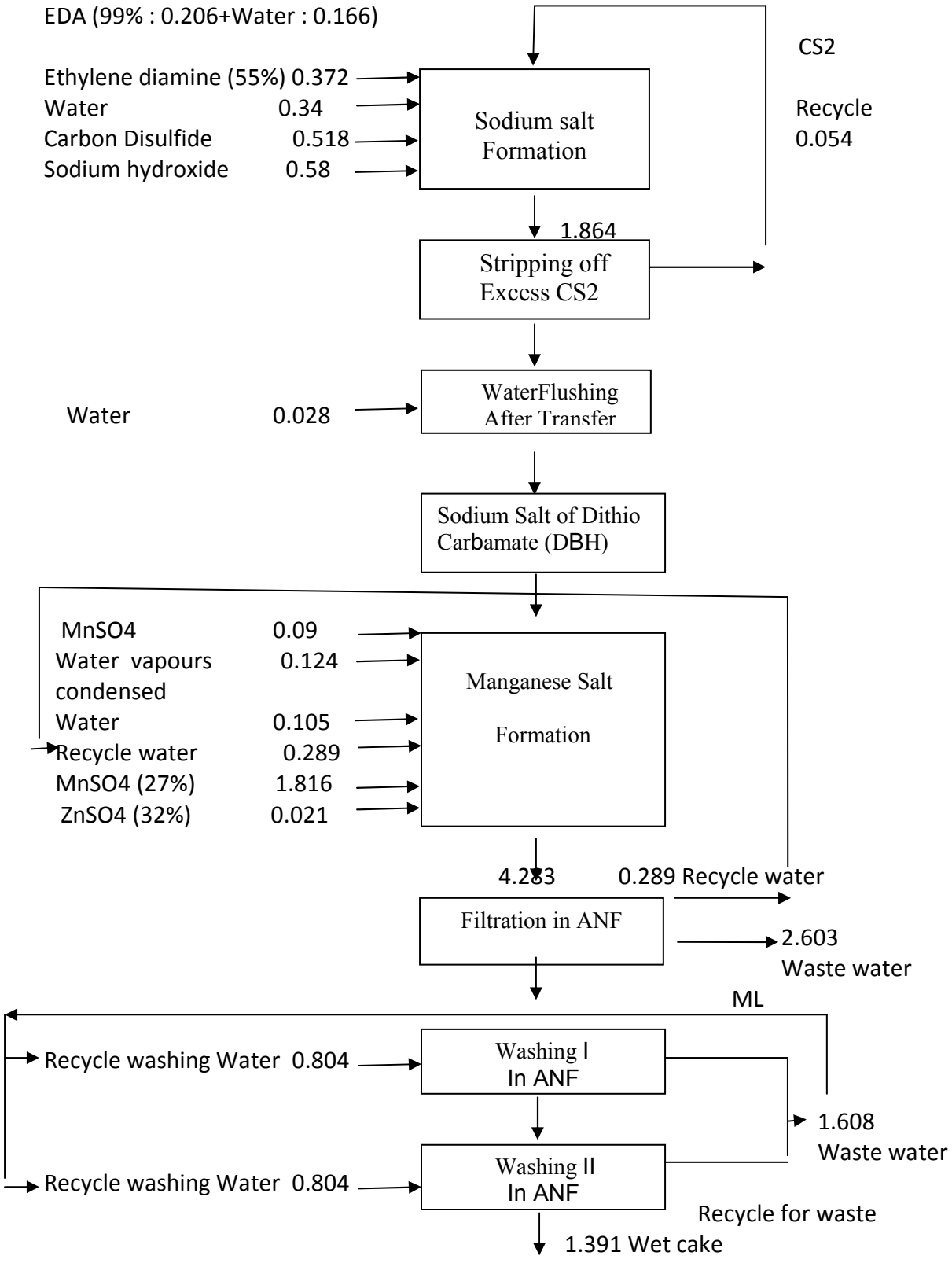
Process description

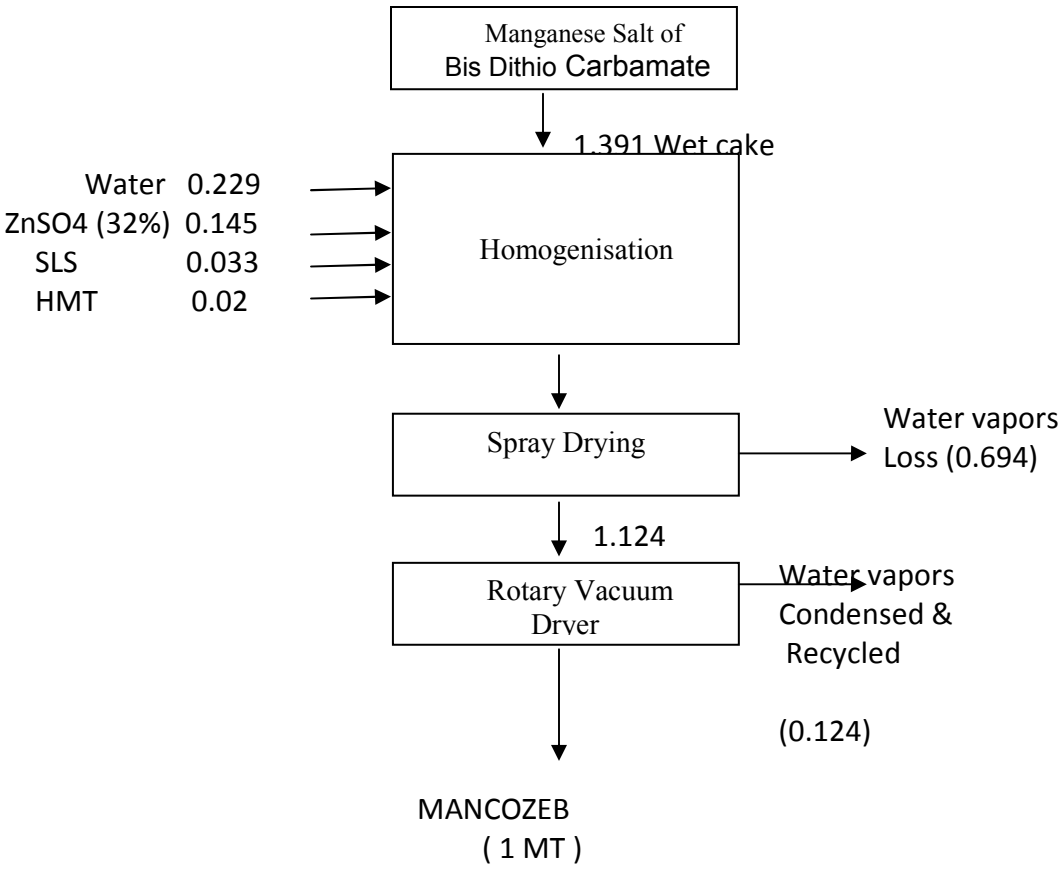
Stage 1
Carbon Disulphide and Ethylene Diamine and Sodium Hydroxide are reacted in the presence of water to form the DiSodium salt of Ethylene Bis Dithio Carbamate Hexahydrate (DBH).

Stage 2
DiSodium salt of Ethylene Bis Dithio Carbamate Hexahydrate is reacted with manganese sulphate to form manganese salt of Bis Dithio Carbamate.

Stage 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.

SCHEMATIC FLOW DIAGRAM OF MANCOZEB:




Manganese Salt of
Bis Dithio Carbamate
1.391 Wet cake
Water 0.229
ZnSO4 (32%) 0.145
SLS 0.033
HMT 0.02
Homogenisation
Spray Drying
Water vapors
Loss (0.694)
1.124
Rotary Vacuum
Drver
Water vapors
Condensed &
Recycled
(0.124)
MANCOZEB
(1 MT)

MASS BALANCE FOR MANCOZEB

MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	Ethylene diamine	0.206
2	Carbon disulfide	0.572
3	Sodium hydroxide (47%)	0.580
4	Manganese Sulphate (27%)	1.906
5	Zinc Sulphate (32%)	0.166
6	SLS	0.033
7	HMTA	0.020
8	Water	0.868
	Total	**4.351**

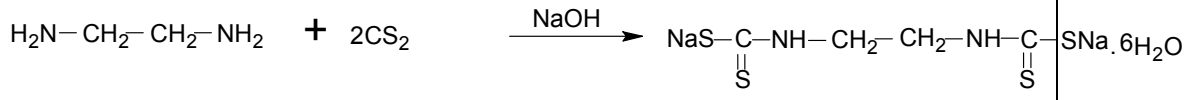
MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Mancozeb	1.00	Product
2	Carbon disulfide	0.054	Recycle
3	Sodium Sulphate solution	2.603	ETP
4	Losses	0.570	Evaporation
5	Condensate water recycled	0.124	Recycle
	Total	**4.351**	

A2 : MANEB

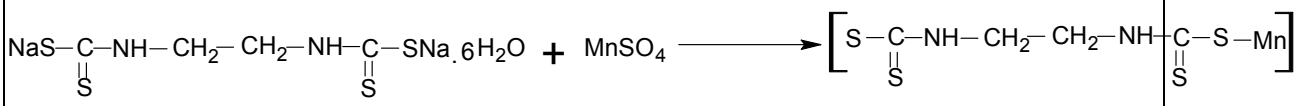
Chemical reaction

Stage-I



Ethylene diamine	Carbon disulfide	DBH
M.F.:-$C_2H_8N_2$	M.F.:-CS_2	M.F.:-C4H6S4N2Na2.6H2O
M.wt.:-60	M.wt.:-76	M.wt.:- 365

Stage:-II



DBH	Manganes sulphate	Maneb
M.F.:-C4H6S4N2Na2.6H2O	M.F.:- $MnSO_4$	M.F.:- $C_4H_6N_2S_4Mn$
M.wt.:- 365	M.wt.:- 151	M.wt.:- 265.3

+ Na_2SO_4 + $6H_2O$

Sodium sulphate

M.wt.:-142

Process Description

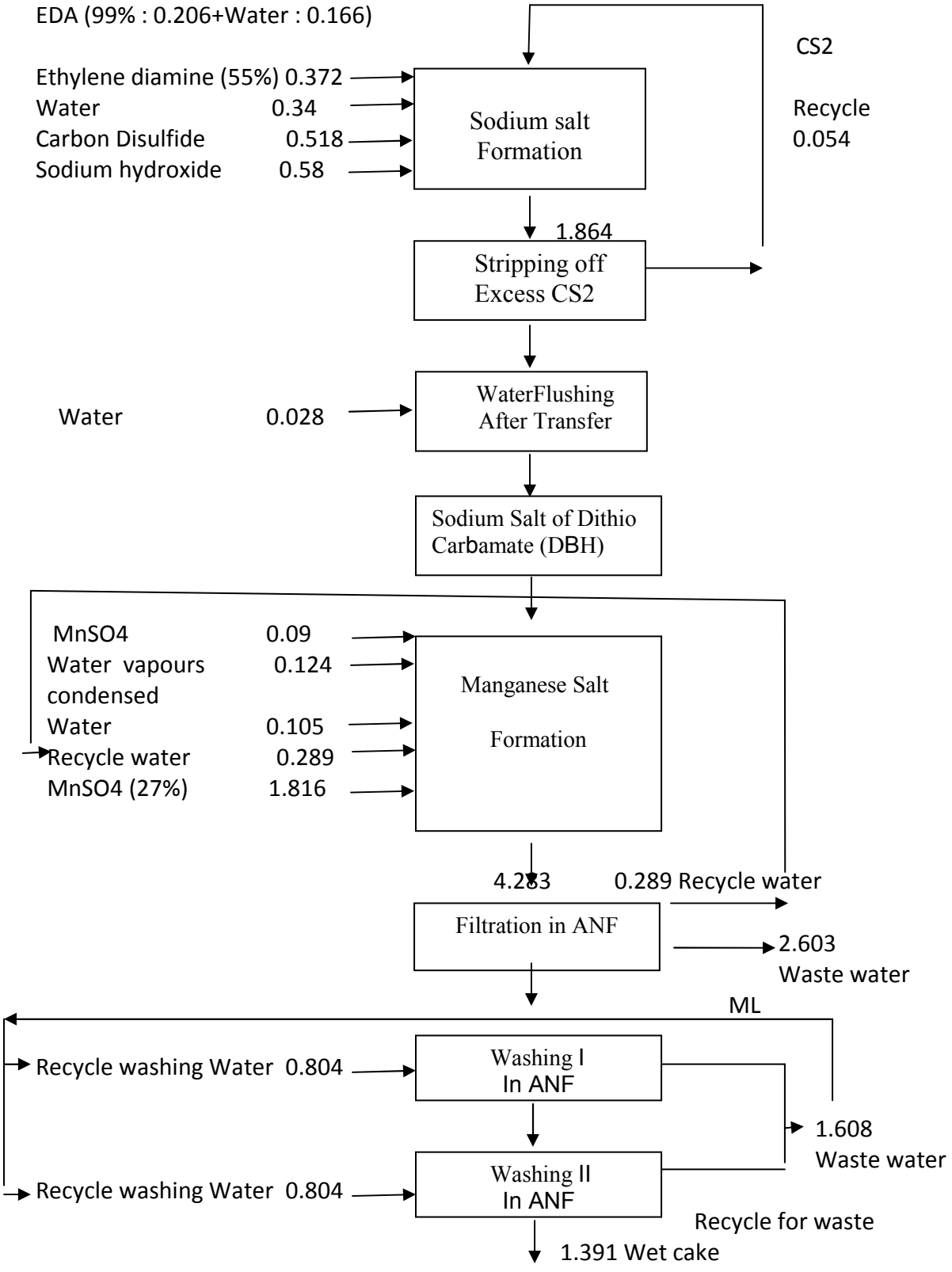
Stage 1

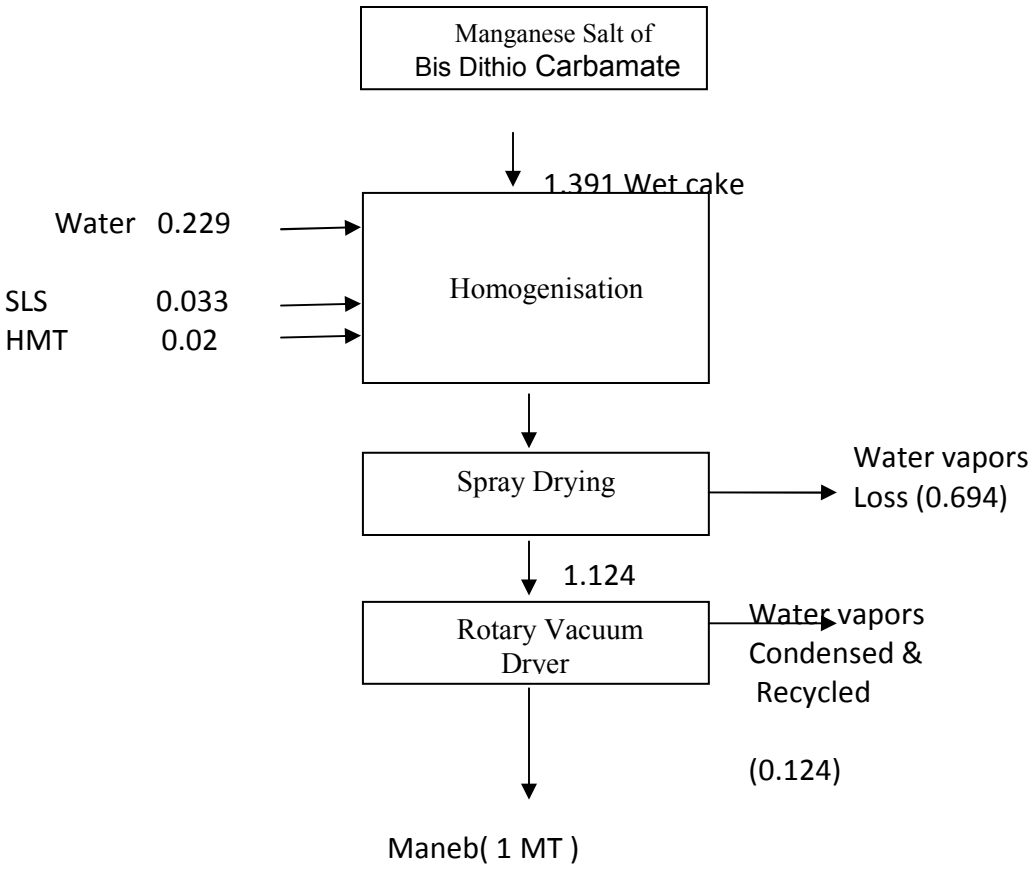
Carbon Disulphide and Ethylene Diamine and Sodium Hydroxide are reacted in the presence of water to form the DiSodium salt of Ethylene Bis Dithio Carbamate Hexahydrate (DBH).

Stage 2

DiSodium salt of Ethylene Bis Dithio Carbamate Hexahydrate is reacted with manganese sulphate to form Maneb.

SCHEMATIC FLOW DIAGRAM OF MANEB:




Manganese Salt of
Bis Dithio Carbamate
1.391 Wet cake
Water 0.229
SLS 0.033
HMT 0.02
Homogenisation
Spray Drying
Water vapors
Loss (0.694)
1.124
Rotary Vacuum
Drver
Water vapors
Condensed &
Recycled
(0.124)
Maneb(1 MT)

MASS BALANCE FOR MANEB

MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	Ethylene diamine	0.206
2	Carbon disulfide	0.572
3	Sodium hydroxide (47%)	0.580
4	Manganese Sulphate (27%)	1.906
5	SLS	0.033
6	HMTA	0.020
7	Water	0.868
8	Condensate water recycled	0.124
	Total	**4.309**

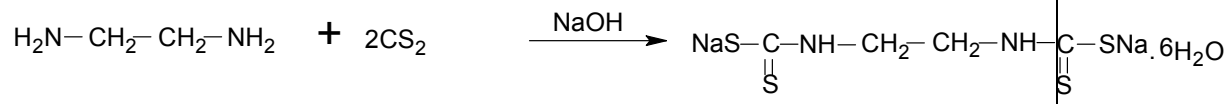
MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Maneb	1.00	Product
2	Carbon disulfide	0.054	Recycle
3	Sodium Sulphate solution	2.603	ETP
4	Losses	0.528	Evaporation
5	Condensate water recycled	0.124	Recycle
	Total	**4.309**	

A3:ZINEB

Reaction chemistry

Stage-I

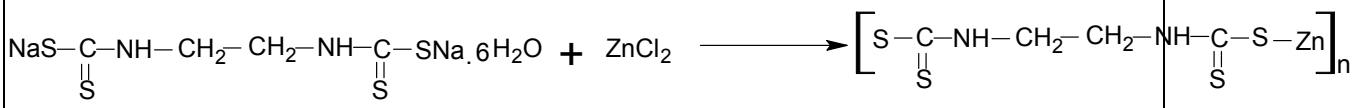


Ethylene diamine
M.F.:-$C_2H_8N_2$
M.wt.:-60

Carbon disulfide
M.F.:-CS_2
M.wt.:-76

DBH
M.F.:-C4H6S4N2Na2.6H2O
M.wt.:- 365

Stage:-II



DBH
M.F.:-C4H6S4N2Na2.6H2O
M.wt.:- 365

Zinc chloride
M.F.:- $ZnCl_2$
M.wt.:- 136.28

Zineb
M.F.:- $C_4H_6N_2S_4Zn$
M.wt.:- 275.8

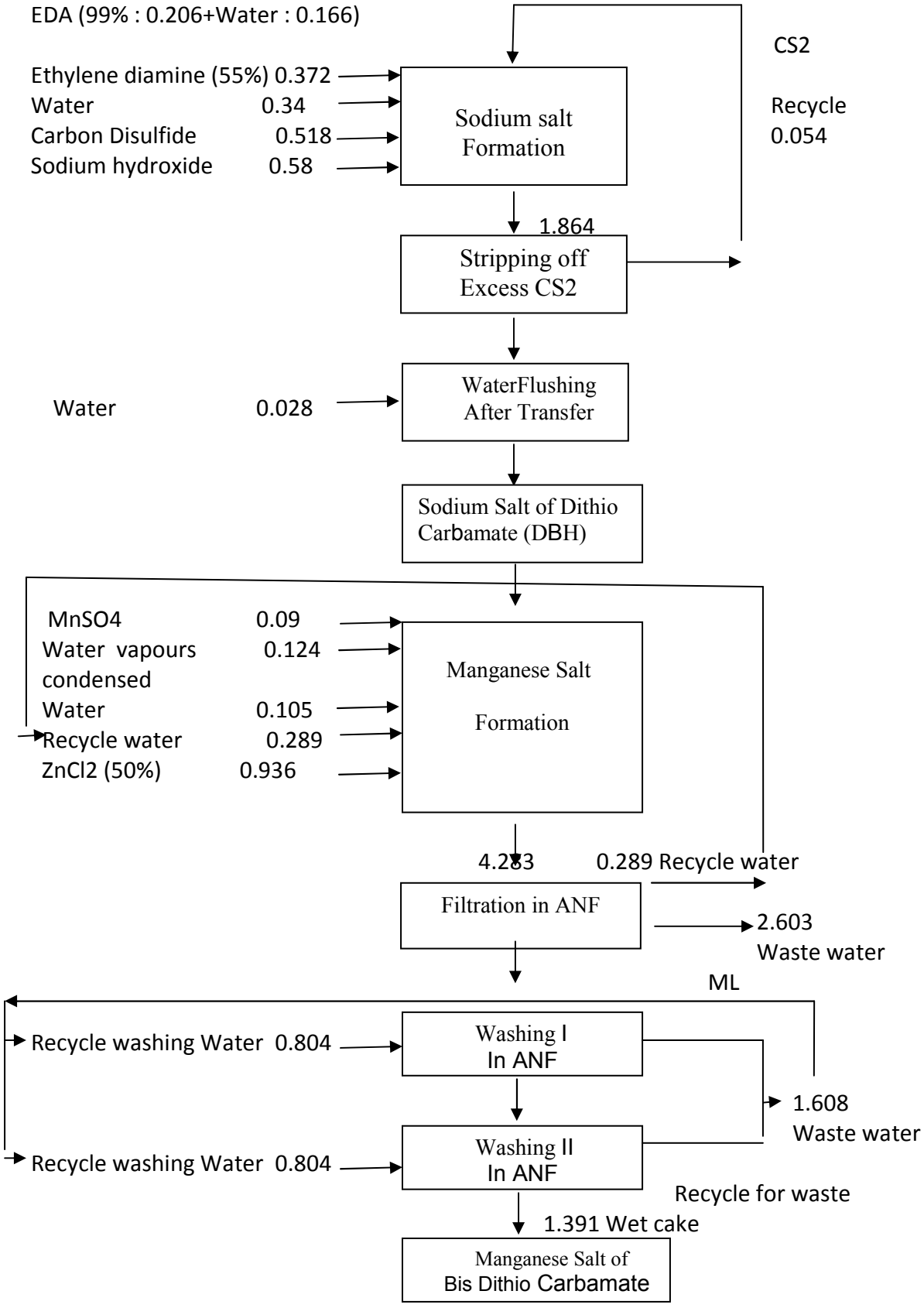
+ 2NaCl + $6H_2O$

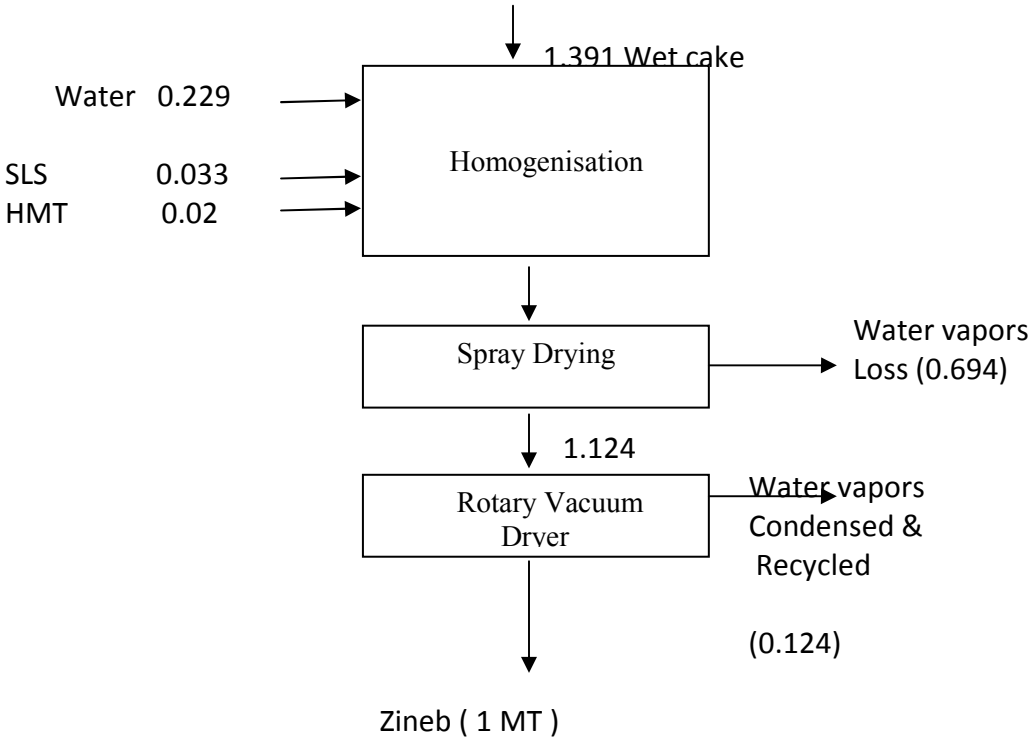
Sodium chloride
M.wt.:-58.5

Brief Process:

Water is charged into the reactor and carbon disulfide is added at room temperature and then a 55% solution of ethylene diamine. Initially 20 % of the total amount and then the remaining 80 % is added simultaneously with 47% C.S.lye to form disodium salt of is ethylene dithiocarbamate which on further reaction with zinc chloride (50 %) is converted into zinc ethylene bis dithiocarbamate (Zineb) which is further subjected to filtration, washing and 50 – 55 % slurry is made for spray drying. Dispersants like SLS are added to make 86 % technical grade with zinc content of 20-21 %.

SCHEMATIC FLOW DIAGRAM OF ZINEB:




1.391 Wet cake
Water 0.229
SLS 0.033
HMT 0.02
Homogenisation
Spray Drying
Water vapors
Loss (0.694)
1.124
Rotary Vacuum
Drver
Water vapors
Condensed &
Recycled
(0.124)
Zineb (1 MT)

MASS BALANCE FOR ZINEB

MATERIAL INPUT (QUANTITY IN MT)

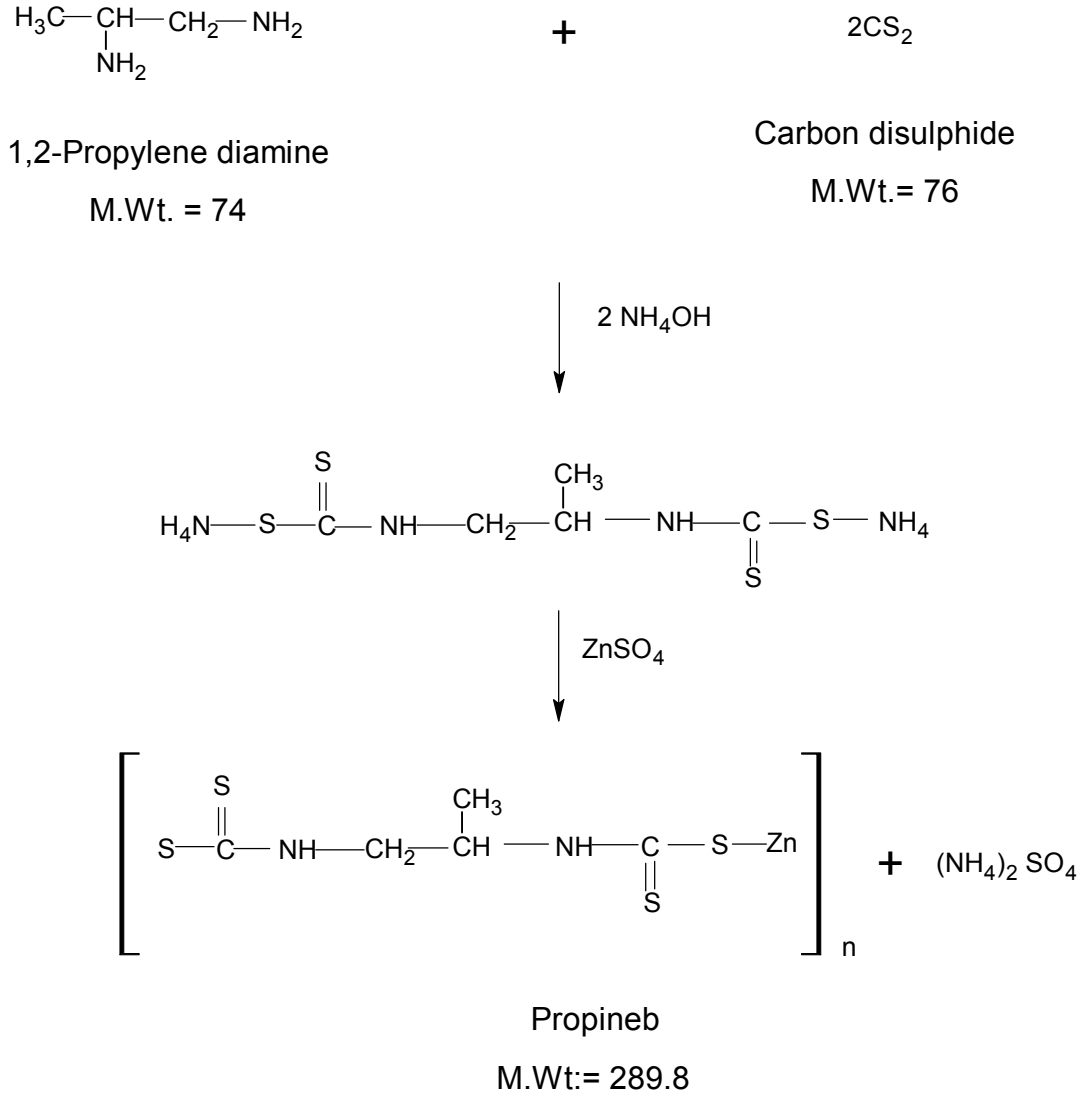
Sr. No.	Material	1 MT product
1	Ethylene diamine	0.206
2	Carbon disulfide	0.572
3	Sodium hydroxide (47%)	0.580
4	Zinc chloride (50%)	0.936
5	SLS	0.033
6	HMTA	0.020
7	Water	0.868
8	Condensate water recycled	0.124
	Total	**3.339**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Zineb	1.00	Product
2	Carbon disulfide	0.054	Recycle
3	Sodium chloride solution	2.603	ETP
4	Losses	0.849	Evaporation
5	Condensate water recycled	0.124	Recycle
	Total	**3.339**	

A4: PROPINEB

Reaction chemistry



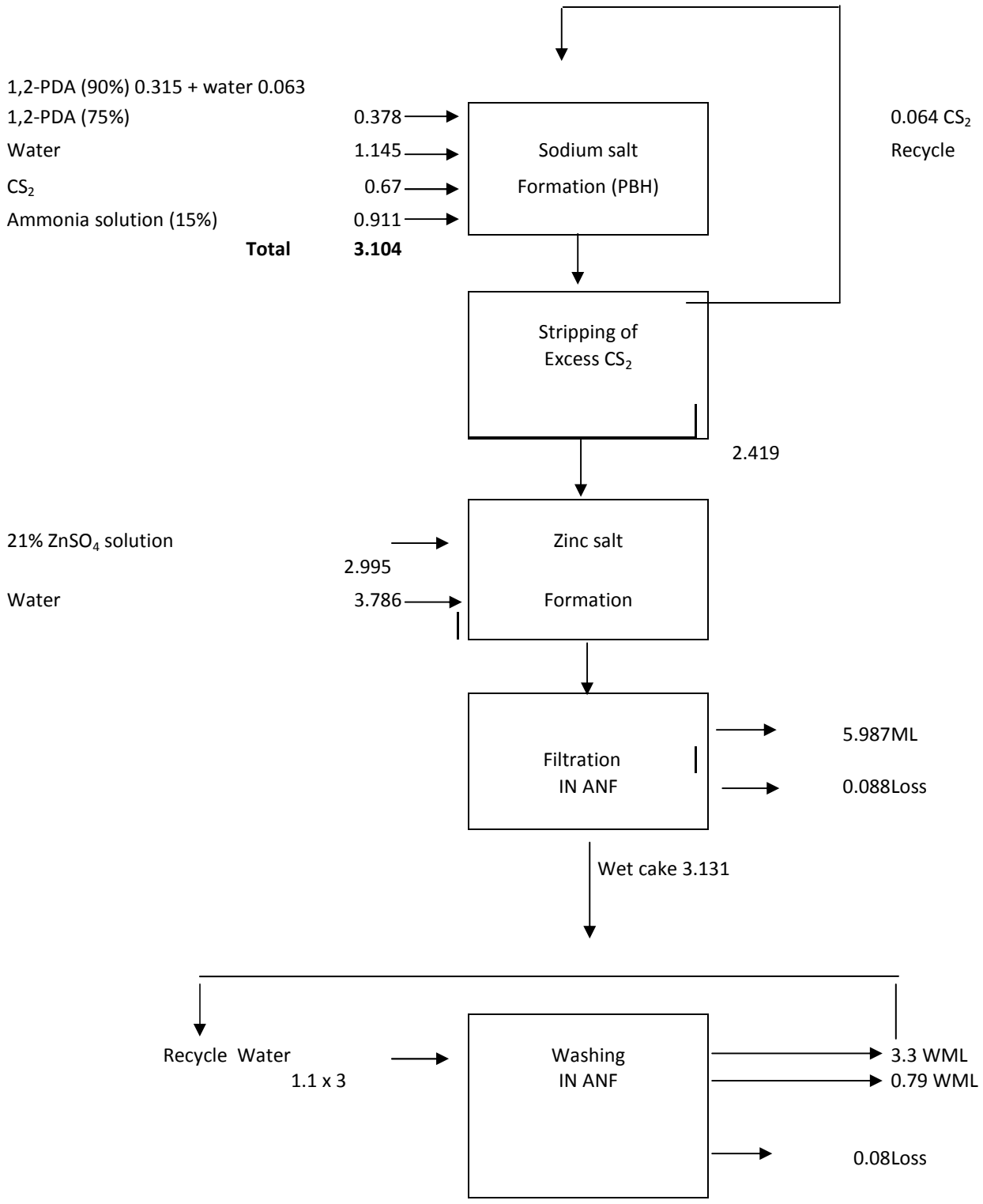
Propineb

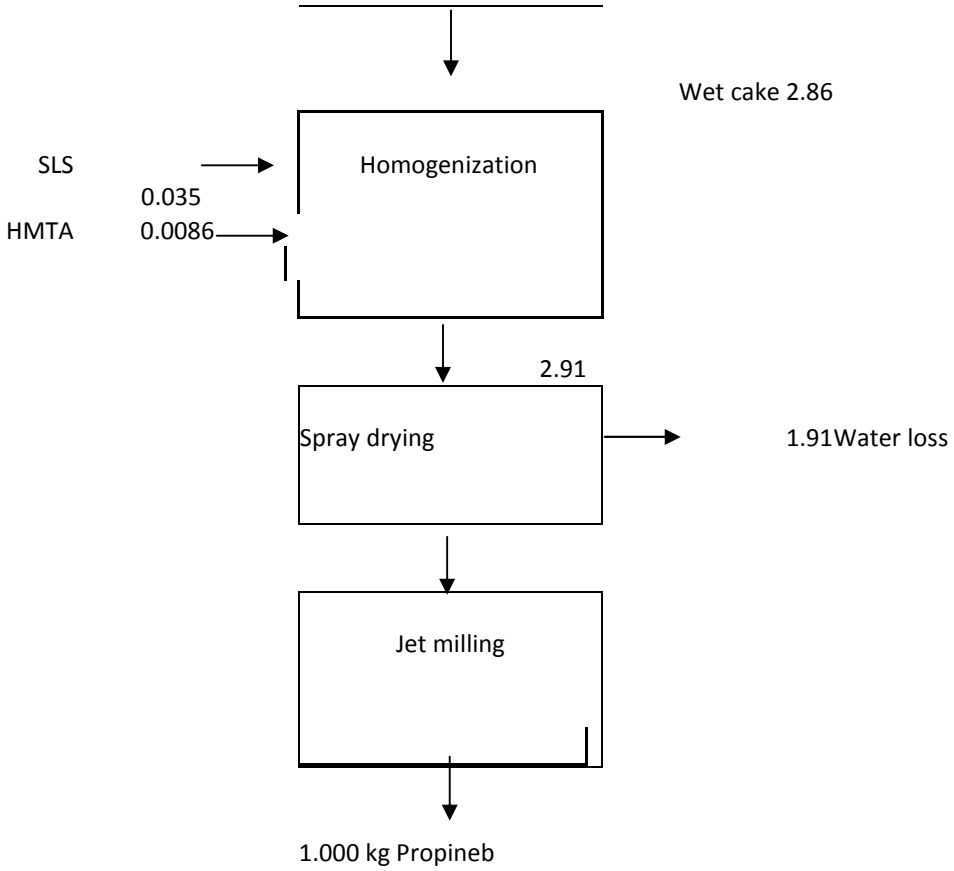
M.Wt:= 289.8

Brief Process:

Water is charged into the rector and carbon disulfide is added at room temperature and then 1,2- Propylene diamine is dissolved in water and the solution is added initially 20 % of the total amount and then the remaining 80 % is added simultaneously with 15 % ammonia to form disodium salt of is propylene bis dithiocarbamate which on further reaction with zinc sulfate (21 %) to convert into zinc iso propylene bis dithiocarbamate (Propineb) which is further subjected to filtration, washing and 30 – 35 % slurry is made to spray drier followed by drying in RVD.Fillers like SLS , stabilizer, HMTA as diluents to make 80 % technical grade with zinc content of 18 – 20 %.

SCHEMATIC FLOW DIAGRAM OF Propineb




Wet cake 2.86
SLS
0.035
HMTA
0.0086
Homogenization
2.91
Spray drying
1.91Water loss
Jet milling
1.000 kg Propineb

MASS BALANCE FOR PROPINEB

MATERIAL INPUT (QUANTITY IN MT)

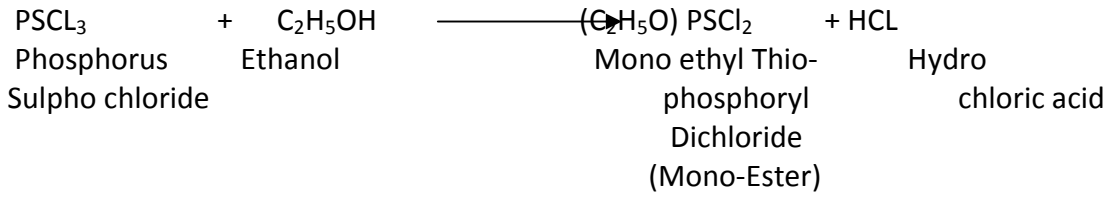
Sr. No.	Material	1 MT product
1	1,2 –PDA	0.252
2	Carbon disulfide	0.600
3	Ammonia solution (15%)	0.729
4	Zinc Sulphate solution (21%)	2.396
5	SLS	0.035
6	HMTA	0.0086
7	Water	5.9
	Total	**9.92**

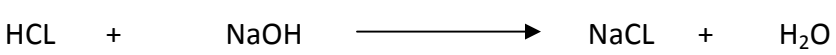
MATERIAL OUTPUT (QUANTITY IN MT)

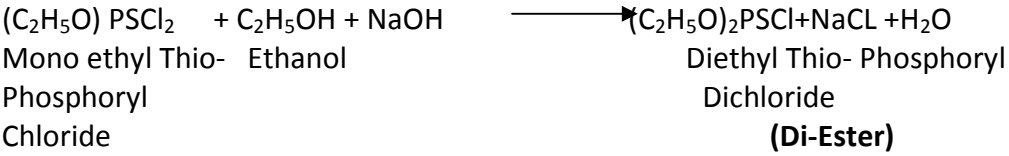
Sr. No.	Material	1 MT product	
1	Propineb	1.00	Product
2	Carbon disulfide	0.064	Recycle
3	Sodium Sulphate solution	6.77	ETP
4	Losses	2.078	Evaporation
	Total	**9.92**	

B1: DIETHYL THIOPHOSPHORYL CHLORIDE (DETC)

Reaction chemistry







Process Description :

The manufacturing process of DETC involves following four steps :

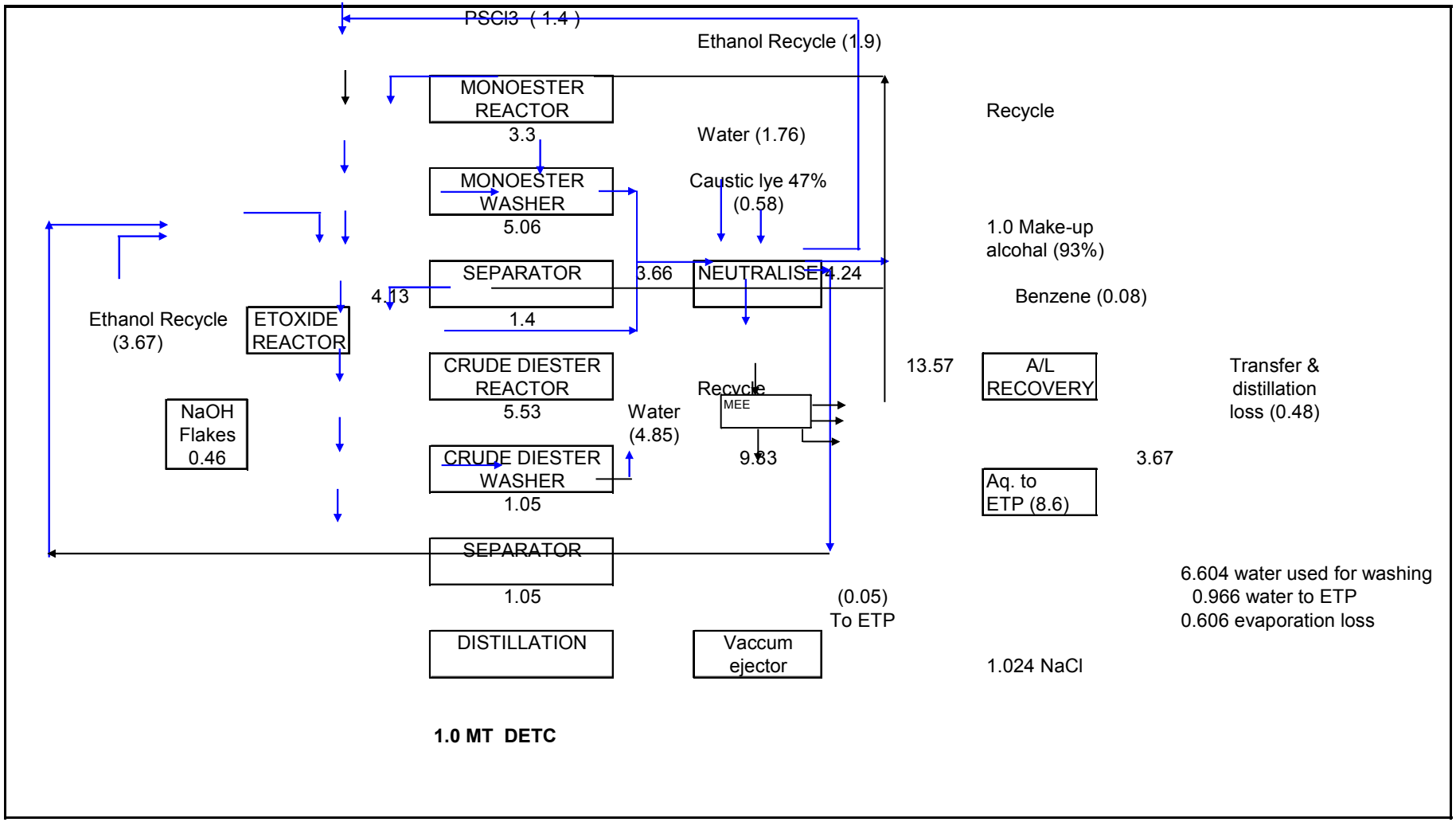
$PSCl_3$ on low temperature reacts with absolute alcohol gives monoester.
The monoester thus formed reacts with absolute alcohol and sodium hydroxide and crude ester is separated out.
The crude ester thus separated is subjected to fractional distillation to achieve desired purity.

Mono Ester is prepared by continuous feeding of $PSCl_3$. Ethanol in reactor at lower temperature followed by washing of Mono Ester Water to remove the Acidity. The aqueous layer separated is sent to recovery column after neuterialisation while the mono ester is sent to next stage called Di-Ester.

The Di-Ester is manufactured by reaction of Mono Ester with Ethanol and Sodium Hydroxide at lower temperature. The sodium chloride formed are washed with water and sent to alcohol recovery column while crude Di-Ester is sent for the further purification by vacuum distillation.

The crude Di-Ester contains the mainly Mono Ester and Tri-Ester which is purified by distillation at 10 mm. vacuum and max. 100^{o}c. The distilled product is stored in storage tank.

SCHEMATIC FLOW DIAGRAM OF DETC



MASS BALANCE FOR DIETHYL THIOPHOSPHORYL CHLORIDE (DETC)

MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	PSCl3	1.4
2	Ethanol	6.57
3	Caustic flakes	0.46
4	Caustic lye 47%	0.58
5	Benzene	0.08
6	Water	6.61
7		
	Total	**15.700**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	DETC	1.00	Product
2	Ethanol recover	5.57	Recycle
3	NaCl	1.024	By product
4	Water	6.004	Recycle
5	Effluent	1.016	ETP
6	Losses	1.086	Distillation
	Total	**15.700**	

B2 : DIMETHYL THIOPHOSPHORY CHLORIDE (DMTC)

Reaction chemistry

$PSCl_3$ + $2CH_3OH + 2NaOH \longrightarrow (CH_3O)_2 PSCl + 2NaCl + 2H_2O$

Phosphorus Sulpho Chloride	Methanol	Di Methyl Thio-Phosphoryl Chloride

Process Description :

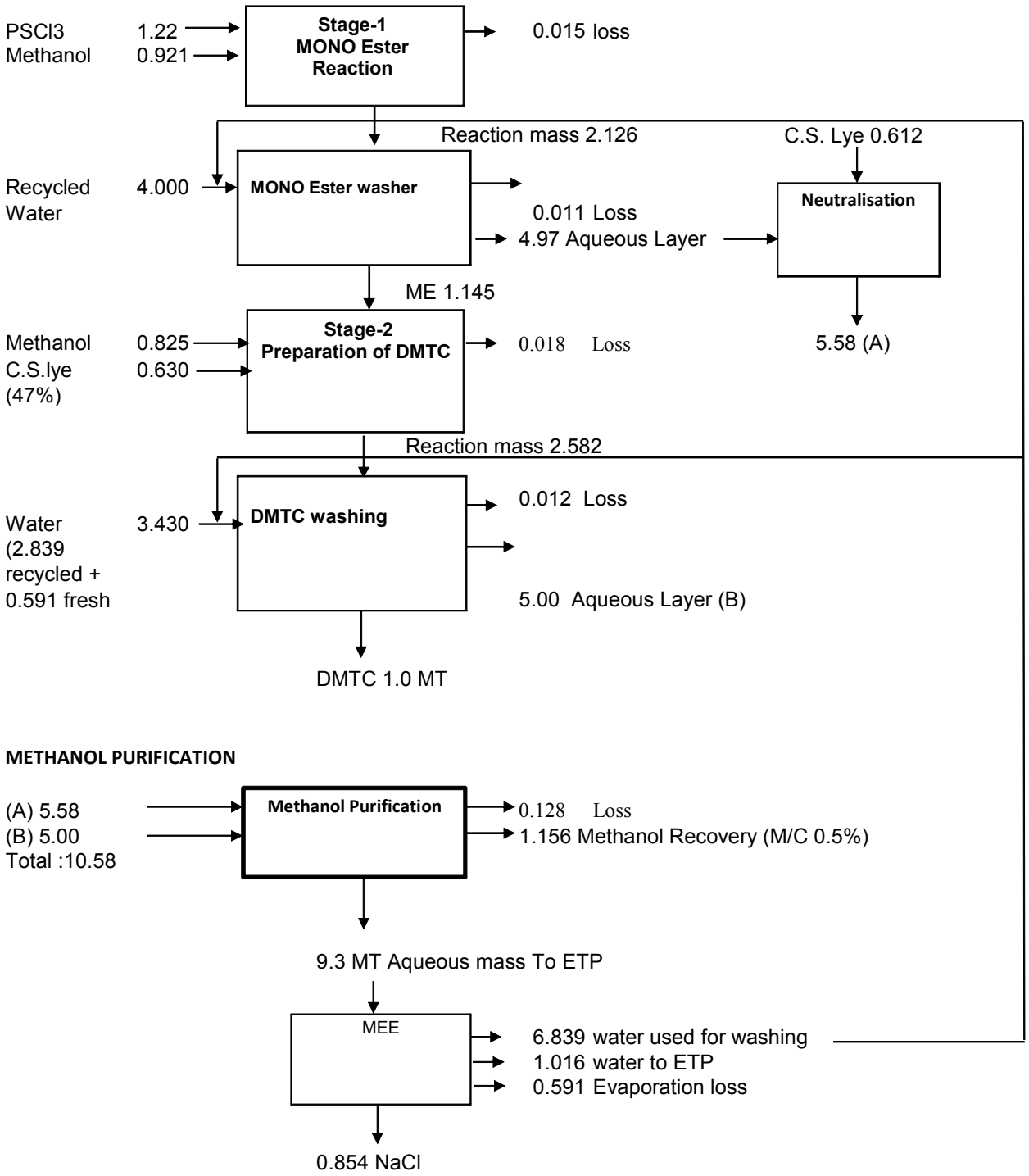
The manufacturing process of DMTC involves following four steps :

$PSCl_3$ on low temperature reacts with methanol gives monoester.
The monoester thus formed reacts with methanol and sodium hydroxide and crude ester is separated out.
The crude ester thus separated is subjected to fractional distillation to achieve desired purity.

Mono Ester is prepared by continuous feeding of $PSCl_3$. Methanol in reactor at lower temperature followed by washing of Mono Ester with water to remove the Acidity. The aqueous layer separated is sent to recovery column while the mono ester is sent to next stage called Di-Ester.

The Di-Ester is manufactured by reaction of Mono Ester with Methanol and Sodium Hydroxide at lower temperature. The sodium chloride formed are washed with water and sent to recovery column while crude Di-Ester is sent for the next Stage.

Flow diagram for DMTC 1 MT



METHANOL PURIFICATION

MASS BALANCE FOR DIMETHYL THIOPHOSPHORYL CHLORIDE (DMTC)

MATERIAL INPUT (QUANTITY IN MT)

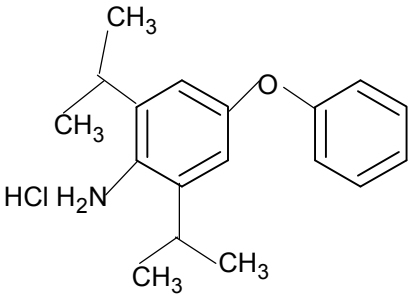
Sr. No.	Material	1 MT product
1	PSCl3	1.22
2	Methanol	1.746
3	Caustic lye 47%	1.242
4	Water	7.432
	Total	**11.638**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	DMTC	1.00	Product
2	Methanol recover	1.156	Recycle
3	NaCl	0.854	By product
4	Water	6.83916	Recycle
5	Effluent	1.016	ETP
6	Losses	0.775	Distillation
	Total	**11.640**	

B3- DIAFENTHIURON TECHNICAL

Reaction chemistry



2,6-Diisopropyl-4-Phenoxyenzamine Hydrochloride

MWt.= 305.5

\+ NaSCN +

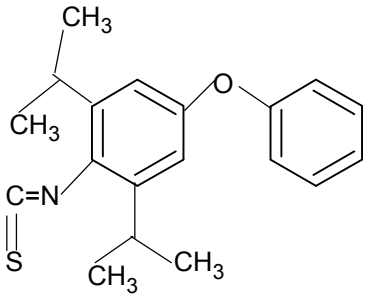
Sodium Thocyanide

M. WT.=81

HCl

Hydrochloric Acid

M.Wt.=36.5

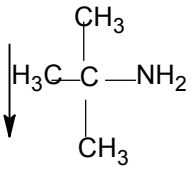


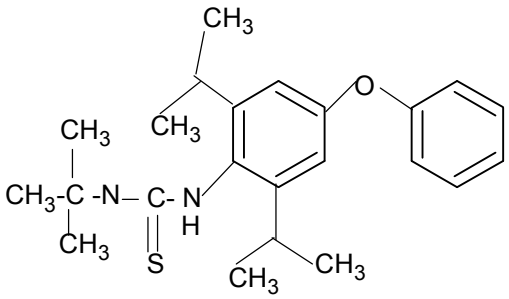
1-(2,6- Diisopropyl-4-Phenoxyphenyl Thiourea

M.Wt.=328

\+ NH_4Cl +

NaCl





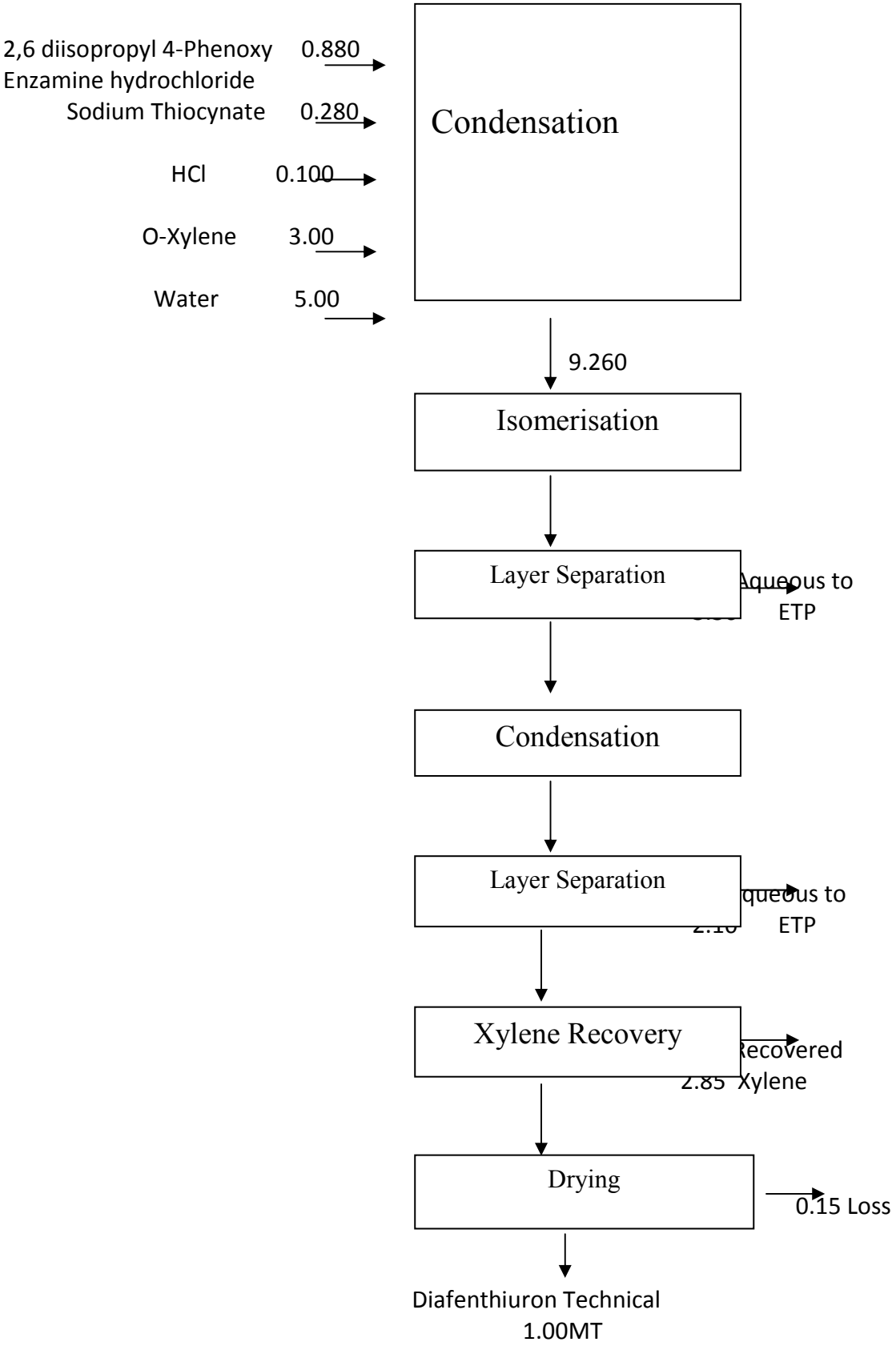
Diafenthiuron

Process Description :
2,6-diisopropyl-4-phenocyenxenamine hydrochloride is reacted with sodium thiocynate on the presence of dilute hydrochloride acid using Xylene as al solvent to form 1-(2,6-diisopropyl4-phenocylphenyl)-thiourea.

The mifal fixture of setep-1 is then continuously reflux till conversion into 1,2 diisopropyl-2-isothiocyanto-5-phenoxyenxene which is an isothiocyante derivative. Organic layer is separated.

Organic layer having 1,3-diisopropyl-2-isothiocyanto-5-phenoxyenzene obtained in step 11 is then condensed with tertialry utyl amine to amine to form Diafenthiuron.

SCHEMATIC FLOW DIAGRAM OF DIFENTHIURON



MASS BALANCE FOR DIAFENTHIURON TECHNICAL

MATERIAL INPUT (QUANTITY IN MT)

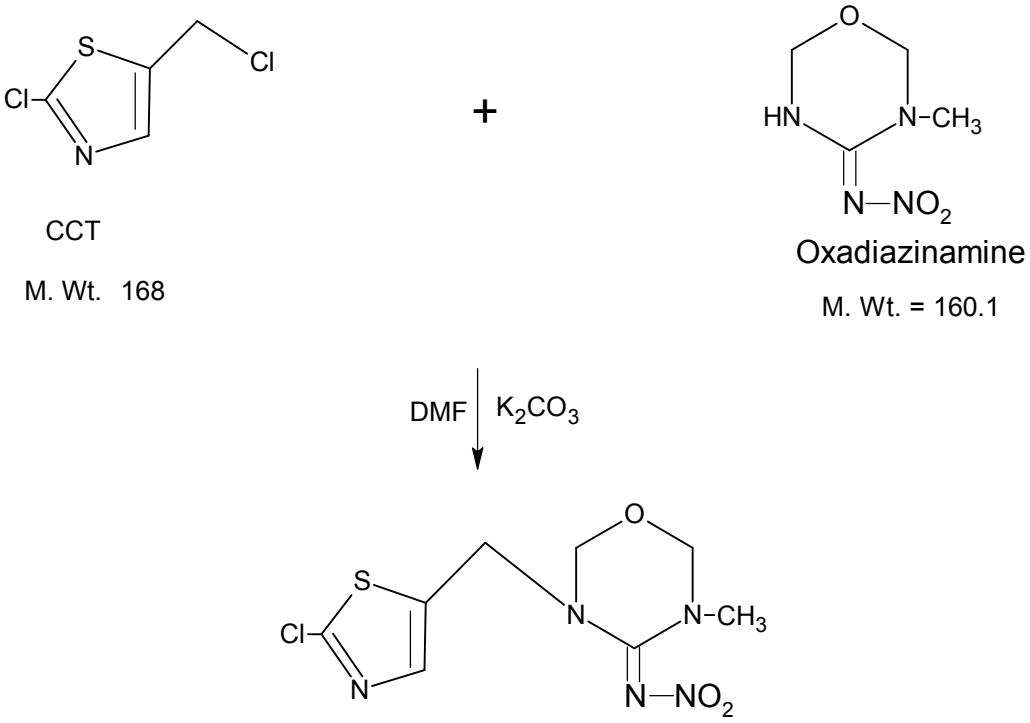
Sr. No.	Material	1 MT product
1	2,6 diisopropyl 4-Phenoxy Enzamine hydrochloride	0.880
2	Sodium Thiocynate	0.280
3	HCl	0.100
4	Tertiary butyl Amine	0.20
5	0-Xylene	3.00
6	Water	5.00
	Total	**9.46**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Diafenthiuron	1.00	Product
3	Rec. o- Xylene	2.85	Recycle
4	Water (Effluent)	5.46	ETP
6	Losses	0.15	Distillation
	Total	**9.46**	

B4- THIAMETHOXAM TECHNICAL

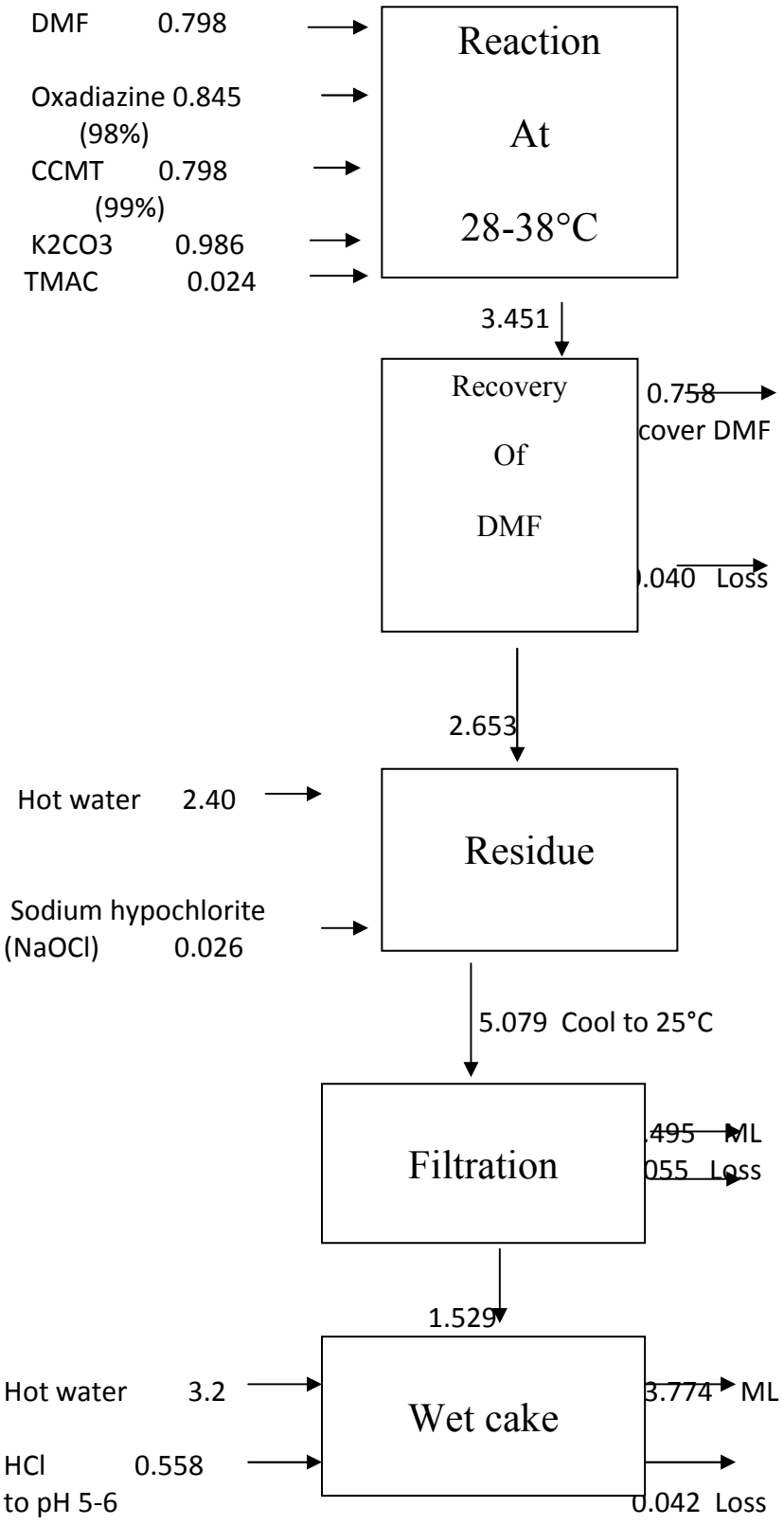
Reaction chemistry

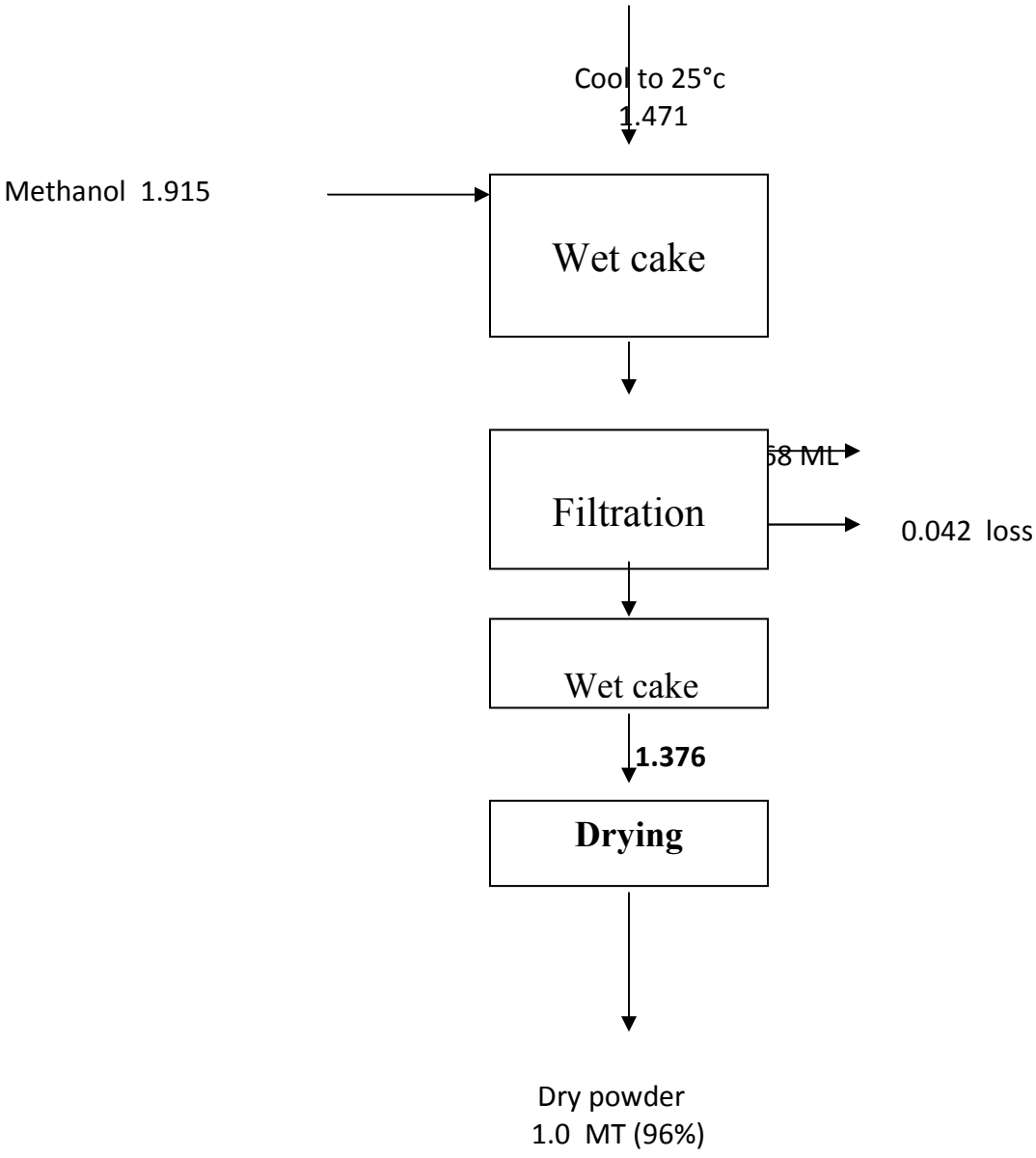


Process Description :

Thiamethoxam is manufactured from CCT and 3-methyl-4-nitroiminoperhydro-1,3,5-oxadiazine in presence of K_2CO_3 in solvent dimethyl formamide.

SCHEMATIC FLOW DIAGRAM OF THIAMETHOXAM




Cool to 25°c
1.471
Methanol 1.915
Wet cake
Filtration
58 ML
0.042 loss
Wet cake
1.376
Drying
Dry powder
1.0 MT (96%)

MASS BALANCE FOR THIAMETHOXAM

MATERIAL INPUT (QUANTITY IN MT)

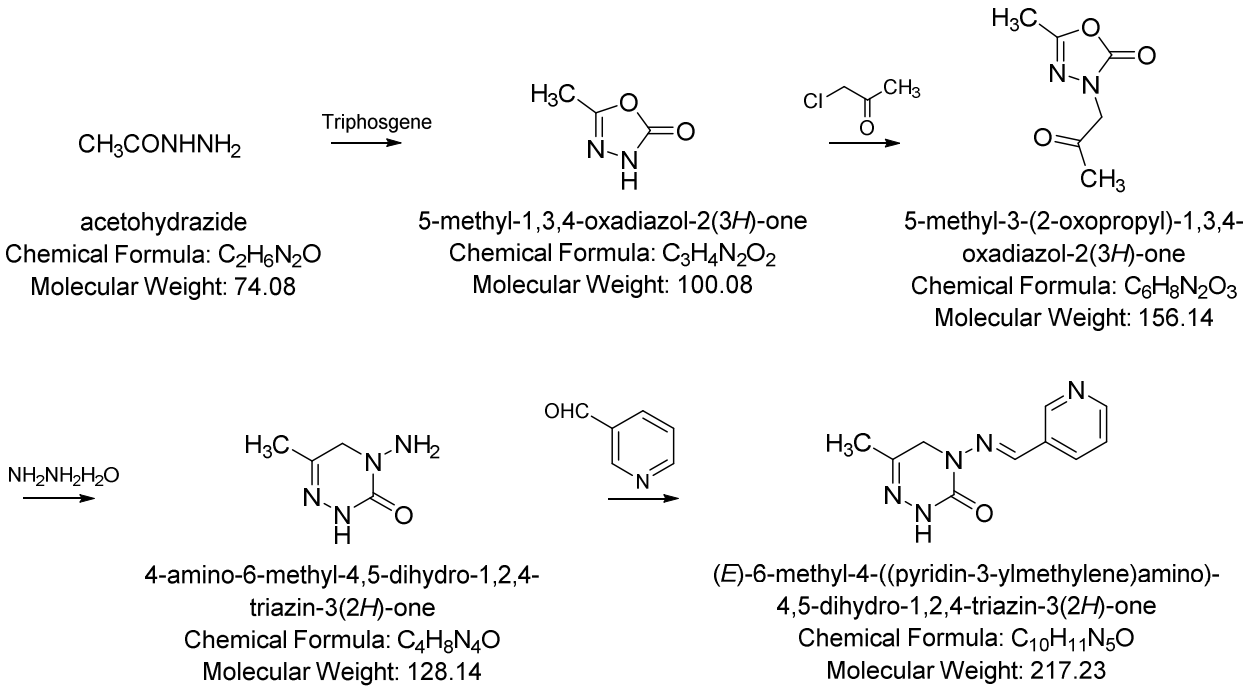
Sr. No.	Material	1 MT product
1	DMF	0.798
2	Oxadiazine	0.845
3	CCMT	0.798
4	K2CO3	0.986
5	TMAC	0.024
6	Hot water	5.6
7	Sodium hypochlorite	0.026
8	Methanol	1.915
	HCL	0.558
	Total	**11.55**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Thiamethoxam	1	Product
2	Rec. DMF	0.758	Recycle
3	KCl	0.531	By product
4	Water	5.6	Recycle
5	Effluent	0.478	ETP
6	Rec Methanol	1.655	Recycle
	Losses	1.408	Distillation
	Org. residue	0.12	Recycle
	Total	**11.55**	

B5- PYMETROZINE

PYMETROZINE REACTION SCHEME



acetohydrazide
Chemical Formula: $C_2H_6N_2O$
Molecular Weight: 74.08

5-methyl-1,3,4-oxadiazol-2(3*H*)-one
Chemical Formula: $C_3H_4N_2O_2$
Molecular Weight: 100.08

5-methyl-3-(2-oxopropyl)-1,3,4-oxadiazol-2(3*H*)-one
Chemical Formula: $C_6H_8N_2O_3$
Molecular Weight: 156.14

4-amino-6-methyl-4,5-dihydro-1,2,4-triazin-3(2*H*)-one
Chemical Formula: $C_4H_8N_4O$
Molecular Weight: 128.14

(*E*)-6-methyl-4-((pyridin-3-ylmethylene)amino)-4,5-dihydro-1,2,4-triazin-3(2*H*)-one
Chemical Formula: $C_{10}H_{11}N_5O$
Molecular Weight: 217.23

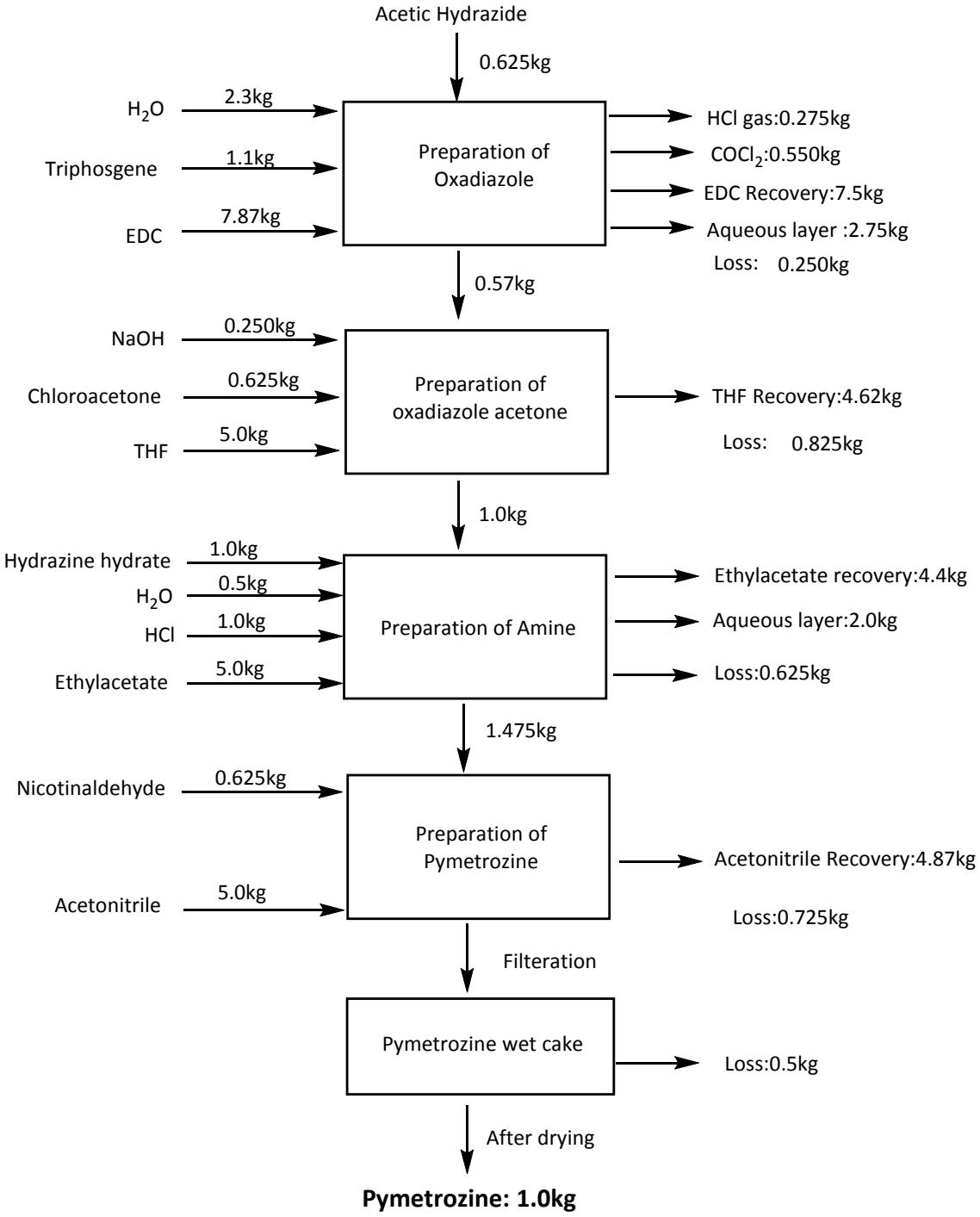
Process Description :

Acetohydrazide is reacted with Triphosgene to form of 5-methyl-1,3,4- oxadiazol-2(3H)- one and further react with Chloroacetone to form 5-methyl -3-(2-Oxopropyl) 1-3,4- Oxadiazol -2-(3H)-one.

Charge Ethylacetate and add 5-methyl -3-(2-Oxopropyl) 1-3,4- Oxadiazol -2-(3H)-one ans start addition of Hydrazine hydrate to form 4-amino-6-methyl -4,5-dihydro-1,2,4-triazin-3(2H)-one.

Charge Acetonitrile and add form 4-amino-6-methyl -4,5-dihydro-1,2,4- triazin-3(2H)-one to react with nicotinaldehyde to form pymetrozine.

Pymetrozine material balance:



MASS BALANCE FOR PYMETROZINE

MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	Acetic Hydrazide	0..625
2	Water	2.8
3	Triphosgene	1.1
4	EDC	7.87
5	NaOH	0.250
6	Chloroacetone	0.625
7	THF	5.0
8	Hydrazine hydrate	1.00
9	HCL	1.00
10	Ethylacetate	5.0
11	Nicotinaldehyde	0.625
12	Acetonitrile	5.00
	Total	**30.27**

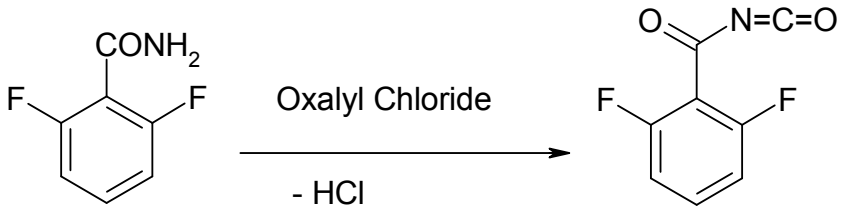
MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Pymetrozine	1	Product
2	HCL gas	0.275	By product
3	COCl2	0.550	By product
4	EDC rec.	7.50	Recycle
5	Aqueous layer	4.75	ETP
6	THF Rec.	4.62	Recycle
	Ethylacetate Rec.	4.40	Recycle
	Acetonitrile Rec.	4.87	Recycle
	Loss	2.305	
	Total	**30.27**	

B5 : Diflubenzuron

REACTION CHEMISTRY:

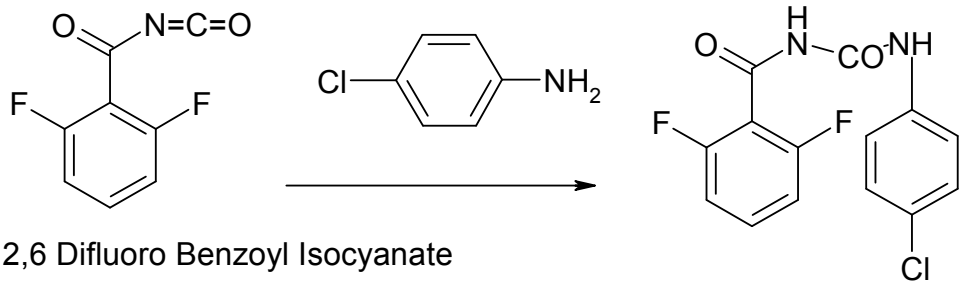
1ST Step : Preparation of Benzoyl Isocyanate.



2,6 Difluoro Benzamide

2,6 Difluoro Benzoyl Isocyanate

2nd Step : preparation of Diflubenzuron.



2,6 Difluoro Benzoyl Isocyanate

Diflubenzuron

DIFLUBENZURON MANUFACTURING PROCESS:

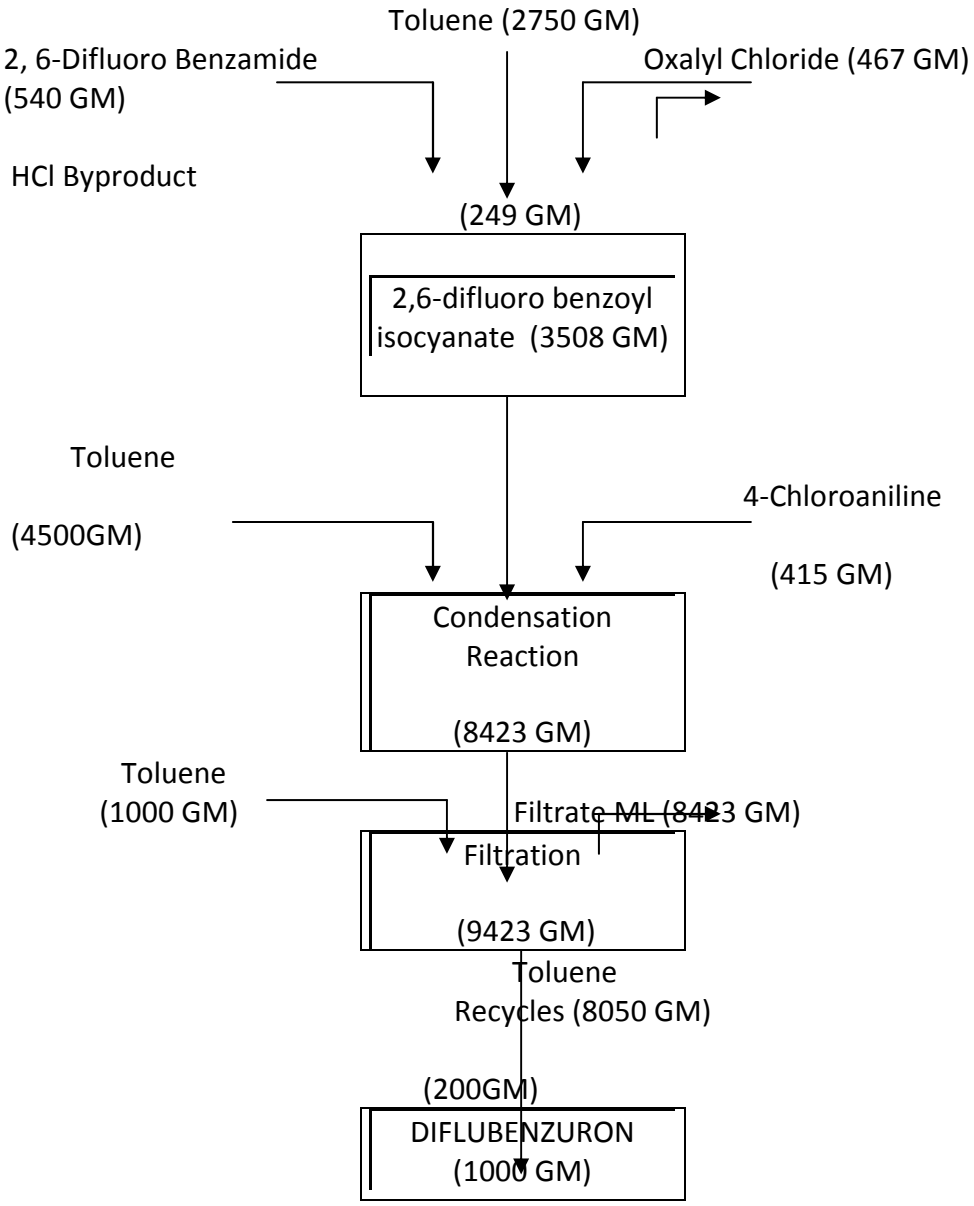
STEP: 1 PREPARATION OF 2,6-DIFLUORO BENZOYL ISOCYANATE:

2,6-Difluoro Benzamide is reacted with Oxalyl Chloride at 100-115^{O}C temperature in Toluene as solvent. The liberated Hydrogen chloride gas is absorbed in water & Hydrochloric acid formed is sold as by-product. Once reaction is over, the Isocyanate formed is taken for next reaction.

STEP: 2 PREPARATION OF DIFLUBENZURON:

In a mixture of 4-Chloroaniline and Toluene is charged above 2,6-Difluoro Benzoyl Isocyanate at RT and stirred at room temperature for 5-6 hours.. Once the reaction is over, the Diflubenzuron formed is filtered at Room temperature under vacuum and dried at 70^{0}C. Toluene is distilled out under vacuum & recycled back in process & distillation residue is incinerated.

DIFLUBENZURON PROCESS FLOW CHART & MATERIAL BALANCE:



MASS BALANCE FOR DIFLUBENZURON

MATERIAL INPUT (QUANTITY IN MT)

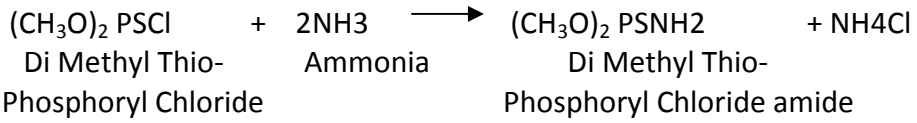
Sr. No.	Material	1 MT product
1	2,6- Difluoro Benzamide	0.540
2	Toluene	8.250
3	Oxalyl Chloride	0.467
	Total	**9.25**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Diflubenzuron	1.00	Product
4	Rec. Toluene	8.05	Recycle
5	Residue	0.200	ETP
	Total	**9.25**	

C1: DMTC AMIDE
DIMETHYL THIOPHOSPHORY CHLORIDE AMIDE (DMTC)

Reaction chemistry

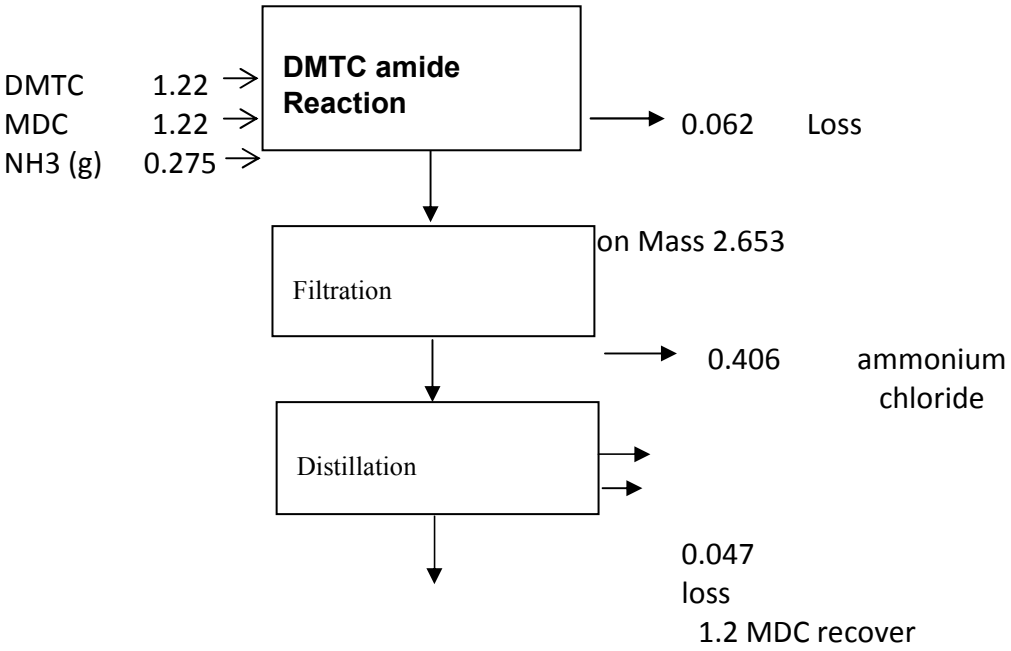


Process Description :

The manufacturing process of DMTC-amide

DMTC is react with ammonia gas at a low temperature in presence of Methylene dichloride as solvent. after completion of reaction to give product DMTC amide and byproduct is ammonium chloride

Flow diagram for 1 MT DMTC amide



DMTC Amide 1.000

MASS BALANCE FOR DIMETHYL THIOPHOSPHORYL CHLORIDE AMIDE (DMTC- Amide)

MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	DMTC	1.22
2	MDC	1.22
3	Ammonia	0.275
	Total	**2.715**

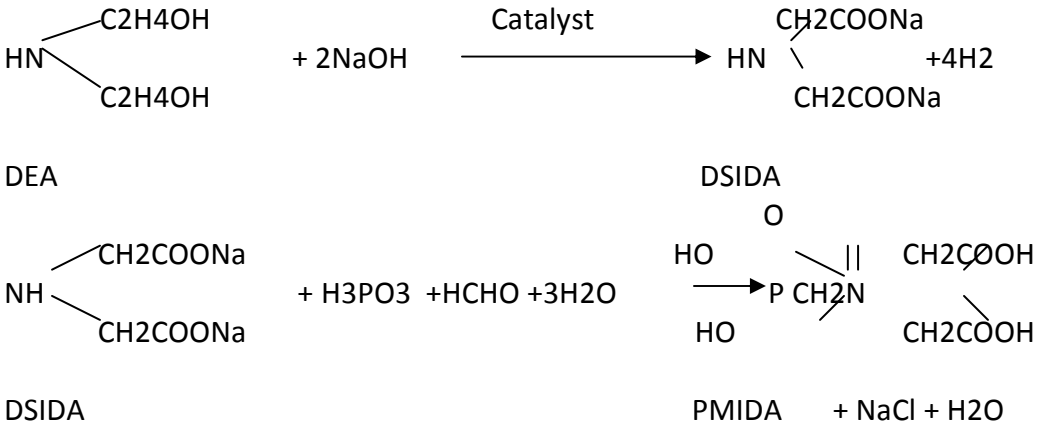
MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	DMTC- Amide	1.00	Product
2	MDC recover	1.2	Recover
3	Losses	0.109	Distillation
4	Salt	0.406	Solid waste
	Total	**2.715**	

D1: PMIDA

Phosphanomethyl iminodiacetic acid (PMIDA)

Reaction chemistry



Brief process

Stage I

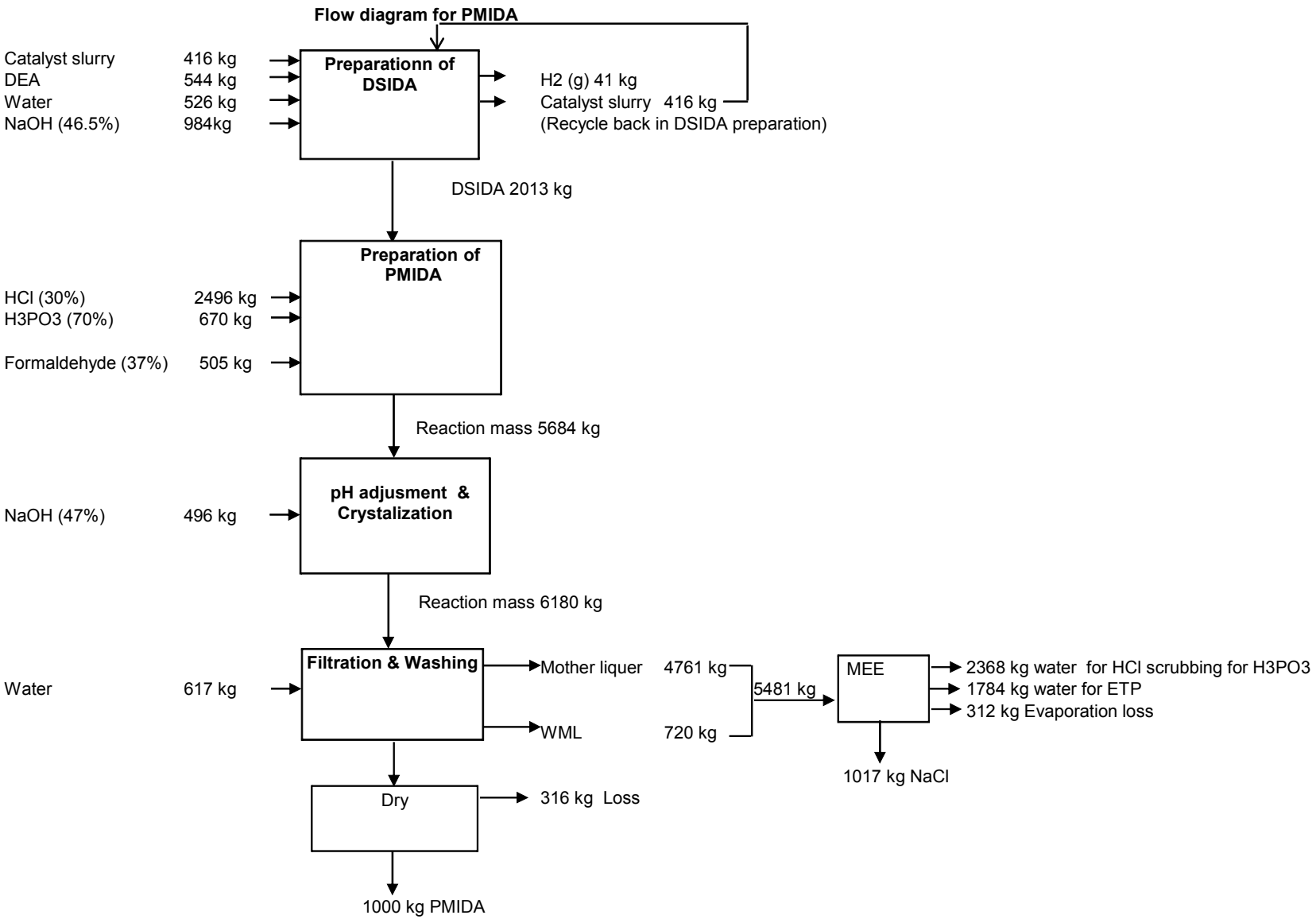
Manufacturing of Di Sodium salt of Imino Di Acetic Acid

Di Ethanol Amine is reacted with Sodium Hydroxide in presence of Catalyst Catalyst under pressure of nitrogen at an elevated temperature. This results into formation of Di Sodium Salt of Imino Di Acetic Acid along with liberation of hydrogen. The product is isolated and Catalyst is Recycled back in the next batch. The recycling of Catalyst is done ten times.

Stage II

Manufacturing of Phosphono Methyl Imino Di Acetic Acid

Di Sodium salt of Imino Di Acetic Acid is reacted with Formaldehyde and Phosphorus acid at elevated temperature resulting into Phosphono Methyl Imino Di Acetic Acid. The product is isolated by filtration wet cake of PMIDA used for next stage


Flow diagram for PMIDA
Catalyst slurry 416 kg
DEA 544 kg
Water 526 kg
NaOH (46.5%) 984kg
Preparationn of DSIDA
H2 (g) 41 kg
Catalyst slurry 416 kg
(Recycle back in DSIDA preparation)
DSIDA 2013 kg
Preparation of PMIDA
HCl (30%) 2496 kg
H3PO3 (70%) 670 kg
Formaldehyde (37%) 505 kg
Reaction mass 5684 kg
pH adjusment & Crystalization
NaOH (47%) 496 kg
Reaction mass 6180 kg
Filtration & Washing
Water 617 kg
Mother liquer
WML
4761 kg
720 kg
5481 kg
MEE
2368 kg water for HCl scrubbing for H3PO3
1784 kg water for ETP
312 kg Evaporation loss
1017 kg NaCl
Dry
316 kg Loss
1000 kg PMIDA

MASS BALANCE FOR PHOSPHANOMETHYL IMINODIACETIC ACID (PMIDA)
MATERIAL INPUT (QUANTITY IN MT)

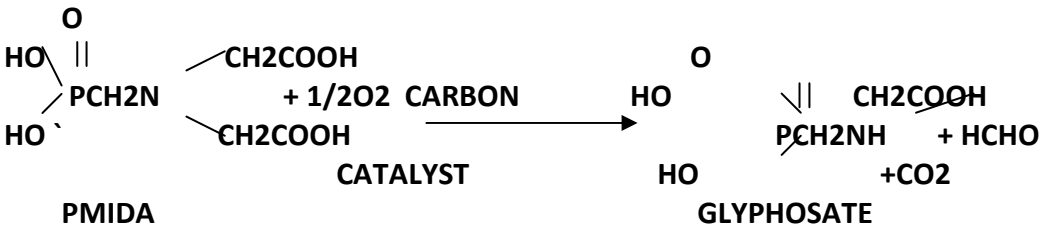
Sr. No.	Material	1 MT product
1	Catalyst slurry	0.416
2	Diethanol amine (DEA)	0.544
3	NaOH (47%)	1.48
4	HCl(30%)	2.496
5	H3PO3(70%)	0.670
6	Formaldehyde (37%)	0.505
7	Water	1.143
	Total	**7.254**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	PMIDA	1.00	Product
2	Hydrogen	0.041	
3	Catalyst	0.416	Recycle
4	Water	2.368	Recycle
5	NaCl	1.017	By product
6	Effluent	1.784	ETP
7	Losses	0.628	Evaporation
	Total	**7.254**	

D2 : GLYPHOSATE

Reaction chemistry

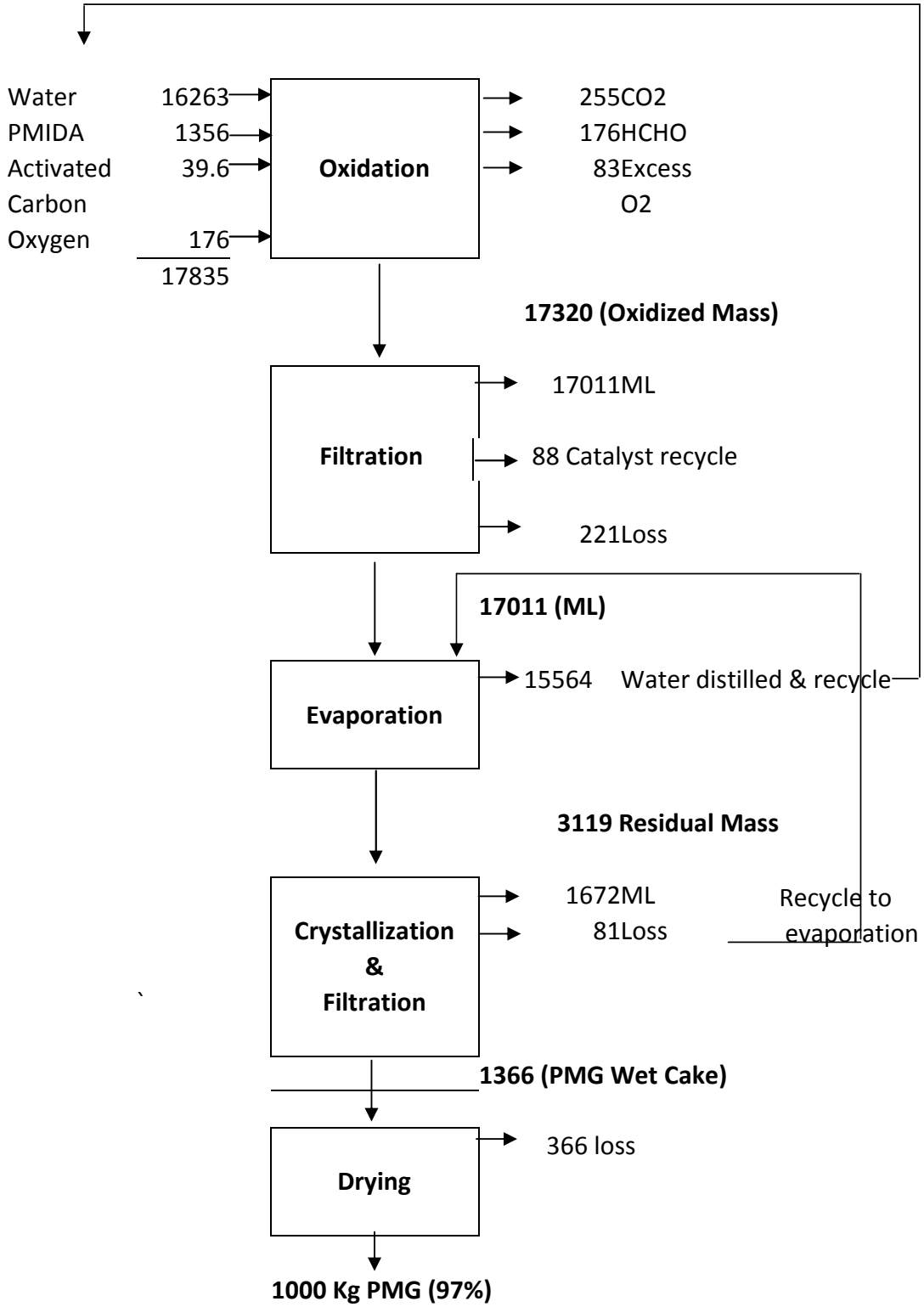


Stage I

Manufacturing of Phosphono Methyl Glycine (Glyphosate)

Phosphono Methyl Imino diacetic Acid slurry is prepared by addition of water and activated carbon & is further oxidized by molecular oxygen to give N-phosphanomethyl glycine followed by water distillation & followed by filtration and further drying.

MASS BALANCE OF PMIDA TO PMG



MASS BALANCE FOR GLYPHOSATE
MATERIAL INPUT (QUANTITY IN MT)

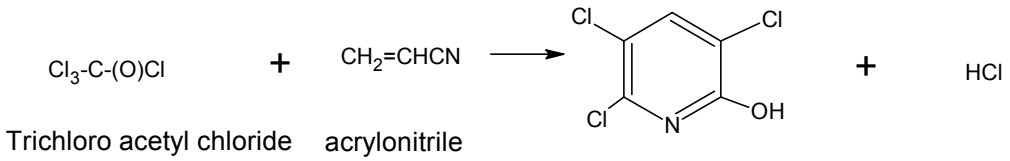
Sr. No.	Material	1 MT product
1	PMIDA	1.356
2	Activated carbon	0.0396
3	Oxygen	0.176
4	Water	16.262
	Total	**17.834**

MATERIAL OUTPUT (QUANTITY IN MT)

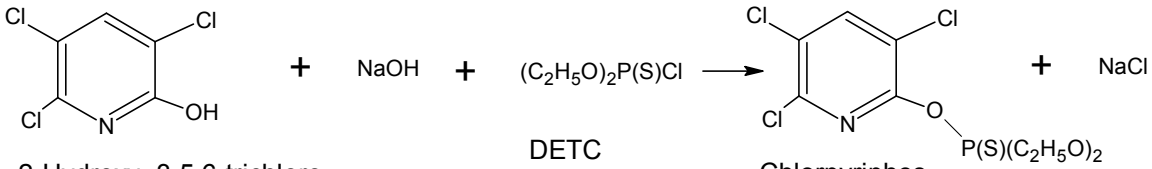
Sr. No.	Material	1 MT product	
1	Glyphosate	1.00	Product
2	Carbon dioxide	0.255	
3	Formaldehyde	0.176	
4	Activated carbon recycle	0.088	Recycle
5	Water	15.564	Recycle
6	Losses	0.668	
7	Excess oxygen	0.083	
	Total	**17.834**	

E1 :CHLORPYRIPHOS

Reaction chemistry



Trichloro acetyl chloride acrylonitrile 2-Hydroxy -3,5,6-trichloro pyridine



2-Hydroxy -3,5,6-trichloro pyridine DETC Chlorpyriphos

Manufacturing Process

Stage-I HTCP :

Charge the specified amount of raw material in order of solvent, TCAC, Acrylonitrile and last Catalyst and mass is heated upto 140 °C under reflex condition. During reaction HCl will be generated and same is absorbed in water scrubber.
Solvent recovered under vacuums at 730 mm Hg & temperature is maintained at about 110 °C. recovered solvent is recycled in the process and part quantity transfered to Incinerator. Cool the mass temperature to 105 °C and slowly release the vacuum.

Stage-II Sodium HTCP :

Maintain the temperature of the 15 % Sodium Hydroxide solution between 10 – 15 °C and slowly add the hot reaction mass of 'Stage I' in it. The reaction mass temperature would increase, however it should not go above 65 °C. Again cool it down to 15 °C and digest for 1.0 hours. Filter the entire mass and collect the ML and transfer to Incinerator. Remove the wet cake.

Stage III: Slurry Preparation :

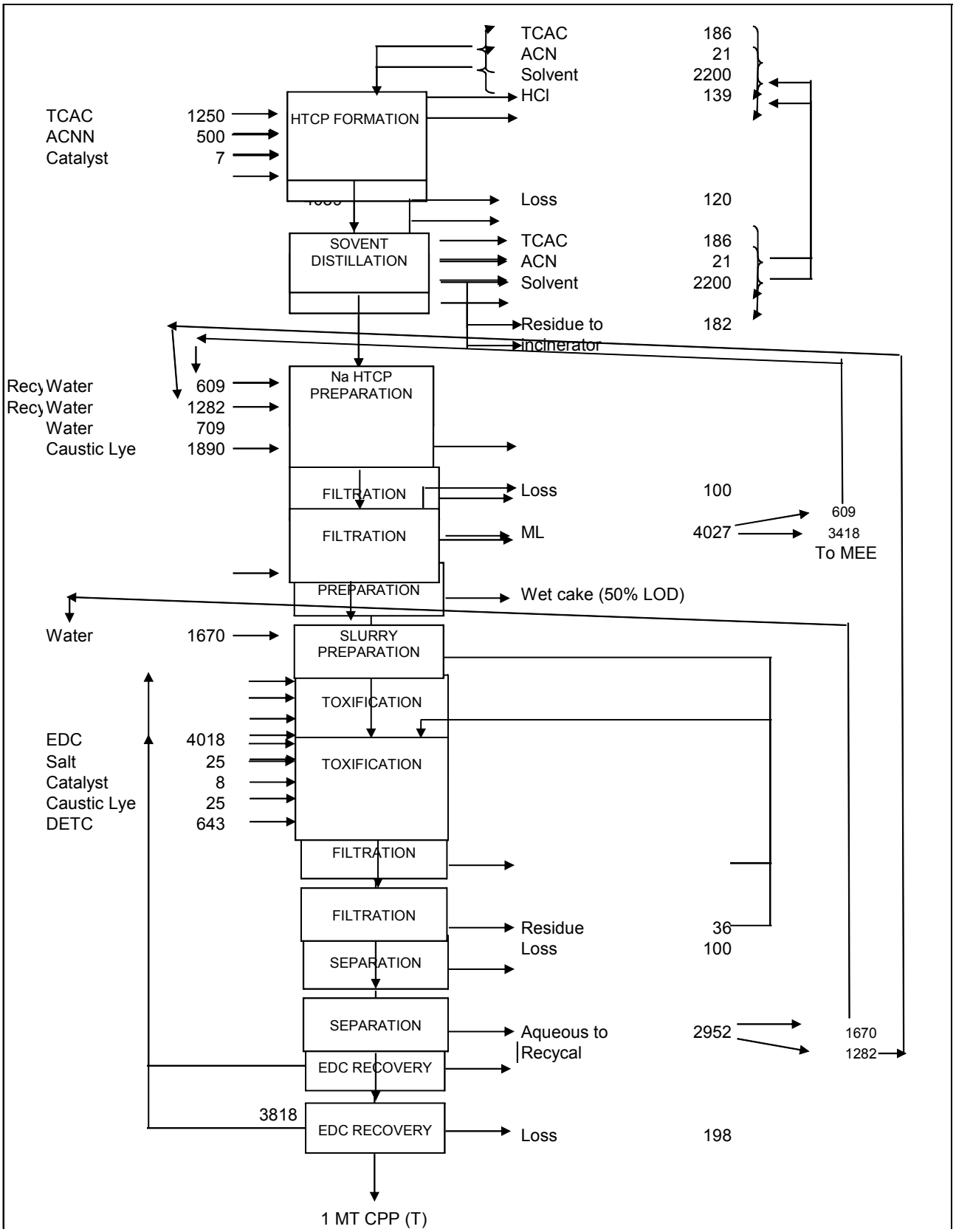
Take water and charge wet cakes and makes slurry. Also charge calculated amount of caustic lye solution. Heat the mass. Once the temperature is around 60 - 65 °C, shut the autoclave and increase the reaction mass temperature up to 130 °C.

Stage IV: Toxification reaction.

Based on calculation of active content of HTCP in the slurry add catalyst. Also add EDC as a solvent and maintain the reaction temperature around 50 °C. Add DETC over a period of 3 – 4 hours maintaining the reaction temperature around 50 $\pm$ 2 °C. Once the reaction is completed settle the mass for 1.0 hour. Filter the mass through filter. Separate out the organic and aqueous layer. Aqueous transfer to Incinerator and organic mass is transfer to EDC recovery section

Stage V: EDC Recovery :

Slowly raise the temperature and vacuum and recover EDC at 755 mm of Hg and temperature at 70 °C. Recover EDC is recycled in the stage IV. After recovery of EDC, CPP technical is drum out for final packing


TCAC 186
ACN 21
Solvent 2200
HCl 139
TCAC 1250
ACNN 500
Catalyst 7
HTCP FORMATION
Loss 120
SOVENT DISTILLATION
TCAC 186
ACN 21
Solvent 2200
Residue to Incinerator 182
Recy Water 609
Recy Water 1282
Water 709
Caustic Lye 1890
Na HTCP PREPARATION
FILTRATION
Loss 100
FILTRATION
ML 4027
609
3418
To MEE
PREPARATION
Wet cake (50% LOD)
Water 1670
SLURRY PREPARATION
TOXIFICATION
EDC 4018
Salt 25
Catalyst 8
Caustic Lye 25
DETC 643
TOXIFICATION
FILTRATION
FILTRATION
Residue 36
Loss 100
SEPARATION
SEPARATION
Aqueous to Recycal 2952
1670
1282
EDC RECOVERY
3818
EDC RECOVERY
Loss 198
1 MT CPP (T)

MASS BALANCE FOR CHLORPYRIFOS
MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	Trichloro acetyl chloride (TCAC)	1.436
2	Acrylonitrile	0.521
3	Catalyst	0.015
4	Solvent	2.200
5	Caustic lye	1.915
6	Ethylene dichloride	4.018
7	Salt	0.025
8	Recycle residue	0.036
9	DETC	0.643
10	Water	0.709
	Total	**11.51**

MATERIAL OUTPUT (QUANTITY IN MT)

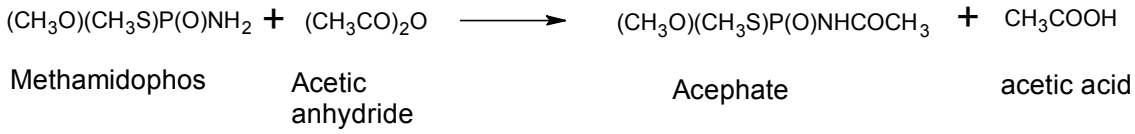
Sr. No.	Material	1 MT product	
1	Chlorpyrifos	1.00	Product
2	Acrylonitrile	0.021	Recycle
3	HCl	0.125	By product
4	Solvent	2.2	
5	Organic residue	0.182	To incinerator
6	Distillation loss	0.120	
7	Aqueous layer	3.418	MEE
8	Loss	0.398	
9	Residue	0.036	Recycle
10	EDC	3.818	Recycle
11	TCAC	0.186	Recycle
	Total	**11.51**	

F1 : ACEPHATE

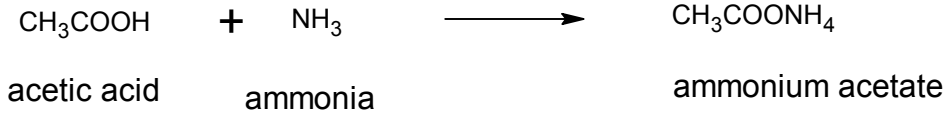
Reaction chemistry

Isomerisation

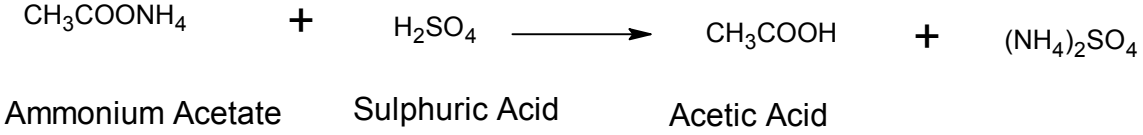
Acetylation



Neutralisation



Rec. of acetic Acid and Ammonium Sulphate



Process description :

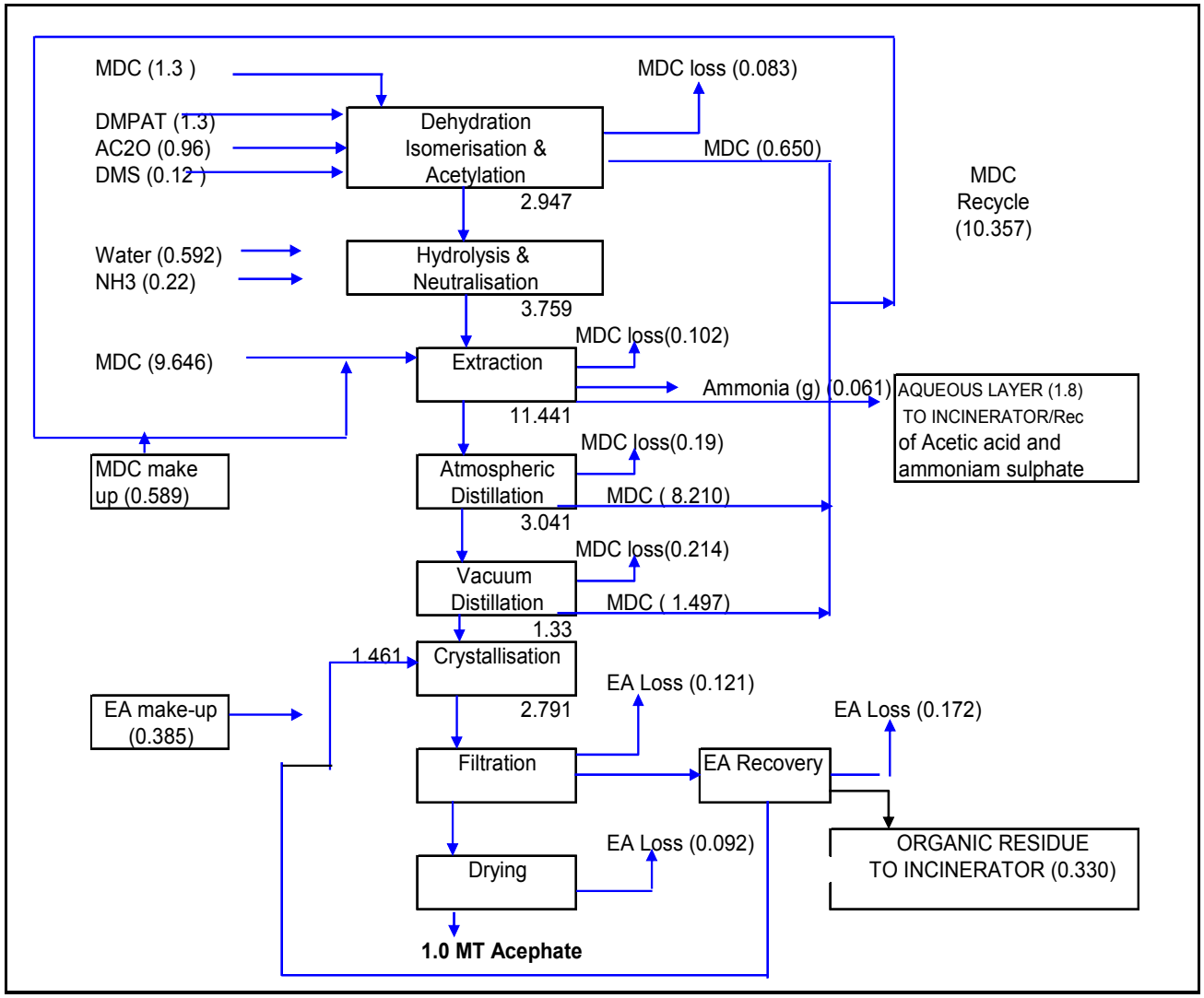
DMPAT in MDC as solvent is 'Isomerised' by aid of Di methyl Sulphate (DMS) to give Methamidophos (MMP). This MMP is then further 'Acetylated' by Acetic Anhydride to yield Acephate. This reaction generates Acetic Acid, which is Neutralize by Ammonia solution.

The Neutralize mass is then further extracted repeatedly with MDC. The aqueous layer generated contains 'Ammonium Acetate and is incinerated. The organic mass obtained is fed to MDC recover unit.

MDC is recovered by atmospheric and vacuum distillation. This recovered MDC is recycle back in the process. The residual mass of the distillation is carried forward for Acephate recovery by crystalisation.

Ethyl Acetate is added to the residual mass and crystallized to get Acephate. The wet Acephate thus obtained from filtration is further dried in rotary vacuum dryer.

The mother liquor obtained from filtration is further used to recover Ethyl Acetate under vacuum. The Ethyl Acetate recovered is recycled back in the process. The residue obtained after Ethyl Acetate recovery is incinerated.


MDC (1.3)
DMPAT (1.3)
AC2O (0.96)
DMS (0.12)
Dehydration Isomerisation & Acetylation
2.947
MDC loss (0.083)
MDC (0.650)
MDC Recycle (10.357)
Water (0.592)
NH3 (0.22)
Hydrolysis & Neutralisation
3.759
MDC (9.646)
Extraction
11.441
MDC loss(0.102)
Ammonia (g) (0.061)
AQUEOUS LAYER (1.8) TO INCINERATOR/Rec of Acetic acid and ammoniam sulphate
MDC make up (0.589)
Atmospheric Distillation
3.041
MDC loss(0.19)
MDC (8.210)
Vacuum Distillation
1.33
MDC loss(0.214)
MDC (1.497)
1.461
Crystallisation
2.791
EA make-up (0.385)
EA Loss (0.121)
EA Loss (0.172)
Filtration
EA Recovery
Drying
EA Loss (0.092)
ORGANIC RESIDUE TO INCINERATOR (0.330)
1.0 MT Acephate

MASS BALANCE FOR ACEPHATE
MATERIAL INPUT (QUANTITY IN MT)

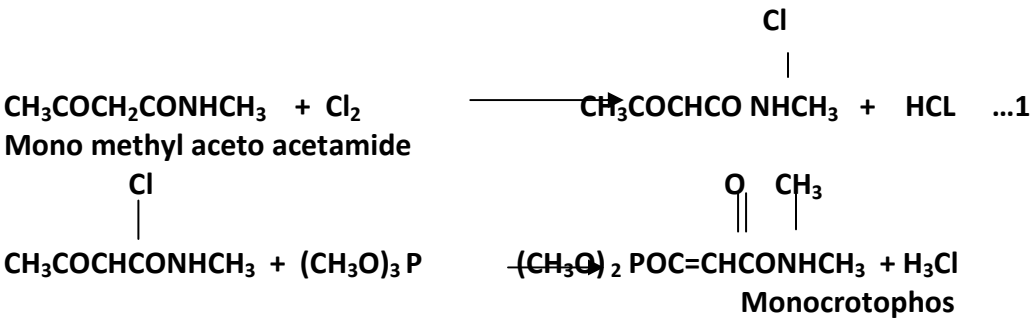
Sr. No.	Material	1 MT product
1	DMPAT	1.300
2	Dimethyl Sulphate	0.120
3	Acetic anhydride	0.960
4	Ammonia (gas)	0.220
5	Water	0.592
6	MDC	10.946
7	Ethyl acetate	2.347
	Total	**16.48**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Acephate	1.00	Product
2	Aqueous layer	1.8	To Incinerator
3	MDC	10.357	Recycle
4	Process & Distillation loss	0.974	
5	Ethyl Acetate	1.962	Recycle
6	Organic residue	0.330	To Incinerator
	Total	**16.48**	

G1 ; MONOCROTOPHOS

Reaction chemistr



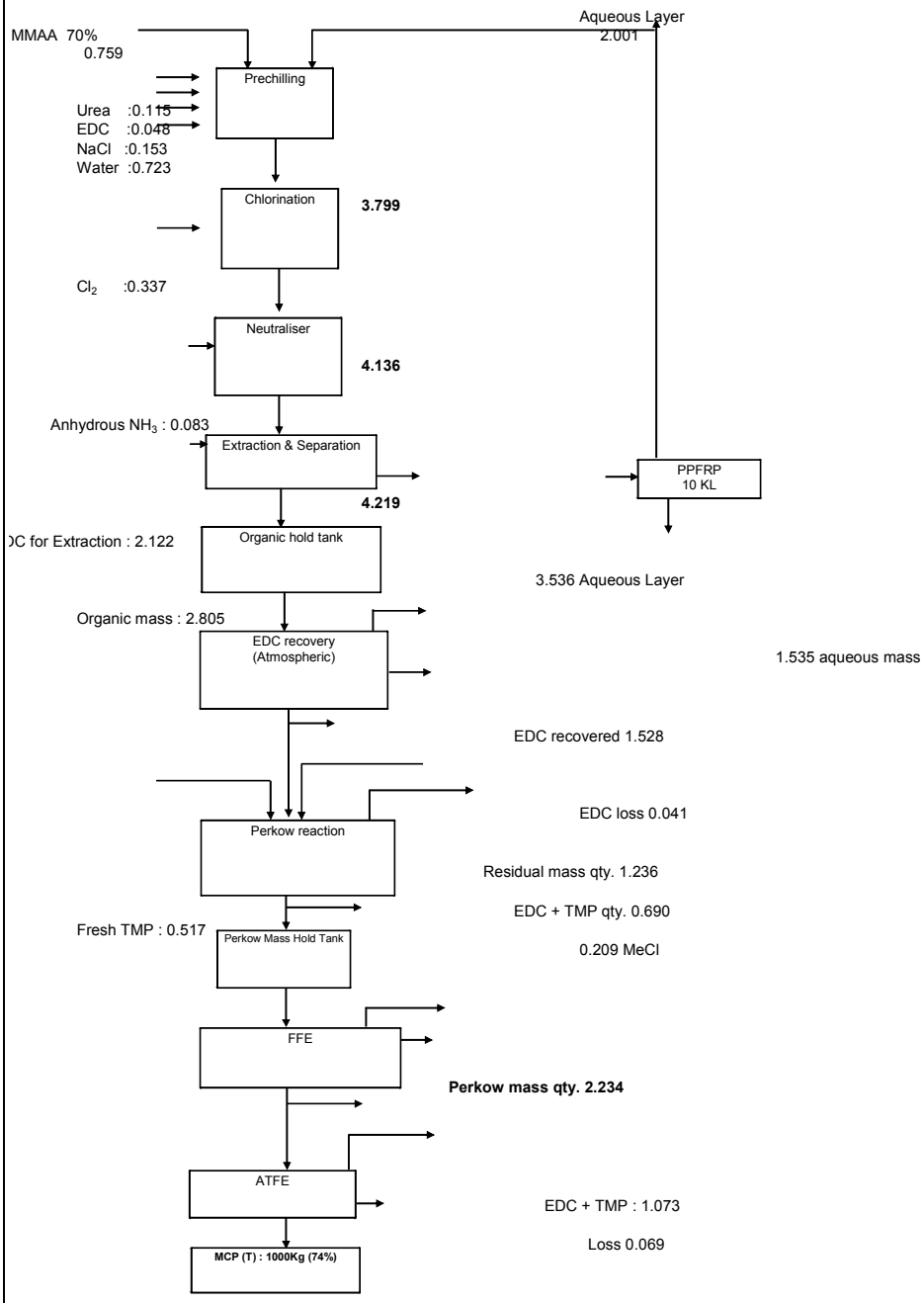
Process Description:

Monocrotophos is manufactured by a two stage reaction

In the first reaction Monomethyl Acetoacetamide is chlorinated to Monochloro Methyl Acetoacetamide (MMACl) in the presence of water . This reaction is carried out at low temperature . The chlorinated mass is neutralised . MMACl is then taken in an organic solvent and any moisture in is removed.

Then MMACl is reacted with Trimethyl Phosphite (TMP) and crude Monocrotophos is obtained. From this crude material solvent and unreacted TMP are removed by vacuum distillationand Techanical grade Monocrotophos is obtained.

MCP AQUEOUS ROUTE PROCCESS FLOW DIAGRAM



MASS BALANCE FOR MONOCROTOPHOS
MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	MMAA 70%	0.759
2	Urea	0.115
3	EDC	2.17
4	NaCl	0.153
5	Chlorine	0.337
6	Ammonia	0.083
7	TMP	0.517
8	EDC+TMP	0.690
9	Water	0.723
10	Aqueous mass	2.001
	Total	**7.548**

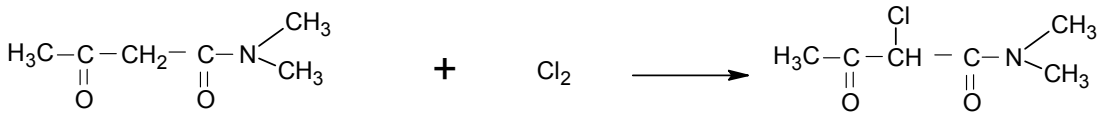
MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Monocrotophos	1.00	Product
2	Aqueous mass	1.535	To Incinerator
3	EDC	1.528	Recycle
4	EDC+TMP	1.073	Recycle
5	Organic residue	0.069	To Incinerator
6	Methyl chloride	0.209	To Incinerator
7	Losses	0.133	
8	Aqueous mass	2.001	Recycle
	Total	**7.548**	

G2: DICROTOPHOS

Reaction chemistry

Stage-1



Dimethyl aceto acetamide

M.F. = $C_6H_{11}NO_2$

M.wt.=129

Chlorine

M.F.= Cl2

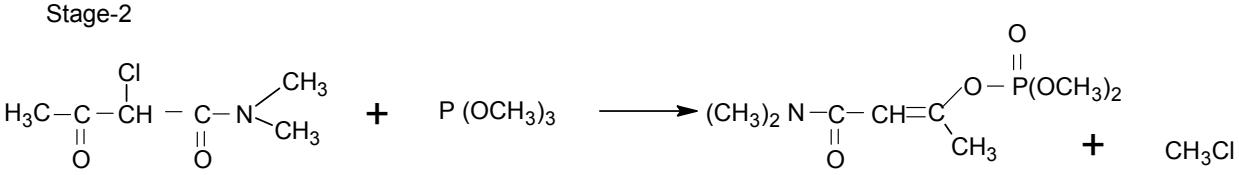
M.wt=71

N,N-Dimethyl-2-chloro acetoacetamide

M.F.= $C_6H_{10}ClNO_2$

M.wt=163.5

Stage-2



N,N-Dimethyl-2-chloro acetoacetamide

M.F.= $C_6H_{10}ClNO_2$

M.wt=163.5

Trimethyl phosphite

M.F.= $C_3H_9PO_3$

M.wt. = 124

Dicrotophos

M.F.= $C_8H_{16}PNO_5$

M.wt. = 237

Methyl chloride

M.F.= CH_3Cl

M.wt. = 50.5

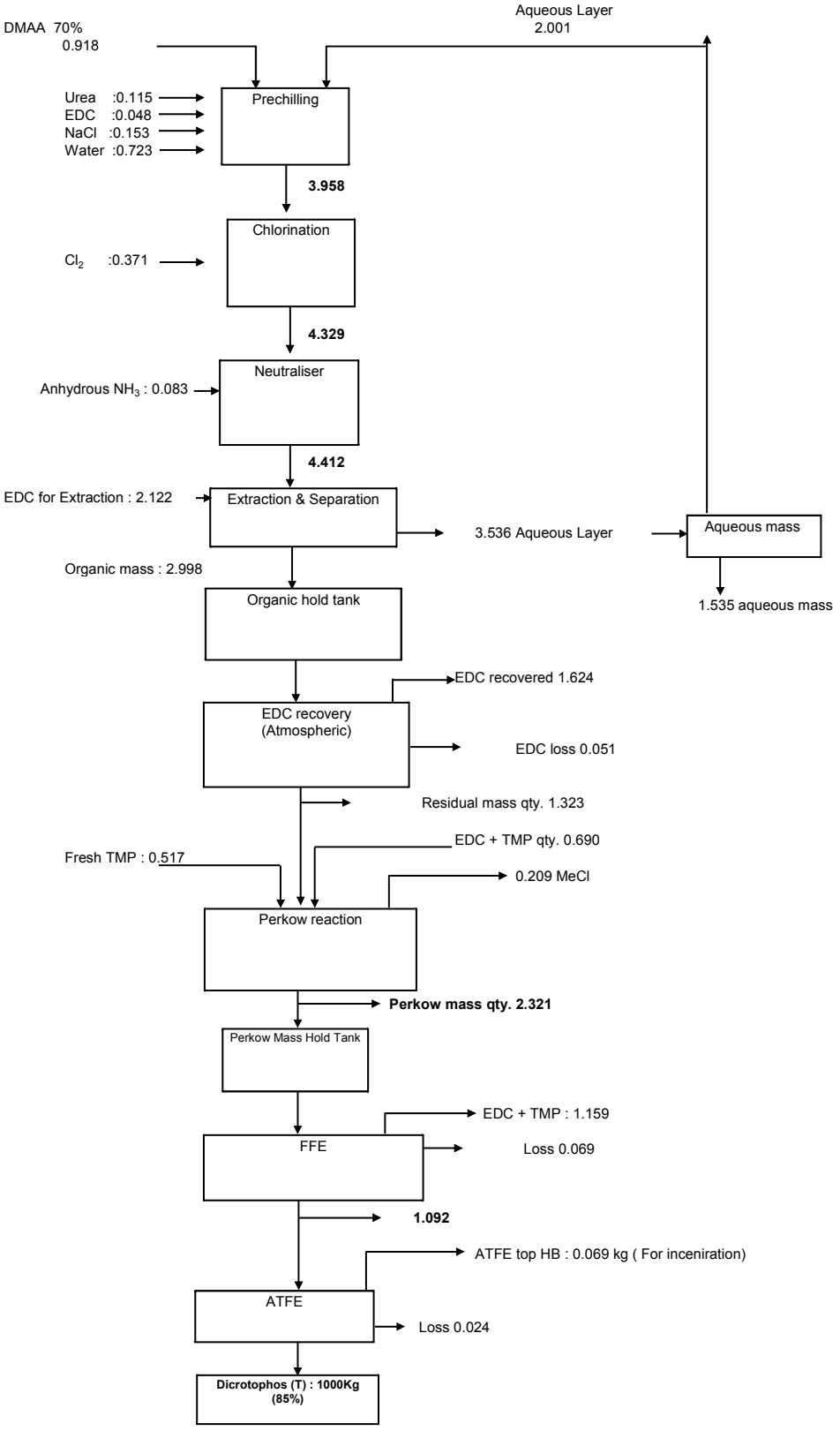
Process

Dicrotophos is manufactured by a two stage reaction

In the first reaction Dimethyl Acetoacetamide is chlorinated to Chloro Dimethyl Acetoacetamide (DMACl) in the presence in a water. This reaction is carried out at low temperature. The chlorinated mass is neutralised and the solvent is distilled out. DMACl is then taken in an organic solvent and any moisture in it is removed.

Then DMACl is reacted with Trimethyl Phosphite (TMP) and crude Dicrotophos is obtained. From this crude material solvent and unreacted TMP are removed by vacuum distillation and Technical grade Dicrotophos is obtained.

DICROTOPHOS AQUEOUS ROUTE PROCCESS FLOW DIAGRAM



MASS BALANCE FOR DICROTOPHOS
MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	DMAA 70%	0.918
2	Urea	0.115
3	EDC	2.17
4	NaCl	0.153
5	Chlorine	0.371
6	Ammonia	0.083
7	TMP	0.517
8	EDC+TMP	0.690
9	Water	0.723
10	Aqueous mass	2.001
	Total	**7.741**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Dicrotophos	1.00	Product
2	Aqueous mass	1.535	To Incinerator
3	EDC	1.624	Recycle
4	EDC+TMP	1.159	Recycle
5	Organic residue	0.069	To Incinerator
6	Methyl chloride	0.209	To Incinerator
7	Losses	0.144	
8	Aqueous mass	2.001	Recycle
	Total	**7.741**	

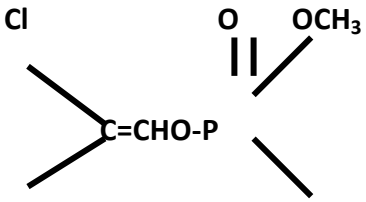
H1:DDVP

Reaction chemistry

Cl_3C_2-(O)H + **$(OCH_3)_3P$**

Tri Chloro Acetaldehyde **Tri Methyle Phosphite**

M. Wt. : 147.5 **124**



+ **CH_3Cl**

DDVP **Methyl Chloride**

(2,2 Di- Chloro Vinyl Di Methyl Phosphate)

M. Wt. : 221 **50.5**

Process

Flush the reactor with N2

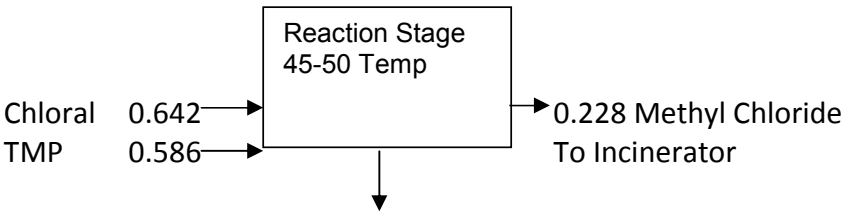
Change the Chloral in Reactor.

Add TMP (Trimethyl Phosphate) by maintaining the temperature 45-50^{0}c by circulating the chilled water. During the reaction methyl Chloride gas generated will be remove through vent condense and sent to Incinerator.

Finally maintain the Temperature 90^{0}c and stripped the methyl Chloride traces by N2 purging.

Cool the mass to room temperature and check the quality of Product and pack the material.

MATRIAL FLOW DIAGRAM FOR DICHLORVOS



1 MT DDVP (Tech)
Product

MASS BALANCE FOR DICHLORVOS
MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	Chloral	0.642
2	TMP	0.586
	Total	**1.228**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Dichlorvos	1.00	Product
2	Methyl chloride	0.228	To Incinerator
	Total	**1.228**	

I1: PHOSPHORUS TRICHLORIDE (PCl3)

Reaction chemistry

$$P_4 + 6Cl_2 \longrightarrow 4\,PCl_3$$

Process Description :

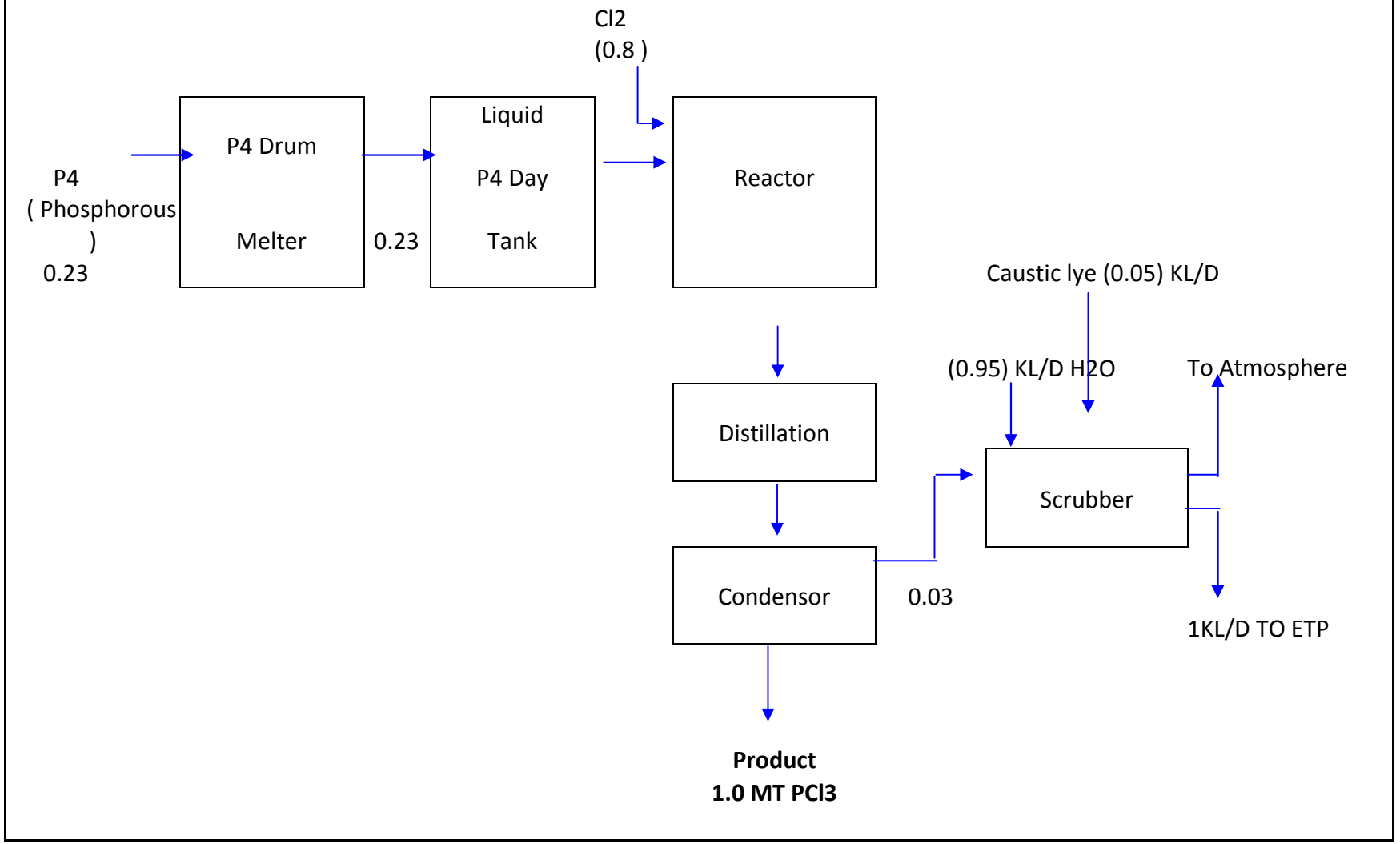
The following are the main steps for PCl_3 production.

Phosphorus drums are transferred to melting tank containing water heated by sparging live steam into it. The melted phosphorus is transferred by water pressure through pump into phosphorus day tank which is installed in hot water tank.

Phosphorus is continuously fed into reactor filled with PCl_3 at a controlled rate by water through pump.

Chlorine liquid from toner is fed into chlorine vaporizers which is heated by steam. Chlorine gas at a controlled rate is fed to reactor via glass tube rotameter.

Phosphorus reacts with chlorine to form PCl_3, which vaporized due to exothermic heat, vapor passes through packed column and condenser which is externally cooled by cooling water. The distilled PCl_3 is transferred to storage tank and partly feed to the column as a reflux.


Cl2
(0.8)
P4
(Phosphorous
)
0.23
P4 Drum
Melter
0.23
Liquid
P4 Day
Tank
Reactor
Caustic lye (0.05) KL/D
(0.95) KL/D H2O
To Atmosphere
Distillation
Scrubber
Condensor
0.03
1KL/D TO ETP
Product
1.0 MT PCl3

MASS BALANCE FOR PHOSPHORUS TRICHLORIDE (PCl3)
MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	Phosphorus	0.23
2	Chlorine	0.80
	Total	**1.03**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Phosphorus Trichloride	1.00	Product
2	Distillation loss	0.03	Scrubber
	Total	**1.03**	

J1: TRIMETHYL PHOSPHITE (TMP)

Reaction chemistry

$$PCl_3 + 3CH_3OH \longrightarrow P(CH_3O)_3 + 3HCl$$

Phosphorus Tri-Chloride — Methanol — TMP

$$HCl + NH_3 \longrightarrow NH_4Cl$$

Ammonia — Ammonium Chloride

Process Description :

Trimethyl Phosphite is manufactured by reaction of Phosphorus Trichloride and Methanol and the liberated Hydrogen chloride is neutralised with Ammonia to make Ammonium Chloride.

Following are the basic steps of manufacturing Trimethyl Phosphite.

Formation of Trimethyl Phosphite (Main Reaction) Methanol, Solvent with catalyst, and PCl_3 and NH_3 with equal molar proportion fed to reactor under stirring. The reaction is highly exothermic. The Phosphorus Trichloride react with methanol to form TMP and HCl. And Hydrochloric Acid is immediately react with NH_3 to convert into Ammonium Chloride.

The form reaction mass is sent to washer where the slightly Ammonical Water is fed and stirred mixture is fed to separator.

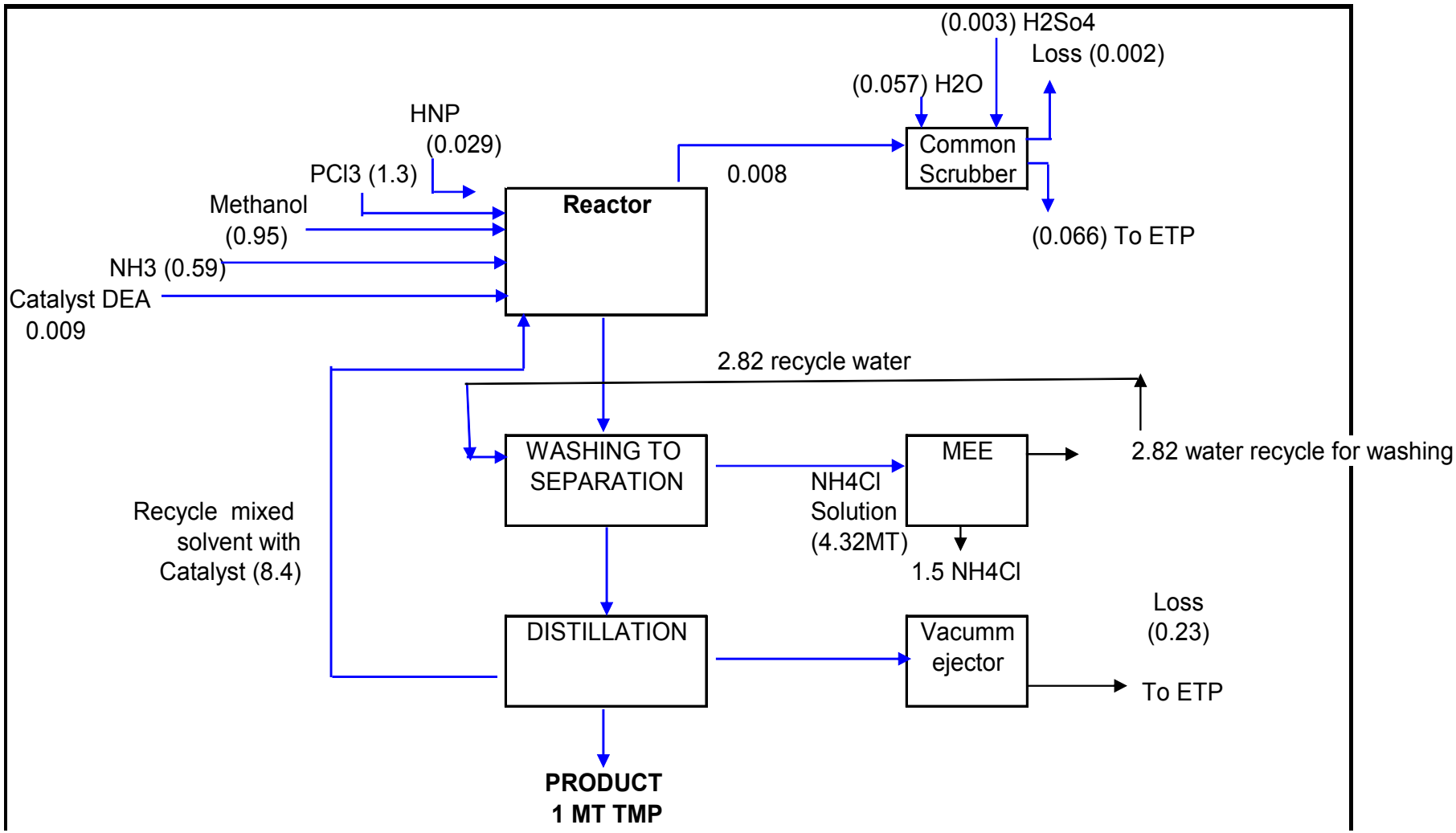
The mixture of organic layer containing TMP and Aqueous layer containing Ammonium Chloride gets separated. The organic layer containing TMP is sent to series of purification/distillation columns, while the aqueous layer containing NH_4Cl is sent to NH_4Cl recovery plant.

The low boilers are stripped in the first distillation column while TMP along with the solvent sent for further purification to next distillation column.

The distillation is carried out under vacuum where the pure 99% + Trimethyl Phosphite is getting distilled out from the top of the column while the solvent alongwith catalyst will be collected from the bottom of the column continuously and recycled back in first steps of reaction.

The distilled product is stored under the nitrogen atmosphere in storage tank**.**

SCHEMATIC FLOW DIAGRAM OF TMP



MASS BALANCE FOR TRIMETHYL PHOSPHITE (TMP)
MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	Phosphorus Trichloride	1.3
2	Methanol	0.95
3	Ammonia	0.59
4	Recycle Water	2.82
	Fresh Water	0.057
5	Catalyst	0.009
6	Solvent	0.029
7	Recycle Mixed solvent with catalyst	8.4
8	H2SO4	0.003
	Total	**14.15**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	TMP	1.00	Product
2	Ammonium chloride	1.5	By Product
3	Mixed solvent with catalyst	8.4	Recycle
4	Water for washing	2.82	Recycle
5	Water for ETP	0.29	
6	Losses	0.148	Evaporation
	Total	**14.15**	

J2: TRIETHYL PHOSPHITE (TEP)

Reaction chemistry

PCl_3 + $3C_2H_5OH$ ⟶ $P(C_2H_5O)_3$ + 3HCl

Phosphorus Tri-Chloride — Ethanol — TEP

$HCl + NH_3 \longrightarrow NH_4Cl$

Ammonia — Ammonium Chloride

Process Description :

Tri Ethyl Phosphite is manufactured by reaction of Phosphorus Trichloride and Ethanol and the liberated Hydrogen chloride is neutralised with Ammonia to make Ammonium Chloride.

Following are the basic steps of manufacturing Triethyl Phosphite.

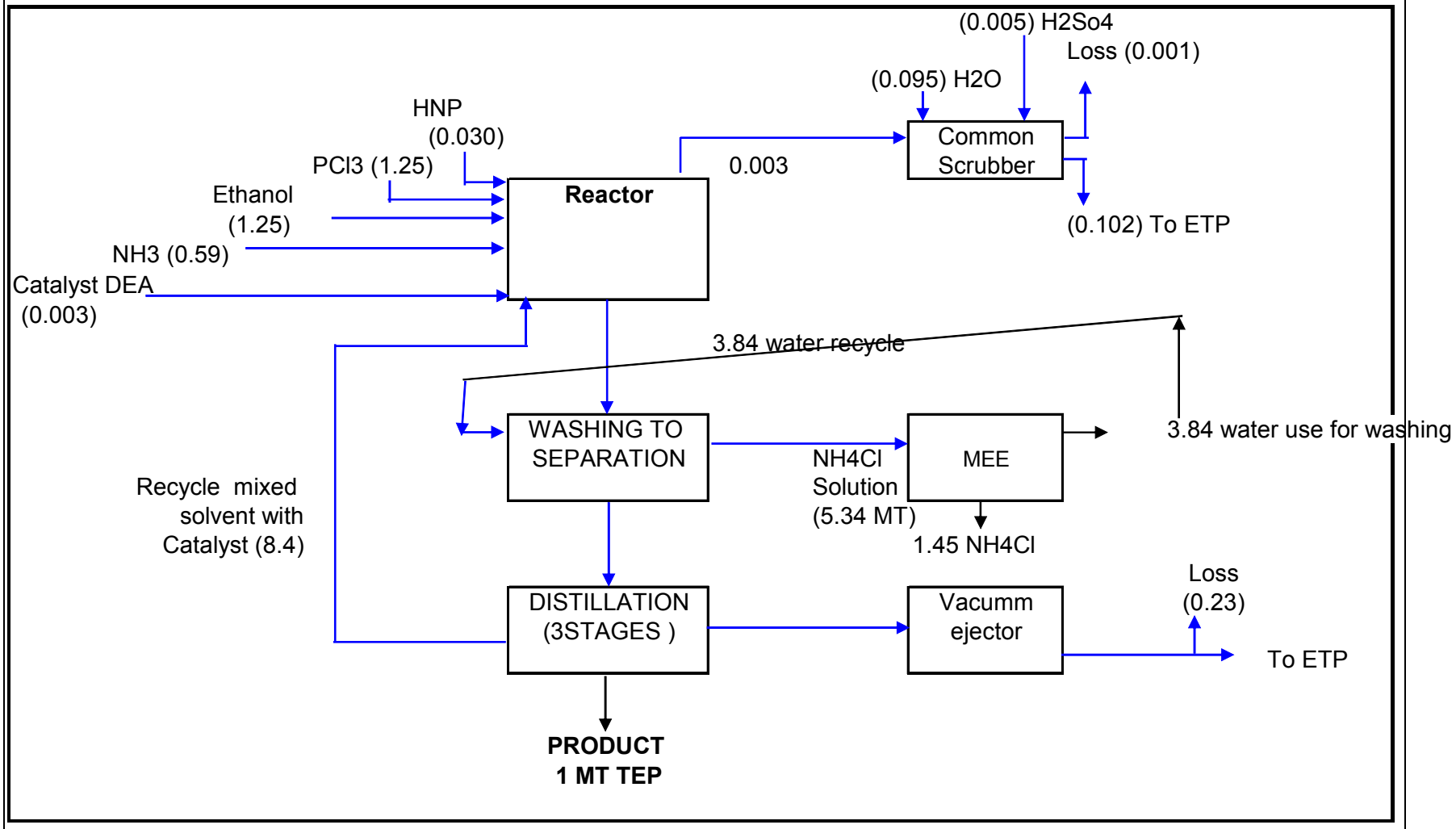
Formation of Triethyl Phosphite (Main Reaction) Ethanol, Solvent with catalyst,

and PCl_3 and NH_3 with equal molar proportion fed to reactor under stirring. The reaction is highly exothermic. The Phosphorus Trichloride react with methanol to form TEP and HCl. And Hydrochloric Acid is immediately react with NH_3 to convert into Ammonium Chloride.

The form reaction mass is sent to washer where the slightly Ammonical Water is fed and stirred mixture is fed to separator. The mixture of organic layer containing TMP and Aqueous layer containing Ammonium Chloride gets separated. The organic layer containing TEP is sent to series of purification/distillation columns, while the aqueous layer containing NH_4Cl is sent to NH_4Cl recovery plant.

The low boilers are stripped in the first distillation column while TEP along with the solvent sent for further purification to next distillation column. The distillation is carried out under vacuum where the pure 99% + Triethyl Phosphite is getting distilled out from the top of the column while the solvent along with catalyst will be collected from the bottom of the column continuously and recycled back in first steps of reaction. The distilled product is stored under the nitrogen atmosphere in storage tank.

SCHEMATIC FLOW DIAGRAM OF TEP



MASS BALANCE FOR TRIETHYL PHOSPHITE (TEP)
MATERIAL INPUT (QUANTITY IN MT)

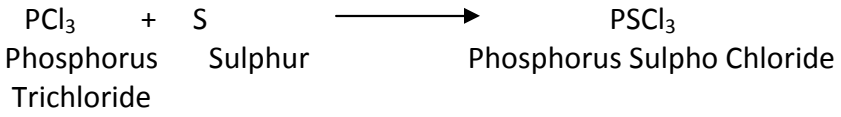
Sr. No.	Material	1 MT product
1	Phosphorus Trichloride	1.25
2	Ethanol	1.25
3	Ammonia	0.59
4	Recycle Water	3.84
5	Fresh water	0.095
6	Catalyst	0.003
7	Solvent	0.030
8	Recycle Mixed solvent with catalyst	8.4
9	H2SO4	0.005
	Total	**15.46**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	TEP	1.00	Product
2	Ammonium chloride	1.45	By Product
3	Mixed solvent with catalyst	8.4	Recycle
4	Water for washing	3.84	Recycle
5	Effluent	0.332	ETP
6	Losses	0.438	Evaporation
	Total	**16.983**	

K1: PHOSPHORUS SULPHO TRICHLORIDE

Reaction chemistry



Process Description :

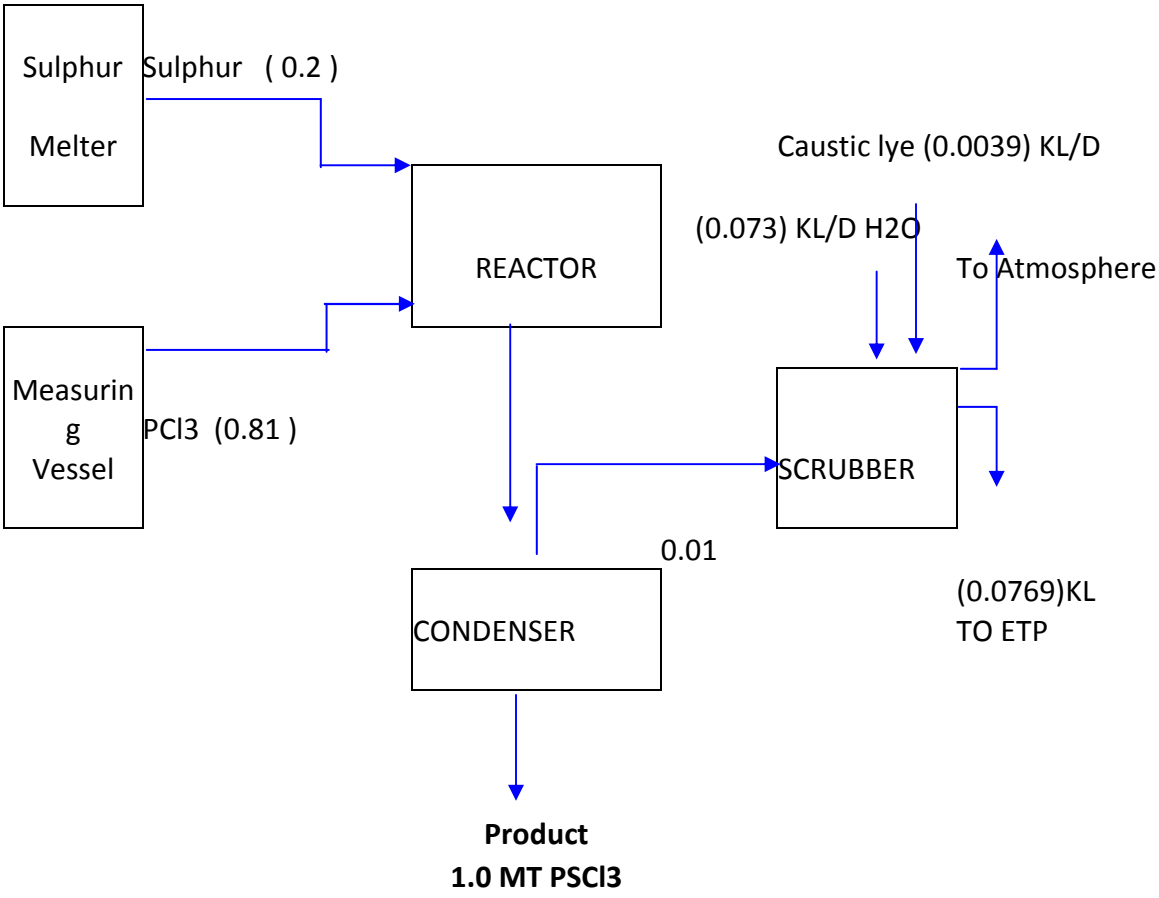
First of all Sulphur is charged into the Sulphur melter. Measured quantity of molten Sulphur is charged in $PSCl_3$ Reactor from Sulphur melter. In reactor residual charge of $PSCl_3$ and suitable activator is already present in reactor. Measured quantity of PCl_3 is charged in Reactor from PCl_3 measuring vessel in reactor.

In reactor Phosphorus Trichloride is reacting with molten Sulphur at elevated

temperature in presence of suitable activator to form Phosphorus Sulphochloride($PSCl_3$

)and product $PSCl_3$ is distilled out and transferred to $PSCl_3$ storage Tank.

PSCL3 FLOW DIAGRAM



MASS BALANCE FOR PHOSPHORUS SULPHO CHLORIDE ($PSCl_3$)
MATERIAL INPUT (QUANTITY IN MT)

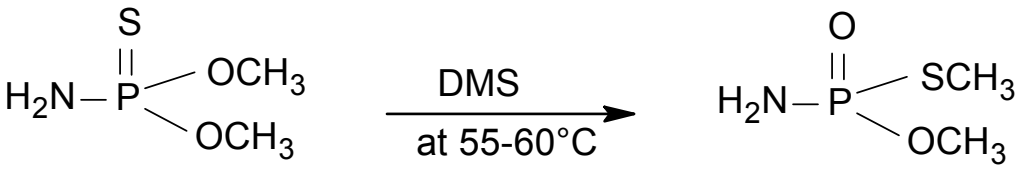
Sr. No.	Material	1 MT product
1	Phosphorus Trichloride	0.81
2	Sulphur	0.20
	Total	**1.01**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Phosphorus sulpho chloride	1.00	Product
2	Residue and Scrubber	0.01	
	Total	**1.01**	

L1 : METHAMIDOPHOS

Reaction chemistry



DMPAT

M.F.=$C_2H_8O_2PSN$

M.wt.=141

Methamidophos

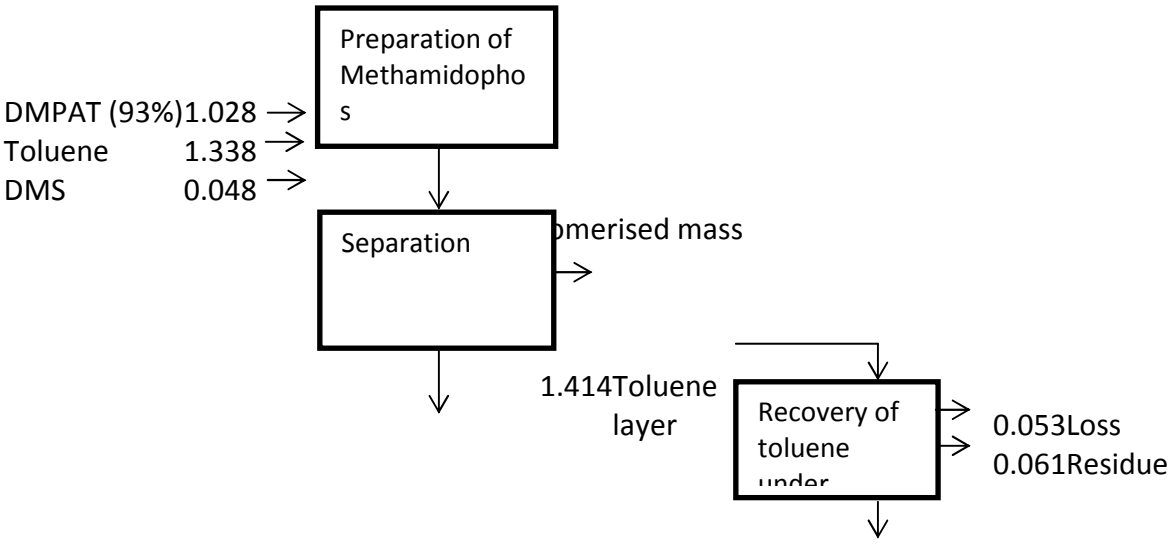
M.F.=$C_2H_8O_2PSN$

M.wt.=141

Brief Process

DMPAT is reacting with Dimethyl sulphate at elevated temperature in presence of Toluene as solvent. After completion of reaction recover the solvent to obtain Methamidophos.

MATERIAL BALANCE FOR METHAMIDOPHOS



1.000 MT Methamidophos (72%)

1.30 Toluene recycle to reaction mass

MASS BALANCE FOR METHAMIDOPHOS
MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	**Material**	**1 MT product**
1	DMPAT	1.028
2	Toluene	1.338
3	Dimethyl Sulphate	0.048
	Total	**2.414**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	**Material**	**1 MT product**	
1	Methamidophos	1.00	Product
2	Toluene	1.30	Recover
3	Loss	0.053	Distillation
4	Residue	0.061	
	Total	**2.414**	

M1: PHOSPHORUS ACID

Reaction chemistry

PCl3 + 3 H2O ⟶ H3PO3 + 3HCl

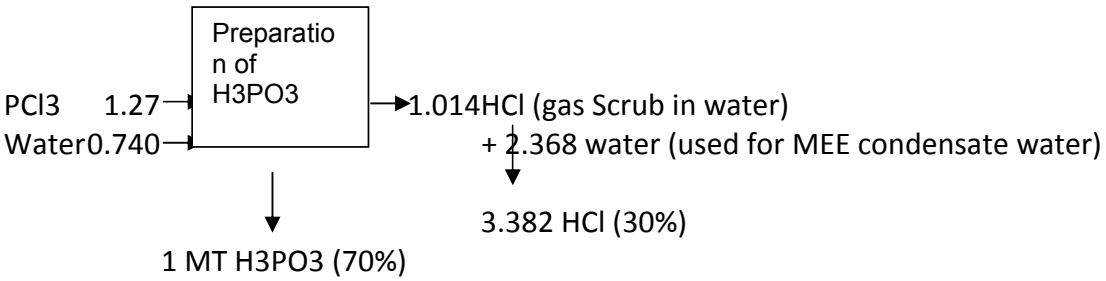
Phosphorus Trichloride **water** **Phosphorus acid** **Hydrochloric acid**

Brief Process

Phosphorus trichloride in presence of water reacts to form phosphorus acid and HCl is liberated

Which is scrubbed in water and is used as raw material.

MATERIAL BALANCE FOR PHOSPHORUS ACID



MASS BALANCE FOR PHOSPHORUS ACID

MATERIAL INPUT (QUANTITY IN MT)

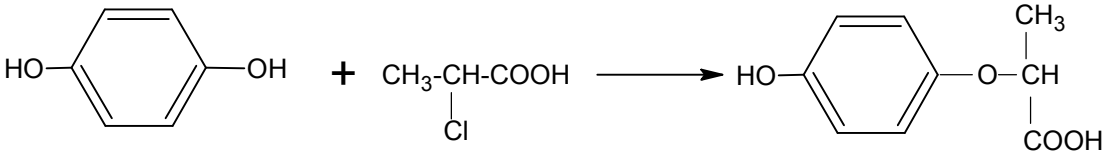
Sr. No.	Material	1 MT product
1	Phosphorus Trichloride	1.274
2	Water	0.740
	Total	**2.014**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Phosphorus acid	1.00	Product
2	HCl	1.014	By- Product (scrub in water)
	Total	**2.014**	

N1: 2-(4-HYDROXY PHENOXY) PROPIONIC ACID

Reaction chemistry



Hydroquinone

M.wt. = 110

2-Chloro propionic acid

M.wt. = 108.5

2-(4-Hydroxy Phenoxy) Propionic acid

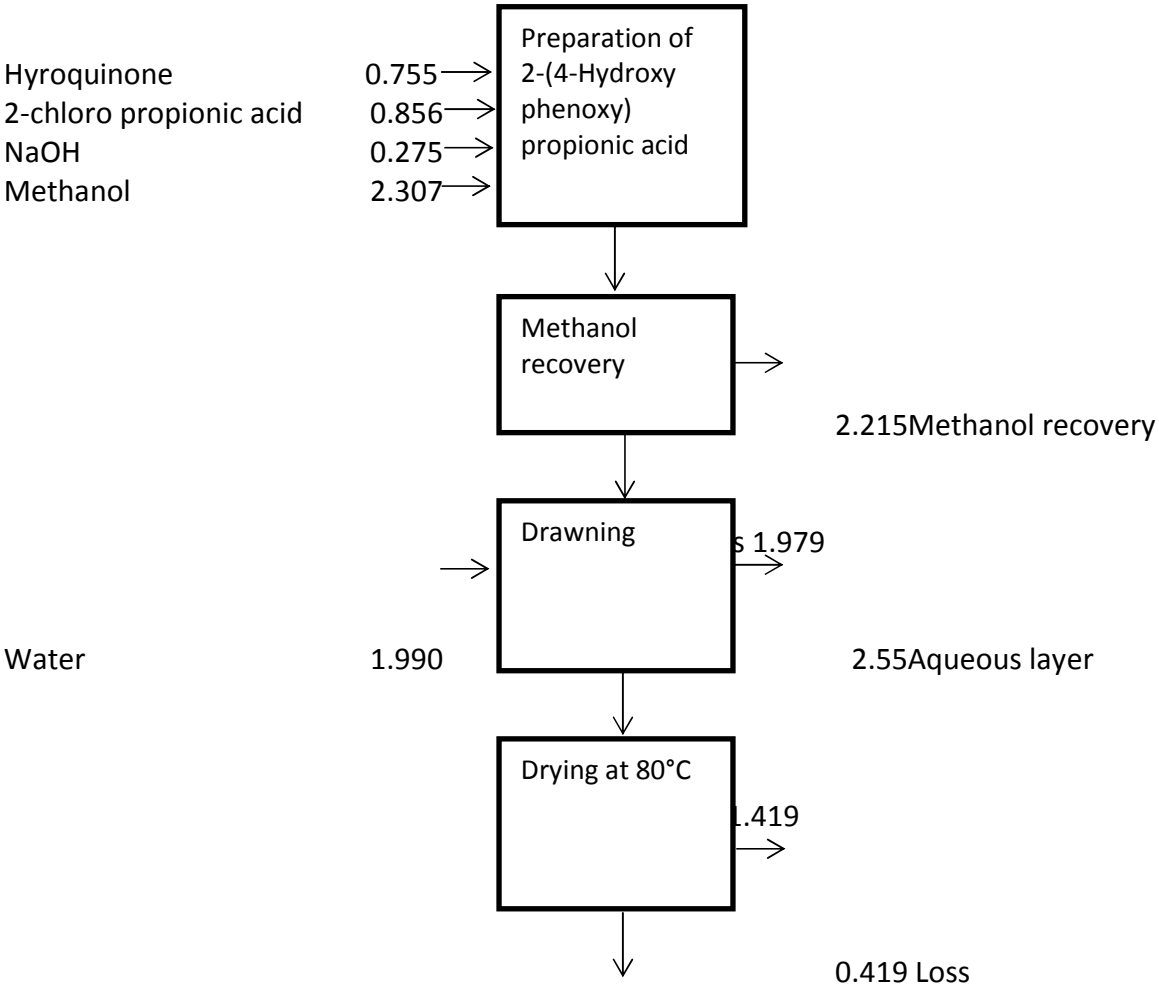
M.wt.= 182

Brief Process

Preparation of 2-(4-hydroxy phenoxy) propionic acid

Hydroquinone reacts with 2-chloropropionic acid in presence of NaOH as base and solvent Methanol to give 2-(4-hydroxy phenoxy) propionic acid

SCHEMATIC FLOW DIAGRAM OF 2-(4-Hydroxy phenoxy) propionic acid



1 MT 2-(4-hydroxy phenoxy) propionic acid

MASS BALANCE FOR 2-(4-HYDROXY PHENOXY) PROPIONIC ACID

MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	**Material**	**1 MT product**
1	Hydroquinone	0.755
2	2-chloro Propionic acid	0.856
3	NaOH flakes	0.275
4	Methanol	2.307
5	Water	1.990
	Total	**6.183**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	**Material**	**1 MT product**	
1	2-(4-hydroxy phenoxy) Propionic acid	1.00	Product
2	Methanol	2.215	Recover
3	Aqueous mass	2.55	To incinerator
4	Loss	0.418	
	Total	**6.183**	

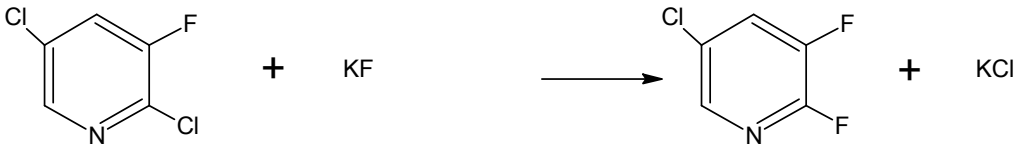
N2: 2,3-DIFLUORO-5-CHLORO PYRIDINE

Reaction chemistry

Stage-1

3- amino-2,5-dichloro pyridine	Hydrogen fluoride	2,5-dichloro-3-fluoro pyridine	ammonia
M.F.=$C_5H_4N_2Cl_2$	M.F.= HF	M.F.=$C_5H_2NFCl_2$	M.F.=NH3
M.wt.= 163	M.wt.= 20	M.wt.= 166	M.wt.=17

Stage-2



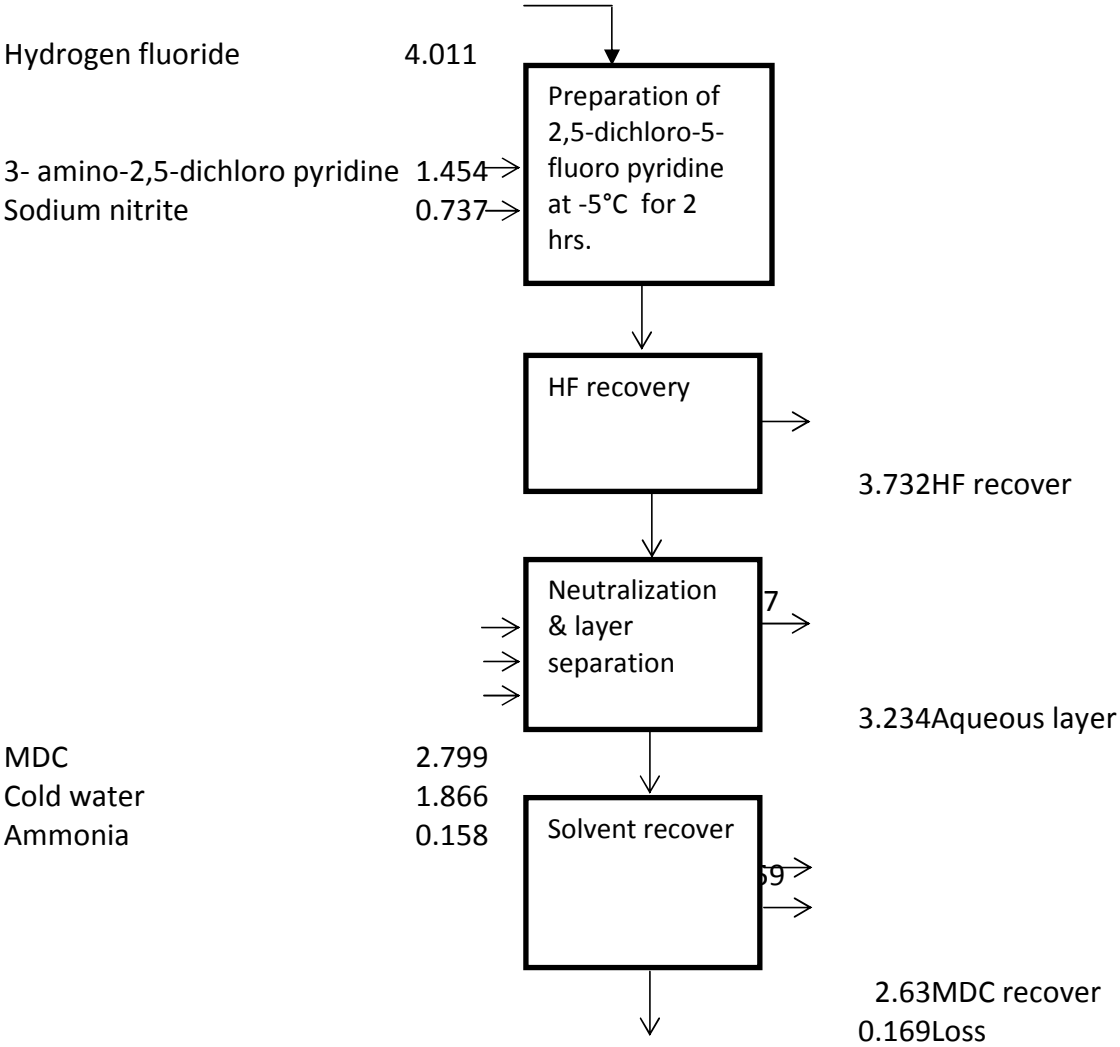
2,5-dichloro-3-fluoro pyridine	potassium fluoride	5-chloro-2,3-difluoro pyridine	Potassium chloride
M.F.=$C_5H_2NFCl_2$	M.F.= KF	M.F.=$C_5H_2NF_2Cl$	M.F.=KCl
M.wt.= 166	M.wt.= 58	M.wt.= 149.5	M.wt.= 74.5

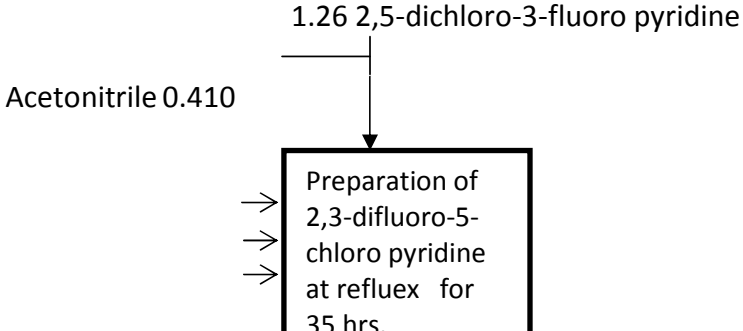
Brief Process

Preparation of 2,3-difluoro-5-chloro pyridine

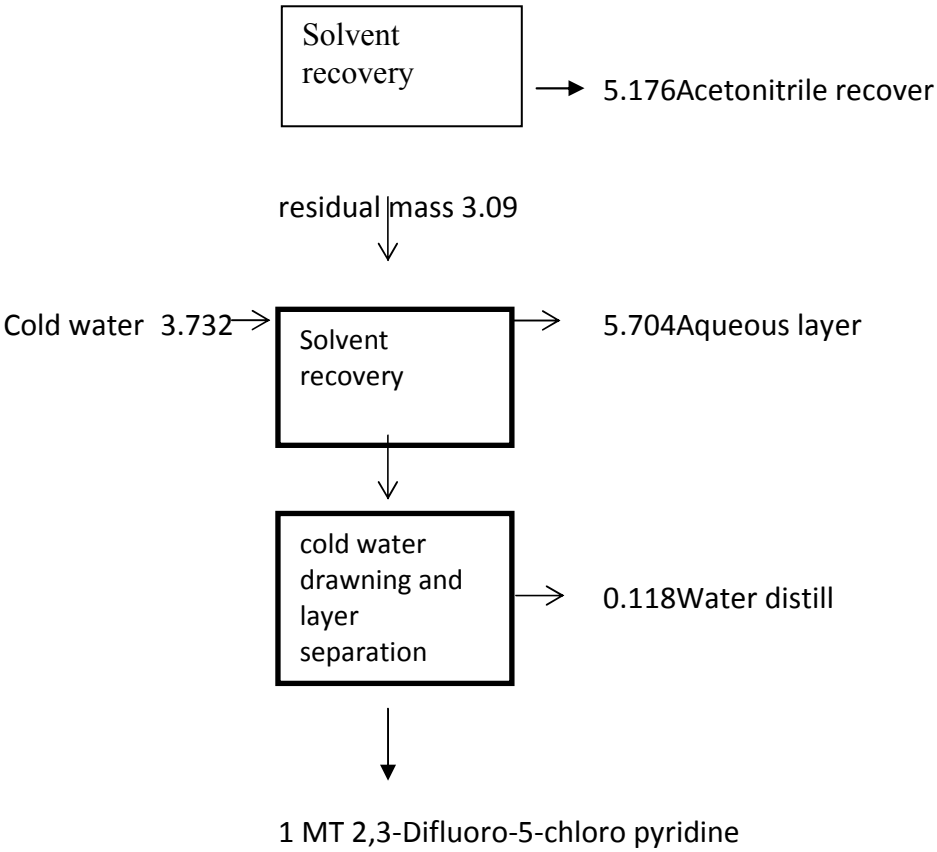
3- amino-2,5-dichloro pyridine is added slowly to hydrogen fluoride which further is reacted with sodium nitrite. Excess Hydrogen fluoride is distilled off the residue is dilutated with Methylene dichloride and extracted and neutralized with ammonium

hydroxide solution. The organic layer is concentrated to give2,5-dichloro-3-fluoro pyridine to which is added potassium fluoride solution in presence of acetonitrile under reflex . after completion of the reaction the solvent is distilled off to yield colorless oil layer of 5-chloro-2,3-difluoro pyridine





Potassium fluoride 1.327
Cesium fluoride 0.231
Acetonitrile 5.038



MASS BALANCE FOR 2,3-DDIFLUORO-5-CHLORO PYRIDINE

MATERIAL INPUT (QUANTITY IN MT)

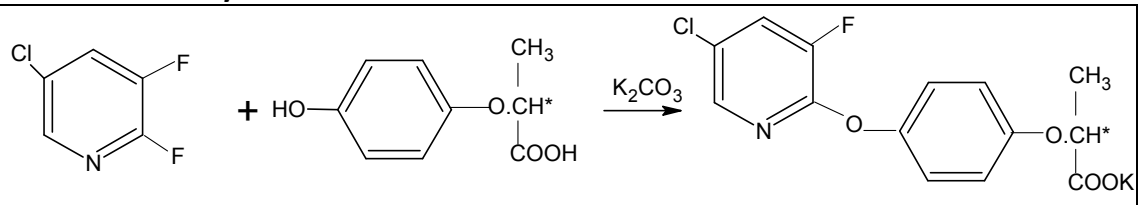
Sr. No.	Material	1 MT product
1	Hydrogen fluoride	4.011
2	3-amino-2,5-dichloro pyridine	1.454
3	Sodium nitrite	0.737
4	MDC	2.799
5	Ammonia	0.158
6	Acetonitrile	5.448
7	Potassium fluoride	1.327
8	Cesium fluoride	0.231
9	Water	5.598
	Total	**21.763**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	2,3-difluoro-5-chloro pyridine	1.00	Product
2	Hydrogen fluoride	3.732	Recover
3	MDC	2.63	Recover
4	Acetonitrile	5.176	Recover
5	Aqueous mass	8.938	To incinerator
6	Losses	0.169	Distillation
7	Water	0.118	
	Total	**21.763**	

N3: CLODINAFOP PROPARGYL

Reaction chemistry



2,3-difluoro-5-chloro pyridine

M.F.=$C_5H_2ClF_2N$

M.wt.=149.5

2-(4-hydroxy phenoxy) propionic acid

M.F.=$C_9H_{10}O_4$

M.wt.=182

(+)-2-[4-(5-chloro-3-fluoropyridin-2-yloxy)-phenoxy propionic acid

M.F.=$C_{14}H_{11}ClFNO_4$

M.wt.=311.5

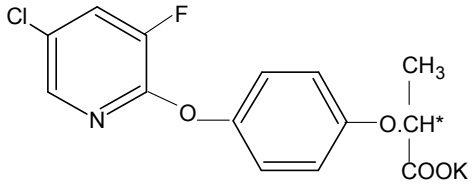
+ $KHCO_3$ + KF

Potassium bicarbonate

M.wt.=100

Potassium fluoride

M.wt.=58



+ $ClCH_2$-C≡CH

(+)-2-[4-(5-chloro-3-fluoropyridin-2-yloxy)-phenoxy propionic acid

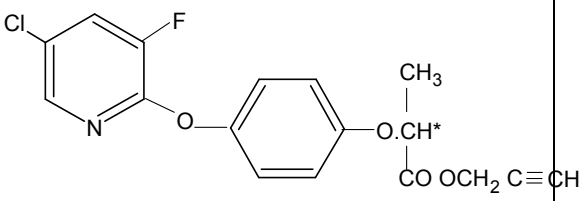
M.F.=$C_{14}H_{11}ClFNO_4$

M.wt.=311.5

Propargyl chloride

M.F.=C_3H_3Cl

M.wt.= 74.5

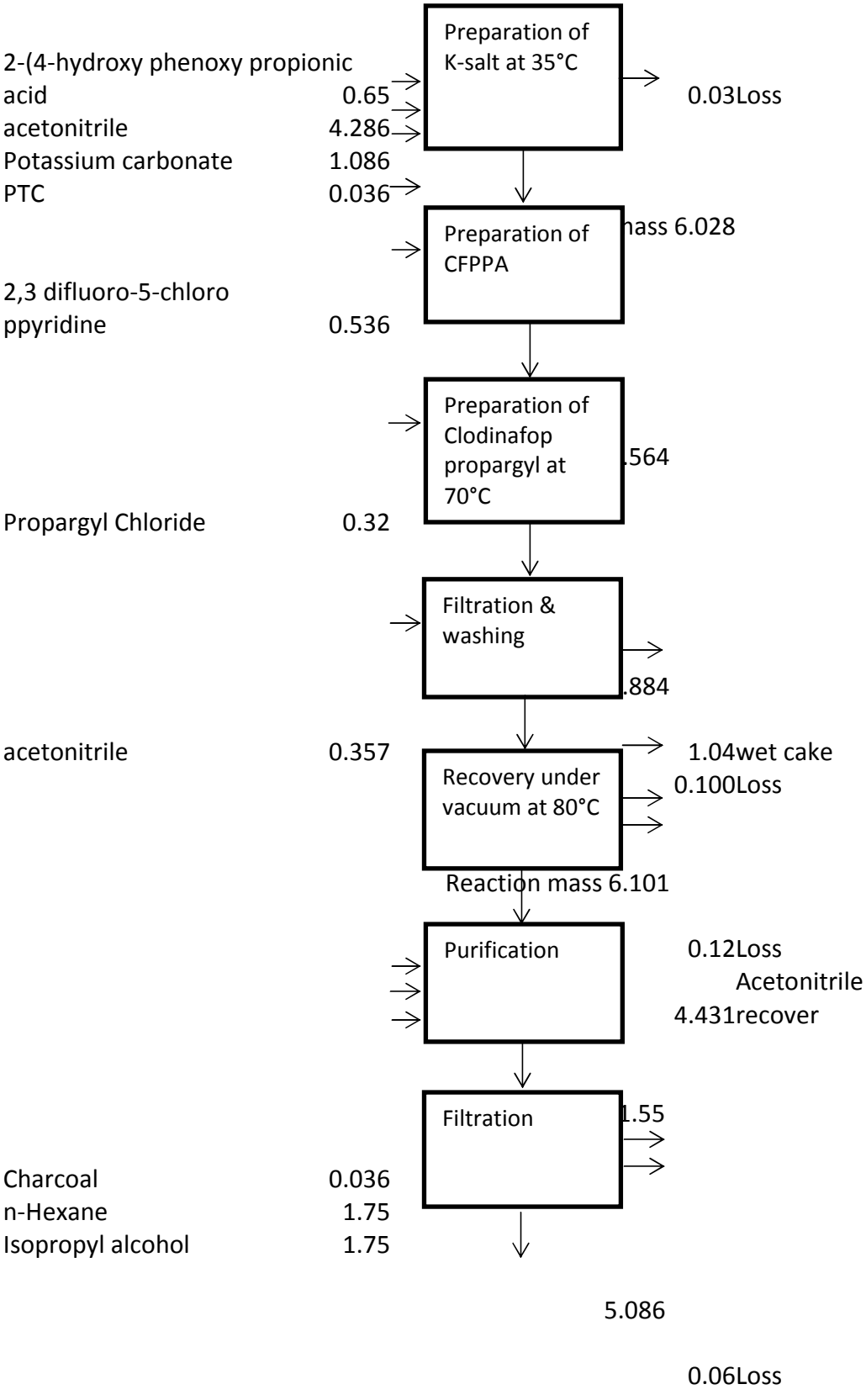


Clodinofop propargyl

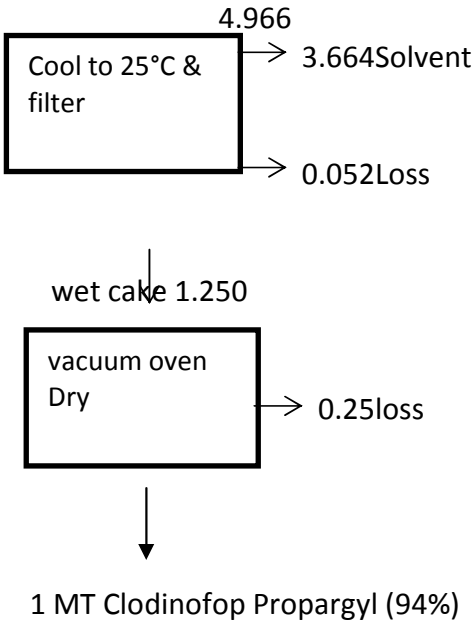
M.F.=$C_{17}H_{13}ClFNO_4$

M.wt.=349.5

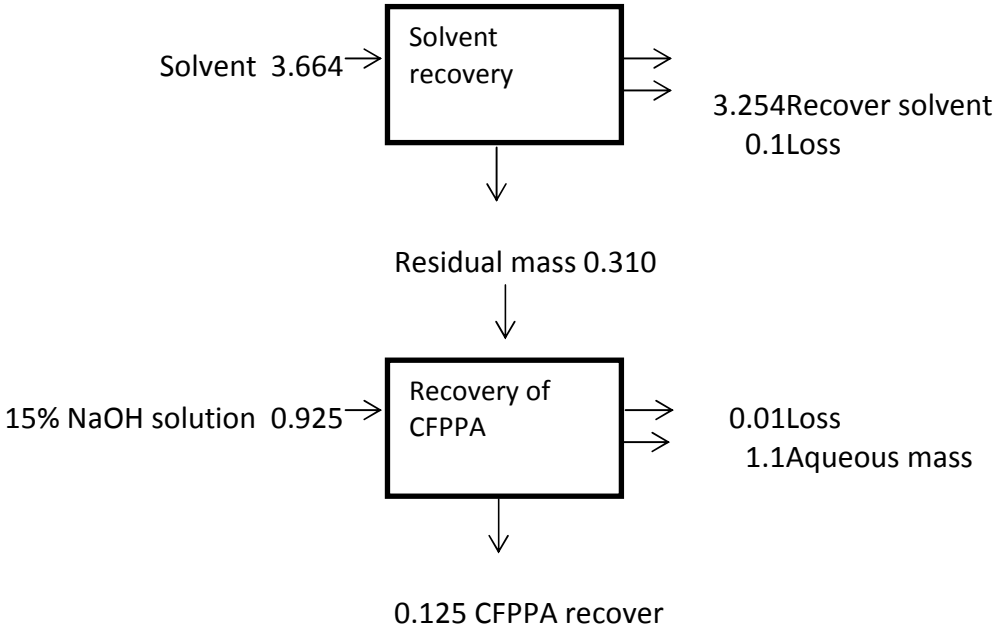
SCHEMATIC FLOW DIAGRAM OF CLODINOFOP PROPARGYL



0.06Wet cake carbon



2-(4-chloro-3-fluoropyridin-2-yloxy)-phenoxy propionic acid (CFPPA) recoery



MASS BALANCE FOR CLODINAFOP PROPARGYL
MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	2-(4-hydroxy phenoxy) Propionic acid	0.65
2	Potassium carbonate	1.09
3	Catalyst	0.04
4	2,3-difluoro –5-chloro pyridine	0.54
5	Propargyl chloride	0.32
6	Acetonitrile	4.29
7	n-Hexane	1.75
8	Isopropyl alcohol	1.75
9	Charcoal	0.04
10	NaOH solution	0.93
	Total	**11.4**

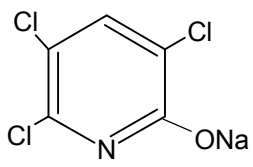
MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Clodinafop Propargyl	1.00	Product
2	Salt	1.06	By Product
3	Acetonitrile	3.669	Recover
4	Carbon wet cake	0.06	
5	Solvent	3.664	Recover
6	Losses	0.722	Distillation
7	Aqueous mass	1.1	To incinerator
8	CFPPA	0.125	Recover
9			
	Total	**11.4**	

N4: TRICLOPYR ACID

Reaction chemistry

Stage-1



+ Cl CH_2COOCH_3

soduim salt of 2-hydroxy 3,5,6-tricloro pyridine

M.F.:-C_5HCl_3NONa

M.wt.: 220.5

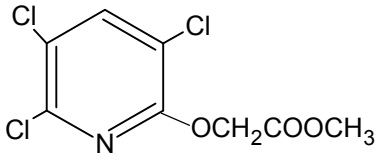
Methyl chloro acetate

M.F. :-$C_3H_5O_2Cl$

M.wt.: 108.5

Toluene

PTC



+ NaCl

Triclopyr methyl ester

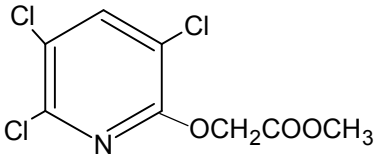
M.F.:-$C_8H_6NCl_3O_3$

M.wt.:-270.5

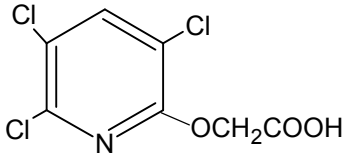
soduim chloride

M.wt.:- 58.5

Stage-2



+ NaOH $\xrightarrow{H_2SO_4}$



Triclopyr methyl ester

M.F.:-$C_8H_6NCl_3O_3$

M.wt.:-270.5

Sodium Hydroxide

M.wt.:-40

Triclopyr acid

M.F.:-$C_7H_4NCl_3O_3$

M.wt.:-256.5

Process

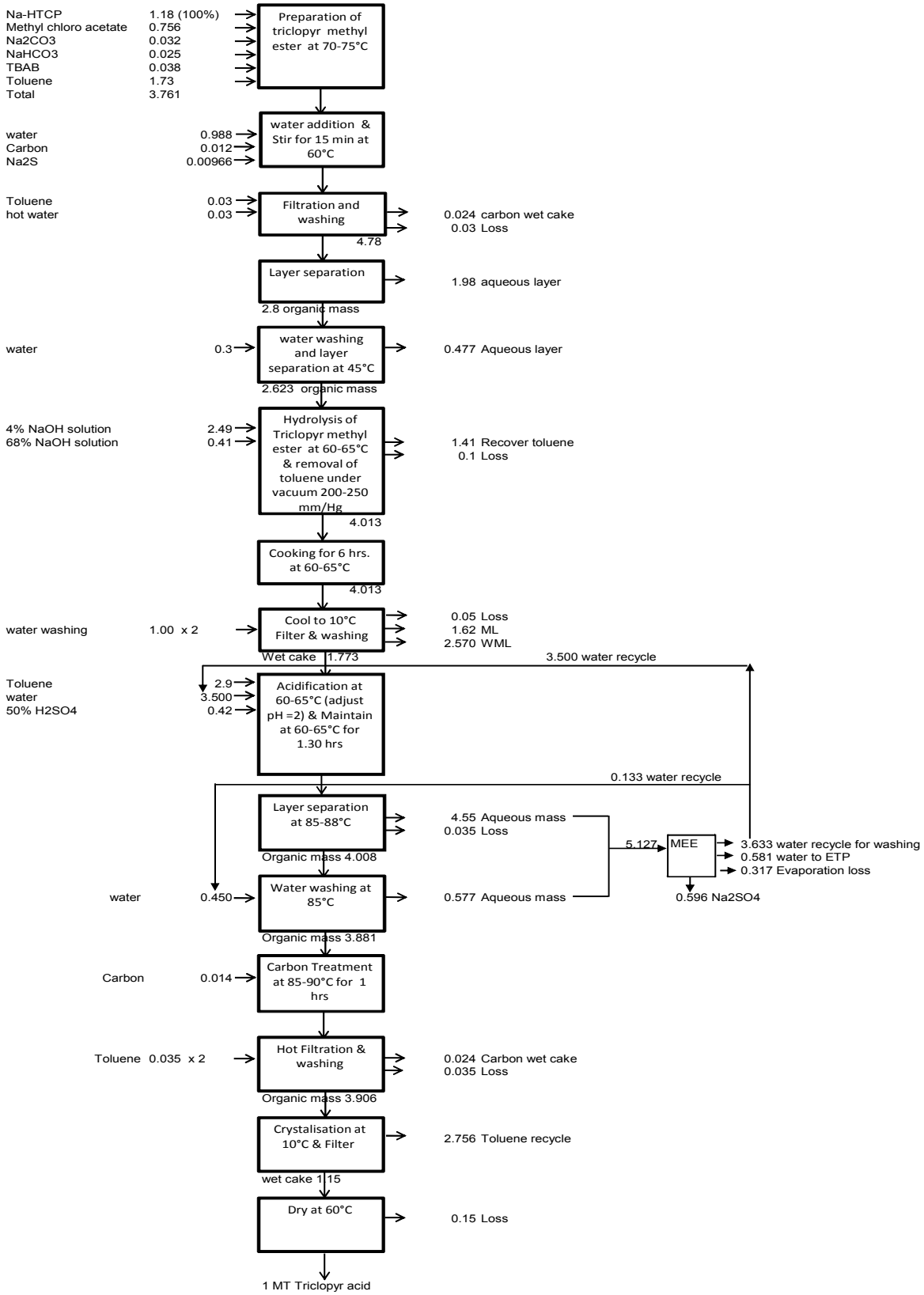
The Manufacturing process of Triclopyr butotyl ester involve in three step

Sodium salt of 2-Hydroxy 3,4,5-trichloro pyridine is reacted with methyl Chloro acetate in presence of toluene as a solvent and PTC as a catalyst to give Triclopyr methyl ester and Solvent is remove under vacuum.

Triclopyr methyl ester is hydrolyzed with sodium hydroxide to give Triclopyr acid.

Flow diagram for 1MT Triclopyr acid

Material balance of Triclopyr acid 98%



MASS BALANCE FOR TRICLOPYR ACID
MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	Na-HTCP	1.18
2	Methyl chloro acetate	0.756
3	Na2CO3	0.032
4	NaHCO3	0.025
5	TBAB	0.038
6	Toluene	4.73
7	Water	7.268
8	Carbon	0.026
9	Na2S	0.00966
10	NaOH	2.9
11	50% H2SO4	0.42
	Total	**17.385**

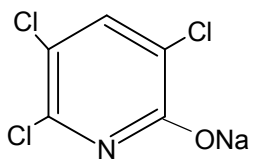
MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Triclopyr acid	1.00	Product
2	Na2SO4	0.596	By Product
3	Toluene	4.166	Recover
4	Aqueous mass	6.647	To incinerator
5	Water	3.633	Recover
6	Losses	0.400	
7	Effluent	0.581	ETP
8	Evaporation loss	0.314	
9	Carbon wet cake	0.048	
	Total	**17.385**	

N5: TRICLOPYR BUTOTYL ESTER

Reaction chemistry

Stage-1



+ Cl CH_2COOCH_3

soduim salt of 2-hydroxy 3,5,6-tricloro pyridine

M.F.:-C_5HCl_3NONa

M.wt.: 220.5

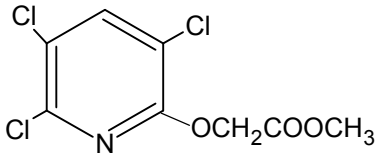
Methyl chloro acetate

M.F. :-$C_3H_5O_2Cl$

M.wt.: 108.5

Toluene

PTC



+ NaCl

Triclopyr methyl ester

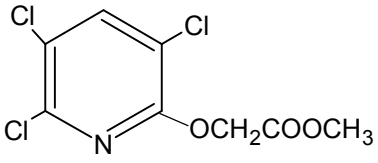
M.F.:-$C_8H_6NCl_3O_3$

M.wt.:-270.5

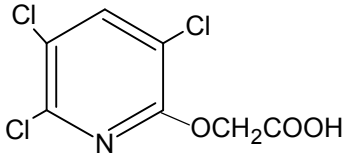
soduim chloride

M.wt.:- 58.5

Stage-2



+ NaOH $\xrightarrow{H_2SO_4}$



Triclopyr methyl ester

M.F.:-$C_8H_6NCl_3O_3$

M.wt.:-270.5

Sodium Hydroxide

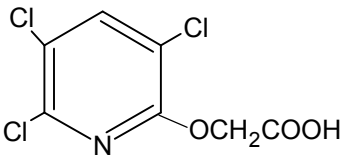
M.wt.:-40

Triclopyr acid

M.F.:-$C_7H_4NCl_3O_3$

M.wt.:-256.5

Stage-3



+ $HOCH_2CH_2\text{-}O\text{-}C_4H_9$

Triclopyr acid

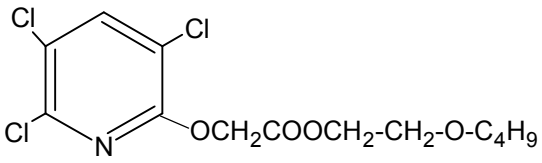
M.F.:-$C_7H_4NCl_3O_3$

M.wt.:-256.5

Butyl cellosolve

M.F.= $C_6H_{14}O_2$

M.wt.=118



+ H_2O

Triclopyr Butotyl ester

M.F.:-$C_{13}H_{16}NCl_3O_4$

M.wt.:-356.5

Process

The Manufacturing process of Triclopyr butotyl ester involve in three step

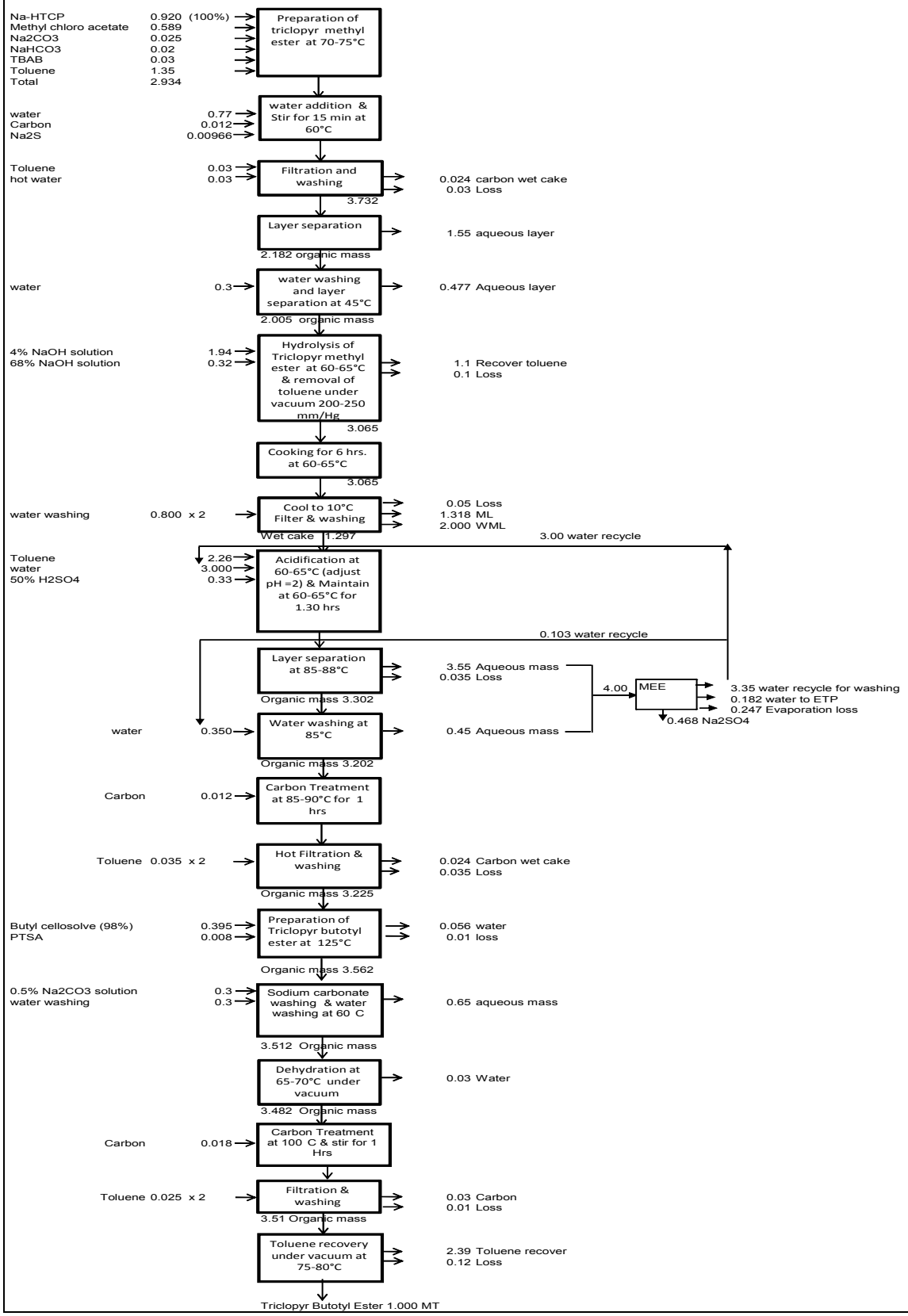
Sodium salt of 2-Hydroxy 3,4,5-trichloro pyridine is reacted with methyl Chloro acetate in presence of toluene as a solvent and PTC as a catalyst to give Triclopyr methyl ester and Solvent is remove under vacuum.

Triclopyr methyl ester is hydrolyzed with sodium hydroxide to give Triclopyr acid.

Triclopyr acid is reacted with Butyl cellosolve at elevated temperature in presence of solvent toluene to form Triclopyr butotyl ester.

Flow diagram for 1MT Triclopyr Butotyl Ester

Material balance of Triclopyr butotyl ester 98%



MASS BALANCE FOR TRICLOPYR BUTOTYL ESTER
MATERIAL INPUT (QUANTITY IN MT)

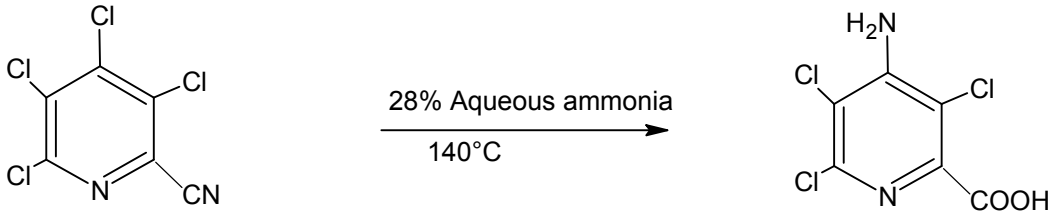
Sr. No.	Material	1 MT product
1	Na-HTCP	0.920
2	Methyl chloro acetate	0.589
3	Na2CO3	0.025
4	NaHCO3	0.02
5	TBAB	0.03
6	Toluene	3.76
7	Water	6.35
8	Carbon	0.042
9	Na2S	0.00966
10	NaOH	2.26
11	50% H2SO4	0.33
12	Butyl cellosolve	0.395
13	PTSA	0.008
14	0.5% N2CO3 solution	0.3
	Total	**15.038**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Triclopyr butotyl ester	1.00	Product
2	Na2SO4	0.468	By Product
3	Toluene	3.366	Recover
4	Aqueous mass	5.995	To incinerator
5	Water	3.312	Recover
6	Losses	0.390	
7	Effluent	0.182	ETP
8	Evaporation loss	0.247	
9	Carbon wet cake	0.078	
	Total	**15.038**	

N6: PICLORAM

Reaction chemistry



3,4,5,6-Tetra chloro picolinonitrile

M.F.= $C_6N_2Cl_4$

M.wt.=242

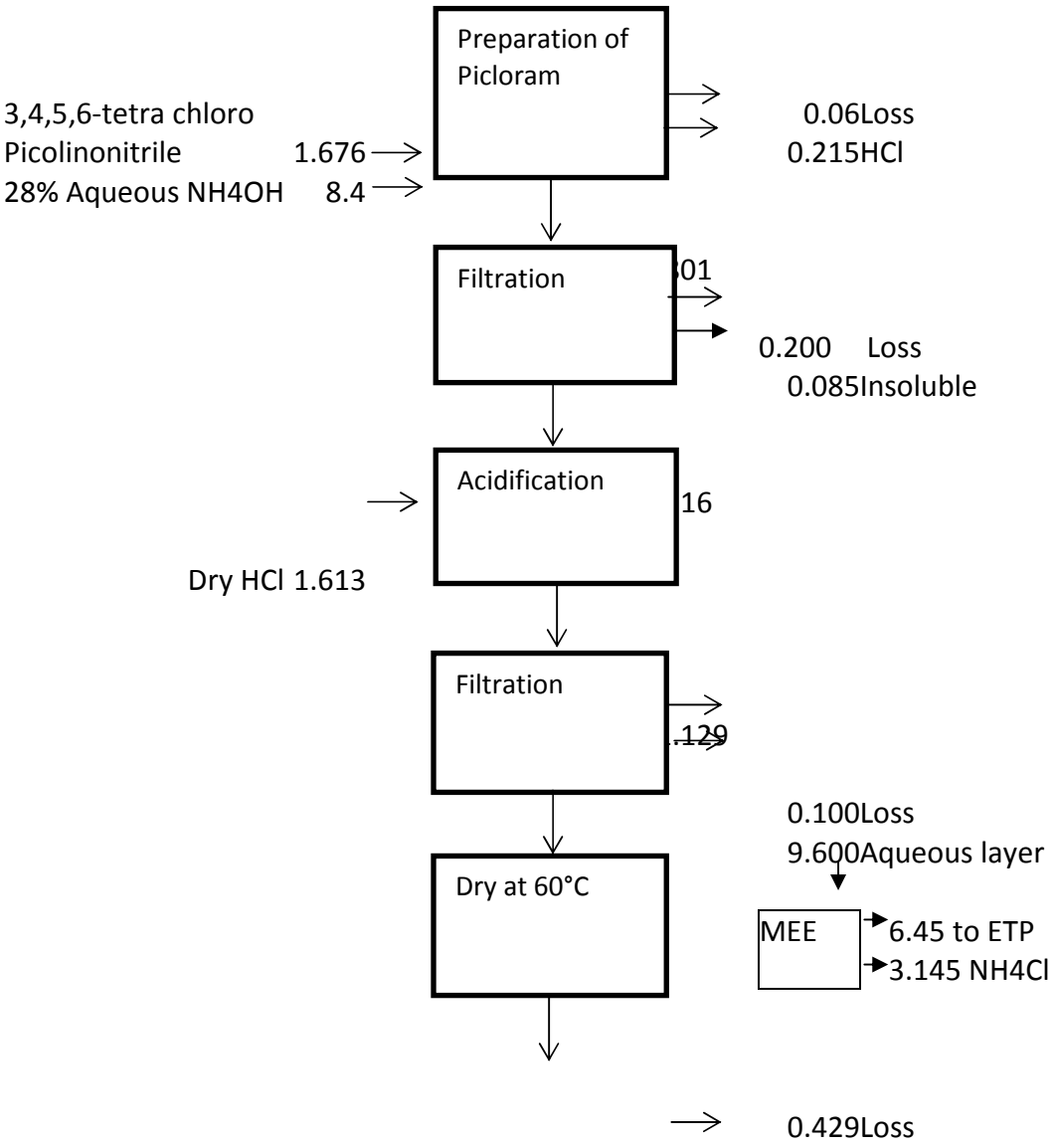
Picloram

M.F.=$C_6H_3N_2Cl_3O_2$

M.wt. = 241.5

Process

3,4,5,6 tetra Chloro picolinonitrile is reacted with 28% ammonium hydroxide under pressure at an elevated temperature. This results into formation of Picloram. The product is isolated by adding Hydrochloric acid.



1 MT Dry Picloram

MASS BALANCE FOR PICLORAM

MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	3,4,5,6-tetra chloro picolinonitrile	1.68
2	28% aqueous NH4OH	8.4
3	35% HCl	1.38
	Total	**11.46**

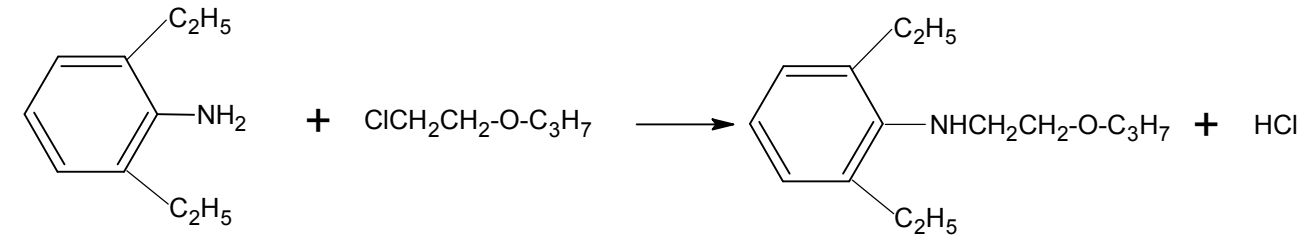
MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Picloram	1.00	Product
2	Aqueous mass	6.45	ETP
3	Losses	0.559	
4	HCl	0.215	By product
5	Insoluble	0.085	
6	Ammonium chloride	3.145	By product
	Total	**11.46**	

N7: PRETILACHLOR

Reaction chemistry

Step-I

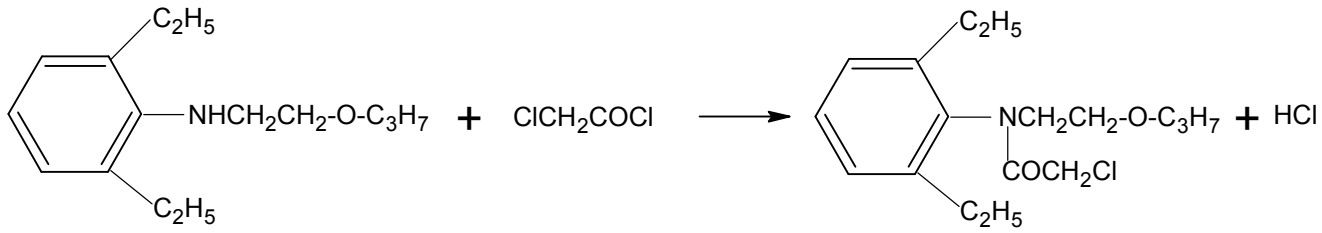


2,6-Diethyl aniline
M.Wt. 149

Propoxy ethyl chloride
M.Wt. 122.5

Diethyl Propoxy ethyl amine
M.Wt. 235

Step-II



Diethyl Propoxy ethyl amine
M.Wt. 235

Chloracetyl chloride
M.Wt. 113

Pretilachlor
M.Wt. 311.5

Brief Process

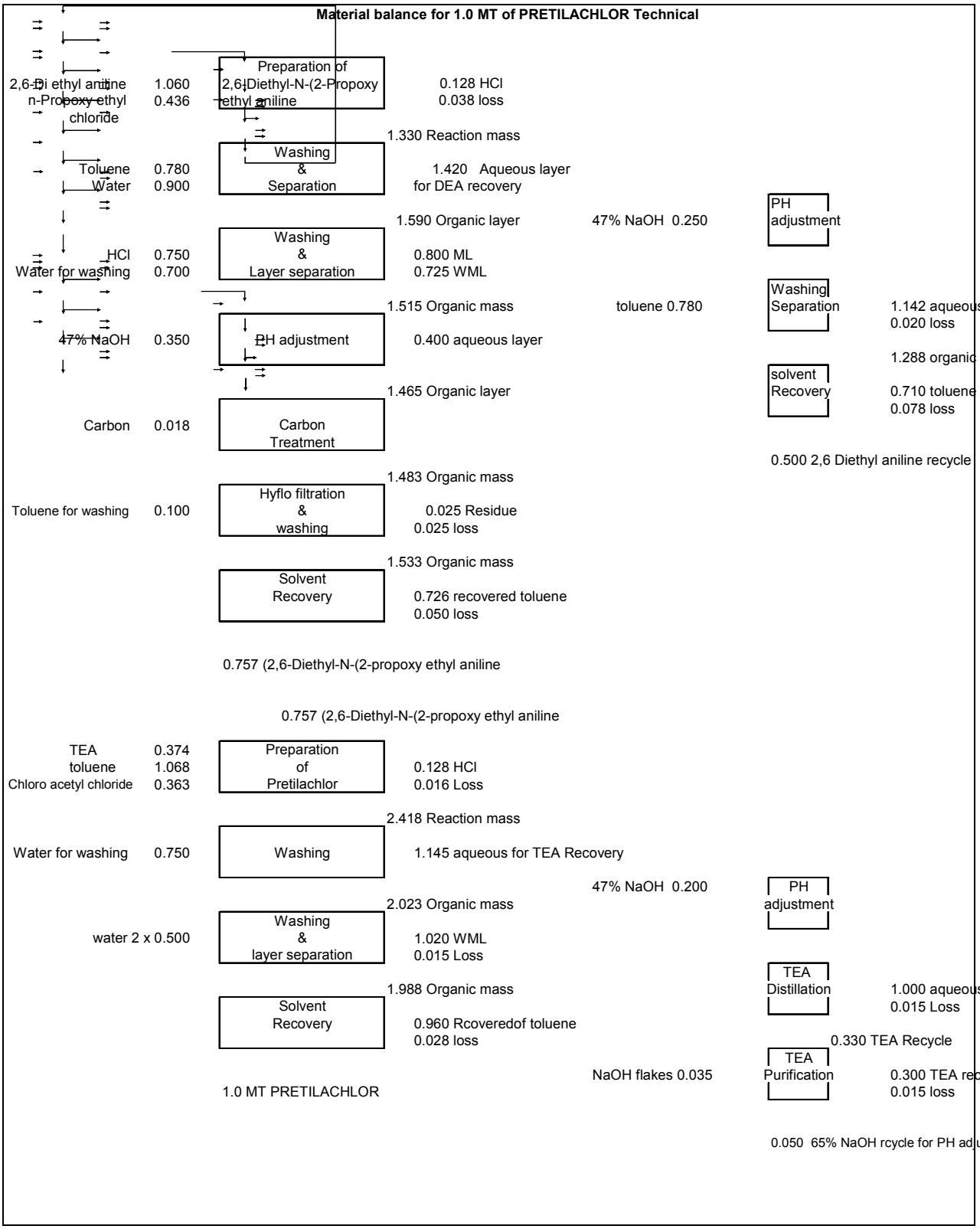
Stage:1

2,6 Diethyl aniline reacts with Propoxy ethyl chloride to form diethyl propoxy ethyl amine and Hydrochloric acid is liberated which is further scrub in water and use as raw material.

Stage :-2

Diethyl propoxy ethyl amine is reacts with chloro acetyl chloride to give Pretilachlor and hydrochloric acid is liberated which is further scrub in water and use as raw material

Material balance for 1.0 MT of PRETILACHLOR Technical



MASS BALANCE FOR PRETILACHLOR
MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	2,6-Diethyl aniline	1.060
2	n-Propoxy ethyl chloride	0.436
3	Toluene	2.728
4	Water	3.35
5	NaOH (47%)	0.835
6	HCl	0.750
7	TEA	0.374
8	Chloro acetyl chloride	0.363
9	Carbon	0.018
	Total	**9.914**

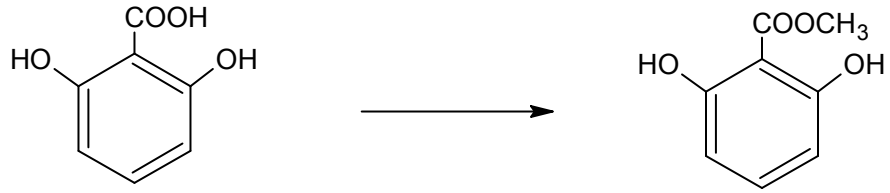
MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Pretilachlor	1.00	Product
2	Aqueous mass	5.087	To incinerator
3	2,6 DEA	0.500	Recover
4	Toluene	2.396	Recover
5	TEA	0.300	Recover
6	NaOH	0.050	Recover
7	HCl	0.256	By-Product
8	Losses	0.30	Distillation
9	Residue	0.025	
	Total	**9.914**	

N8: BISPYRIBAC SODIUM

Chemical Reaction:

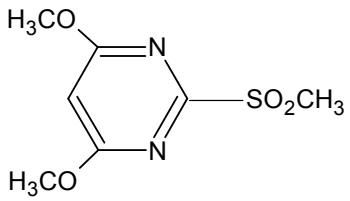
Step I : Preparation of methyl 2, 6-dihydroxy benzoate.



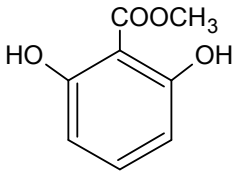
2, 6- dihydroxy benzoicacid
M. F. $C_7H_6O_4$
M. Wt. 154

Methyl 2, 6-dihydroxy benzoate
M. F. $C_8H_8O_4$
M. Wt. 168

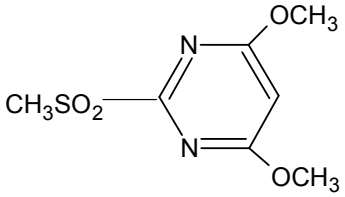
Step II : Preparation of Methyl- 2, 6- bis[(4, 6 - dimethoxypyrimidine- 2-yl)oxy] benzoate



+



+



4, 6 -dimethoxy- 2-methylsulfonyl pyrimidine

M. F. $C_7H_{10}O_4N_2S$

M. Wt. 218

Methyl 2, 6-dihydroxy benzoate

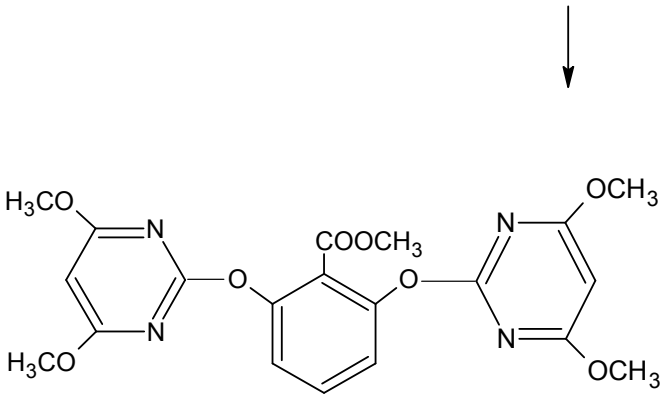
M. F. $C_8H_8O_4$

M. Wt. 168

4, 6 -dimethoxy- 2-methylsulfonyl pyrimidine

M. F. $C_7H_{10}O_4N_2S$

M. Wt. 218



+ $2\ SO_2\uparrow$ + $2\ CH_4\uparrow$

Methyl 2, 6 -bis[(4, 6-dimethoxypyrimidin- 2-yl)oxy]benzoate

M. F. $C_{20}H_{20}O_8N_4$

M. Wt. 444

Sulfur dioxide

M. F. O_2S

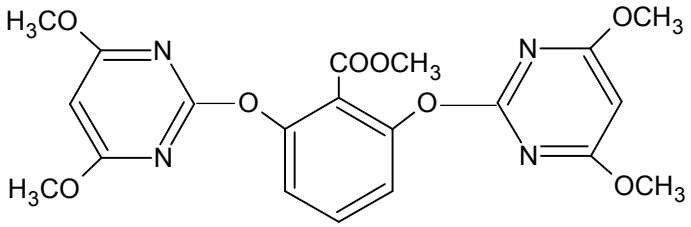
M. Wt. 64 x 2

Methane

M. F. CH_4

M. Wt. 16 x 2

Step III : Preparation of bispyribac sodium

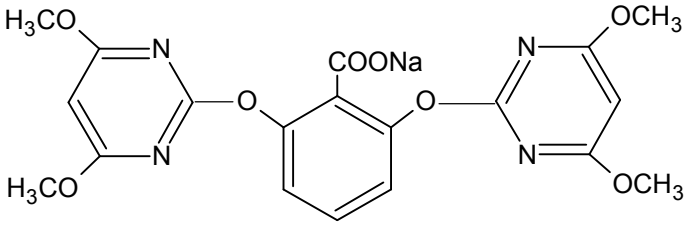


Methyl 2, 6 -bis[(4, 6-dimethoxypyrimidin- 2-yl)oxy]benzoate

M. F. $C_{20}H_{20}O_8N_4$

M. Wt. 444

Base ↓ NaOH



Bispyribac sodium

M. F. $C_{19}H_{17}O_8N_4Na$

M. Wt. 452

+ CH_3OH

Methanol

M. F. CH_4O

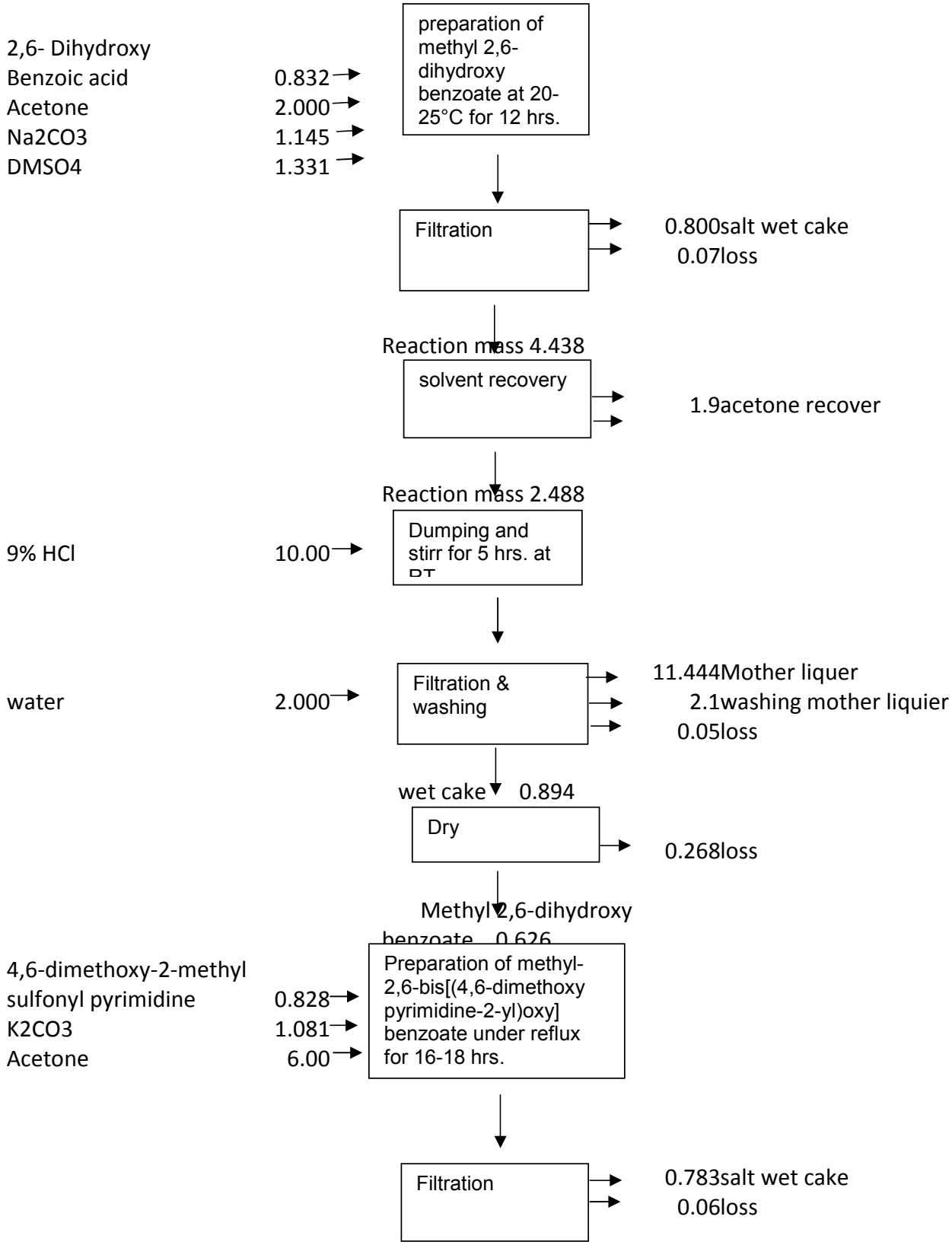
M. Wt. 32

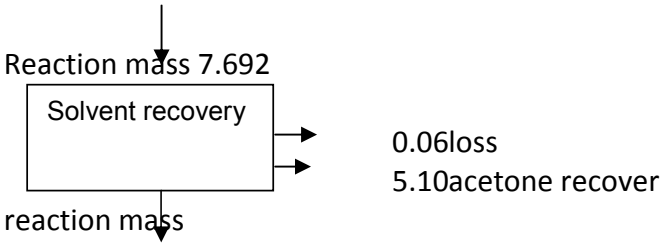
Brief Process

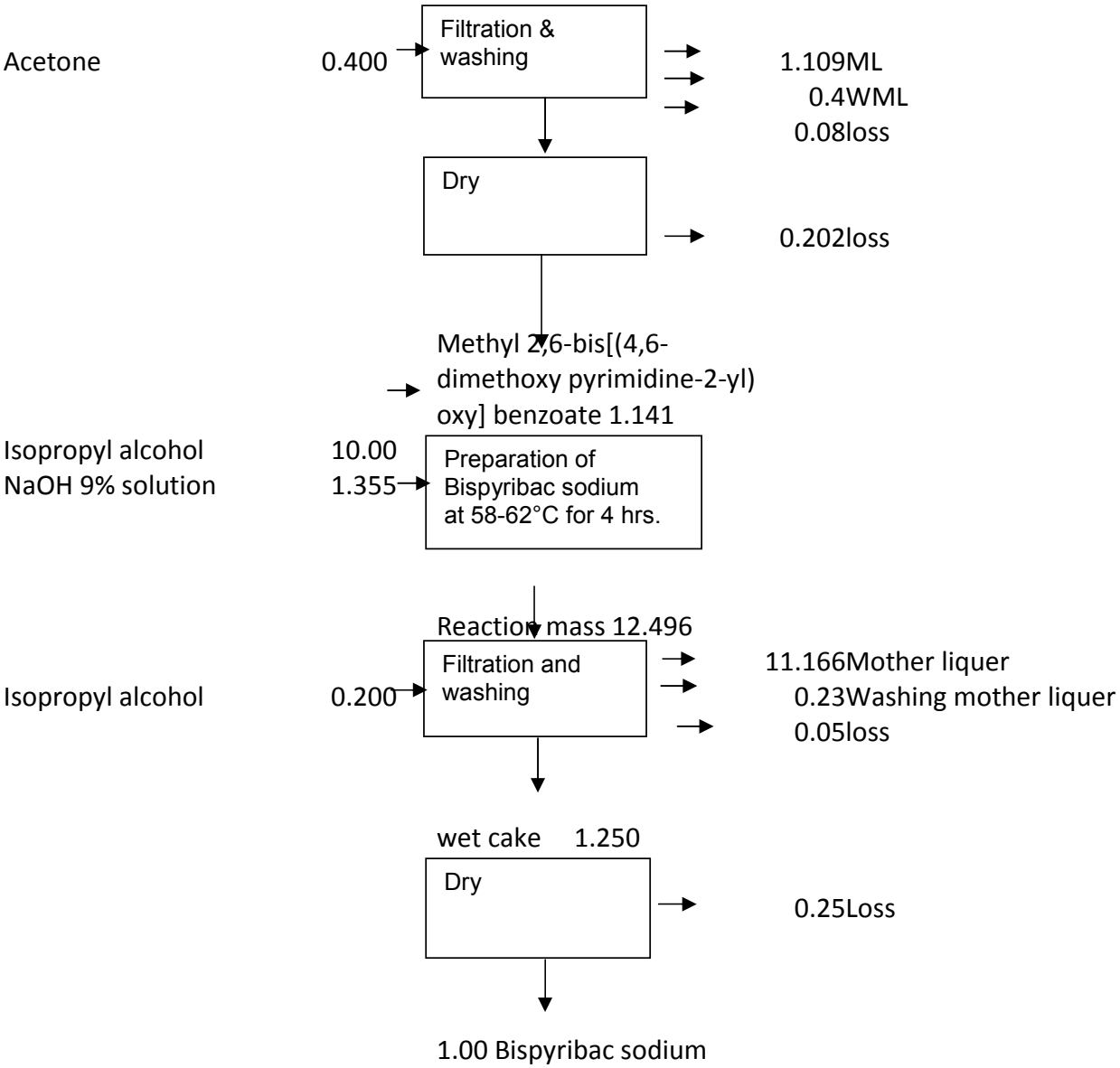
Reaction of 2,6-dihydroxybenzoic acid in presence of sodium carbonate and dimethyl sulfate and solvent acetone leads to the formation of Methyl 2, 6 – dihydroxy benzoate which is the first intermediate which further is reacted with 4,6-Dimethoxy-2-methyl sulfonyl pyrimidine and a base potassium carbonate to give the product of intermediate II known as Methyl 2,6 – bis [(4,6-dimethoxy pyrimidine-2-yl) oxy] benzoate.

Methyl 2,6 – bis [(4,6-dimethoxy pyrimidine-2-yl) oxy] benzoate is hydrolyzed with caustic with IPA as the solvent to give Bispyribac sodium salt.

Material balance for Bispyribac sodium




Reaction mass 7.692
Solvent recovery
0.06loss
5.10acetone recover
reaction mass


Acetone
0.400
Filtration & washing
1.109ML
0.4WML
0.08loss
Dry
0.202loss
Methyl 2,6-bis[(4,6-dimethoxy pyrimidine-2-yl) oxy] benzoate 1.141
Isopropyl alcohol
10.00
NaOH 9% solution
1.355
Preparation of Bispyribac sodium at 58-62°C for 4 hrs.
Reaction mass 12.496
Isopropyl alcohol
0.200
Filtration and washing
11.166Mother liquer
0.23Washing mother liquer
0.05loss
wet cake 1.250
Dry
0.25Loss
1.00 Bispyribac sodium

MASS BALANCE FOR BISPYRIBAC SODIUM

MATERIAL INPUT (QUANTITY IN MT)

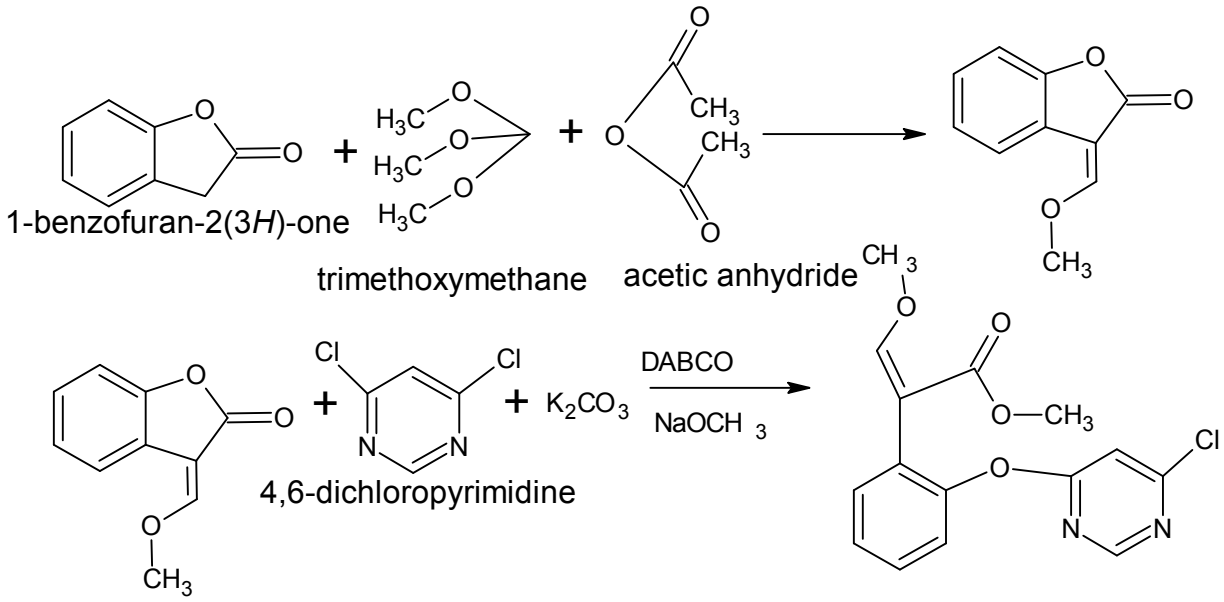
Sr. No.	**Material**	**1 MT product**
1	2,6-dihydroxy benzoic acid	0.832
2	Na2CO3	1.145
3	DMSO4	1.331
4	Acetone	8.4
5	9% HCl	10.00
6	Water	2.00
7	4,6-dimethoxy-2-methyl sulfonyl pyrimidine	0.828
8	K2CO3	1.081
9	Isopropyl alcohol	10.20
10	NaOH 9% solution	1.355
	Total	**37.172**

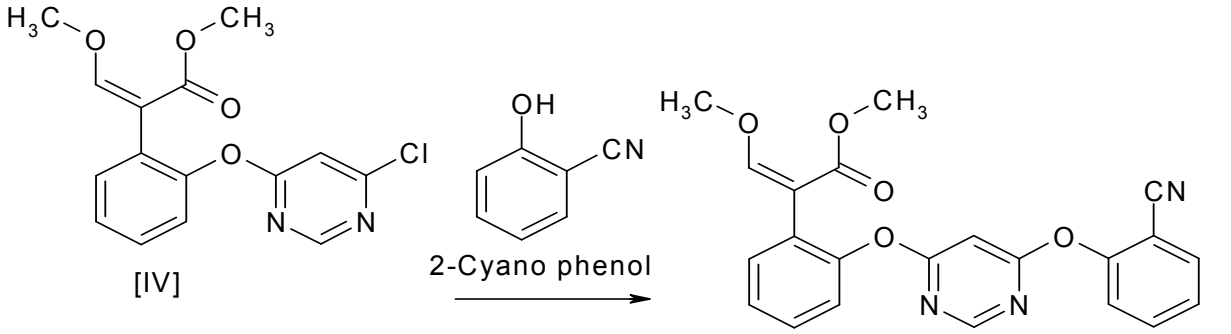
MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	**Material**	**1 MT product**	Remarks
1	Bispyribac sodium	1.00	Product
2	Aqueous mass	15.05	To incinerator
3	Salt wet cake	1.583	By product
4	Acetone	7.0	Recover & recycle
5	Isopropyl alcohol	11.396	Recover & recycle
6	Loss	1.143	
	Total	**37.172**	

N9: AZOXYSTROIN

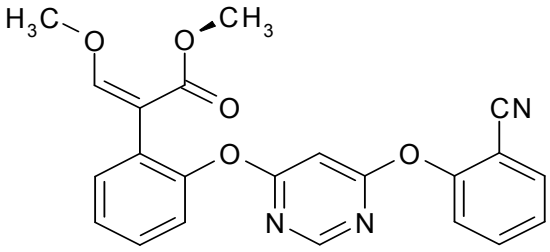
Reaction Scheme:





Azoxystrobin [E]

+



Azoxystrobin (Z) Isomer

Manufacturing Process:

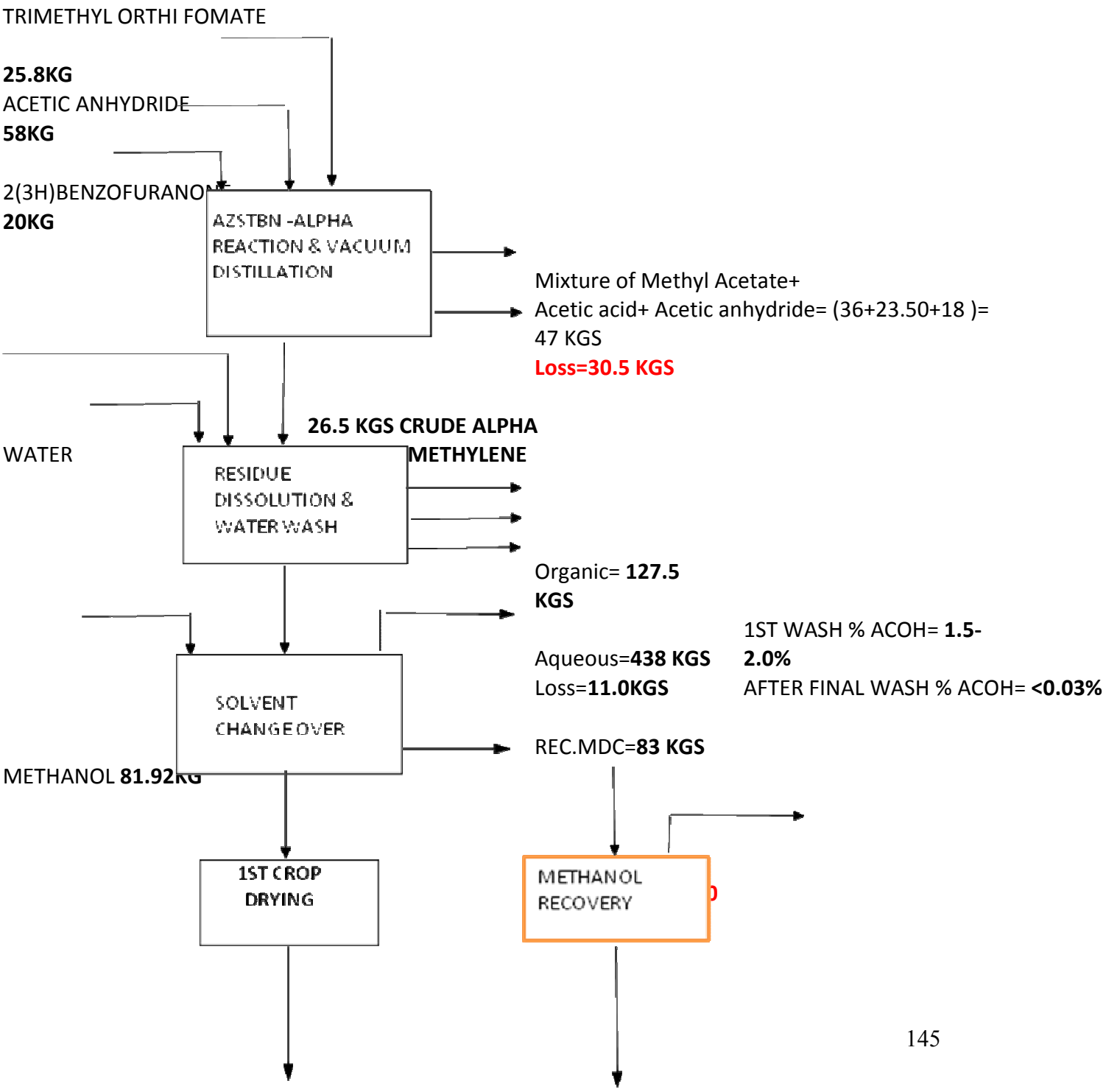
Charge Toluene in Round Bottom flask and Benzofuranone in the toluene.

Charge Trimethyl orthoformate in the above reaction mass.Charge Acetic anhydride in the reaction mass under stirring at RT.Heat the reaction mass for 100-105^{0}C temp. for 6-7 hours.Check % Benzofuranone. It should be less than 5-6% in the reaction mass.Charge Toluene in the reaction mass at RT.Charge K2CO3 (Potassium Carbonate) in the reaction mass.Cool down the reaction mass upto 0^{0}C temp. .Charge Sodium methoxide in the chilled 0^{0}C-5^{0}C temp.. Reaction mass.Stirr the reaction mass for 30 mints at 0^{0}C-5^{0}C.Charge DEBCO at 0^{0}C-5^{0}C.Charge 4, 6-Di Chloro Pyrimidine at 0^{0}C-15^{0}C.Cook the reaction mass at 0^{0}C-15^{0}C for two hours.Filter the reaction mass at 0^{0}C-15^{0}C under vacuum in Buckner funnel & remove inorganic solid waste.Give water wash 1000gms *02 to organic phase at Room temperature.Collect the organic phase in the round bottom flask & charge methyl sulfonic acid.Recover the toluene at 60^{0}C-65^{0}C under 745-750 mm Hg vacuum.Intermediate [E]-Methyl-[2]-[2-(6-chloro Pyrimidine-4-yloxy) phenyl]-3-methoxy- propionate **obtained**.

Charge ACTN in the above made intermediate [E]-Methyl-[2]-[2-(6-chloro Pyrimidine-4-yloxy) phenyl]-3-methoxy- propionate.Charge 2-Cyano phenol in the above organic mass.Heat the reaction mass (2-Cyano phenol & 3-Methoxy propionate mixer) up to 50^{0}C temp. and make homogeneous.Cool down the above made mixer up to Room temperature.Charge ACTN in another RBF with stirrer & condenser.Charge Potassium Carbonate in the ACTN.Charge DEBCO in the Potassium carbonate & ACTN mixer at RT.Heat the reaction mass upto 50^{0}C temp. Add above made (point: 04) 2-Cyano phenol & 3-Methoxy propionate mixer in the reaction mass within 15-20 mints. at 50^{0}C-60^{0}C temp..Heat the reaction mass up to reflux temp..Maintain the reaction mass temp. for 4-5 hours.Check % 2-Cyano Phenol. It should be less than 4%.Filter the reaction mass at RT.Recover ACTN from the organic phase at 60^{0}C-65^{0}C under 745-750 mm Hg vacuum. Charge Methanol in the above mass.Heat the reaction mass for dissolution upto 62^{0}C-65^{0}C.Maintain for one hour temp.at 62^{0}C-65^{0}C.Cool down the reaction mass 5^{0}C temp. per half an hour till 02^{0}C-05^{0}C temp..Main the temp. 02^{0}C-05^{0}C for one hour.Filter the

crystalized mass at 02^0C-05^0C under vacuum.Dry in oven at 65^0C temp. in atmospheric condition.Dry Azoxystrobin obtains.

Material balance of Azoxystrobin
Step-1



23 KGS WET CAKE

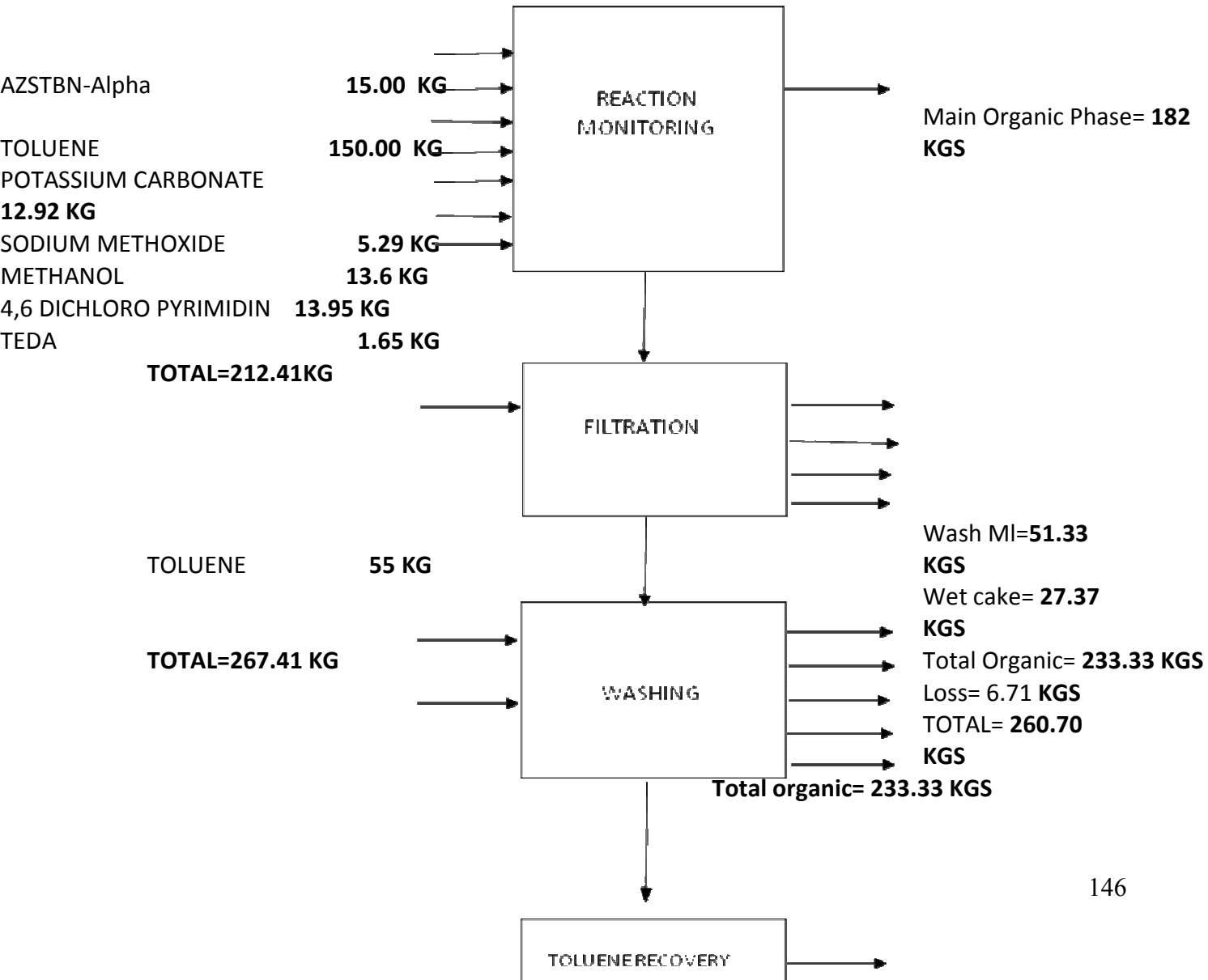
Recovered MeOH= 58 KGS

30% Concentration of mass after recovery for 2nd crop

1ST CROP
21 KGS DRY ALPHA METHOXY METHYLENE

2ND CROP
1.35 KGS DRY ALPHA METHOXY METHYLENE

Step-2



210
2% KOH SOLUTION **KG**

WATER **600 KG**

TOTAL=810 KG

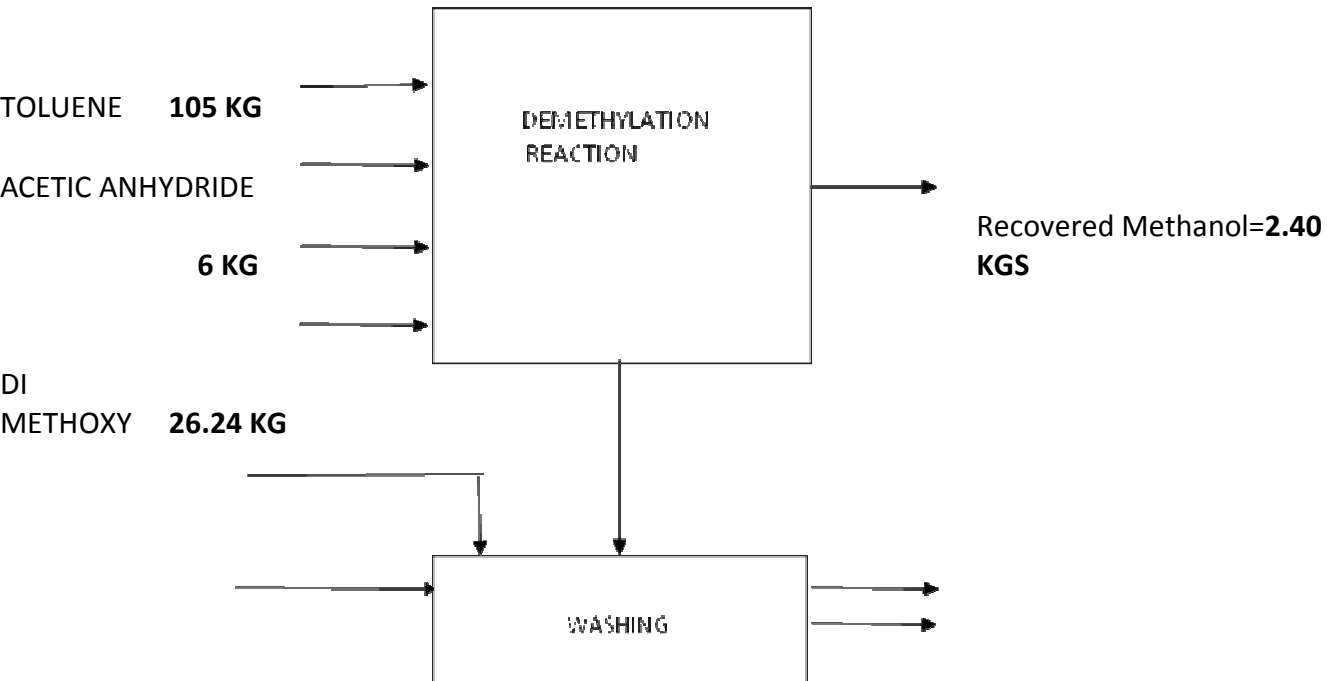
Organic after KOH wash=
217 KGS
KOH washed effluent=
220.5 KGS
Organic after total water washes=
210 KGS
Effluent after plain water washes=
606 KGS
Loss= **6.83 KGS**
TOTAL= **826.5**
KGS

Washed organic for recovery=210
KGS

Recovered Toluene=
165.50 KGS
Loss= **18.26 KGS**

26.24
KGS

Step-3



138.44
TOTAL KG

132.5 KG REACTION MASS

TOLUENE = **52 KG**

1ST WASH CONTAINS= **5%**
WATER= **390 KGS** 400 KGS **ACOH**
WET SOLID (CLOUD POINT SEPRATION
(130*3) 1.0 KGS POSSIBILITY)
(FILTER)

132.5+52+390 = 574.5 - 400=174.5Kg

170 KG Organic mass

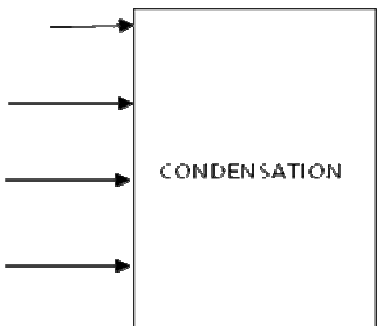
Rec. Toluene=**138 KGS**

170-138=32

20.62KG

Step-4

ACETONITRILE
101.5+22.5=124 KG



POTASSIUM CARB.	**22.19 KG**		
TEDA	**0.360 KG**		
2-CYANO PHENOL	**9.186 KG**		
3-MONO METHOXY PROPIONATE	**20.62 KG**		
TOTAL=**176.35 KG**			
ACETONITRILE	**100 KG**		
		Wet cake K-salt=**29 KG** LOSS= **246 KG Organic**	
METHANOL	**24.53 KG**	**162 kg** Rec.ACETONITRILE **29.70 KG** Crude Azoxystrobin LOSS**= 53.7 kgs**	
		54.83 Kg	54.38+8.3=63.13 - 40.5=22.63Kg 22.63-2.83=19.8Kg
METHANOL	**8.3 KG**	METHANOL ML=**40.5 KG** LOSS= **2.83 KG**	
		19.2 KG	
		17.62 kg dry powder	

TENTATIVE RAW MATERIAL NORMS AS PER DISCUSS WITH MR. MITESH PATEL

RMS	IN KG	RECYCLE	LOSS IN KG	NORMS /KG	NORMS /TON	REMARK
TRIMETHYLE ORTHO FORMATE	17.41			1.15	1155	
ACETIC ANHYDRIDE	45.15			2.89	2890	
2(3)BENZOFURANON	13.5			0.90	895	
MDC	77.62	55.62		1.46	1459	
METHANOL	101.72	65.15	23.83	1.97	1970	
TOLUENE	362	303.5	3.44	2.40	2400	
POTASSIUM CARBONATE	42.19			2.01	2010	
SODIUM METHOXIDE	5.29			0.20	199	
4,6 DICHLORO PYRIMIDIN	13.95			0.52	524	
TEDA	2.01			0.08	80	
KOH	4.2			0.16	160	
METHYLE SULFONIC ACID	1.2			0.06	58	
DI-METHOXY	26.24			1.27	1273	
ACETONITRILE	224	162	1.35	3.52	3519	
2-CYNO PHENOL	9.186			0.52	521	

BY PRODUCTS

METHYLE ACETATE,ACETIC ACID,ACETIC ANHHY.	39.15			2.60	2596	BY PRODUCT
WET CAKE	29			1.65	1646	BY PRODUCT

SOLID WASTE GENERATION

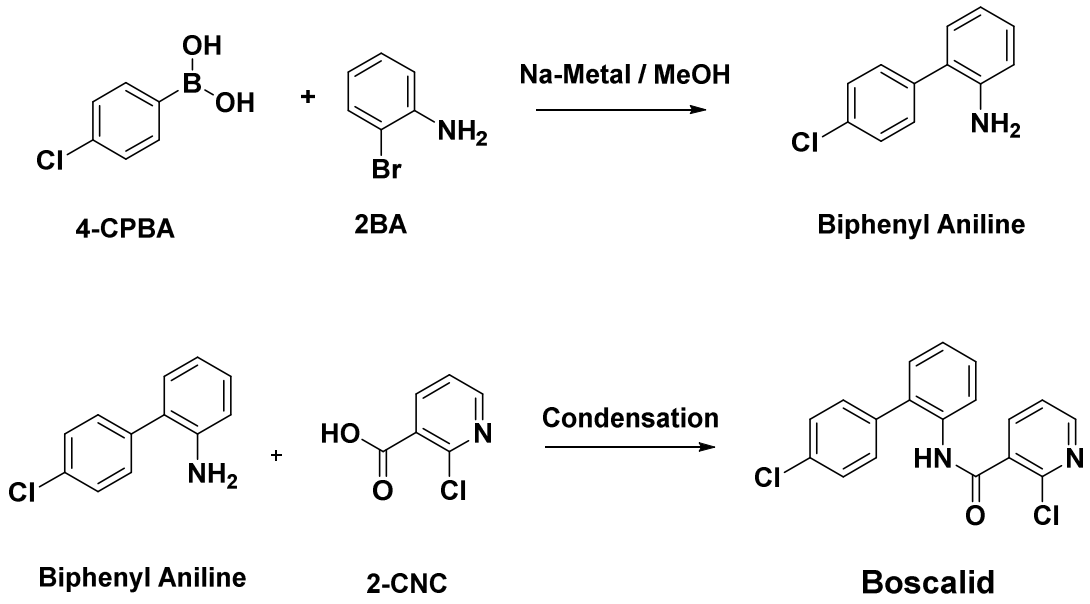
WET CAKE	27.37			1.03	1027	FOR DISPOSAL
WET SOLID	1			0.05	48	FOR DISPOSAL
TOTAL SOLID WASTE					1076	

EFFLUENT GENERATION

WATER	293	-2	11	19.56	19562	FROM PROCESS
2% KOH SOLUTION EFFLUENT	210	-10.5	6.83	8.28	8277	
WATER	600	-6		22.75	22748	
WATER	390	-10		19.40	19399	
EFFLUENT FROM EJECTOR					20995	OPERATION
TOTAL EFFLUENT					90981	

N10:BOSCALID

Chemical Reaction:



Brief Process

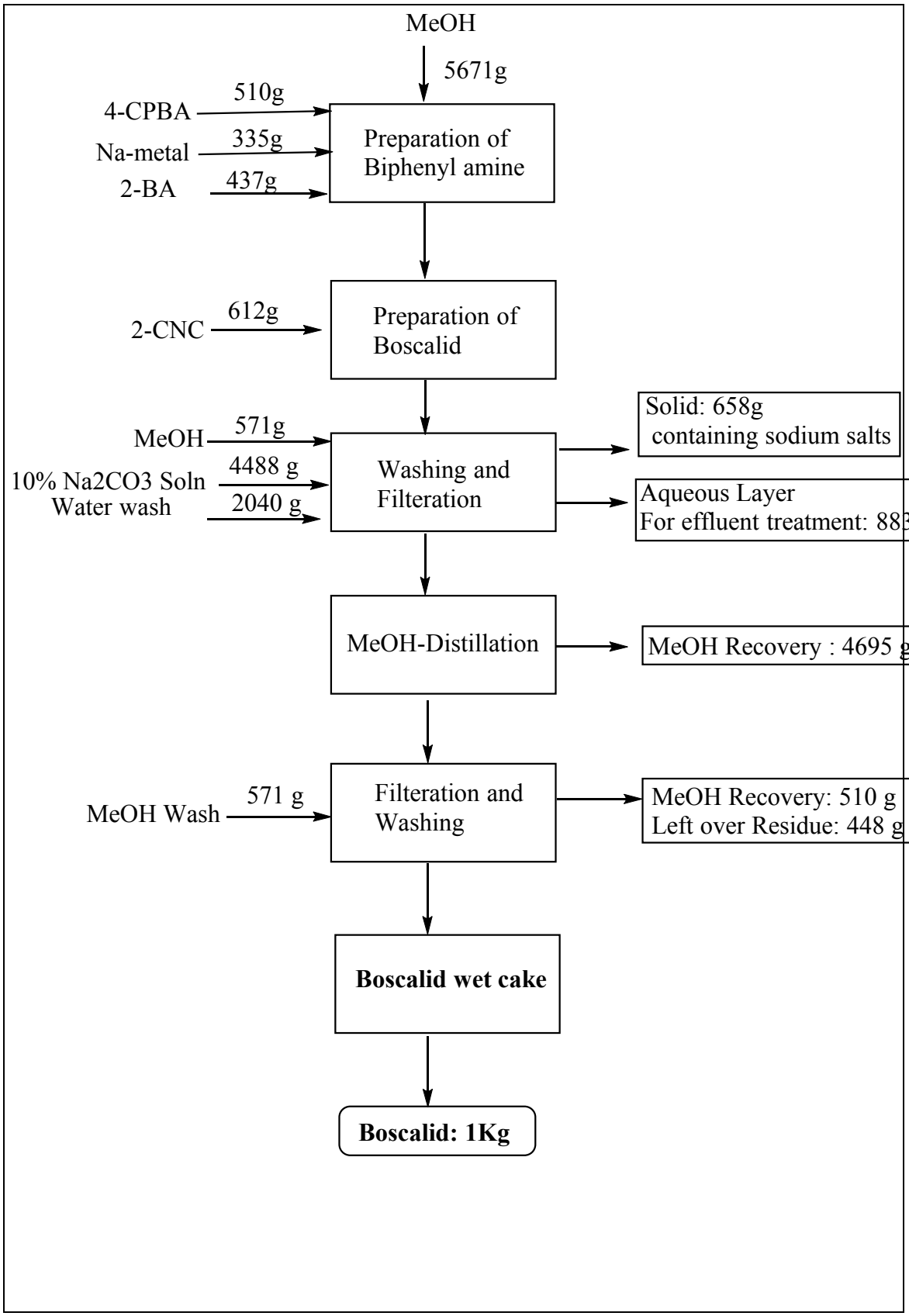
Step:1 Preparation of **Biphenyl amine**

Charge Methanol and add 4- CPA and 2A stir and slowly addition of sodium metal after reaction to form of Biphenyl amine.

Step:2 Preparation of **Biphenyl amine.**

Condensation of Biphenyl amine and 2-CNC after reaction add 10% Na2CO3 solution. Start recovery of methanol and cool mass and filter to Boscalid and dry.

SCHEMATIC FLOW DIAGRAM OF BOSCALID



MASS BALANCE FOR BOSCALID

MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	MeOH	6.813
2	4-CPA	0.510
3	Na-Metal	0.335
4	2-BA	0.437
5	2-CNC	0.612
6	Water	2.040
7	Na2CO3(10%)	4.488
	Total	**15.235**

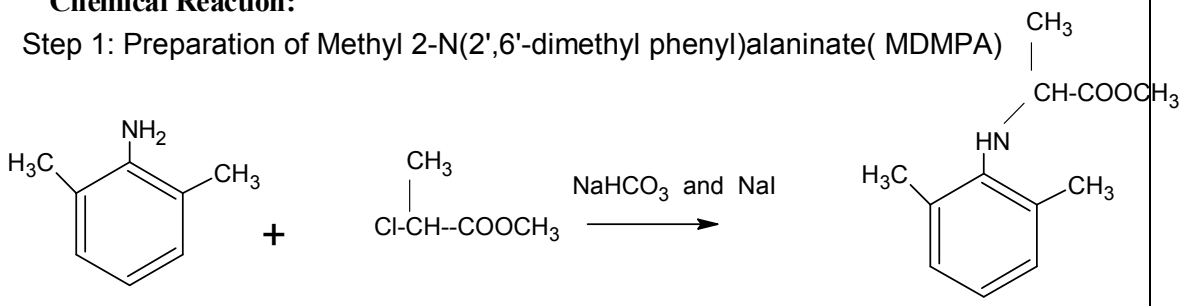
MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	Remarks
1	Boscalid	1.00	Product
3	Salt wet cake(NaCl)	0.658	By product
4	Rec. Water for MEE	2.040	Recycle
5	Rec. Water for MEE	5.534	ETP
6	Rec. MeOH	5.205	Recycle
7	Org. Residue	0.448	To incinerator
8	Loss	0.350	
	Total	**15.235**	

N11:METALAXYL

Chemical Reaction:

Step 1: Preparation of Methyl 2-N(2',6'-dimethyl phenyl)alaninate(MDMPA)



2,6-Dimethylaniline

M.Wt.=121

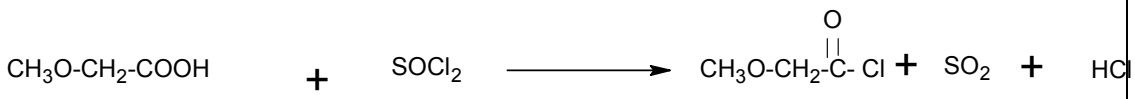
2-Chloro propionate

M.Wt.+122.5

Methyl 2-N(2',6'-dimethyl phenyl)alaninate(MDMPA)

M.Wt=207

Step 2: Preparation of methoxyacetyl Chloride (MAC)



Methoxyacetic acid

M.Wt=90

Thionyl Chloride

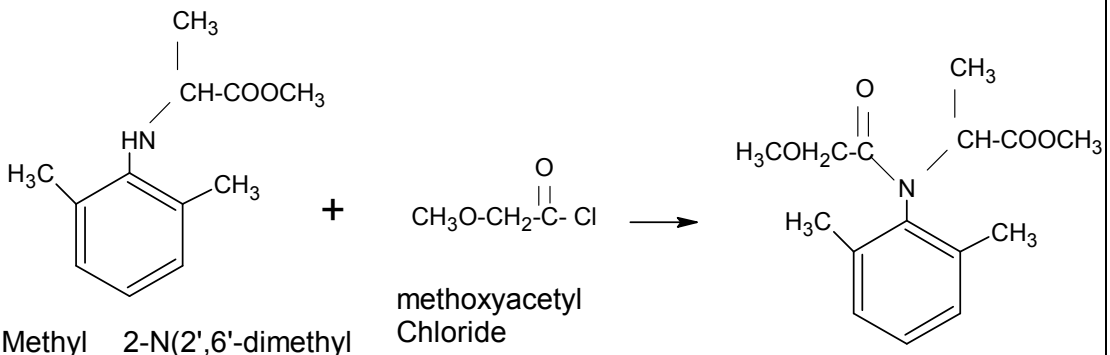
M.wt=119

methoxyacetyl Chloride

(MAC).

MWt=108.5

Step: 3 Condensation of MDMPA with MAC to give Metalaxyl



Methyl 2-N(2',6'-dimethyl phenyl)alaninate(MDMPA)

M.Wt=207

methoxyacetyl Chloride

(MAC).

MWt=108.5

Metalaxyl

M.Wt.=279

Brief Process

Step 1: Preparation of Methyl 2-N(2',6'-dimethyl phenyl)alaninate(MDMPA)

2,6- Dimethylaniline and 2-chloropropionate reacted in presence of $NaHCO_3$ and NaI is catalyst to form of of Methyl 2-N(2',6'-dimethyl phenyl)alaninate(MDMPA)

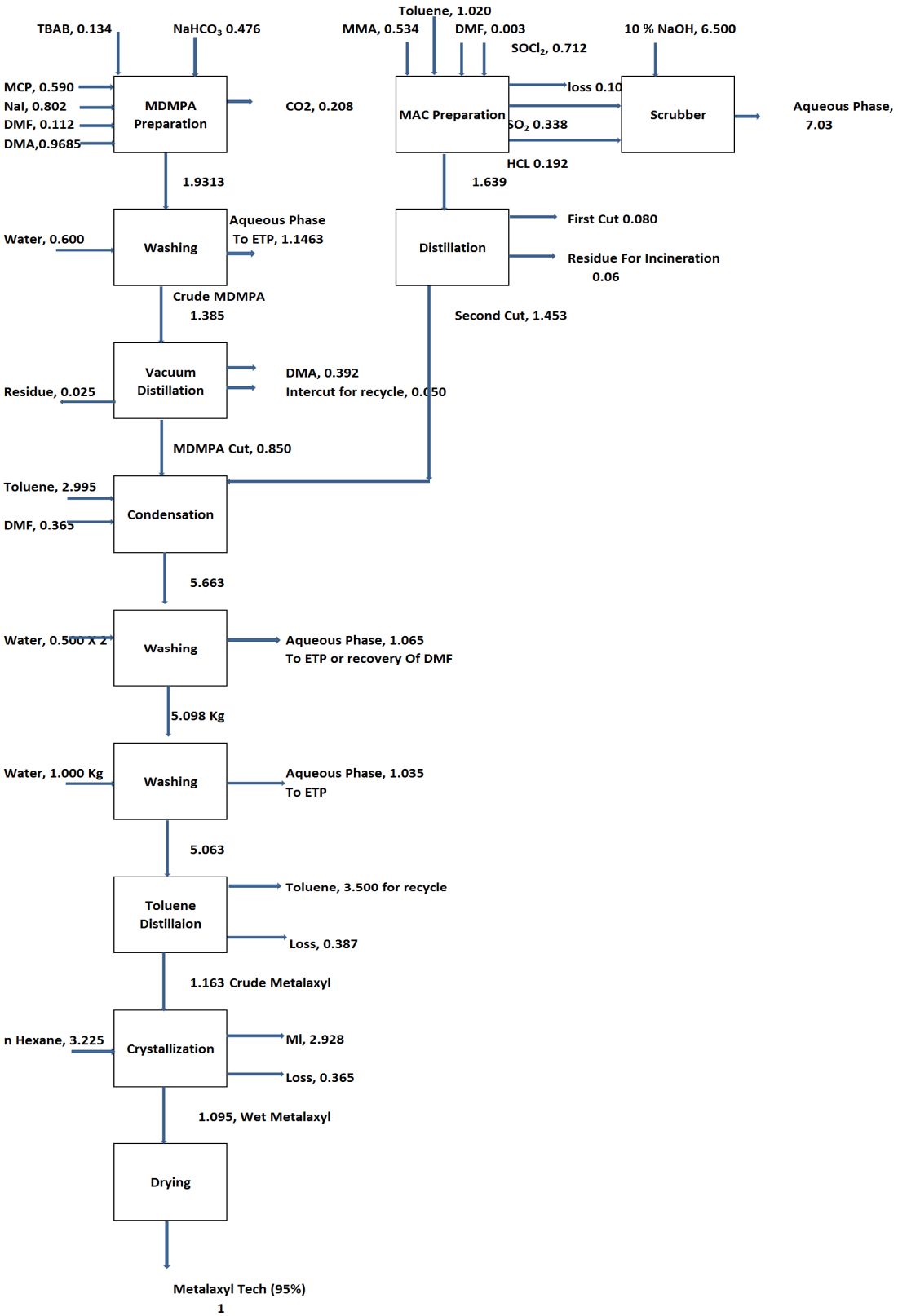
Step 2: Preparation of methoxyacetyl Chloride (MAC)

Methoxyaacetic acid is react with Thionly chloride to give Methoxyacetyl chloride.

Step: 3 Condensation of MDMPA with MAC to give Metalaxyl

Condensation of Methyl 2-N(2',6'-dimethyl phenyl)alaninate(MDMPA) and Methoxyacetyl chloride to give a Matalaxyl.

Flow Diagram For Metalaxyl Tech (95%)



MASS BALANCE FOR METALAXYL

MATERIAL INPUT (QUANTITY IN MT)

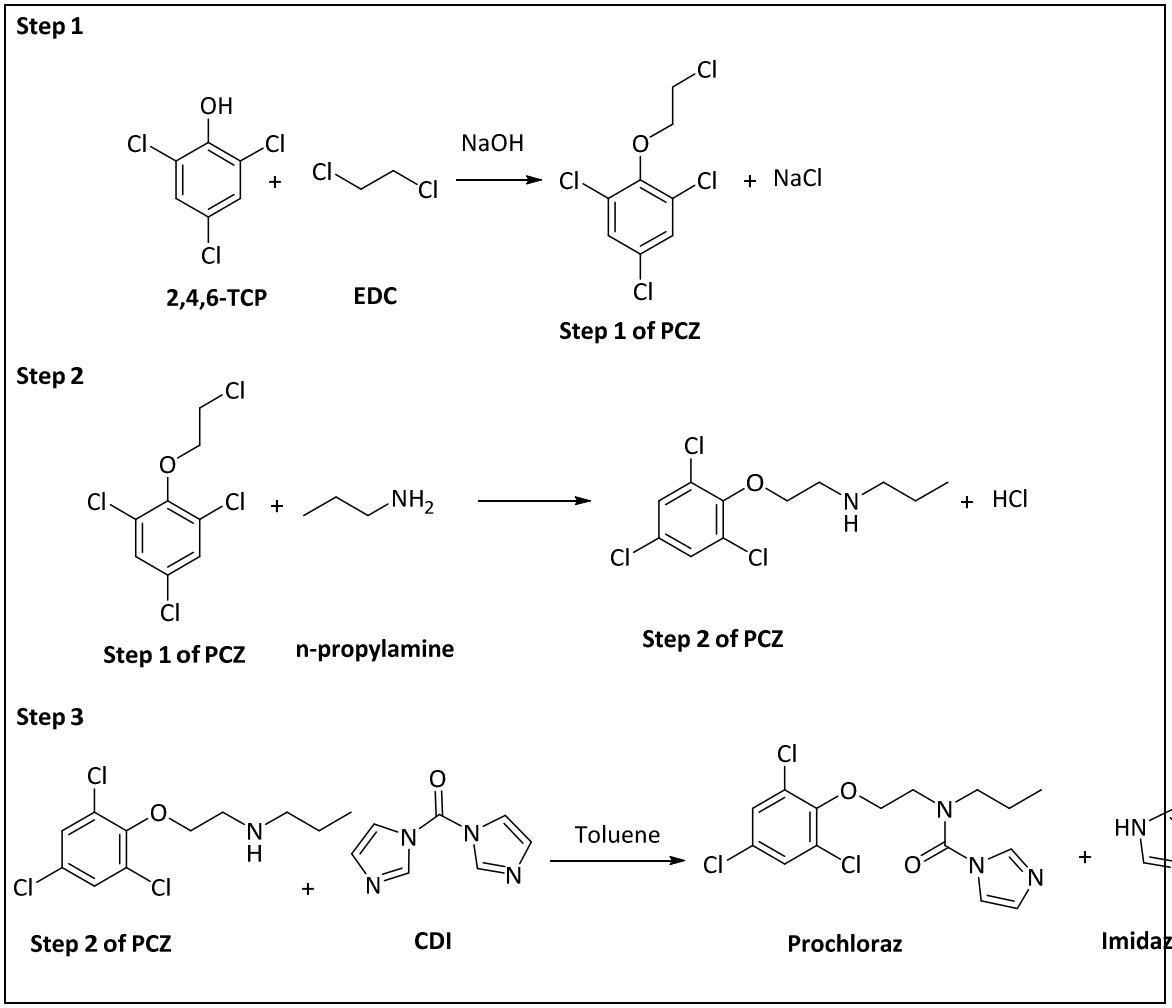
Sr. No.	**Material**	**1 MT product**
1	DMA	0.9685
2	TBAB	0.134
3	Na2HCO3	0.476
4	MCP	0.590
	NaI	0.802
	Water	2.600
	DMF	0.488
	Toluene	4.015
5	n-Hexane	3.225
6	MMA	0.533
7	SOCl2	0.712
	Total	**14.54**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	**Material**	**1 MT product**	Remarks
1	Metalaxyl	1.00	Product
3	DMA	0.92	Recycle
4	Rec. Toluene	3.5	Recycle
5	Rec. N- Hexane	2.928	Recycle
6	SO2 gas	0.338	By product
7	HCl gas	0.192	By product
	Org +Aq.	1.125	Incineration
	Dis. MCA	1.533	Recycle
	Aq. Effluent	2.1813	To ETP
8	Loss	0.826	
	Total	**14.54**	

N12:PROCHLORAZ

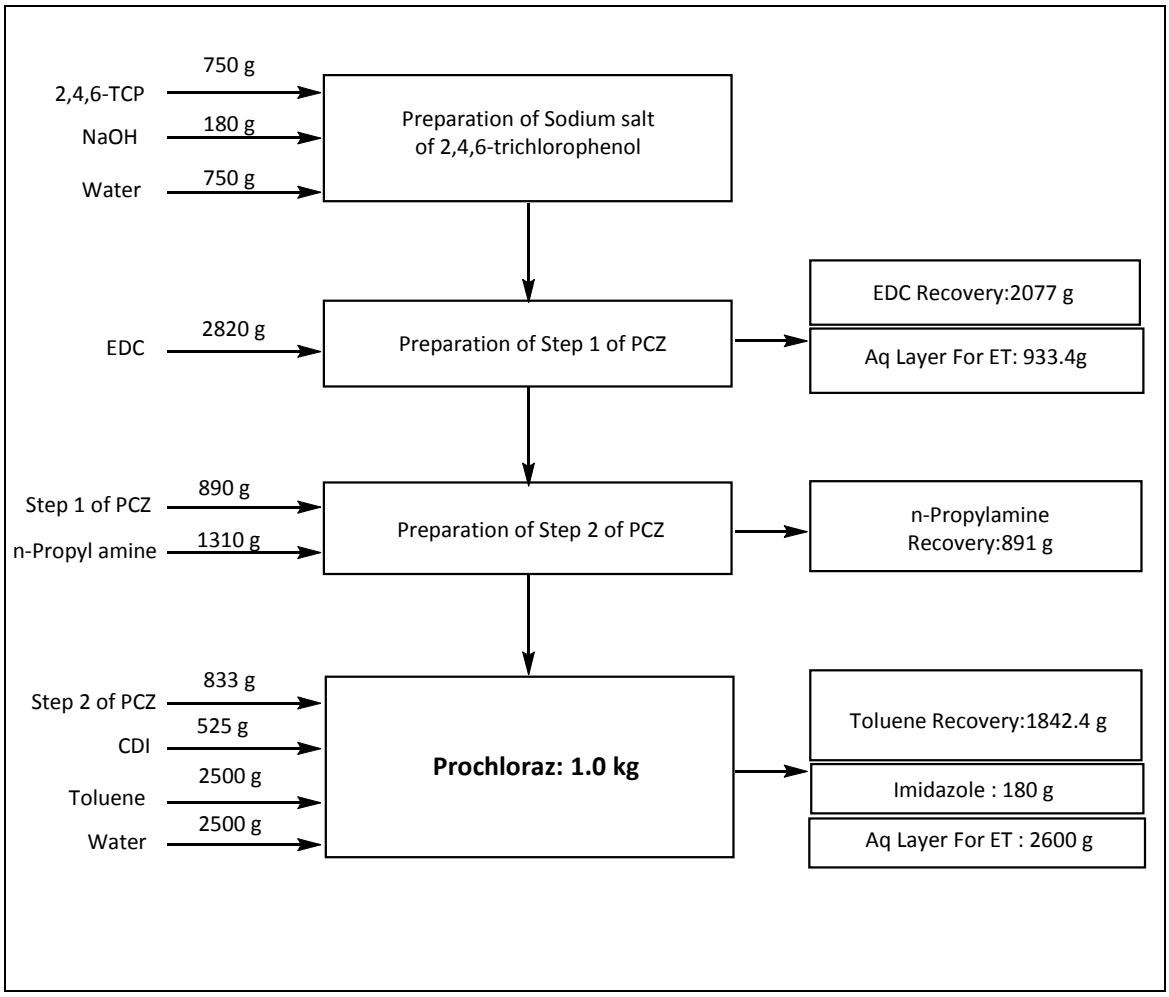
Prochloraz Reaction Scheme:



Brief Process

Preparation of Sodium salt of 2,4,6- Trichlorophenol in presence of NaOH solution with reacted with EDC to form of step-1 PCZ further react with n- propyl amine to form step2 of PCZ.Charge Toluene and add step-2 PCZ is react with CDI to give Prochloraz.

Prochloraz material balance:



MASS BALANCE FOR PROCHLORAZ

MATERIAL INPUT (QUANTITY IN MT)

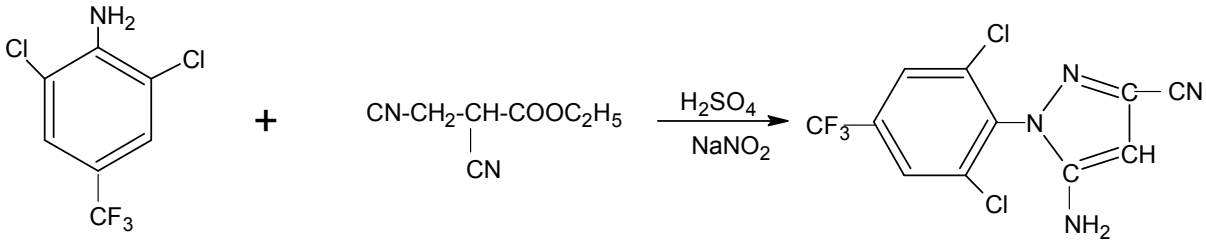
Sr. No.	**Material**	**1 MT product**
1	2,4,6-TCP	0.750
2	NaOH	0.180
3	Water	3.25
4	EDC	2.820
5	n-Propyl amine	1.310
6	CDI	0.525
7	Toluene	2.500
	Total	**11.33**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	**Material**	**1 MT product**	Remarks
1	Prochloraz	1.00	Product
3	Aq. Layer	3.533	ETP
4	Rec. EDC	2.077	Recycle
5	n-Propylamine Rec.	0.891	Recycle
6	Toluene Rec.	1.842	Recycle
7	Imidazol	0.180	By Product
8	Loss	1.81	
	Total	**11.33**	

O1:5-AMINO-3-CYANO-1-(2,6-DICHLORO-4-TRIFLUORO METHYL PHENYL) PYRAZOLE

Reaction chemistry



2,6-Dichloro-4-trifluoro methyl amine

M.wt.=230

Ethyl-2,3-dicyano Propionate

M.wt.=152

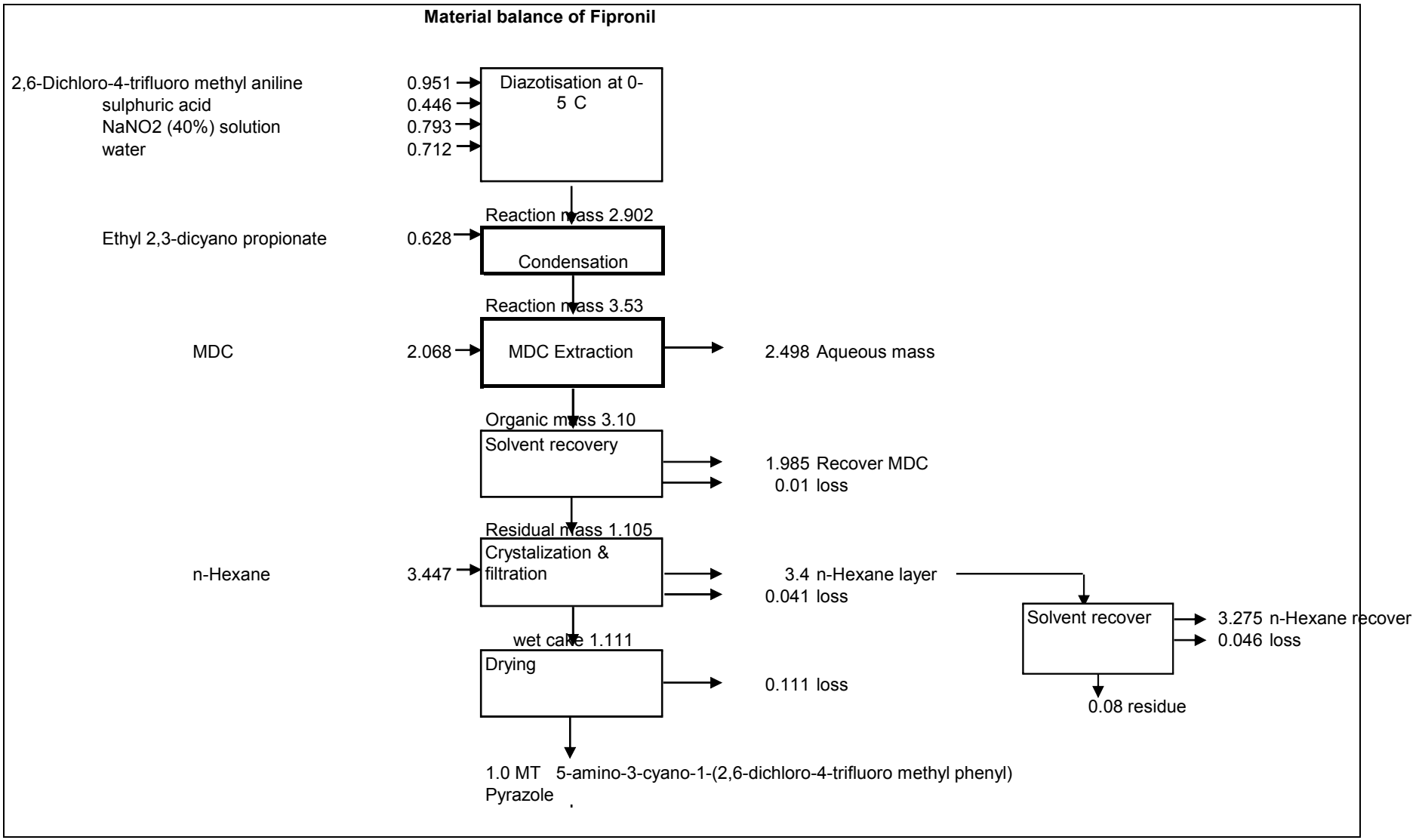
5-Amino-3-Cyano-1(2,6-dichloro -4-trifluoromethyl phenyl) pyrazole

M.wt.=321

Brief Process

Diazotisation of 2,6-dichloro-4-trifluoro methyl amine and reacted with ethyl 2,3-dicyano propionate to form 5- amino-3-cyano-1-(2,6-dichloro-4-trifluoromethyl phenyl) Pyrazole

Material balance of Fipronil



MASS BALANCE FOR 5- AMINO-3-CYANO-1-(2,6-DICHLORO-4-TRIFLUORO METHYL PHENYL) PYRAZOLE

MATERIAL INPUT (QUANTITY IN MT)

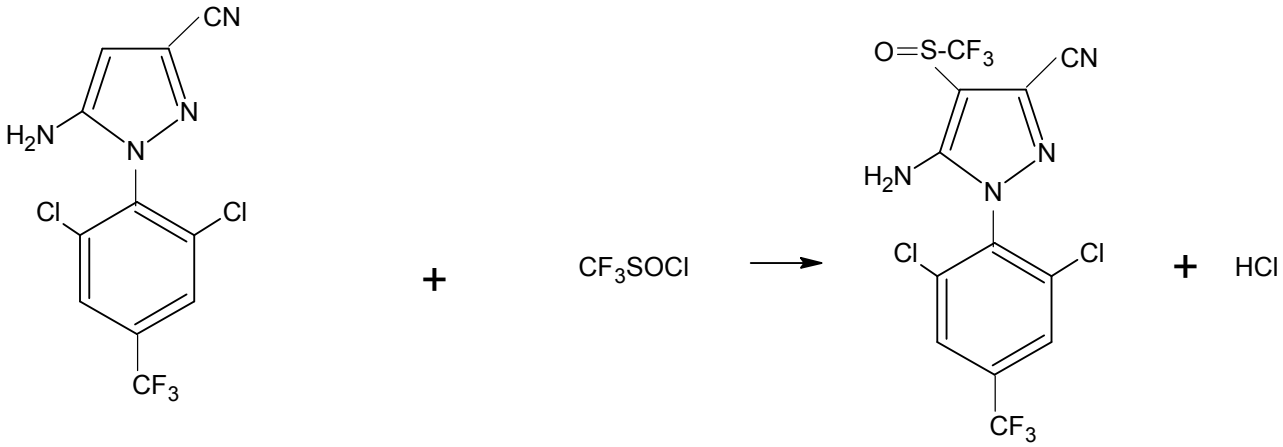
Sr. No.	Material	1 MT product
1	2,6-Dichloro-4-trifluoro methyl aniline	0.951
2	Sulphuric acid	0.446
3	NaNO2 Solution	0.793
4	Ethyl-2,3-dicyano propionate	0.628
5	MDC	2.068
6	n-Hexane	3.447
7	Water	0.712
	Total	**9.045**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	5-amino-3-cyano-1-(2,6-dichloro-4-trifluoro methyl phenyl) pyrazole	1.00	Product
2	Aqueous mass	2.498	To incinerator
3	MDC	1.985	Recover
4	n-Hexane	3.275	Recover
5	Losses	0.208	Distillation
6	Residue	0.08	To incinerator
	Total	**9.045**	

O2: FIPRONIL

Reaction chemistry



5-amino-3-cyano-1-(2,6-dichloro-4 -trifluoromethyl phenyl) pyrazole

M.F.=$C_{11}H_5N_4Cl_2F_3$

M.wt.=321

Trifluoromethyl sulfinyl chloride

M.F.=CF_3SOCl

M.wt.=152.5

Fipronil

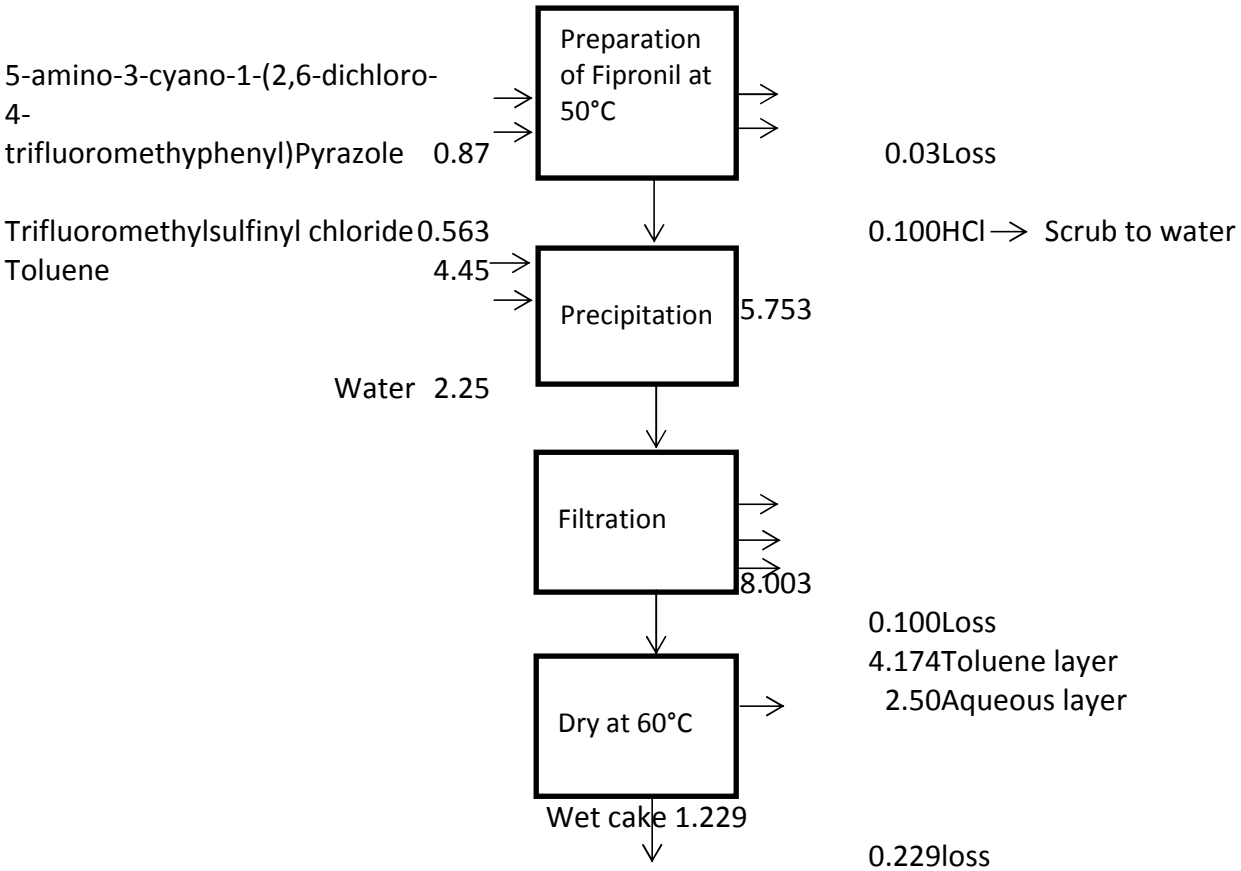
M.F.=$C_{12}H_4N_4F_6Cl_2SO$

M.wt.=421

Brief Process

5-amino-3-cyano-1-(2,6-dichloro-4-trifluoromethyl phenyl) Pyrazole is reacted with trifluoromethyl sulfinyl chloride in presence of toluene as a solvent to form Fipronil and by product hydrochloric acid is scrubbed in water and toluene is recovered by distillation.

Fipronil SCHEMATIC FLOW DIAGRAM



MASS BALANCE FOR FIPRONIL
MATERIAL INPUT (QUANTITY IN MT)

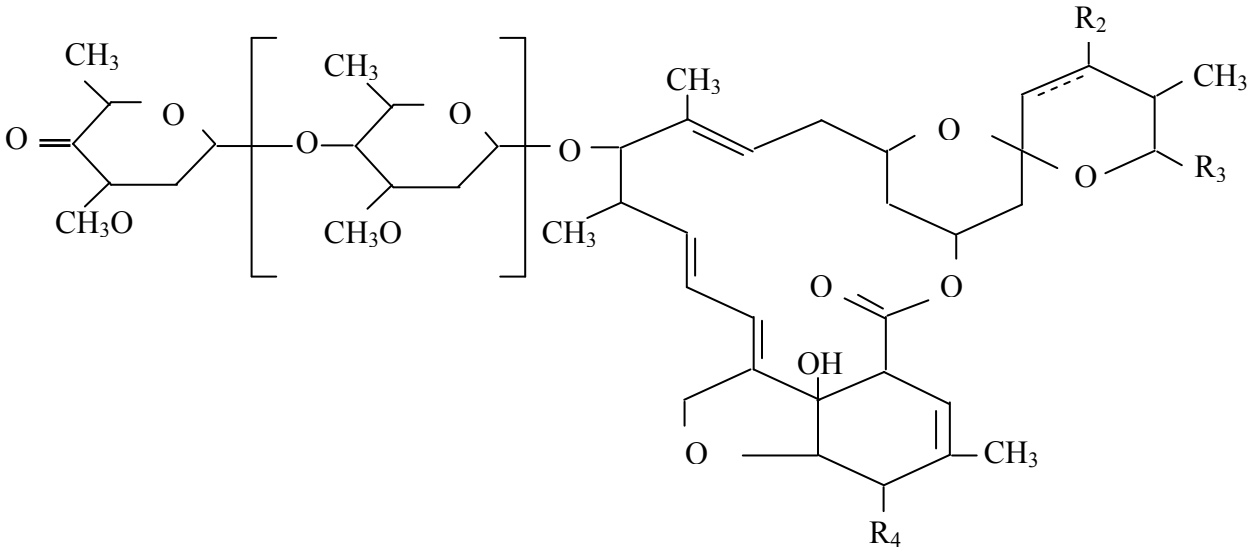
Sr. No.	Material	1 MT product
1	5-amino-3-cyano-1-(2,6-dichloro-4-trifluoro methyl phenyl) pyrazole	0.87
2	Trifluoro methyl sulfinyl chloride	0.563
3	Toluene	4.45
4	Water	2.25
	Total	**8.133**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Fipronil	1.00	Product
2	Aqueous mass	2.50	To incinerator
3	Toluene	4.174	Recover
4	Losses	0.359	Distillation
5	HCl	0.100	By product
		8.133	

O3:EMMAMECTIN BENZOATE

Reaction chemistry

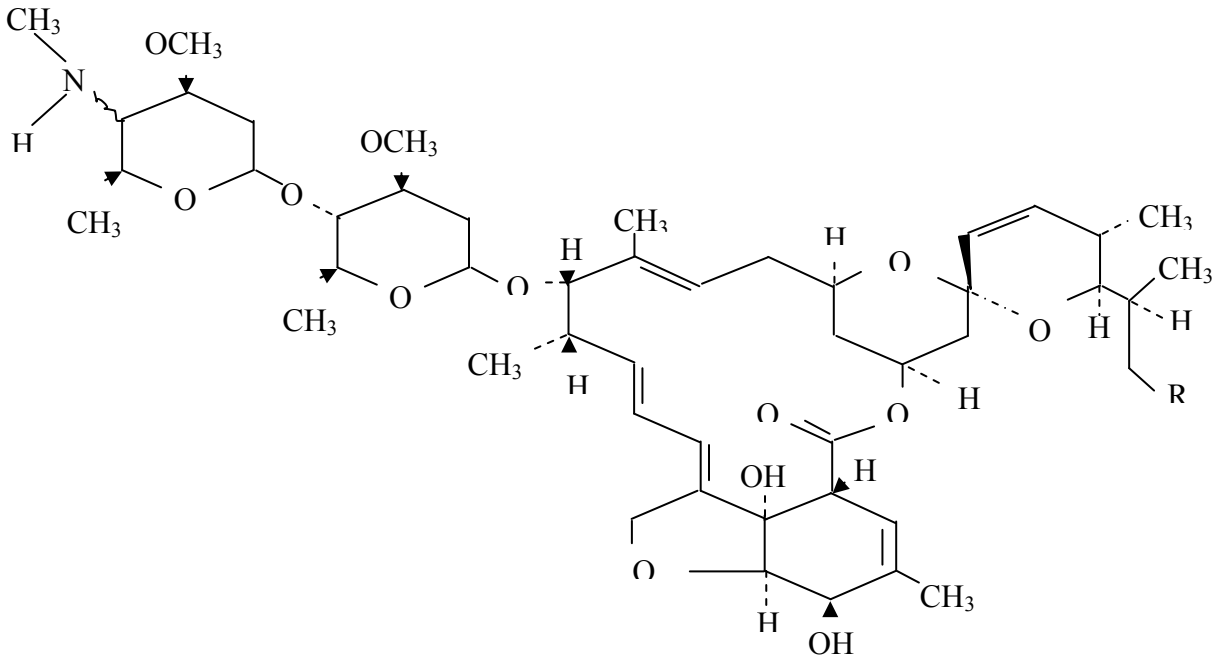


$R_2 = CH_3CH_2-$ = A_{1a} M. Formula = $C_{48}H_{70}N_2O_{14}$ M. Wt. = 898

$R_2 = CH_3-$ = A_{1b} M. Formula = $C_{47}H_{68}N_2O_{14}$ M. Wt. = 884

Avermactine

Methyl
amine

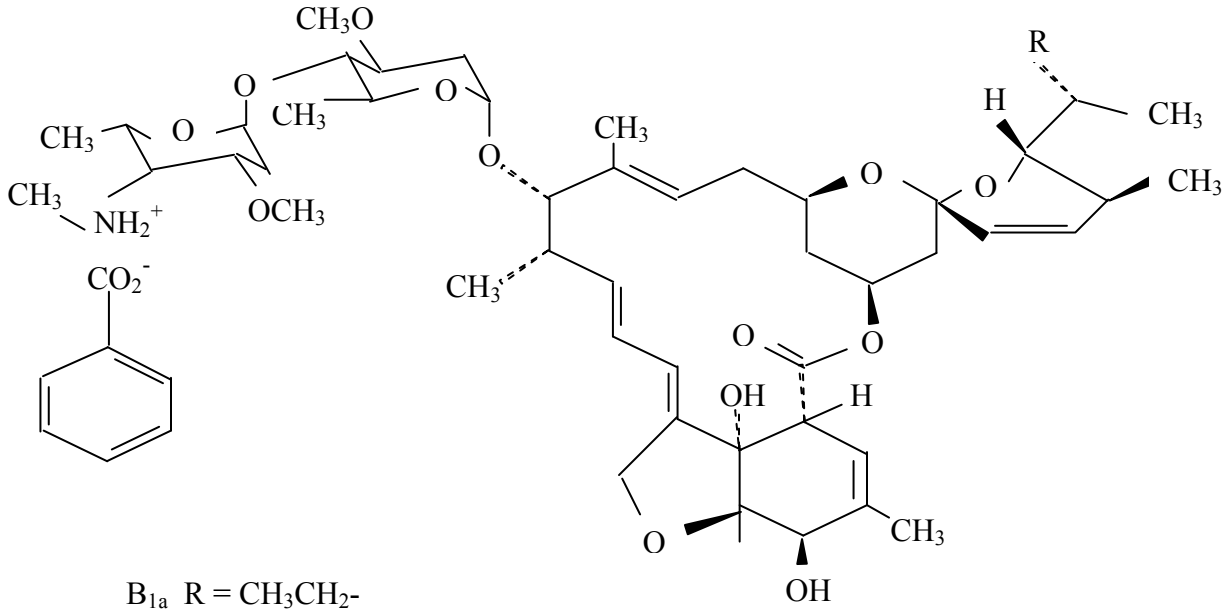


$R_2 = CH_3CH_2-$ = B_{1a} M. Formula = $C_{49}H_{75}NO_{13}$ M. Wt. = 872

$R_2 = CH_3-$ = B_{1b} M. Formula = $C_{48}H_{73}NO_{13}$ M. Wt. = 872

Emamectin

Benzoic acid



B_{1a} R = CH_3CH_2-

B_{1b} R = CH_3-

R_2 = CH_3CH_2- = B_{1a} M. Formula = $C_{56}H_{81}NO_{15}$ M. Wt. = 1008

R_2 = CH_3- = B_{1b} M. Formula = $C_{55}H_{79}NO_{15}$ M. Wt. = 994

Emamectin Benzoate

Brief Process:-

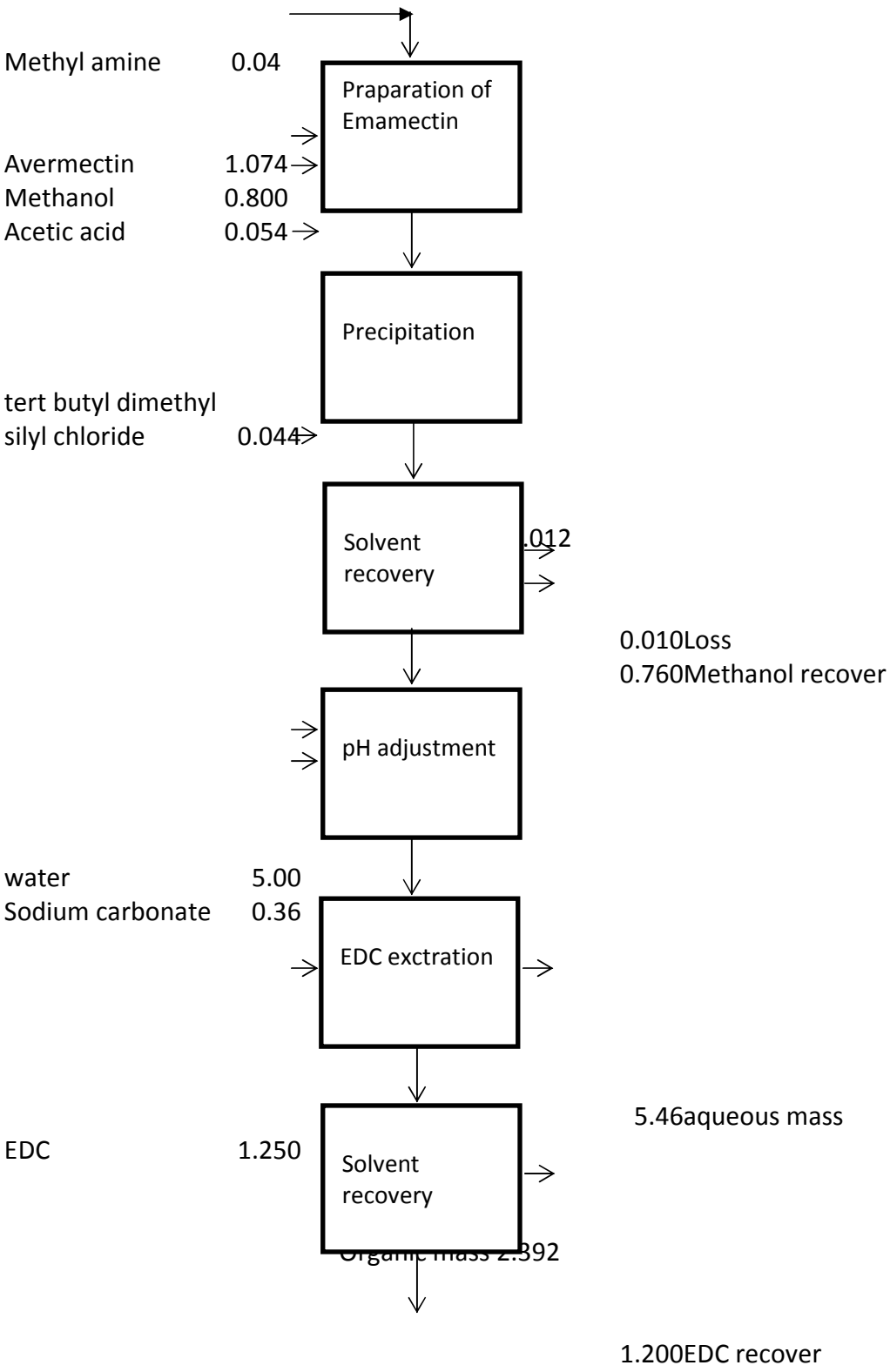
Emamectin Benzoate is prepared in two steps.

Step-1

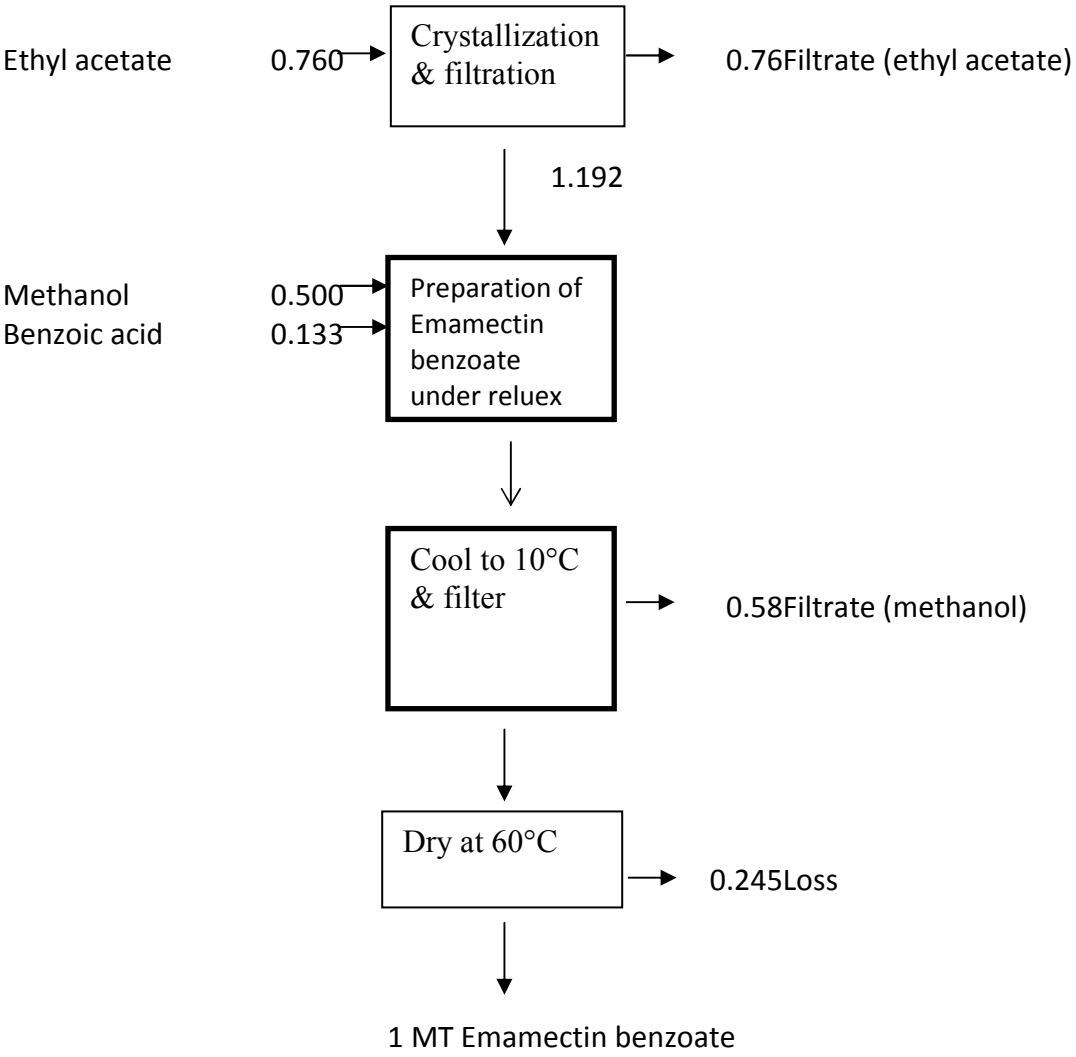
Avermactine is added to Methanol and acetic acid and is purged with methyl amine gas and butyl dimethylsilyl chloride to obtain Emamectin. Solvent is distilled and crude Emamectin is purified ethyl acetate the material is filtered and dried. Solvent is distilled.

Step-2
Methanol is taken is solvent to which benzoic acid is added and stir Emamectin is condensed to this reaction mass at reflex temperature and material is cooled and filtered. The solvent is distilled and the material is dried to obtain Emamectin benzoate.

Emmamectin Benzoate SCHEMATIC FLOW DIAGRAM


Methyl amine 0.04
Praparation of Emamectin
Avermectin 1.074
Methanol 0.800
Acetic acid 0.054
Precipitation
tert butyl dimethyl silyl chloride 0.044
Solvent recovery
.012
0.010Loss
0.760Methanol recover
pH adjustment
water 5.00
Sodium carbonate 0.36
EDC exctration
5.46aqueous mass
EDC 1.250
Solvent recovery
Organic mass 2.392
1.200EDC recover

Residue 1.192



MASS BALANCE FOR EMAMECTIN BENZOATE
MATERIAL INPUT (QUANTITY IN MT)

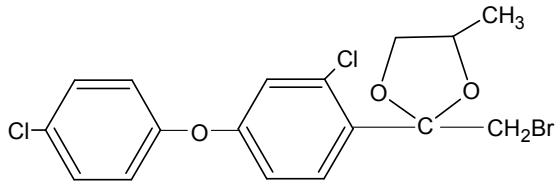
Sr. No.	Material	1 MT product
1	Methyl amine	0.04
2	Avermectin	1.074
3	Methanol	1.3
4	Acetic acid	0.054
5	Tert butyl dimethyl silyl chloride	0.044
6	Water	5.00
7	Sodium carbonate	0.36
8	EDC	1.25
9	Ethyl acetate	0.76
10	Benzoic acid	0.133
	Total	**10.015**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Emamectin benzoate	1.00	Product
2	Aqueous mass	5.46	To incinerator
3	Methanol	1.34	Recover
4	Losses	0.255	Distillation
5	EDC	1.2	Recover
6	Ethyl acetate	0.76	
		10.015	

O4: DIFENOCONAZOLE

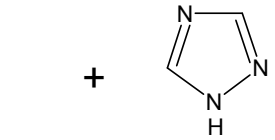
Reaction chemistry



2-[p-(p-chlorophenoxy)-m-chlorophenyl]-2-brom omethyl-4-methyl-1,3-dioxolane

M.F.=$C_{17}H_{15}O_3Cl_2Br$

M.wt.=418

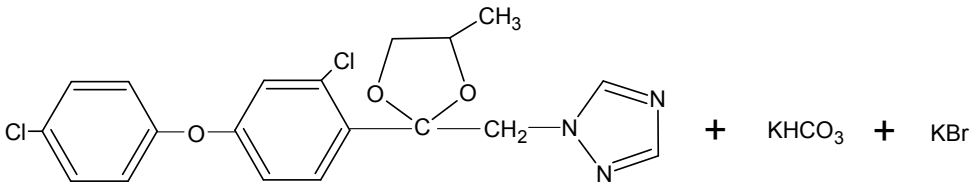


1-H-1,2,4-Triazole

M.F.=$C_2H_3N_3$

M.wt.= 69

K_2CO_3 DMF



Difenoconazole

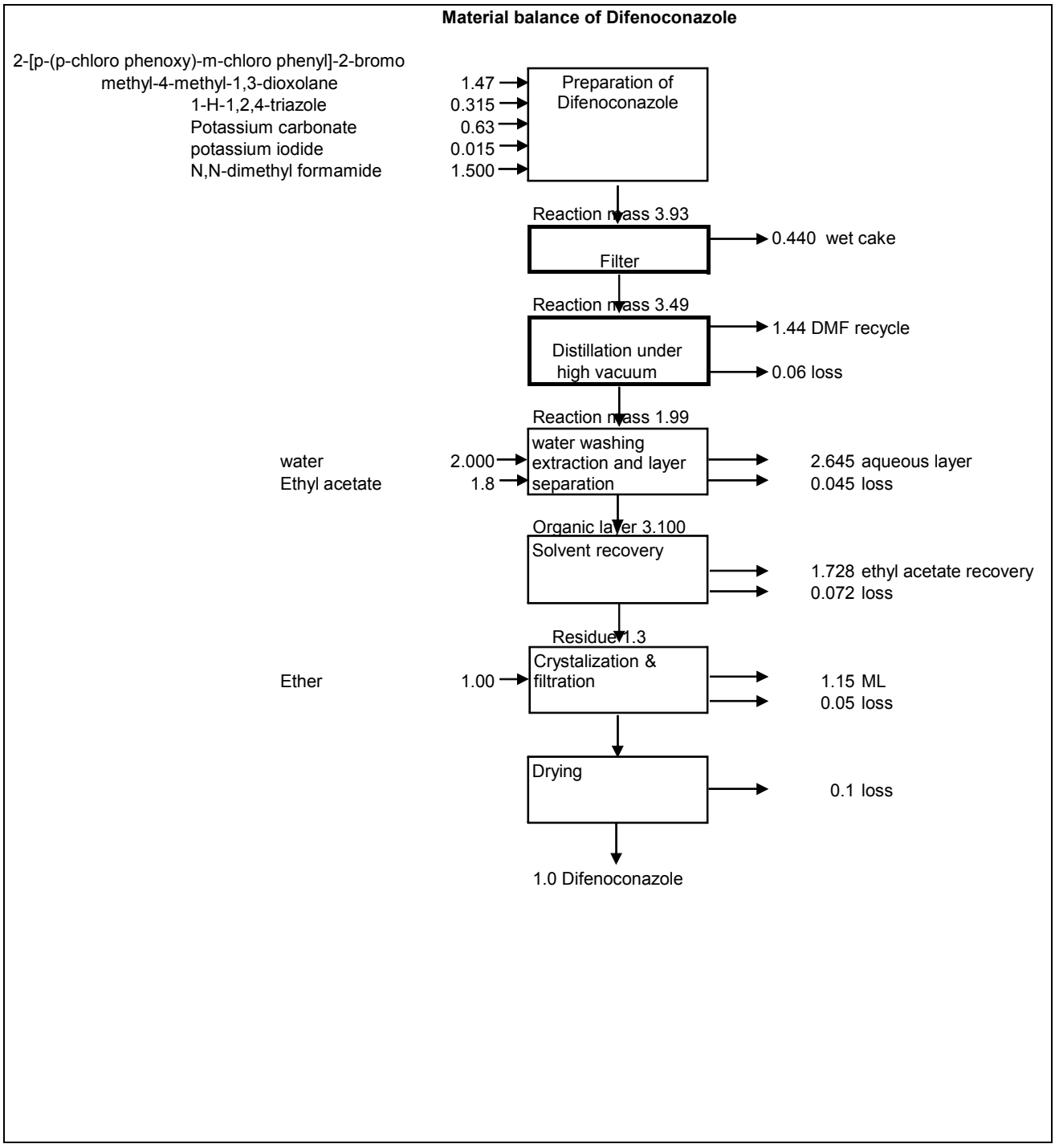
M.F.=$C_{19}H_{17}Cl_2N_3O_3$

M.wt.=406

BRIEF PROCESS

2-[p-(p-chloro phenoxy)-m-chloro phenyl]-2-bromomethyl-4-methyl-1,3-dioxolane is react with 1-H-1,2,4-triazole in presence of potassium carbonate ,DMF and catalytic amount of potassium iodide gives difenoconazole

Material balance for Difenoconazole



MASS BALANCE FOR DIFENOCONAZOLE
MATERIAL INPUT (QUANTITY IN MT)

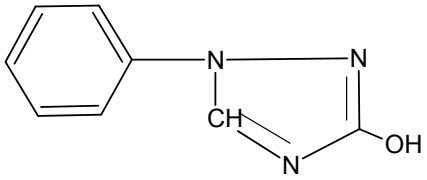
Sr. No.	Material	1 MT product
1	2-[p-(p-chloro phenoxy)-m-chloro phenyl]-2-bromo methyl-4-methyl-1,3-dioxolane	1.47
2	1-H-1,2,4-triazole	0.315
3	Potassium carbonate	0.63
4	Potassium iodide	0.015
5	N,N-dimethyl formamide	1.5
6	Ethyl acetate	1.80
7	Ether	1.00
8	Water	2.00
	Total	**8.73**

MATERIAL OUTPUT (QUANTITY IN MT)

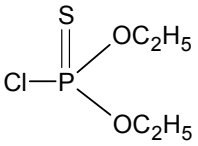
Sr. No.	Material	1 MT product	
1	Difenconazole	1.00	Product
2	Aqueous mass	3.795	To incinerator
3	DMF	1.44	Recover
4	Losses	0.327	Distillation
5	Ethyl acetate	1.728	Recover
6	Salt	0.440	
	Total	**8.73**	

O5: TRIAZOPHOS

Reaction Chemistry of Triazophos:



+

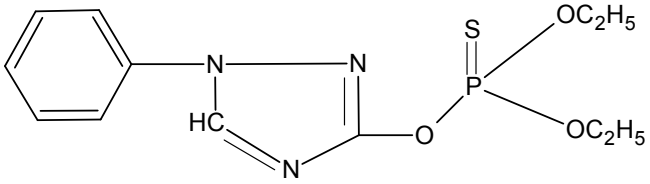


1-Phenyl-3-Hydroxy-1,2,4-Triazole

M. Wt. = 161

Diethyl Thiophosphoryl Chloride

M. Wt. = 188.5



+ NaCl

Triazophos

M. Wt. = 313.3

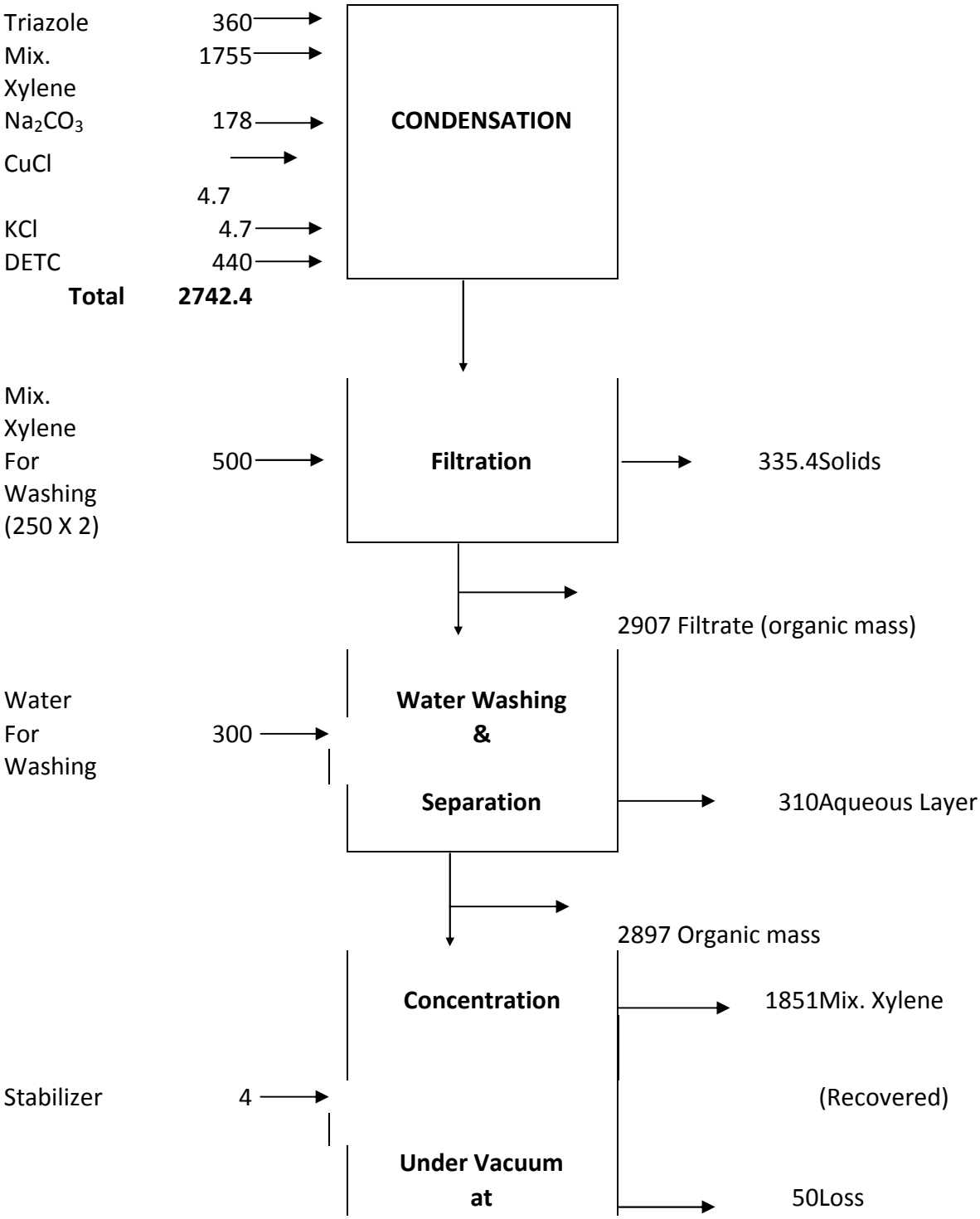
Sodium Chloride

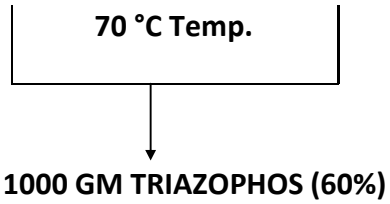
M. Wt. = 58.5

Brief Process:

1-Phenyl-3-Hydroxy-1,2,4-triazole reacts with diethyl thiophosphoryl chloride in presence of solvent to form Triazophos technical and sodium chloride is by product which is remove by filtration.

MATERIAL BALANCE FOR 1.0 KG OF TRIAZOPHOS




70 °C Temp.
1000 GM TRIAZOPHOS (60%)

MASS BALANCE FOR TRIAZOPHOS

MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	Triazole	0.360
2	Mix. Xylene	2.255
3	Na2CO3	0.178
4	CuCl	0.0047
5	KCl	0.0047
6	DETC	0.440
7	Water	0.300
	Total	**3.542**

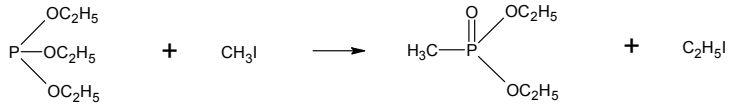
MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Triazophos	1.00	Product
2	Aqueous mass	0.310	To incinerator
3	Mix. Xylene	1.851	Recover
4	Salt cake	0.335	By product
5	Loss	0.05	Evaporation
	Total	**3.542**	

O6: GLUFOSINATE AMMONIUM SALT

Chemical Reaction:

Step-I Preparation of Diethyl Methane Phosphonate



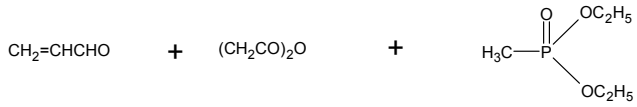
Triethyl Phosphite
M. Wt. = 166.1

Methyl iodide
M.Wt. = 141.9

Diethyl Methane Phosphonate
M. Wt. = 152

Ethyl Iodide
M.Wt.=155.9

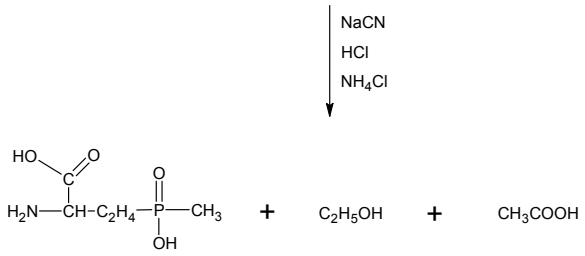
Step-II Preparation of Glufosinate ammonuim salt



Acrolein
M.Wt.=56.1

Acetic anhydride
M.Wt.=102

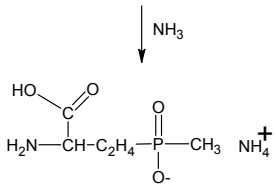
Diethyl Methane Phosphonate
M. Wt. = 152



Glufosinate
M. Wt. = 181.1

Ethanol
M.Wt. =46

Acetic acid
M.Wt.=60



Glufosinate Ammonium Salt
M. Wt. = 198.2

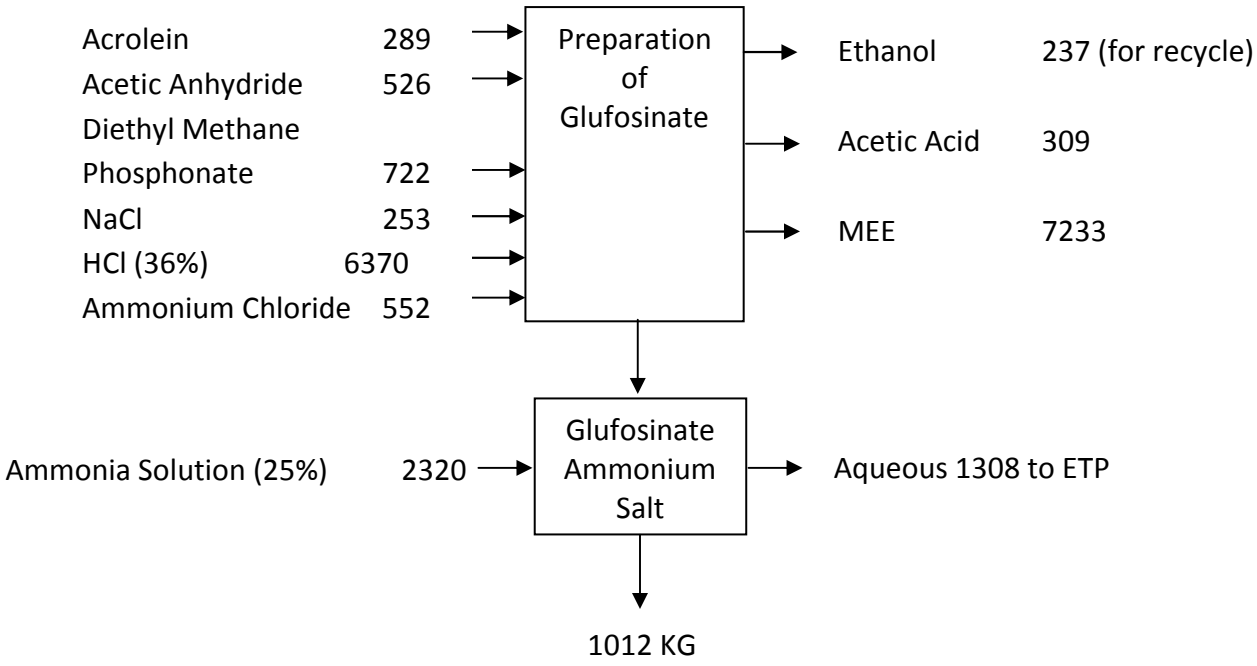
Manufacturing Process:

Step 1: The Trimethyl Phosphite is reacting with Methyl Iodide converted into Diethyl Methane Phosphonate and Ethyl Iodide.

Step 2: The Acroline is reacted with Acetic anhydride and Diethyl Methane Phosphonate and further it is reacted with Sodium Cyanide and Ammonium Chloride followed by hydrolyze with HCl to foam Glufosinate. This further reacts with Ammonium and forms Glufosinate Ammonium Salt.

Mass Balance:

MATERIAL BALANCE OFGLUFOSINATE AMMONIUM SALT



MASS BALANCE FOR GLUFOSINATE AMMONIUM SALT

MATERIAL INPUT (QUANTITY IN MT)

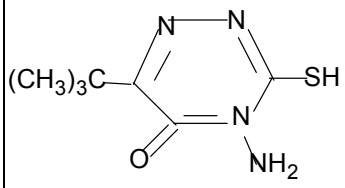
Sr. No.	Material	1 MT product
1	Acrolein	0.289
2	Acetic Anhydrie	0.526
3	Diethyl Methane Phosphonate	0.722
4	NaCl	0.253
5	HCl	6.370
6	Ammonia solution (25%)	2.320
	Total	**16.48**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Glufosinate Ammoniumsalt	1.00	Product
	Ethanol Rec.	0.237	Recover
2	Aqueous mass	1.308	To incinerator
3	Acetic Acid	0.309	By product
4	Aq.	6.233	ETP
5	Loss	0.393	Evaporation
	Total	**16.48**	

O7: METRIBUZINE

Chemical Reaction:



3- Thio-4- amino-6-t-utyl -

1,2,4- triazine-5-one (TAT)

M. Wt.=200

+ CH_3 Br

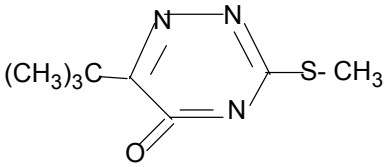
Methyl romide

M.Wt.=95

+ Na_2Co_3

Sodium Caronate

M.Wt.=106



Metribuzine

M.Wt=214

+ NaBr

Sodium romide

M.Wt.=103

+ H_2O

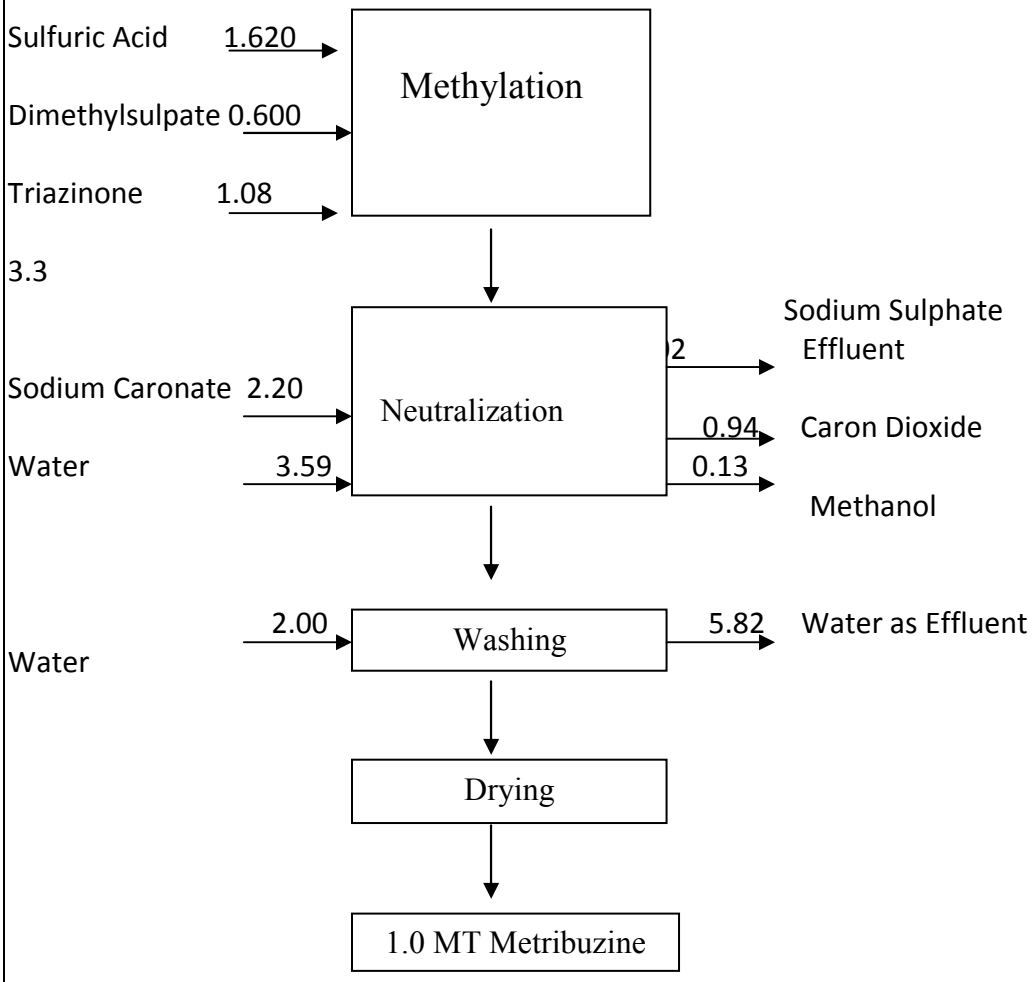
Water

M.Wt.=18

Process Description

3-Thio -4-amono-6-t-utyl-1,2,4-trizine-5-one(TAT) is reacted with dimethyl sulfate in presence of sulfuric acid as solvent to from Metriuzine. Reaction mixture is neutralized with sodium caronate solution to get pure Metribuzine.

MATERIAL BALANCE FOR 1.0 KG OF METRIBUZINE



MASS BALANCE FOR METRIBUZINE

MATERIAL INPUT (QUANTITY IN MT)

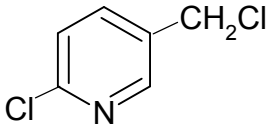
Sr. No.	Material	1 MT product
1	Sulfuric Acid	1.620
2	Dimethylsulpate	0.600
3	Triazinone	1.08
4	Sodium Caronate	2.20
5	Water	5.59
	Total	**11.09**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	**Metribuzine**	1.00	Product
	Caron Dioxide	0.94	Loss
	Sodium sulphate	3.20	By product
2	Re. MeOH	0.13	Recover
3	Water as Effluent	5.82	ETP
	Total	**11.09**	

P3: IMIDACLOPRID

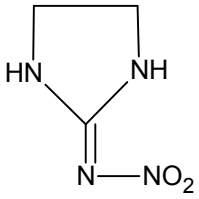
Reaction chemistry



2-Chloro-5-Chloromethyl Pyridine

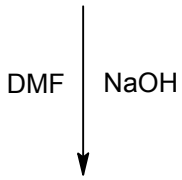
Mol. Wt. 162

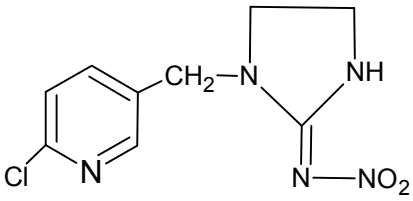
+



Nitroiminoimidazolidine

Mol. Wt. 130





Imidacloprid

Mol Wt. = 255.5

+

NaCl

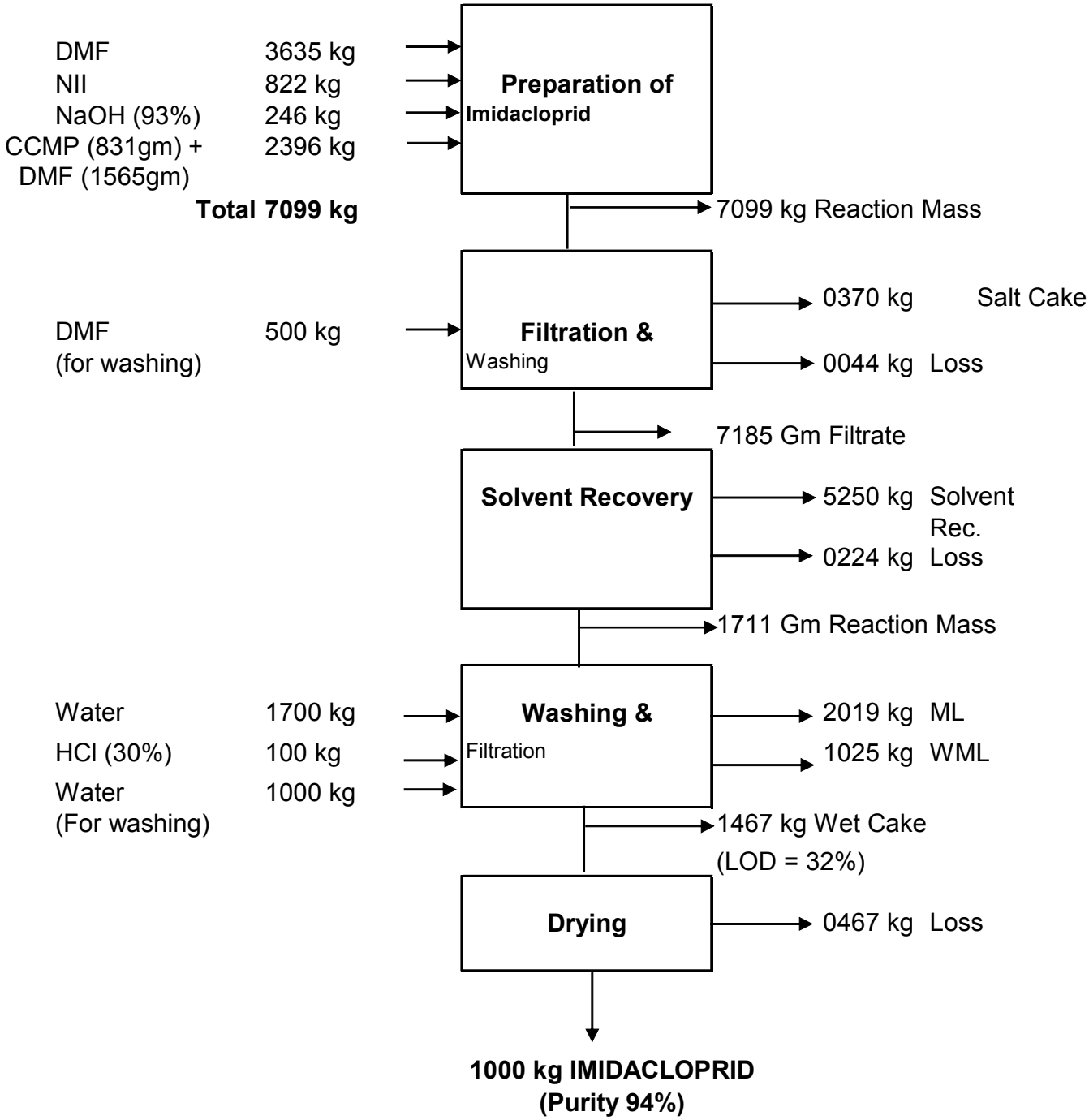
Sodium Chloride

Mol Wt. = 58.5

Preparation of Imidacloprid

Imidacloprid is prepared by reaction of 2-Chloro-5-chloromethylpyridine in presence of solvent and Nitroiminoimidazolidine with Caustic flakes. After the completion of CCMP the product is subjected to filtration to remove the formed salt followed by recovery of solvent. To the residual mass is added water, followed by filtration to obtain Imidacloprid.

Material balance FOR 1.0 KG of IMIDACLOPRID Technical



MASS BALANCE FOR NITRO IMIDACLOPRID

MATERIAL INPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product
1	Nitro imino imidazolidine	0.822
2	2-Chloro-5-Chloro methyl pyridine	0.831
3	NaOH flakes	0.246
4	DMF	5.700
5	HCl (30%)	0.100
6	Water	2.700
	Total	**10.399**

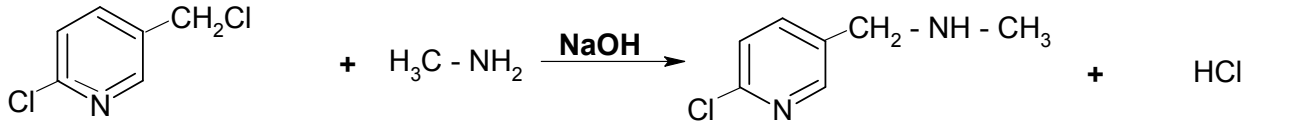
MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Imidacloprid	1.00	Product
2	Aqueous mass	3.044	To incinerator
3	DMF	5.250	Recover
4	Salt cake	0.370	By product
5	Loss	0.735	Evaporation
	Total	**10.399**	

P5: ACETAMIPRID

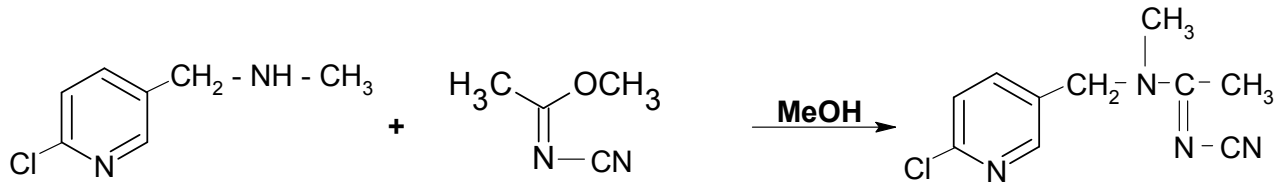
Reaction chemistry

STAGE : I



2-Chloro-5-Chloromethyl Pyridine	Mono Methyl Amine	N-Methyl-2-Chloro-5-Pyridyl Methyl amine (MACMP)	Hydrochloric acid
Mol. Wt. 162	Mol. Wt. 31	Mol Wt. 156.5	Mol Wt. 36.5

STAGE : II

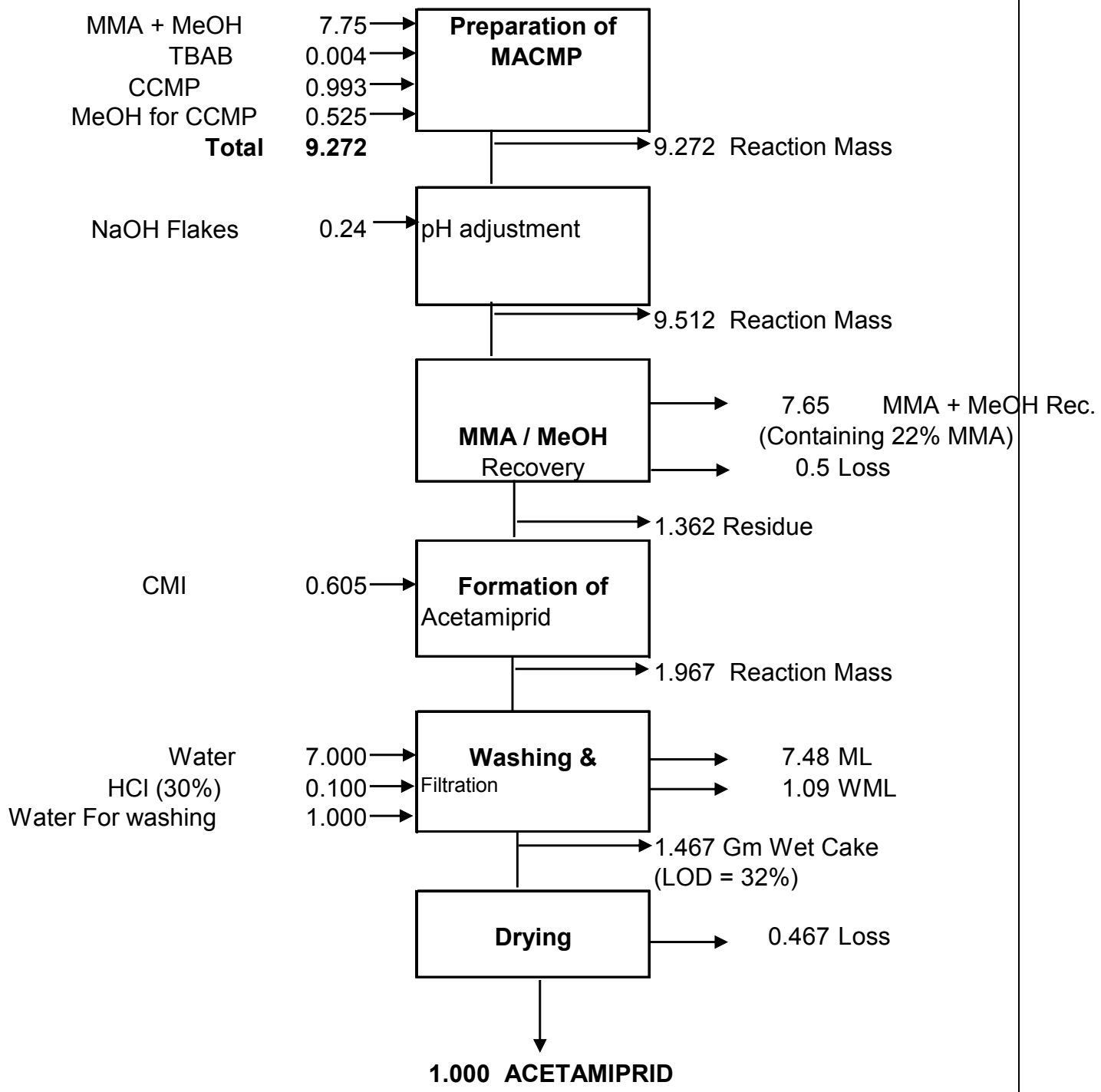


N-Methyl-2-Chloro-5-Pyridyl Methyl amine (MACMP)	Cyano Methyl Imidoate (CMI)	Acetamiprid
Mol Wt. 156.5	Mol Wt. 98	Mol Wt. 222.5

Brief Process:

To Methanolic solution of mono methylamine is added a mixture of (CCMP + MeOH) and Caustic flakes. The reaction mixture is subjected to distillation for recovery of MMA and on addition of CMI to the residual mixture gives Acetamiprid.

Material balance FOR 1.0 KG of ACETAMIPRID Technical



MASS BALANCE FOR ACETAMIPRID

MATERIAL INPUT (QUANTITY IN MT)

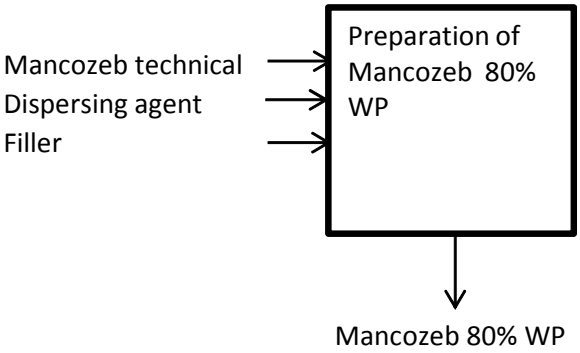
Sr. No.	Material	1 MT product
1	MMA+ methanol	7.75
2	Catalyst	0.004
3	2-Chloro-5-Chloro methyl pyridine	0.993
4	Methanol	0.525
5	Cyano methyl Imidoate	0.605
6	NaOH flakes	0.240
7	Water	8.000
8	HCl (30%)	0.100
	Total	**18.217**

MATERIAL OUTPUT (QUANTITY IN MT)

Sr. No.	Material	1 MT product	
1	Acetamiprid	1.00	Product
2	Aqueous mass	8.57	To incinerator
3	MMA+ Methanol	7.65	Recover
4	Loss	0.970	Evaporation
	Total	**18.217**	

BRIEF MANUFACTURING PROCESS WITH MASSS BALANCE & FLOW DIAGRAM OF FORMULATION PRODUCTS

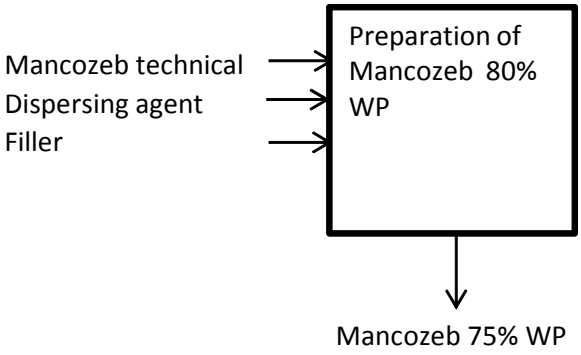
Flow diagram for Mancozeb 80% WP



Process

1. Ensure the Ribbon Blender being used is clean and dry.
2. Close the bottom gate of the Ribbon Blender.
3. Charge Mancozeb technical,Dispersing agent and Filler in the Ribbon Blender.
4. Close the top lid of the Ribbon Blender.
5. Start agitation for blending the ingredients.
6. Blend the ingredients for 5 hours leading to a homogeneous mass.
7. If the blending is not homogenous than further blend it for 1 - 2 hour for proper
8. Stop blending and before unload check the quality of material .

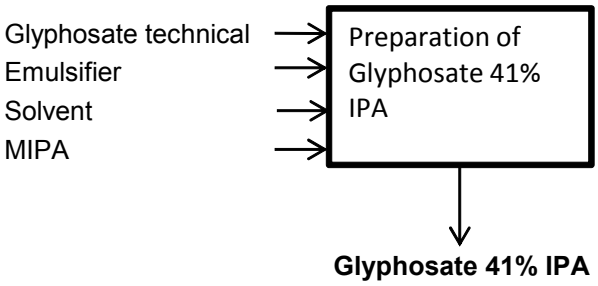
Flow diagram for Mancozeb 75% WP



Process

1. Ensure the Ribbon Blender being used is clean and dry.
2. Close the bottom gate of the Ribbon Blender.
3. Charge Mancozeb technical,Dispersing agent and Filler in the Ribbon Blender.
4. Close the top lid of the Ribbon Blender.
5. Start agitation for blending the ingredients.
6. Blend the ingredients for 5 hours leading to a homogeneous mass.
7. If the blending is not homogenous than further blend it for 1 - 2 hour for proper
8. Stop blending and before unload check the quality of material .

Flow diagram and process of Glyphosate 41% IPA



Process

1) In a neat, clean and dry reactor charge water, followed by addition of Glyphosate.

2) Start agitation for Proper homogenization

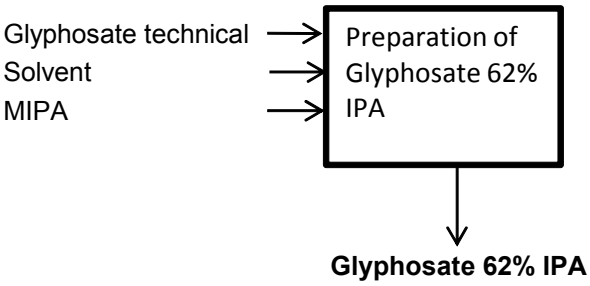
3) Now add the MIPA and stir for Glyphosate IPA

4) Now add emulsifier and stir.

5) Further continue to stir for proper homogenization.

6) Evalute the quality of the finished product before druming for packing in suitable container.

Flow diagram and process of Glyphosate 62% IPA



Process

1) In a neat, clean and dry reactor charge water, followed by addition of Glyphosate.

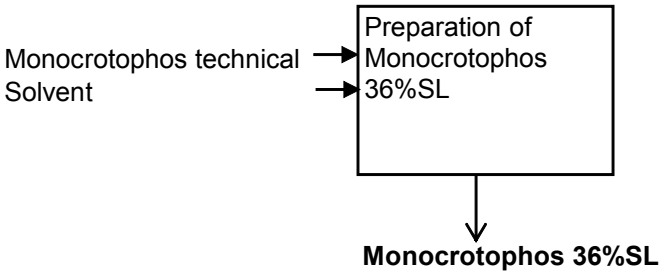
2) Start agitation for Proper homogenization

3) Now add the MIPA and stir for Glyphosate IPA

4) Further continue to stir for proper homogenization.

5) Evalute the quality of the finished product before druming for packing in suitable container.

Flow diagram of Monocrotophos 36%SL



Process

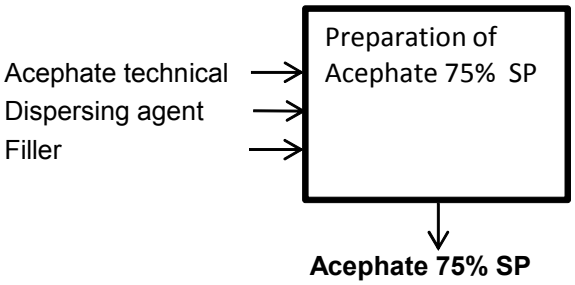
1) In a neat, clean and dry reactor charge solvent, followed by addition of Monocrotophos technical.

2) Start agitation for dissolution of Monocrotophos in solvent.

3) Further continue to stir for proper homogenization.

4) Evalute the quality of the finished product before druming for packing in suitable container.

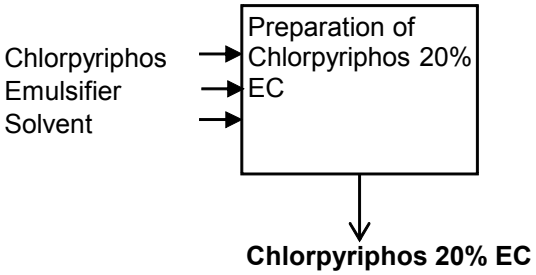
Flow diagram and process of Acephate 75% SP



Process

1. Ensure the Ribbon Blender being used is clean and dry.
2. Close the bottom gate of the Ribbon Blender.
3. Charge all the specified raw materials in the Ribbon Blender.
4. Close the top lid the Ribbon Blender.
5. Start agitation for blending the ingredients.
6. Blend the ingredients for 4 hours leading to a homogeneous mass.
7. Stop blending and unload the material.
8. Evaluate the material for Quality .

Flow diagram of Chlorpyriphos 20% EC



Process

1) In a neat, clean and dry reactor charge solvent, followed by addition of chlorpyrifos.

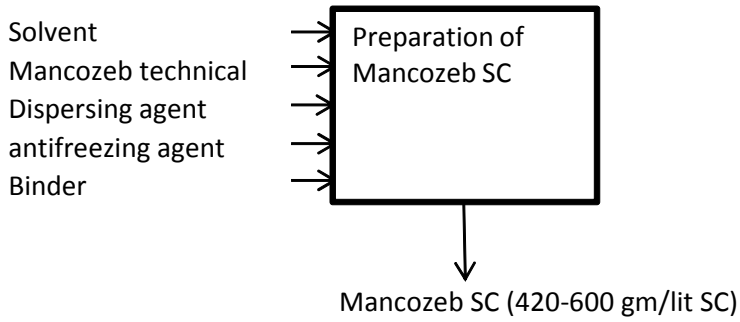
2) Start agitation for dissolution of chlorpyrifos in solvent.

3) Now add the emulsifier as specified to the above.

4) Further continue to stir for proper homogenization.

5) Evalute the quality of the finished product before druming for packing in suitable container.

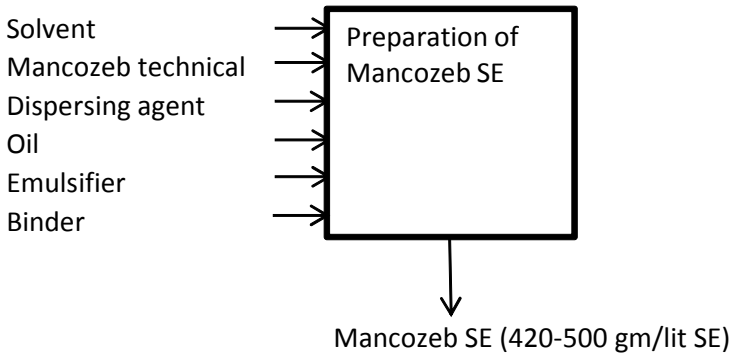
Flow diagram for Mancozeb SC (420-600 gmlit SC)



Process

1. Ensure the High Sheer Disperser is empty, dry and absolutely clean. It should be totally free from moisture and any foreign contaminants.
2. Charge water in the High sheer Disperser and start stirring.
3. To the above add dispersing agent and antifreezing agent and homogenize it by continuos stirring. Stir for 15 – 20 minutes for proper dissolution.
4. Now add the Mancozeb Technical in small lots over a period of 1- 2 hour under continuos stirring.
5. After completion of Mancozeb Technical addition further stir the total mass for 2 hour to achieve a proper and homogenized suspension.
6. Now to the homogenized suspension add Binder over a period of 15 minutes. Further stir for 1 hour.
7. Finally stir for 2 hour.
8. Evaluate the Finished product quality before drumming.

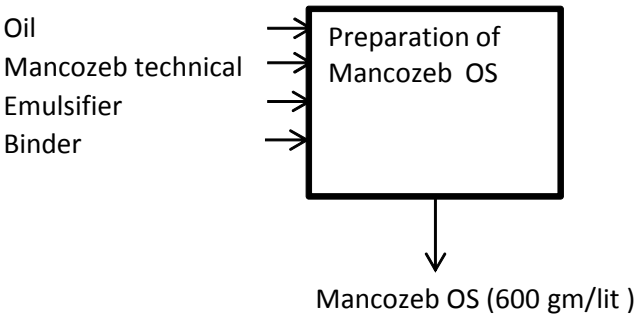
Flow diagram for Mancozeb SE (420-500 gmlit SE)



Process

1. Ensure the High Sheer Disperser is empty, dry and absolutely clean. It should be totally free from moisture and any foreign contaminants.
2. Charge water in the High sheer Disperser and start stirring.
3. To the above add dispersing agent , oil and emulsifier and homogenize it by continuos stirring. Stir for 15 – 20 minutes for proper dissolution.
4. Now add the Mancozeb Technical in small lots over a period of 1- 2 hour under continuos stirring.
5. After completion of Mancozeb Technical addition further stir the total mass for 2 hour to achieve a proper and homogenized suspension.
6. Now to the homogenized suspension add Binder over a period of 15 minutes. Further stir for 1 hour.
7. Finally stir for 2 hour.
8. Evaluate the Finished product quality before drumming.

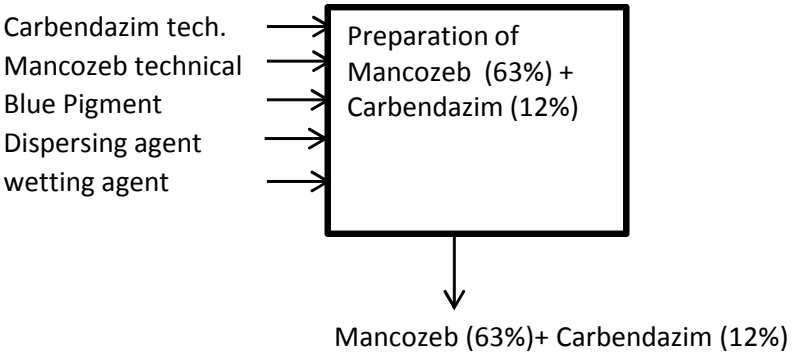
Flow diagram for Mancozeb OS (600 gm/lit)



Process

1. Ensure the High Sheer Disperser is empty, dry and absolutely clean. It should be totally free from moisture and any foreign contaminants.
2. Charge Oil in the High sheer Disperser and start stirring.
3. To the above add emulsifier and homogenize it by continuos stirring.
4. Now add the Mancozeb Technical in small lots over a period of 1- 2 hour under continuos stirring.
5. After completion of Mancozeb Technical addition further stir the total mass for 2 hour to achieve a proper and homogenized suspension.
6. Now to the homogenized suspension add Binder over a period of 15 minutes. Further stir for 1 hour.
7. Finally stir for 2 hour.
8. Evaluate the Finished product quality before drumming.

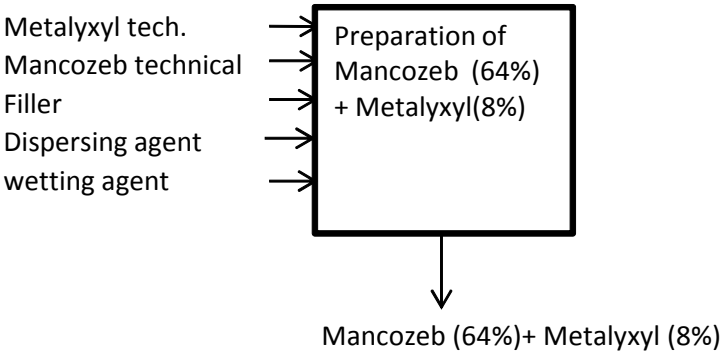
Flow diagram for Mancozeb (63%)+ Carbendazim (12%)



Process

1. Ensure the Ribbon Blender being used is clean and dry.
2. Close the bottom gate of the Ribbon Blender.
3. Charge Mancozeb technical,carbendazim technical,Blue pigment,Dispersing agent and wetting agent in the Ribbon Blender.
4. Close the top lid of the Ribbon Blender.
5. Start agitation for blending the ingredients.
6. Blend the ingredients for 5 hours leading to a homogeneous mass.
7. If the blending is not homogenous than further blend it for 1 - 2 hour for proper homogenization.
8. Stop blending and before unload the material check the quality.

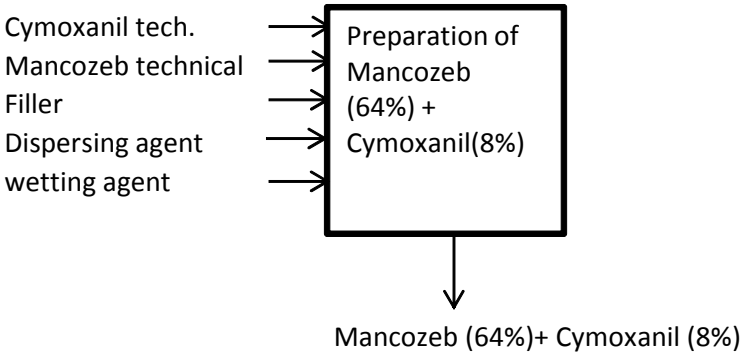
Flow diagram for Mancozeb (64%)+ Metalyxyl (8%)



Process

1. Ensure the Ribbon Blender being used is clean and dry.
2. Close the bottom gate of the Ribbon Blender.
3. Charge Mancozeb technical,metalyxyl technical,filler,Dispersing agent and wetting agent in the Ribbon Blender.
4. Close the top lid of the Ribbon Blender.
5. Start agitation for blending the ingredients.
6. Blend the ingredients for 5 hours leading to a homogeneous mass.
7. If the blending is not homogenous than further blend it for 1 - 2 hour for proper homogenization.
8. Stop blending and before unload the material check the quality.

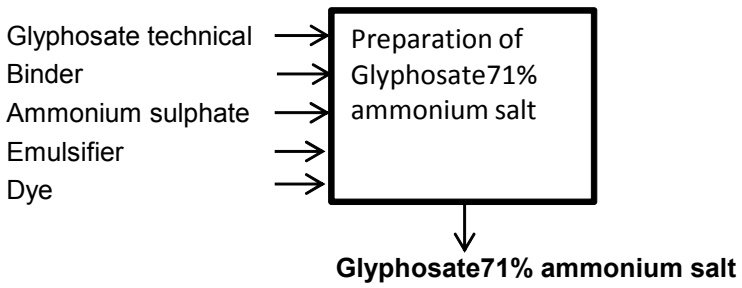
Flow diagram for Mancozeb (64%)+ Cymoxanil (8%)



Process

1. Ensure the Ribbon Blender being used is clean and dry.
2. Close the bottom gate of the Ribbon Blender.
3. Charge Mancozeb technical,Cymoxanil technical,filler,Dispersing agent and wetting agent in the Ribbon Blender.
4. Close the top lid of the Ribbon Blender.
5. Start agitation for blending the ingredients.
6. Blend the ingredients for 5 hours leading to a homogeneous mass.
7. If the blending is not homogenous than further blend it for 1 - 2 hour for proper homogenization.
8. Stop blending and before unload the material check the quality.

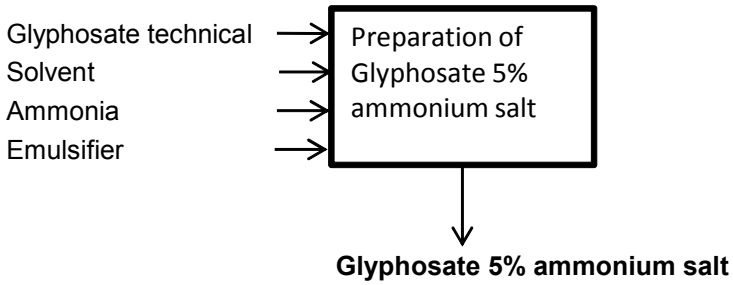
Flow diagram and process of Glyphosate71% ammonium salt



Process: -

1) Charge Glyphosate technical and binder, Ammonium sulfate and dye in a Grinder.
2) Stir and crush the ingredients to less than 2 micron through grinder. It has to pass then take a second pass; the material is fed through a hopper, which passes through the mesh. If it does not then re-crush and pass it through the mesh to meet th
3) Make a homogenous powder
4) Add Emulsifier to the powder and blend the material for 2 hours
5) Ensure homogenization of the material
6) Pass the material through extruder for making the granules as per the mesh size
7) During the extrusion spray Methanol on the dough to make the material granular
8) Collect the noodles and dry in hot air @ 50°C
9) Crush the noodles through the mesh as per the size desired
10) Analyze the material to the active constituent of Glyphosate Ammonium salt and pack.

Flow diagram and process of Glyphosate 5% ammonium salt



Process

1) In a neat, clean and dry reactor charge water, followed by addition of Glyphosate.

2) Start agitation for Proper homogenization

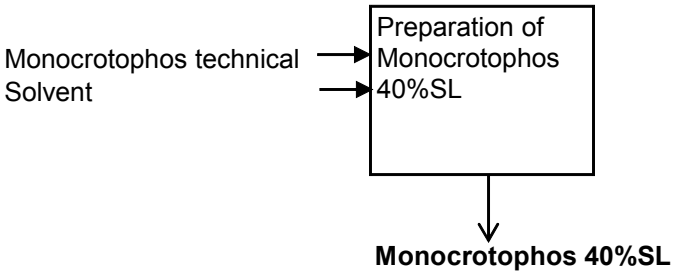
3) Now add the ammonia and stir for Glyphosate ammonia salt

4) Now add emulsifier and stir.

4) Further continue to stir for proper homogenization.

5) Evalute the quality of the finished product before druming for packing in suitable container.

Flow diagram of Monocrotophos 40%SL



Process

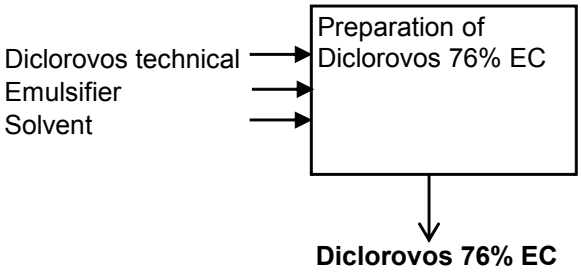
1) In a neat, clean and dry reactor charge solvent, followed by addition of Monocrotophos technical.

2) Start agitation for dissolution of Monocrotophos in solvent.

3) Further continue to stir for proper homogenization.

4) Evalute the quality of the finished product before druming for packing in suitable container.

Flow diagram of Diclorovos 76% EC



Process

1) In a neat, clean and dry reactor charge solvent, followed by addition of Diclorovos.

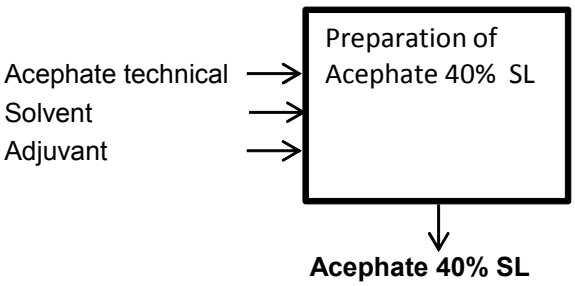
2) Start agitation for dissolution of Diclorovos in solvent.

3) Now add the emulsifier as specified to the above.

4) Further continue to stir for proper homogenization.

5) Evalute the quality of the finished product before druming for packing in suitable container.

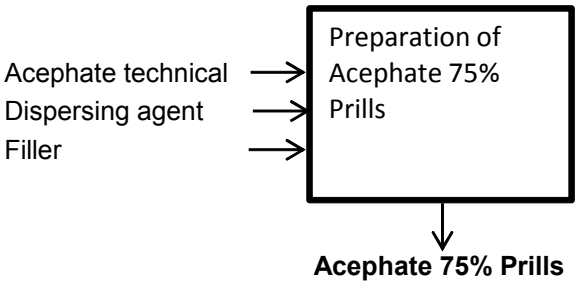
Flow diagram and process of Acephate 40% SL



Process

1. Ensure the Reactor is clean and dry.
2. Ensure the bottom valve of the Reactor is closed.
3. Charge Solvent in to reactor.
4. Slowly charge Acephate technical under stirring and ensure complete dissolution of Acephate in solvent.
5. Now charge Adjuvant.
6. Further agitate for complete homogenization resulting into proper dissolution.
7. Stop stirring and unload the material.
8. Evaluate the material for Quality.

Flow diagram and process of Acephate 75% Prills



Process: -

1 Charge Acephate technical,Dispersing agent and Filler in a Grinder.

2 Stir and crush the ingredients to less than 2 micron through grinder. It has to pass then take a second pass; the material is fed through a hopper, which passes through the mesh. If it does not then re-crush and pass it through the mesh to meet t

3 Make a homogenous powder

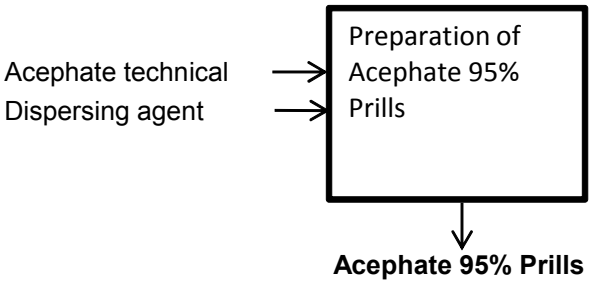
4 Pass the material through extruder for making the granules as per the mesh size

5 Collect the noodles and dry in hot air @ 45°C

6 Crush the noodles through the mesh as per the size desired

7 Analyze the material for the active constituent of Acephate.

Flow diagram and process of Acephate 95% Prills



Process: -

1 Charge Acephate technical and Dispersing agent in a Grinder.

2 Stir and crush the ingredients to less than 2 micron through grinder. It has to pass then take a second pass; the material is fed through a hopper, which passes through the mesh. If it does not then re-crush and pass it through the mesh to meet t

3 Make a homogenous powder

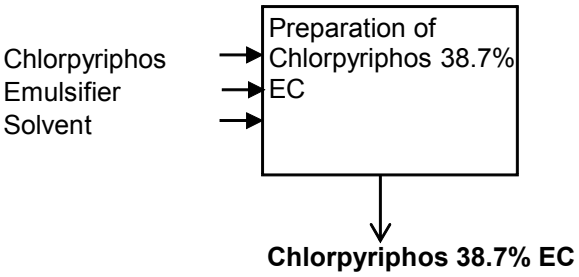
4 Pass the material through extruder for making the granules as per the mesh size

5 Collect the noodles and dry in hot air @ 45°C

6 Crush the noodles through the mesh as per the size desired

7 Analyze the material for the active constituent of Acephate.

Flow diagram of Chlorpyriphos 38.7% EC



Process

1) In a neat, clean and dry reactor charge solvent, followed by addition of chlorpyrifos.

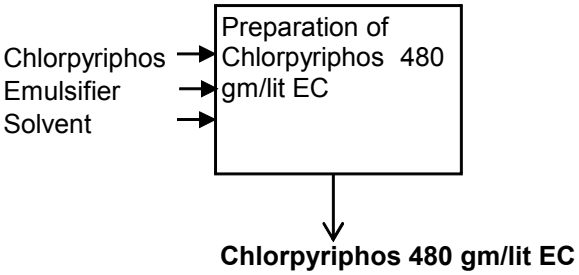
2) Start agitation for dissolution of chlorpyrifos in solvent.

3) Now add the emulsifier as specified to the above.

4) Further continue to stir for proper homogenization.

5) Evalute the quality of the finished product before druming for packing in suitable container.

Flow diagram of Chlorpyriphos 480 gm/lit EC



Process

1) In a neat, clean and dry reactor charge solvent, followed by addition of chlorpyrifos.

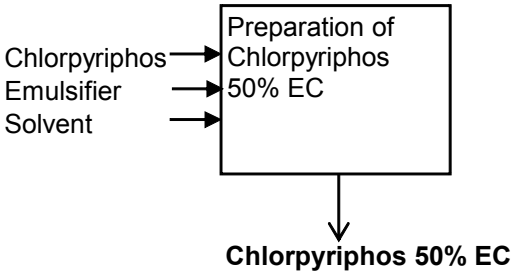
2) Start agitation for dissolution of chlorpyrifos in solvent.

3) Now add the emulsifier as specified to the above.

4) Further continue to stir for proper homogenization.

5) Evalute the quality of the finished product before druming for packing in suitable container.

Flow diagram of Chlorpyriphos 50% EC



Process

1) In a neat, clean and dry reactor charge solvent, followed by addition of chlorpyrifos.

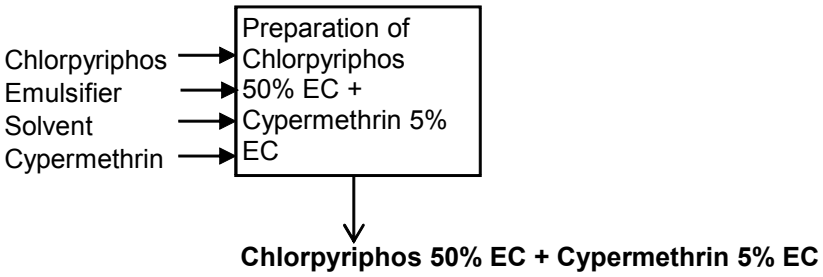
2) Start agitation for dissolution of chlorpyrifos in solvent.

3) Now add the emulsifier as specified to the above.

4) Further continue to stir for proper homogenization.

5) Evalute the quality of the finished product before druming for packing in suitable container.

Flow diagram of Chlorpyriphos 50% + Cypermethrin 5% EC



Process

1) In a neat, clean and dry reactor charge solvent, followed by addition of chlorpyrifos and Cypermethrin

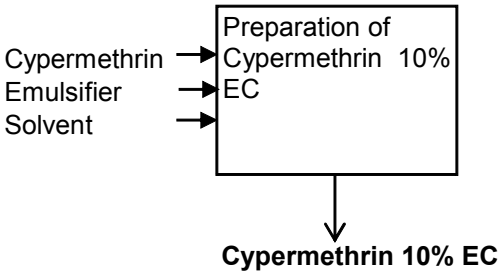
2) Start agitation for dissolution of chlorpyrifos in solvent

3) Now add the emulsifier as specified to the above.

4) Further continue to stir for proper homogenization.

5) Evalute the quality of the finished product before druming for packing in suitable container.

Flow diagram of Cypermethrin 10% EC



Process

1) In a neat, clean and dry reactor charge solvent, followed by addition of cypermethrin.

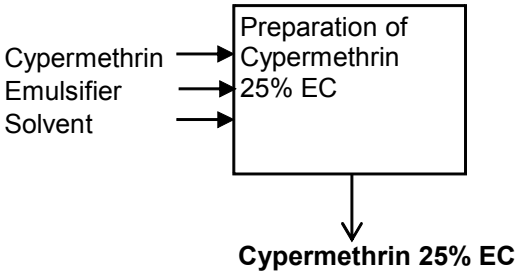
2) Start agitation for dissolution of cypermethrin in solvent.

3) Now add the emulsifier as specified to the above.

4) Further continue to stir for proper homogenization.

5) Evalute the quality of the finished product before druming for packing in suitable container.

Flow diagram of Cypermethrin 25% EC



Process

1) In a neat, clean and dry reactor charge solvent, followed by addition of cypermethrin.

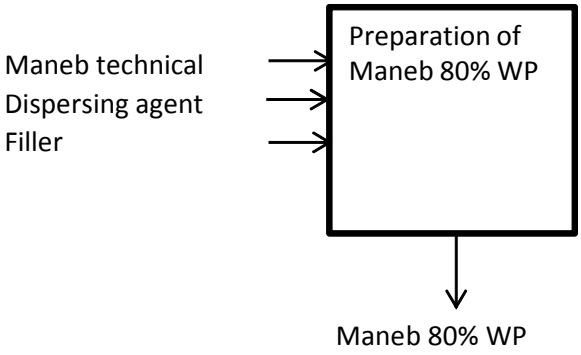
2) Start agitation for dissolution of cypermethrin in solvent.

3) Now add the emulsifier as specified to the above.

4) Further continue to stir for proper homogenization.

5) Evalute the quality of the finished product before druming for packing in suitable container.

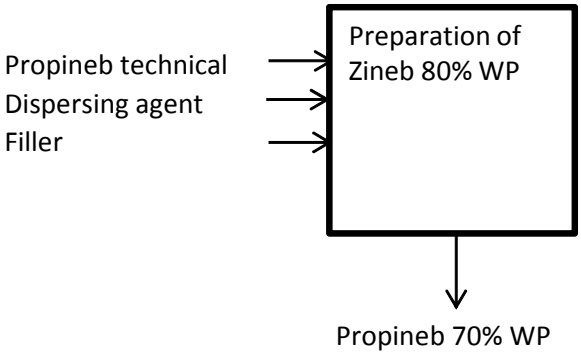
Flow diagram for Maneb 80% WP



Process

1. Ensure the Ribbon Blender being used is clean and dry.
2. Close the bottom gate of the Ribbon Blender.
3. Charge Mancozeb technical,Dispersing agent and Filler in the Ribbon Blender.
4. Close the top lid of the Ribbon Blender.
5. Start agitation for blending the ingredients.
6. Blend the ingredients for 5 hours leading to a homogeneous mass.
7. If the blending is not homogenous than further blend it for 1 - 2 hour for proper
8. Stop blending and before unload check the quality of material .

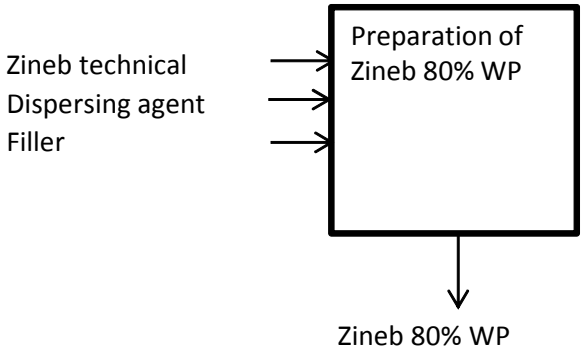
Flow diagram for Propineb 70% WP



Process

1. Ensure the Ribbon Blender being used is clean and dry.
2. Close the bottom gate of the Ribbon Blender.
3. Charge Mancozeb technical,Dispersing agent and Filler in the Ribbon Blender.
4. Close the top lid of the Ribbon Blender.
5. Start agitation for blending the ingredients.
6. Blend the ingredients for 5 hours leading to a homogeneous mass.
7. If the blending is not homogenous than further blend it for 1 - 2 hour for proper
8. Stop blending and before unload check the quality of material .

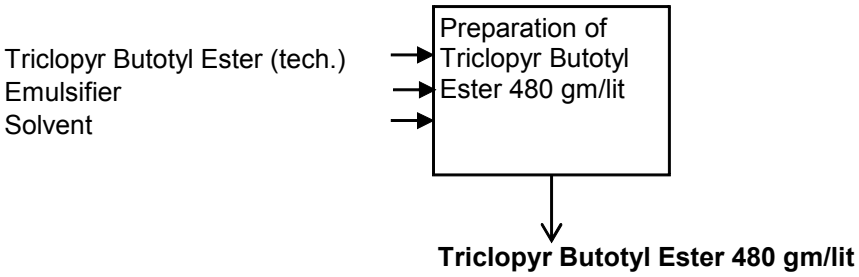
Flow diagram for Zineb 80% WP



Process

1. Ensure the Ribbon Blender being used is clean and dry.
2. Close the bottom gate of the Ribbon Blender.
3. Charge Mancozeb technical,Dispersing agent and Filler in the Ribbon Blender.
4. Close the top lid of the Ribbon Blender.
5. Start agitation for blending the ingredients.
6. Blend the ingredients for 5 hours leading to a homogeneous mass.
7. If the blending is not homogenous than further blend it for 1 - 2 hour for proper
8. Stop blending and before unload check the quality of material .

Flow diagram of Triclopyr Butotyl Ester 480 gm/lit



Process

1) In a neat, clean and dry reactor charge solvent, followed by addition of Triclopyr Butotyl Ester tech.

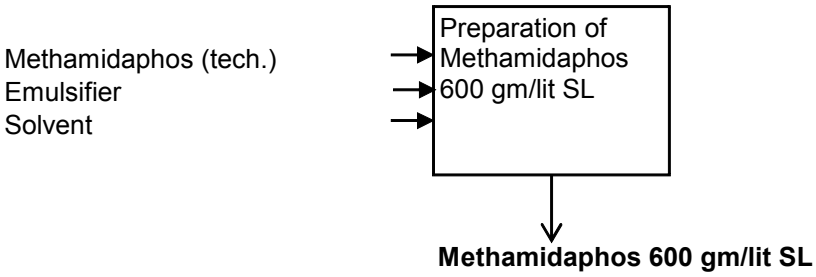
2) Start agitation for dissolution of T Triclopyr Butotyl Ester in solvent.

3) Now add the emulsifier as specified to the above.

4) Further continue to stir for proper homogenization.

5) Evalute the quality of the finished product before druming for packing in suitable container.

Flow diagram of Methamidaphos 600 gm/lit SL



Process

1) In a neat, clean and dry reactor charge solvent, followed by addition of Methamidaphos tech.

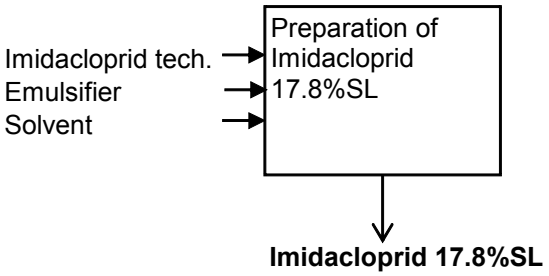
2) Start agitation for dissolution of Methamidaphos in solvent.

3) Now add the emulsifier as specified to the above.

4) Further continue to stir for proper homogenization.

5) Evalute the quality of the finished product before druming for packing in suitable container.

Flow diagram of Imidacloprid 17.8%SL



Process

1) In a neat, clean and dry reactor charge solvent, followed by addition of Imidacloprid tech.

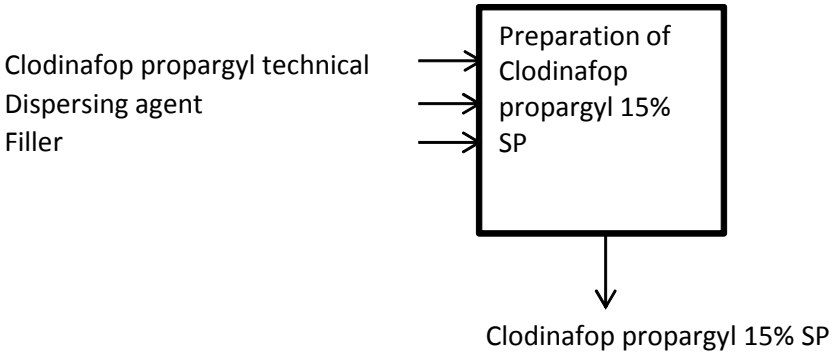
2) Start agitation for dissolution of Imidacloprid in solvent.

3) Now add the emulsifier as specified to the above.

4) Further continue to stir for proper homogenization.

5) Evalute the quality of the finished product before druming for packing in suitable container.

Flow diagram for Clodinafop propargyl 15% SP



Process

1. Ensure the Ribbon Blender being used is clean and dry.
2. Close the bottom gate of the Ribbon Blender.
3. Charge Clodinafop propargyl technical,Dispersing agent and Filler in the Ribbon Blender.
4. Close the top lid of the Ribbon Blender.
5. Start agitation for blending the ingredients.
6. Blend the ingredients for 5 hours leading to a homogeneous mass.
7. If the blending is not homogenous than further blend it for 1 - 2 hour for proper
8. Stop blending and before unload check the quality of material .

ANNEXURE-IV

STORAGE DETAILS OF HAZARDOUS CHEMICALS

Sr. No.	Raw materials	Storage size	Type of Storage and Nos.	Max quantity stored	Phase of Chemical	Storage Condition	Hazards Involved
1	Acetic anhydride	40 KL	1 Tank	42 MT	Liquid	Over Ground	Corrosive
2	Caustic lye 47%	100 KL	1 Tank	150 MT	Liquid	Over Ground	Corrosive
3	Methanol	20 KL	3 Tanks	47.5 MT	Liquid	Under Ground	Inflammable
4	Ethanol	20 KL	2 Tanks	31.6 MT	Liquid	Under Ground	Inflammable
5	Carbon disulphide	50 KL	2 Tank	120 MT	Liquid	Over Ground	Inflammable
6	Ammonia	20 KL	2 Tanks	39.674 MT	Liquid	Over Ground	Toxic
7	Ethylene diamine	20 KL	1 Tank	18 MT	Liquid	Over Ground	Toxic
8	Acrylonitrile	12 KL	1 Tank	10 MT	Liquid	Over Ground	Toxic
9	Sulphuric acid	30 KL	1 Tank	30 MT	Liquid	Over Ground	Corrosive
10	Dimethyl sulphate	25 KL	1 Tank	30 MT	Liquid	Over Ground	Corrosive

ANNEXURE-V

DESCRIPTION OF ETP WITH FLOW DIAGRAM

DETAILS OF EFFLUENT TREATMENT PLANT

(A) CONVENTIONAL TREATMENT PLANT

- **PROCEDURE:**

  Effluent Treatment Process comprises Primary, Secondary and Tertiary treatments.

- **PRIMARY TREATMENT:**

  Primary treatment consists of:
  - Removing of oil and grease
  - Collection / equalization of effluent
  - Primary (Chemical) treatment
  - Clarifloculation

1. Removing of oil and grease:

   The waste water coming from boiler and cooling tower blow down, domestic, canteen, leachate from sludge drying bed, QC / R & D, scrubbers, effluent generated from decontamination of drums and contaminated condensate from the various ejectors is collected in equalization tank E through Oil and Grease chamber. The oil and grease is manually removed periodically and sent for incineration.
2. Collection / equalization of effluent:

   The above collected effluent from various streams is equalized in equalization tank E and sent for primary treatment in C & D. the sample is analyzed for pH, COD, TDS, SS ammonical Nitrogen and BOD.
3. Primary chemical treatment:

   The sample coming from tank E after proper equalization is having pH 6 – 7.5. after receipt of 55 – 60 KL effluent, it is neutralized by addition of hydrated lime solution with proper mixing by fixed agitator to maintain the pH 8.5 – 9. After the lime treatment polyelectrolyte is added for coagulation and fast settling.
4. Clarifloculation:

   The treated effluent from tank C & D is transferred to Clarifloculator A. the clear supernant liquid flows to sump. The settled sludge is transferred from bottom to sludge drying beds on regular basis. The clear supernant liquid collected in the sump is transferred to Bioreactor for biological treatment.

- **SECONDARY TREATMENT (BIOLOGICAL):**

  The capacity of Bioreactor 1 is 1000 KL and Bioreactor 2 is 100 KL. Bioreactor 1 is provided with three surface aerators of 25 HP each where as Bioreactor 2 is provided with 7.5 HP fixed type aerator. In addition to this, adequate arrangement for diffused type aeration is provided in both the Bioreactors with Routes Blower installed.

  The primary treated effluent coming from the sump is continuously fed to Bioreactor 1 and the overflow of Bioreactor 1 flows to Bioreactor 2. The bio reacted effluent along with MLSS flows to the Secondary Clarifier (CL2). In secondary process, Nitrogen and phosphorous are required for biomass. Phosphorous and Nitrogen components are already present in conventional waste water. To maintain the bio-mass level and F/M ratio Jaggry is added intermittently as per requirement.

  Supernant effluent from Clarifier 2 flows to Flash Mixture for tertiary treatment. The settled bio mass is recycled to Bioreactor 1 for maintaining the MLSS level. In case the biomass level exceeds the limit, the excess biomass is transferred to sludge drying bed through circulation pump.

- **TERTIARY TREATMNET:**

  The tertiary treatment consists of:

  a) Chemical treatment:

     The supernant effluent coming from Clarifier 2 and new Clarifloculator (Mancozeb effluent after H_2O_2 treatment) is mixed with the help of agitator. Ferrous sulphate lime and activated carbon and flocculants are added after every 4 hours for coagulation and fast settling.

     The treated effluent from flash mixer is coming in Clarifier 3. The clear supernant liquid is transferred to Filter feed sump tank. The settled sludge from Clarifier 3 is transferred to sludge drying beds.

  b) Polishing by filtration in sand filter and carbon filter:

     The treated effluent from Filter Feed Sump Tank is passed through sand filter (2 Nos.) and carbon filters (2 Nos.). The outlet from Carbon filters flows to Treated water Tank and then to RCC guard pond / syntax tanks (2 Nos.). Sand filters and carbon filters are back washed by treated water every alternate day and back washed water is collected in Primary Treatment Tanks C and D. In every three months carbon is replaced from Carbon filter and disposed off.

- **DISPOSAL OF TREATED WATER:**

  The treated water from treated water tank is collected in Guard pond and analyzed. After confirming the analysis report, the treated water is finally discharged from guard ponds to final discharge Tank provided with control valve

and the treated effluent goes to GIDC underground drainage system for ultimate disposal to Arabian Sea.

- **LIST OF EQUIPMENTS AND ITS CAPACITY**

Sr. No.	Tag No.	Title	Qty.	Size/Capacity
1	Tank E Tank C & D	Collection Equalization / Neutralization	1 2	L=9.6, W=4.5, D=2 L=10, W=6, D-2
2	A-105 A/B	Agitator for Equalization tank	2	7.5 HP
3	P-101 A/B	Transfer pump – 1	2	10.5 M^3/HR, 3 HP
4	T-102	Flash Mixer -1	1	L=2, W=2, D=2.
5	A-106	Agitator for mixer	1	3 HP
6	T-103	Clarifloculator	1	Ø=5, SWD=3.
7	A-107	Mechanism for Clarifloculator	1	1 HP
8	T-104	Sump	1	L=2, W=2, D=2.
9	P-102 A/B	Transfer pumps	2	10.5 M^3/HR, 3 HP
10	V-105 A/B	Charcoal Bed Filter	2	D=1.25, H=2.75.
11	T-105	Aeration Tank – I	1	L=26.5, W=11, D=3.8.
12	A-108 A/B/C	Aerators for aeration Tank – I	3	A- 30 HP, B- 25 HP, C- 25HP.
13	T-106	Bioclarifier – 1	1	Ø=4, SWD=2.75.
14	A-109	Clarifier Mechanism	1	1 HP
15	T-107	Bio sludge sump -1	1	L=6.25, W=2, D=3.85
16	P-103 A/B	Bio sludge recirculation pumps	2	22.5 M^3/HR, 5 HP
17	T-108	Aeration tank – II	1	L=7, W=6, D=2.8
18	A-110	Aerator for aeration	1	7.5 HP
19	T-109	Bio clarifier – II	1	Ø=4, D=2.75.
20	A-111	Clarifier Mechanism	1	1 HP
21	T-110	Bio sludge sump –II	1	L=1.58, W=1.2, D=3.85
22	P-104 A/B	Bio sludge recirculation pumps	2	15 M^3/HR, 3 HP
23	T-111	Flash mixer	1	Ø=3.5, SWD=2.85.
24	A-112	Flash mixer agitator	1	3 HP
25	T-112	Clarifier III	1	Ø=4, SWD=2.75.
26	A-113	Clarifier Mechanism	1	1 HP
27	T-113	sludge sump –III	1	L=1.58, W=1.2, D=3.85
28	P-105 A/B	SLUDGE PUMP	2	7.5 M^3/HR, 3 HP
29	T-114	Filter feed sump	1	D=1.25, H=2.75
30	V-106 A/B	Pressure sand filter	2	D=1.25, H=2.75

31	V-107 A/C	Carbon bed pressure filter	2	D=1.25, H=4.25
32	P-106 A/B	Filter feed pump	2	10.5 M^3/HR, 3 HP
33	P-107	Back wash pumps	2	15 M^3/HR, 5 HP
34	V-101	NaOH solution tank	1	D=1.25, H=1.25
35	V-102	Lime solution tank	1	D=1.25, H=1.25
36	V-103	Alum solution tank	1	D=1.00, H=1.05
37	V-104	$FeSO_4$ solution tank	1	D=1.25, H=1.25
38	A-101	Mixer for NaOH tank	1	1 HP
39	A-102	Mixer for lime tank	1	1 HP
40	A-103	Mixer for alum tank	1	1 HP
41	A-104	Mixer for $FeSO_4$ tank	1	1 HP
42	T-115	Treated water sump	1	L=4, W=4, D=2.5
43	T-116 A/B/C/D	Sludge drying beds	5	L=4.0, W=2.3, D=1.5
44	T-117 A/B/C/D	Sludge drying beds	5	L=9.3, W=1.5, D=1.4
45	T-118	Inlet sump	1	L=1.7, W=1.5, D=1.4
46	P-108 A/B	inlet pump	2	7.5 M^3/HR, 3 HP
47	T-119 / T-120	GUARD Pond – I, II, III and IV	4	L=5, W=5, D=1.5
48	P-110	Guard Pond Transfer Pump	1	10.5 M^3/HR, 3 HP
49	T-125	Main hole connected to GIDC line	1	W=1.45 X 1.45
50	T-121	Clarifloculator – II	1	Ø=4, SWD=2.75.
51		Neutralization tank	1	Ø=2, SWD=4.0.
52		Settling tank	1	Ø=2, SWD=2.75.

DETAILS OF NORMAL ETP AT EXISTING

		Existing ETP, m^3/day			
Tag No.	**Title**	**Qty.**	**Size/Capacity**	**cap each**	**total cap.**
Tank E	Collection	1	L=9.6, W=4.5, D=2	86.4	86.1
Tank C & D	Equalization / Neutralization	2	L=10, W=6, D-2	120	240
A-105 A/B	Agitator for Equalization tank	2	7.5 HP		
P-101 A/B	Transfer pump – 1	2	10.5 M^3/HR, 3 HP		
T-102	Flash Mixer -1	1	L=2, W=2, D=2.	8	8
A-106	Agitator for mixer	1	3 HP		
T-103	Clarifloculator	1	Ø=5, SWD=3.	58.9	58.9
A-107	Mechanism for Clarifloculator	1	1 HP		
	New Clarifier	1			
T-104	Sump	1	L=2, W=2, D=2.	8	8
P-102 A/B	Transfer pumps	2	10.5 M^3/HR, 3 HP		
V-105 A/B	Charcoal Bed Filter	2	D=1.25, H=2.75.	3.37	3.37
T-105	Aeration Tank – I	1	L=26.5, W=11, D=3.8.	1107.7	1107.7
A-108 A/B/C	Aerators for aeration Tank – I	3	A- 30 HP,	80 HP	80 HP
			B- 25 HP,		
			C- 25HP.		
T-106	Bioclarifier – 1	1	Ø=4, SWD=2.75.	34.54	34.54
A-109	Clarifier Mechanism	1	1 HP		
T-107	Bio sludge sump -1	1	L=6.25, W=2, D=3.85	48.1	48.1
P-103 A/B	Bio sludge recirculation pumps	2	22.5 M^3/HR, 5 HP		
T-108	Aeration tank – II	1	L=7, W=6, D=2.8	117.6	117.6
A-110	Aerator for aeration	1	7.5 HP	7.5	7.5

T-109	Bio clarifier – II	1	Ø=4, D=2.75.	34.54	34.54
A-111	Clarifier Mechanism	1	1 HP		
T-110	Bio sludge sump –II	1	L=1.58, W=1.2, D=3.85	7.3	7.3
P-104 A/B	Bio sludge recirculation pumps	2	15 M^3/HR, 3 HP		
T-111	Flash mixer	1	Ø=3.5, SWD=2.85.	27.4	27.4
A-112	Flash mixer agitator	1	3 HP		
T-112	Clarifier III	1	Ø=4, SWD=2.75.	34.54	34.54
A-113	Clarifier Mechanism	1	1 HP		
T-113	sludge sump –III	1	L=1.58, W=1.2, D=3.85	7.3	7.3
P-105 A/B	SLUDGE PUMP	2	7.5 M^3/HR, 3 HP		
T-114	Filter feed sump	1	D=1.25, H=2.75	3.37	3.37
V-106 A/B	Pressure sand filter	2	D=1.25, H=2.75	3.37	3.37
V-107 A/C	Carbon bed pressure filter	2	D=1.25, H=4.25	3.37	3.37
P-106 A/B	Filter feed pump	2	10.5 M^3/HR, 3 HP		
P-107	Back wash pumps	2	15 M^3/HR, 5 HP		
V-101	NaOH solution tank	1	D=1.25, H=1.25	1.53	1.53
V-102	Lime solution tank	1	D=1.25, H=1.25	1.53	1.53
V-103	Alum solution tank	1	D=1.00, H=1.05	1.53	1.53
V-104	$FeSO_4$ solution tank	1	D=1.25, H=1.25	1.53	1.53
A-101	Mixer for NaOH tank	1	1 HP		
A-102	Mixer for lime tank	1	1 HP		
A-103	Mixer for alum tank	1	1 HP		
A-104	Mixer for $FeSO_4$ tank	1	1 HP		
T-115	Treated water sump	1	L=4, W=4, D=2.5	40	40
T-116 A/B/C/D	Sludge drying beds	5	L=4.0, W=2.3, D=1.5	13.8	69
T-117 A/B/C/D	Sludge drying beds	5	L=9.3, W=1.5, D=1.4	19.53	97.65
T-118	Inlet sump	1	L=1.7, W=1.5, D=1.4	3.57	3.57

P-108 A/B	inlet pump	2	7.5 M^3/HR, 3 HP		
T-119 / T-120	GUARD Pond – I, II, III and IV	4	L=5, W=5, D=1.5	37.5	150
P-110	Guard Pond Transfer Pump	1	10.5 M^3/HR, 3 HP		
T-125	Main hole connected to GIDC line	1	W=1.45 X 1.45		
T-121	Clarifloculator – II	1	Ø=4, SWD=2.75.	34.54	34.54
	Neutralization tank	1	Ø=2, SWD=4.0.	12.56	12.56
	Settling tank	1	Ø=2, SWD=2.75.	8.635	8.635

(B) EXISTING MANCOZEB EFFLUENT TREATMENT PLANT:

In addition to the effluent treatment plant, M/S Coromandel International Limited has installed a separate Mancozeb effluent treatment plant for Mancozeb ML generated during the Mancozeb production.

The details of Mancozeb effluent treatment plant described as follows.

- Effluents coming from Mancozeb Plant are collected in two 100 KL tanks as provided of 100KL capacity each where sufficient settling time is given.
- The homogenized effluent from these tanks is pumped/by gravity to RCC tank (100 KL capacity) and from here it is pumped to static mixer. In static mixer 20% sodium carbonate solution (Soda ash dosing) and maintain the pH is around 9.0 to 9.5, Caustic addition to maintain the pH is around 12 and Sulphuric acid addition to maintain the pH is around 7.0 to 7.5 to remove the Mn content from effluent. After clarification of the effluent and transfer to filter press via sand filter for removal of Mn content and suspended solids. After clarification of the effluent and sent to MEE for evaporation and drying for sodium sulphate by-product recovery and condensate coming from MEE plant after cooling with heat recovery system / cooling tower with temperature monitoring and sent to ETP for further biological and tertiary treatment
- **DISPOSAL OF TREATED WATER:**
  The treated water from treated water tank is collected in Guard pond and analyzed. After confirming the analysis report, the treated water is finally discharged from guard ponds to final discharge Tank provided with control valve and the treated effluent goes to GIDC underground drainage system for ultimate disposal to Arabian Sea.

MANCOZEB EFFLUENT TREATMENT EQUIPMENT DETAILS

Sr. No.	Tag No.	Title	SIZE (KL)	Qty	Capacity (KL)
1	Collection Tank-1	SS collection tank (ML receiving from plant)	100	1	100
2	Collection Tank-2	SS collection tank (ML receiving from plant)	100	1	100
3	Receiving Tank A	Ml receiving From SS tank	100	1	100
4	Total Collection Capacity	…	300	1	300
5	Treated tank-C	Treated Ml collection tank-C (MEE-4 Feed)	100	1	100
6	D- tank	MEE condensate receiving tank	100	1	100
7	Clarifier-A with Agitator	MNZ pre treatment clarifier	35	1	35
8	Flash mixture with agitator	Poly mixing tank	9	1	9
9	Static mixture	Sodium Carbonate mixing	5	1	5
10	SRT-1,2,7,8	Sodium Carbonate reaction tank	20	4	80
11	Lamella	$MnCO_3$ separation tank	15	1	15
12	PSF-1	PSF- 1 use for MNZ	NA	NA	NA
13	Filter press-1	Filter press -1 use for MEEs	NA	NA	NA
14	Filter press-2	Filter press -1 use for MEEs	NA	NA	NA

15	Filter press-3	Filter press -1 use for $MnCO_3$ separation	NA	NA	NA

DETAILS OF INCINERATOR

	Incinerator system					
	Load on incinerators					
	Material	**Aq waste**	**residue**	**act carbon**	**meth chl.**	**Remarks**
	Required capacity MT/Per day	417.34	25.75	6.48	7.86	
	Required capacity kg/hr	20867	1287.5	324	393	20 hr/day
	Existing capacity kg/hr	**16000**	**1000**	**200**	**460**	**20 hr/day**

1	**Stack attached to**	**Capacity**	**Fuel**	**Fuel cons., m3/hr**	**Stack Ht. m**	**Stack dia. Mm**
	Existing Incinerators					
1	Incinerator no.1					
	Aqueous	1400 kg/hr	NG	1000	52	1066
	Organic	100 kg/hr				
	Gas Methyl chloride	360 kg/hr				
2	Solid waste incinerator No. 3	150 kg/hr	NG			
3	Incinerator no.4					
	Aqueous	2200 kg/hr	NG	2000		
	Organic	200 kg/hr				
	Gas Methyl chloride	100 kg/hr				
	Combined capacity 1,3&4					
	Aqueous kg/hr	5000				
	Organic kg/hr	400				
	Gas Methyl chloride kg/hr	460				
	Existing Incinerators					
	Aqueous kg/hr	**16000**		10000		
	Organic kg/hr	**1000**				
	Gas Methyl chloride kg/hr	**460**				
	Solid	**150**				

Sr. No.	**Name of incinerator**	**Capacity in kg/hr**				**Remarks**
		Aq.	**Org liq.**	**Gas CH_3Cl**	**Solid**	
1	Incinerator 3				150	Solid waste incinerator
2	Incinerator 1	1400	100	100	0	Aq waste incinerator
3	Incinerator 2	1400	100	100	0	Aq waste incinerator
4	Incinerator 4	2200	200	100	0	Aq waste incinerator
	Total kg/hr	5000	400	300	150	
	85 % eff., kg/hr	4250	340	255	127.5	
	Capacity kg/day	102000	8160	6120	2550	
	Load on incinerator kg/day	276800	25755	3021		
	Additional capacity reqd.	174800	17595	nil	200	

ANNEXURE-VI

DETAILS OF HAZARDOUS WASTE

Sr. No.	Waste	Existing Quantity	Proposed quantity	Total Quantity	Schedule and Category of Hazardous waste	Disposal Facility
1	ETP Sludge	2640 MT/year	--	2640 MT/year	Sch-I/ 35.3	Collection, storage, transportation, disposal at common incineration facility TSDF site SEPPL, Kutch, GISPL-Palsana and for co-processing RSPL-Panoli
2	Discarded Container/ bags	24000 Nos./year	--	24000 Nos./year	Sch-I/ 33.3	Collection, storage, decontamination, storage, disposal by selling to GPCB approved reconditioners disposed through common GPCB approved decontamination facility.
3	Oil & Grease skimming residue	32.40 MT/yr	--	32.40 MT/yr	Sch-I/ 36.4	Collection, storage, transportation, disposal at common incinerator facility TSDF site SEPPL, Kutch. GISPL- Palsana & for co-processing RSPL-Panoli.
4	Chemical Sludge containing residue pesticides	2145 MT/year	--	2145 MT/year	Sch-I/ 29.2	Collection, storage, transportation, disposal at common hazardous waste incinerator facility of SEPPL, GISPL & RSPL co-processing facility.
5	Used Oil	0.3 MT/year	--	0.3 MT/year	Sch-I/ 5.1	Collection, storage, transportation, disposal by selling to registered reprocessors.
6	Spent carbon	257.4 MT/year	--	257.4 MT/year	Sch-I/ 38.2	Collection, storage, transportation, disposal at common incinerator facility TSDF site SEPPL, Kutch. GISPL- Palsana & for co-processing RSPL-Panoli.
7	Ash from incinerator	4755 MT/year	--	4755 MT/year	Sch-I/ 37.2	Collection, storage, transportation, disposal at common incinerator facility TSDF site SEPPL, Kutch. GISPL- Palsana & for co-processing RSPL-Panoli.
8	Sludge from wet scrubber	0.240 MT/year	--	0.240 MT/year	Sch-I/ 37.1	Collection, storage, transportation, disposal at common incinerator facility TSDF site SEPPL, Kutch. GISPL- Palsana & for co-processing RSPL-Panoli.

9	Spent HCl 30% Acetic Acid 30%	24588 MT/year 7000 MT/year	--	24588 MT/year 7000 MT/year	Sch-I/ 29.6	Collection, storage, transportation, disposal by selling to actual end user who have valid permission under Rule-9 of hazardous waste and other waste (M) and (TMB) rule-2016
10	Organic residue	2032 MT/yr	--	2032 MT/yr	Sch-I/ 28.1	Collection, storage, transportation, disposal at common incinerator facility TSDF site SEPPL, Kutch. GISPL- Palsana & for co-processing RSPL-Panoli.
11	Salts from MEE	4570.44 MT/yr	--	4570.44 MT/yr	Sch-I/ 37.3	Collection, storage, transportation, disposal at common incinerator facility TSDF site SEPPL, Kutch. GISPL- Palsana & for co-processing RSPL-Panoli.
12	Spent solvents i.e. MDC, EDC, EA, CPN etc.	1995 MT/year	--	1995 MT/year	Sch-I/ 29.4	Collection, storage, transportation, disposal by selling to actual end user who have valid permission under Rule-9 of hazardous waste and other waste (M) and (TMB) rule-2016
13	Date expired and off-specification on residues	50 MT/year	--	50 MT/year	Sch-I/ 29.3	Collection, storage, transportation, disposal through incineration SEPPL, Kutch. GISPL- Palsana.

ANNEXURE-VII

WATER, FUEL & ENERGY REQUIREMENTS

WATER CONSUMPTION (NO CHANGE):

SR. No.	DESCRIPTION	WATER CONSUMPTION (KL/DAY)		
		Existing	Additional	Total
INDUSTRIAL				
1.	Process & Lab	386	--	386
2.	Boiler	280	--	280
3.	Cooling	313	--	313
4.	Canteen, QC & R&D	25	--	25
	TOTAL	**1003**	--	**1003**
5.	Domestic	60	--	60
6.	Other (Gardening)	15	--	15
	GRAND TOTAL	**1078**	--	**1078**

WASTEWATER GENERATION (NO CHANGE):

SR. No.	DESCRIPTION	WATER CONSUMPTION (KL/DAY)		
		Existing	Additional	Total
INDUSTRIAL				
1.	Process	837.93	--	837.93
2.	Boiler	67	--	67
3.	Cooling	23.4		23.4
4.	Canteen, QC & R&D	25		25
	TOTAL	**953.33**	--	**953.33**
5.	Domestic	60	--	60
6.	Other (Gardening)		--	
	GRAND TOTAL	**1013.33**	--	**1013.33**

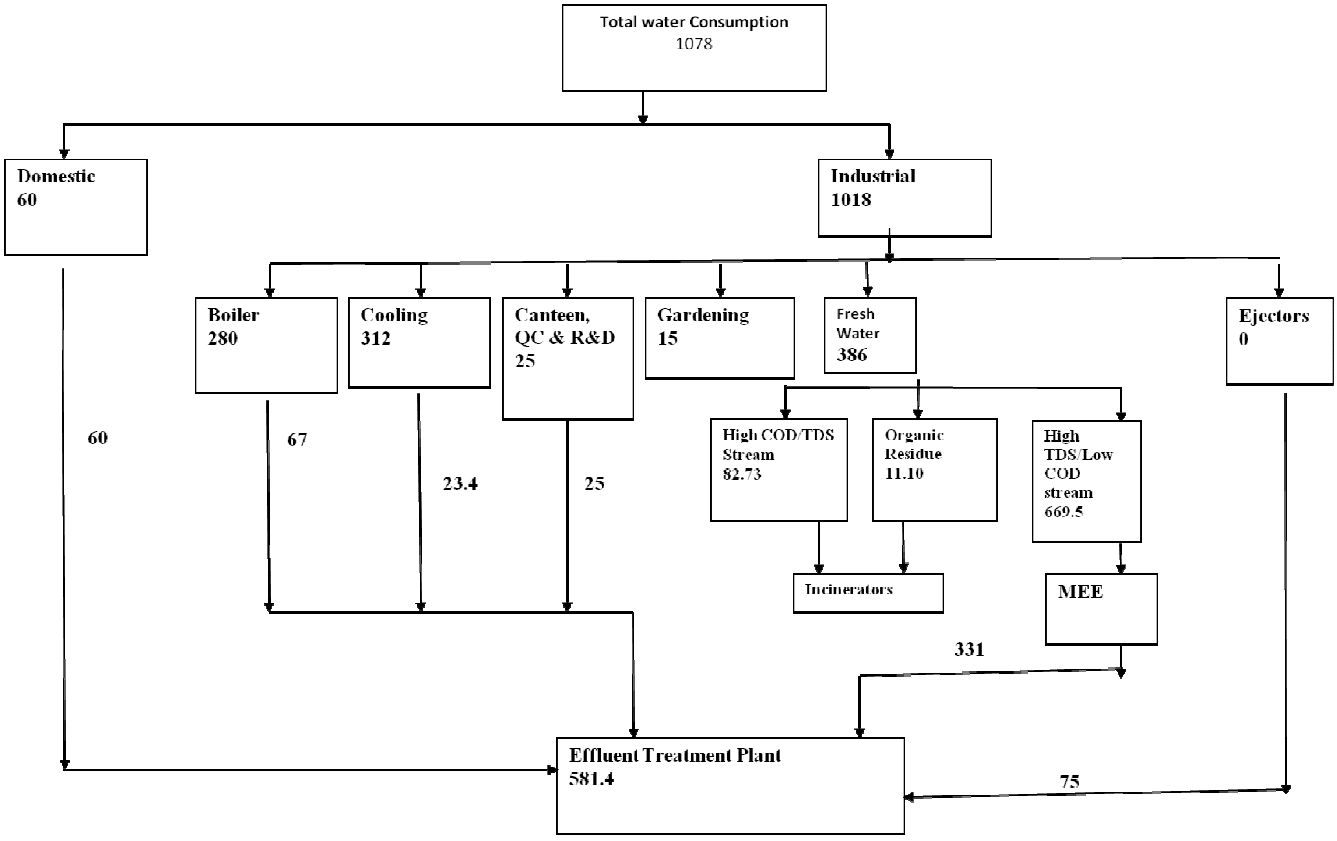
Note:
EXISITING:

Out of 1013.33 KL/day the concentrated and toxic effluent stream generated i.e. 93.63 KL/day shall be segregated and completely incinerated in a well-designed in-house liquid waste incinerator or shall be disposed through common incineration facility SEPPL Kutchh or GSEPL-Palsana. 669.5 KL/Day High TDS Low COD effluent shall be evaporated through Multiple Effective Evaporator (MEEs)/ in case of any breakdown or maintenance of in house MEE, high TDS effluent will be sent to SEPPL for evaporation and drying. 190 KL/day dilutes stream + 60 KL/day domestic i.e. 250 KL/day along with MEE condensate 331 KL/day shall be treated in a well-designed Effluent treatment plant provided within the factory premises and discharged as per standards laid down by the GPCB. The final discharge quantity shall not exceed 581 KL/Day.

The mechanism to monitor of the concentrated stream generated, treated and diluted stream generated treated shall be maintained and submit to the board on monthly basis.

In no case, concentrated stream shall be sent with diluted stream for the further treatment.

WATER BALANCE DIAGRAM (Unit – KL/day)



FUEL CONSUMPTION:

SR. NO.	NAME OF FUEL	QUANTITY			UTILITY
		EXISTING	ADDITIONAL	TOTAL	
1.	Natural gas	Approx 2500 SCM/Hr	--	2500 SCM/Hr	Boiler / Incinerator / MEE
2.	Furnace Oil	2 KL/Hr	--	2 KL/Hr	Boiler
3.	Natural Gas	1000 SCM/Hr		1000 SCM/hr	Hot Air Generator
4.	HSD	6 KL/day	--	6 KL/day	DG

ANNEXURE-VIII

DETAILS OF STACKS & VENTS

SOURCE OF EMMISION AND AIR POLLUTION CONTROL MEASURES (APCM): (EXISTING)

FLUE GAS EMISSION AND APCM:

Sr. No.	Stack Attached to	Height meter	Control Measure Provided	Parameter	Permissible Limit
Existing					
1.	Boiler-3 Nos.	50	--	PM	150 mg/Nm^3
2.	D G Set (1000 KVA)	12	--	SO_X	100 ppm
				NO_X	50 ppm
3.	D G Set (500 KVA)	12	--		
4.	D G Set (200 KVA)	12	--		
5.	Liquid and Gas Incinerator 01	52	Ventury Alkali scrubber	PM	50
				SO_2	200
6.	Solid Incinerator Incinerator 03			NO_x	400
				HCL	50
				CO	100
7.	Liquid Incinerator Incinerator 04	50	Ventury Alkali scrubber	Total Organic Carbon	20
				Total Dioxins and furans	0.2 ng TEQ/ Nm^3
				Sb+As+Pb+Cr+CO+Cu+Mn+Ni+V	1.5

PROCESS GAS EMISSION AND APCM (EXISTING)

Sr. NO.	Plant	Stack attached to	Stack height Mtr.	Air Pollution Control Measures	Stack Dia mm	Parameter to be Monitored	Permissible limit, Mg/nm3	Remarks
1	**GROUP A**							
	Mancozeb	1) Mancozeb reactor	30	Air Blower/ Ventury scrubber	300 650	CS_2 PM SO_2		Either of the product will be manufacture
	Mancozeb + Maneb	2) maneb reactor					180	
	Mancozeb + Zineb	3) Zineb reactor					50	
	Mancozeb + Propineb	4) Propineb Reactor					40	
		5) Spray Dryer (2 Nos.)	30	Bag Filter / Water Scrubber				
2	**GROUP B**							
	Diethyl Thiophosphoryl Chloride (DETC) DMTC	Reactor of Monoester and Diester	20	Alkali scrubber	40	HCl	20	Either of the product will be manufacture
3	**GROUP C**							
	DMTC Amide	DMTC amide reactor	20	Acidic scrubber	500	NH_3	30	
4	**GROUP D**							
	Glyphosate (Tech.)	Slurry Preparation	20	Water Scrubber	100	NH_3	30	
5	**GROUP E**							
	Chlorpyriphos (Tech.)	HTCP Reactor	20	Two	50	HCl	20	

				scrubbers in series-water scrubber &alkali scrubber				
6	**GROUP F**							
	Acephate(Tech.)	Ammonia solution preparation reactor	20	1st Scrubber Water scrubber 2nd with Acid Media	80	NH_3	30	
		Acephate Packing Area	12	Water Scrubber	--	Odour	Nil	
7	**GROUP G**							
	Monocrotophos (T) **OR** Dicrotophos	Chlorination Reactor and Neutralizer	20	Alkali Scrubber	80	HCl Cl_2	20 9	Either of the product will be manufacture
	GROUP H							
	DDVP	Gas to Incinerator				CH_3Cl		
8	**GROUP I**							
	Phosphorous Trichloride (PCl_3)	PCl3 Plant reactor & Storage tank	11	Alkali Scrubber	100	HCl Cl_2 PCl_3	20 9 9	
9	**GROUP J**							
	Trimethyl Phosphite (TMP) **OR** Triethyl Phosphite (TEP)	1) TMP plant reactor and storage tank	20	Acid Scrubber	25	NH_3	30	Either of the product will be manufacture
		2) TMP/DETC products storage	11	Acid Scrubber	40	Odor	Nil	

		tanks						
10	**GROUP K**							
	Phosphorous Sulphochloride ($PSCl_3$)	PSCl3 plant reactor and storage tank	22	Alkali Scrubber	--	HCL PCl_3	20 9	
	GROUP L							
	Methamidafos	NO process gas emission						
11	**GROUP M**							
	Phosphorous Acid	phosphorous acid Reactor	20	Water Scrubber	50	HCl	20	
12	**GROUP N**							
	2-(4-Hydroxy phenoxy) Propionic acid	--						Either of the product will be manufacture
	2,3-Difluoro-5-chloro pyridine	--						
	Triclopyr Acid / Triclopyr Butotyl Ester	--						
	Clodinafop Propargyl							
	Picloram	Picloram & pretilachlor reactors	20	Alkali Scrubber	--	HCl	20	
	Pretilachlor							
	Bispyribac Sodium	--						
13	**GROUP O**							
	5- amino-3-cyano-1-(2,6-dichloro-4-trifluoro methyl phenyl) pyrazole	--						Either of the product will be manufacture
	Fipronil	Fipronil reactor	20	Alkali Scrubber	40	HCl	20	
	Emmamectin Benzoate	--						

	Difenoconazole	--						
	Triazophos	--						
14	NH4Cl	NH4Cl Storage Tank	11	Acid Scrubber	10			
15	Solvent Exhaust	All common vents	26	Carbon Absorption Tower	--	Solvent		
OTHERS								
16	HCl Storage Tank	HCl Storage Tank	11	Alkali Scrubber	--	HCl Cl_2	20 9	
17	Chlorine Shed	Chlorine Shed	13.5	Alkali Scrubber	150	Cl_2	9	
18	Drum Filling Station	Drum Filling Station	11	Alkali Scrubber	--	Odor		
19	Incinerators	1 Gas Waste, 1 Liquid Waste & 1 Solid Waste	52	Ventury Alkali Scrubber	1066	PM SO_2 NOx	50 200 400	

PROCESS GAS EMISSION AND APCM (PROPOSED)

Sr. NO.	Plant	Stack attached to	Stack height Mtr.	Air Pollution Control Measures	Stack Dia mm	Parameter to be Monitored	Permissible limit, Mg/nm3	Remarks
1	**GROUP A**							
	Mancozeb	1) Mancozeb reactor	30	Air Blower/ Ventury scrubber	300	CS_2	180	Either of the product will be manufacture
	Mancozeb + Maneb	2) maneb reactor				PM	50	
	Mancozeb + Zineb	3) Zineb reactor			650	SO_2	40	
	Mancozeb + Propineb	4) Propineb Reactor						
		5) Spray Dryer (3 Nos.)	30	Bag Filter / Water Scrubber				
2	**GROUP B**							
	Diethyl Thiophosphoryl Chloride (DETC) DMTC	Reactor of Monoester and Diester	20	Alkali scrubber	40	HCl	20	Either of the product will be manufacture
3	**GROUP C**							
	DMTC Amide	DMTC amide reactor	20	Acidic scrubber	500	NH_3	30	
4	**GROUP D**							
	Glyphosate (Tech.)	Slurry Preparation	20	Water Scrubber	100	NH_3	30	
5	**GROUP E**							

	Chlorpyriphos (Tech.)	HTCP Reactor	20	Two scrubbers in series-water scrubber &alkali scrubber	50	HCl	20	
6	**GROUP F**							
	Acephate(Tech.)	Ammonia solution preparation reactor	20	1st Scrubber Water scrubber 2nd with Acid Media	80	NH_3	30	
		Acephate Packing Area	12	Water Scrubber	--	Odour	Nil	
7	**GROUP G**							
	Monocrotophos (T) **OR** Dicrotophos	Chlorination Reactor and Neutralizer	20	Alkali Scrubber	80	HCl Cl_2	20 9	Either of the product will be manufacture
	GROUP H							
	DDVP	Gas to Incinerator				CH_3Cl		
8	**GROUP I**							
	Phosphorous Trichloride (PCl_3)	PCl3 Plant reactor & Storage tank	11	Alkali Scrubber	100	HCl Cl_2 PCl_3	20 9 9	
9	**GROUP J**							
	Trimethyl Phosphite (TMP) **OR** Triethyl Phosphite	1) TMP plant reactor and storage tank	20	Acid Scrubber	25	NH_3	30	Either of the product will be manufacture
		2) TMP/DETC	11	Acid	40	Odor	Nil	

	(TEP)	products storage tanks		Scrubber				
10	**GROUP K**							
	Phosphorous Sulphochloride ($PSCl_3$)	PSCl3 plant reactor and storage tank	22	Alkali Scrubber	--	HCl PCl_3	20 9	
	GROUP L							
	Methamidafos	NO process gas emission						
11	**GROUP M**							
	Phosphorous Acid	phosphorous acid Reactor	20	Water Scrubber	50	HCl	20	
12	**GROUP N**							
	2-(4-Hydroxy phenoxy) Propionic acid	--						Either of the product will be manufacture
	2,3-Difluoro-5-chloro pyridine	--						
	Triclopyr Acid / Triclopyr Butotyl Ester	--						
	Clodinafop Propargyl							
	Picloram	Picloram & pretilachlor reactors	20	Alkali Scrubber	--	HCl	20	
	Pretilachlor							
	Bispyribac Sodium	--						
13	**GROUP O**							
	5- amino-3-cyano-1-(2,6-dichloro-4-trifluoro methyl phenyl) pyrazole	--						Either of the product will be manufacture
	Fipronil	Fipronil reactor	20	Alkali Scrubber	40	HCl	20	
	Emmamectin	--						

	Benzoate							
	Difenoconazole	--						
	Triazophos	--						
14	NH4Cl	NH4Cl Storage Tank	11	Acid Scrubber	10			
15	Solvent Exhaust	All common vents	26	Carbon Absorption Tower	--	Solvent		
OTHERS								
16	HCl Storage Tank	HCl Storage Tank	11	Alkali Scrubber	--	HCl Cl_2	20 9	
17	Chlorine Shed	Chlorine Shed	13.5	Alkali Scrubber	150	Cl_2	9	
18	Drum Filling Station	Drum Filling Station	11	Alkali Scrubber	--	Odor		
19	Incinerators	1 Gas Waste, 1 Liquid Waste & 1 Solid Waste	52	Ventury Alkali Scrubber	1066	PM SO_2 NOx	50 200 400	

Note: - We are proposing 1 additional Spray Dryer for the Group-A products.

ANNEXURE-IX

NOISE LEVEL AT DIFFERENT SOURCE WITHIN PREMISES

Various sources of noise in industry have been identified as under,

- Pumps
- Boiler
- Reaction vessel

The typical noise levels of equipments, as indicated by the equipment manufacturers are given below:

Sr. No.	Name of Machinery / Units	Noise level, dB(A)
1	Pumps	60 – 65
2	Boiler	65 – 75
3	Reaction Vessel	55 – 60

NOISE LEVELS:

Sr. No.	Location	During Day time db (A)	During Night time db (A)
1.	Near D.G. Set room	74.0	70.3
2.	Near ETP	65.0	60.6
3.	Out side factory Premises	68.2	62.3
GPCB permissible limit		**75**	**70**

- DG set housed in a separate room, erected on ant vibrating pad.
- Ear muffs are provided to the operators.
- Regular preventive maintenance of equipments carried out.

ANNEXURE-X

SOCIO - ECONOMIC IMPACTS

1) EMPLOYMENT OPPORTUNITIES

During construction phase, skilled and unskilled manpower will be needed. This will temporarily increase the employment opportunity. Secondary jobs are also bound to be generated to provide day-to-day needs and services to the work force. This will also temporarily increase the demand for essential daily utilities in the local market. The manpower requirement for the proposed diversification 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

During construction of the project, the 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 economic status of the locality, to some extent.

3) PUBLIC HEALTH

During construction period, workers will be provided with basic amenities like safe water supply, low cost sanitation facilities, first aid, required personal protective equipment, etc. Otherwise, there could be an increase in diseases related to personal hygiene. Emission, if uncontrolled from process and utility stacks may cause discomfort, burning of eyes to the recipients in the down wind direction. This may be caused due to the failure of control equipment / process. 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 will be 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 project there will be no adverse impact on communication, as sufficient measures will be 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-XI

PROPOSED TERMS OF REFERENCE FOR EIA STUDIES

1. Executive Summary

2. Introduction

i. Details of the EIA Consultant including NABET accreditation
ii. Information about the project proponent
iii. Importance and benefits of the project

3. Project Description

i. Cost of project and time of completion.
ii. Products with capacities for the proposed project.
iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.
iv. List of raw materials required and their source along with mode of transportation.
v. Other chemicals and materials required with quantities and storage capacities
vi. Details of Emission, effluents, hazardous waste generation and their management.
vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)
viii. Process description along with major equipments and machineries, process flow sheet (quantities) from raw material to products to be provided
ix. Hazard identification and details of proposed safety systems.
x. Expansion/modernization proposals:
    a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing *I* existing operation of the project from SPCB shall be attached with the EIA-EMP report.
    b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

4. Site Details

i. Location of the project site covering village Sarigam, Taluka/Tehsil - Umargam, District - Valsad and State - Gujarat, Justification for selecting the site, whether other sites were considered.

ii. A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (Including all eco-sensitive areas and environmentally sensitive places)
iii. Details w.r.t. option analysis for selection of site
iv. Co-ordinates (lat-long) of all four corners of the site.
v. Google map-Earth downloaded of the project site.
vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.
vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.
viii. Landuse break-up of total land of the project site (identified and acquired), government/private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (Not required for industrial area)
ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area
x. Geological features and Geo-hydrological status of the study area shall be included.
xi. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (Mega green field projects)
xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.
xiii. R&R details in respect of land in line with state Government policy

5. Forest and wildlife related issues (if applicable):

i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)
ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (*in case of projects involving forest land more than 40 ha)*
iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.
iv. 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 there on
v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area
vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife

6. Environmental Status

i. Determination of atmospheric inversion level at the project site and site-specific micrometeorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.

ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.
iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with – min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.
iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.
v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.
vi. Ground water monitoring at minimum at 8 locations shall be included.
vii. Noise levels monitoring at 8 locations within the study area.
viii. Soil Characteristic as per CPCB guidelines.
ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.
x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.
xi. Socio-economic status of the study area.

7. Impact and Environment Management Plan

i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.
ii. Water Quality Modelling – in case of discharge in water body
iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.
iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E (P) Rules.
v. Details of stack emission and action plan for control of emissions to meet standards.
vi. Measures for fugitive emission control
vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-

minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.

viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.

ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.

x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.

xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.

xii. Action plan for post-project environmental monitoring shall be submitted.

xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

8. Occupational health

i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers

ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, Colour vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.

iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL)? If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved

iv. Annual report of health status of workers with special reference to Occupational Health and Safety.

9. Corporate Environment Policy

i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.

ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.

iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.

iv. Does the company have system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or

shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report

10. Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.

11. Enterprise Social Commitment (ESC)

i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon.

12. Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.

13. 'A tabular chart with index for point wise compliance of above TORs.

14. The TORs prescribed shall be valid for a period of three years for submission of the EIA-EMP reports.

The following general points shall be noted:

i. All documents shall be properly indexed, page numbered.
ii. Period/date of data collection shall be clearly indicated.
iii. Authenticated English translation of all material in Regional languages shall be provided.
iv. The letter/application for environmental clearance shall quote the MOEF file No. and also attach a copy of the letter.
v. The copy of the letter received from the Ministry shall be also attached as an annexure to the final EIA-EMP Report.
vi. The index of the final EIA-EMP report must indicate the specific chapter and page no. of the EIAEMP Report
vii. While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MOEF vide O.M. No. J-11013/41/2006-IA.II (I) dated 4th August, 2009, which are available on the website of this Ministry shall also be followed.
viii. The consultants involved in the preparation of EIA-EMP report after accreditation with Quality Council of India (QCI) /National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA-EMP reports prepared by them and data provided by other organization/Laboratories including their status of approvals etc. Name of the Consultant and the Accreditation details shall be posted on the EIA-EMP Report as well as on the cover of the Hard Copy of the Presentation material for EC presentation.

TORs' prescribed by the Expert Appraisal Committee (Industry) shall be considered for preparation of EIA-EMP report for the project in addition to all the relevant information as per the 'Generic Structure of EIA' given in Appendix III and IIIA in the EIA Notification, 2006. Where the documents provided are in a language other than English, an English translation shall be provided. Public hearing is exempted under the provisions as per para 7(i) Stage III 3(i)(b) of the EIA Notification,2006. The EIA report shall be submitted to the Ministry for obtaining environmental clearance.

ANNEXURE-XII

CLOSURE NOTICE AND REVOCATION ORDER

A. CLOSURE ORDER

GPCB

GUJARAT POLLUTION CONTROL BOARD

PARYAVARAN BHAVAN
Sector-10-A, **Gandhinagar** 382 010
Phone : (079) 23222425
(079) 23232152
Fax : (079) 23232156
Website : www.gpcb.gov.in

RPAD

DIRECTION UNDER SECTION 33-A OF THE WATER (PREVENTION AND CONTROL OF POLLUTION) Act-1974 (HEREINAFTER REFERRED TO AS THE WATER ACT) AS AMENDED FROM TIME TO TIME.

WHEREAS you are having an industrial plant for manufacturing of Pesticides at Plot No. 2102,2104/1,735& 2112/2113, GIDC Estate, Sarigam, Tal : Umbergaon, Dist ; Valsad – 396 155.

AND WHEREAS Board has issued Consolidated Consent & Authorization (CC&A), AWH – 84402, dated 22/02/2017 valid upto 30/09/2021 with certain conditions.

AND WHEREAS closure direction was issued under Section 33-A of the Water (Prevention and Control of Pollution) Act, 1974, as amended from time to time vide letter no. GPCB/CCA-SRG-229(26)/ID : 24285/441746 dated 16/01/2018.

AND WHEREAS closure direction issued under Section 33-A of the Water (Prevention and Control of Pollution) Act, 1974, as amended from time to time vide letter no. GPCB/CCA-SRG-229(26)/ID : 24285/441746 dated 16/01/2018 was revoked for three month vide letter no. GPCB/CCA-SRG-229(2)/ID – 24285/442958/ dated 30/01/2018.

AND WHEREAS closure direction issued under Section 33-A of the Water (Prevention and Control of Pollution) Act, 1974, as amended from time to time vide letter no. GPCB/CCA-SRG-229(26)/ID : 24285/441746 dated 16/01/2018 was again revoked for three month vide letter no. GPCB/CCA-SRG-229(2)/ID – 24285/456841 dated 30/05/2018.

AND WHEREAS, during the inspection of your industrial plant on 29/09/2018 under Section-23 of the Water Act by the authorized officer of the Board, following was observed:

1. You have installed additional spray dryer at Mancozed Plant-B.
2. You have yet not applied for EC-Amendment for the additional spray dryer.
3. You are using additional spray dryer for production of Mancozed and Propineb in the Mancozeb Plant –B and not completely disconnected the additional spray dryer.

UNDER THE CIRCUMSTANCES, I Sushil Vegda, Senior Environmental Engineer of Gujarat Pollution Control Board is directed to issue the directions under Section –33A of the Water (Prevention and Control of Pollution) Act-1974 as under:-

1. To prohibit you from manufacturing of above said products.
2. To close the operation of your industrial plant on the above mentioned site.
3. To direct the concerned authority to stop supply of electricity(except single phase) and water.
4. This order will be effective with immediate effect.

Clean Gujarat Green Gujarat

ISO-9001-2008 & ISO-14001 - 2004 Certified Organisation

IF the above directions are not complied, you are liable for prosecution under Section 41 (2) of the Water (Prevention and Control of Pollution) Act-1974 which provides punishment with imprisonment for a term not less than one year and six months and may extend to six years and with fine.

For and on behalf of
Gujarat Pollution Control Board

(Sushil Vegda)
Senior Environmental Engineer

NO: GPCB/CCA-SRG-229(26)/ID:24285/ dated :
Issued to:
M/S. Coromandel International Limited
Plot No. 2102,2104/1,735& 2112/2113,
GIDC Estate, Sarigam,
Tal : Umbergaon, Dist ; Valsad – 396 155.

To,

1. **The Deputy Engineer, (O & M),**
   Dakshin Gujarat Vij Company Ltd
   GIDC Sarigam, Dist : Valsad.

I am directed to request you to disconnect supply of electricity(except single phase) with immediate effect of date of issue of this order to the industrial plant of M/S. Grentex & Co. Pvt. Ltd.(U-1, IA) Located at Plot No. 1624,1627,1626/1,1626/3,1631, GIDC Estate, Sarigam – 396 155 Dist: Valsad & intimate to us accordingly.

2. **The Deputy Engineer**
   Gujarat Industrial Development Corporation
   Sarigam, Dist : Valsad.

I am directed to request you to disconnect supply of water with immediate effect of date of issue of this order to the industrial plant of M/S. Grentex & Co. Pvt. Ltd.(U-1, IA) Located at Plot No. 1624,1627,1626/1,1626/3,1631, GIDC Estate, Sarigam – 396 155 Dist: Valsad & intimate to us accordingly.

For and on behalf of
Gujarat Pollution Control Board

(Sushil Vegda)
Senior Environmental Engineer

Copy to:

1. The Regional Officer, Gujarat Pollution Control Board, Sarigam.....To keep close watch on this unit.

B. REVOCATION ORDER

GUJARAT POLLUTION CONTROL BOARD
PARYAVARAN BHAVAN
Sector-10-A, **Gandhinagar** 382 010
Phone : (079) 23222425
(079) 23232152
Fax : (079) 23232156
Website : www.gpcb.gov.in

BY RPAD

REVOCATION OF CLOSURE ORDER ISSUED UNDER SECTION 33-A OF THE WATER (PREVENTION AND CONTROL OF POLLUTION) ACT-1974.

WHEREAS you are having an industrial plant for manufacturing of Pesticides at Plot No. 2102,2104/1,735& 2112/2113, GIDC Estate, Sarigam, Tal : Umbergaon, Dist ; Valsad – 396 155.

AND WHEREAS Board has issued Consolidated Consent & Authorization (CC&A), AWH – 84402, dated 22/02/2017 valid upto 30/09/2021 with certain conditions.

AND WHEREAS closure direction was issued under Section 33-A of the Water (Prevention and Control of Pollution) Act, 1974, as amended from time to time vide letter no. GPCB/CCA-SRG-229(26)/ID : 24285/471364 dated 05/10/2018 for the reason stated therein.

AND WHEREAS, you have applied for revocation of closure direction along with relevant details as per that your unit was inspected on 11/10/2018 under Section-23 of the Water Act by the authorized officers of the Board, and observed that:

1. Unit is having two spray dryer at Mancozeb Plant-B & out of which one additional spray dryer is disconnected.
2. Unit has disconnected additional spray dryer by disconnecting (i) Spray Dryer bottom duct line going to Baghouse (ii) Inlet and outlet of blower connected to Baghouse. (3) Feed tank and slurry feed line was disconnected by removing feed pump (iv) Feed line was disconnected from top of spray dryer. (v) Compressed air line from top of spray dryer was disconnected. (vi) Feed ring from top of spray dryer was removed (vii) HAG inlet line going to spray dryer was disconnected and (vii) HAG gas line was disconnected.

AND WHEREAS you have submitted undertaking on Rs 100/- stamp paper dated 11/10/2018.

AND WHEREAS you have submitted the Bank Guarantee of Rs. 45,00,000/- of Axis Bank Limited valid upto 09/10/2019.

Under the circumstances, I, **Sushil Vegda, Senior Environment Engineer,** Gujarat Pollution Control board is directed to revoke the closure direction dated 05/10/2018 for three months from the date of issue of order with following conditions:

1) You shall apply for EC-Amendment for the additional spray dryer within 3 months and submit the copy of the same.
2) You shall keep your additional spray dryer in complete isolation till you get EC-amendment and CTE.
3) You shall comply with CCA conditions.
4) This order is granted on trial of 3 months.

For and on behalf of
Gujarat Pollution Control Board,

(Sushil Vegda)
Senior Environmental Engineer

NO: GPCB/CCA-SRG-229(27)/ID:24285/ dated :

Issued to:
M/S. Coromandel International Limited
Plot No. 2102,2104/1,735& 2112/2113,
GIDC Estate, Sarigam,
Tal : Umbergaon, Dist ; Valsad – 396 155.

COPY TO: -

1. **The Deputy Engineer, (O & M),**
Dakshin Gujarat Vij Company Ltd
GIDC Sarigam, Dist : Valsad.

With a request to Re-connect the supply of electricity with immediate effect from the date of issue of this order for three months of **M/S. Coromandel International Limited,** Plot No. 2102,2104/1,735& 2112/2113, GIDC Estate, Sarigam, Tal : Umbergaon, Dist ; Valsad – 396 155., and intimate to us accordingly.

GPCB

GUJARAT POLLUTION CONTROL BOARD
PARYAVARAN BHAVAN
Sector-10-A, **Gandhinagar** 382 010
Phone : (079) 23222425
(079) 23232152
Fax : (079) 23232156
Website : www.gpcb.gov.in

2. **The Deputy Engineer**
   Gujarat Industrial Development Corporation
   Sarigam, Dist : Valsad.

With a request to Re-connect the water supply with immediate effect from the date of issue of this order for three months of **M/S. Coromandel International Limited,** Plot No. 2102,2104/1,735& 2112/2113, GIDC Estate, Sarigam, Tal : Umbergaon, Dist : Valsad – 396 155., and intimate to us accordingly.

3. **Regional Officer**
   Gujarat Pollution Control Board
   Sarigam

   For monitoring and sampling under Environmental laws and verify compliances submitted by unit.

For and on behalf of

Gujarat Pollution Control Board,

(Sushil Vegda)
Senior Environmental Engineer