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Amber Crop Science Private Limited

(An ISO 9001:2015 Certified Co.)
Regd. Office: CSC-GH-4/FF-5, DDA Mkt.,
Meera Apartments, Outer Ring Road,
Paschim Vihar, New Delhi-110063
Cont. No. 91-11-25253078
E-mail: ambercrops@gmail.com.
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CIN No: U24211DL2005PTC142505

To,
The Director (Industry-3),
Ministry of Environment, Forests and Climate Change,
Indira Paryavaran Bhawan, Jor Bagh Road,
New Delhi-110003

Dated: 07-08-2021

Subject- Submission of FORM 1 & Pre-feasibility Report for obtaining Terms of Reference for Proposed Pesticide Manufacturing Project at Plot No. A-4, Kosi Kotwan Extension-2, Uttar Pradesh State Industrial Development Corporation (UPSIDC) Industrial Area, Mathura, Uttar Pradesh- 281403. by M/s Amber Crop Science Pvt. Ltd.

Respected Sir,

In reference to above mentioned proposal, we wish to inform you that we have proposed "***Pesticide Manufacturing Project***" at Plot No. A-4, Kosi Kotwan Extension-2, Uttar Pradesh State Industrial Development Corporation (UPSIDC) Industrial Area, Mathura, Uttar Pradesh- 281403. The plant will be developed over a total land area of **18915.50 m²**. The total manufacturing capacity of the plant will be **1050 MT/Month (excluding formulations)**. The project will be manufacturing the following pesticide products:

Type	Quantity (MT/Month)
Insecticides	375
Fungicides	125
Herbicide	300
Intermediate Products	150
R&D product	100
Total	**1050**
Formulation	5000

As per the Government of India (Ministry of Environment, Forests & Climate Change (MoEF&CC),) EIA Notification 2006 and further amendments, the proposed project involves production of "Pesticide and pesticide specific intermediates" and hence falls under **Activity 5(b); Category "A"**. Thereby, the project requires environmental clearance from MoEF&CC, New Delhi.

We are hereby submitting the following documents-:

1. Form-1
2. Pre-feasibility Report with requisite annexures.

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We would be thankful if Terms of Reference is granted for submission of Environmental Impact Assessment Report of the same.

Thank you,
Yours sincerely,

Amber Crop Science (P) Ltd.
New Delhi

SUNIL GUPTA,
Director
M/s Amber Crop Science Private Limited

FORM-1

for

Proposed Pesticide Manufacturing Plant

at

Plot No. A-4, UPSIDC Industrial Area, Kosi Kotwan Extension -2,
Dist- Mathura, Uttar Pradesh – 281403

Type of Project	Greenfield Project
Total Plot Area	18915.50 m² (4.67 Acre.)
Total Cost of Project	Rs. 40 Crores
Category as per EIA notification 2006 and its amendments:	5(b), Category- A (Pesticides industry and pesticide specific intermediates (excluding formulations)
Proposed Production Capacity	1050 MTPM (Insecticides, Fungicides, Herbicides, Advanced Specific Pesticide Intermediates, Research and Development based Products ; Formulations-5000 MTPM)
NABET Acc. No.:	NABET/EIA/1922/RA 0197 valid till 23.11.2022

Project Proponent

M/s Amber Crop Science Pvt. Ltd.
CSC,GH-4/FF-5,DDA Market, Meera Apartments,
Outer Ring Road, Paschim Vihar,
New Delhi-110063
Email: ambercrops@gmail.com ; **Phone no.**: 9212678716

UID No.: EQMS/Form-1 /Amber Crop /5(b)A/PR660/09.08.2021	
Report Release Date: 09/08/2021	**Revision No**: 00

Environmental Consultant:

(Approved Consultant)

EQMS INDIA PVT LTD. (now known as EQMS GLOBAL PVT. LTD.)
QCI/NABET Accredited Consultant
304-305, 3rd Floor, Plot No. 16, Rishabh Corporate Tower,
Community Centre, Karkardooma, Delhi – 110092
Phone: 011-42270087, 43062757 ; Website: www.eqmsglobal.com ; E-mail: eqms@eqmsindia.org

FORM 1

(I) Basic Information

S. No.	Item	Details
1.	**Name of the Project**	Proposed Pesticide Manufacturing Project at Plot No. A-4, UPSIDC Industrial Area, Kosi Kotwan Extension -2, District- Mathura, Uttar Pradesh – 281403
2.	**S. No. in the schedule**	5(b) – Pesticide and pesticide specific intermediates
3.	**Proposed capacity / area/ length/ tonnage to be handled/ command area/ lease area/ number of wells to be drilled**	**Total Production Capacity: 1050 MT/Month (excluding Formulations)** Insecticides- 375 MT/ Month Fungicides- 125 MT/ Month Herbicides- 300 MT/ Month Advance Specific Pesticide Intermediates- 150 MT/ Month Research and Development based Products- 100 MT/ Month Pesticide Formulations- 5000 MT/ Month
4.	**New/Expansion/ modernization**	New (Greenfield Project)
5.	**Existing Capacity / area etc.**	Not Applicable
6.	**Category of Project i.e. 'A' or 'B'**	Category 'A'
7.	**Does it attract the general condition? If yes, please specify**	Yes Haryana boundary at 4.68 km NW of proposed project
8.	**Does it attract the specific condition? If yes please specify**	No
9.	**Location**	
	Plot/Survey/Khasra No.	Plot No. A-4, UPSIDC Industrial Area, Kosi Kotwan Extension -2
	Village	Kosi Kotwan
	Tehsil	Mathura
	District	Mathura
	State	Uttar Pradesh
10.	**Nearest Railway Station / airport along with distance in KMs**	• **Nearest Railway Station:** Kosi Kalan Railway Station (5.55 km SSE) • **Nearest Highway:** National Highway -2 (1.35km, NE)

		• **Nearest Airport**: *Indira Gandhi International Airport* (86.24 km, NNW)
11.	**Nearest Town, city, District headquarters along with distance in Kms**	Kotwan (1.43Km, N)
12.	**Village Panchayats, Zilla Parishad, Municipal Corporation, local body (complete postal address with telephone nos. to be given)**	Kosi Kalan Rural Panchayat, Uttar Pradesh
13.	**Name of the Applicant**	M/s Amber Crop Science Pvt. Ltd.
14.	**Registered address**	CSC,GH-4/FF-5,DDA Market, Meera Apartments, Outer Ring Road, Paschim Vihar, New Delhi-110063
15.	**Address for correspondence:**	
	Name	Mr. Sunil Gupta
	Designation	Director
	Address	CSC,GH-4/FF-5,DDA Market, Meera Apartments, Outer Ring Road, Paschim Vihar, New Delhi-110063
	E-mail	ambercrops@gmail.com
	Telephone No.	9212678716
	Fax No.	
16.	**Details of Alternate Sites examined, if any. Location of these sites should be shown on a toposheet**	The proposed project is located within a Notified Industrial Area i.e. , Kosi Kotwan Extension -2, District- Mathura, Uttar Pradesh – 281403. Thus, alternative sites have not been considered.
17.	**Interlinked Projects**	No
18.	**Whether separate application of interlinked project has been submitted?**	Not Applicable
19.	**If yes, date of submission**	Not Applicable
20.	**If no, reason**	Not Applicable
21.	**Whether the proposal involves approval/ clearance under : if yes, details of the same and their status to be given** **(a) The forest (Conservation) Act, 1980**	No

	(b) The wildlife (Protection) Act, 1972 (c) The C. R.Z Notification, 1991	
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 proposed to be set up? (a) Name of the Court (b) Case No. (c) Orders/ directions of the court, if any and its relevance with the proposed project	No

(II) Activity

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

S. No.	Information/Checklist confirmation	Yes/ No	Details there of (with approximate quantities /rates, wherever possible) with source of information data
1.1	Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan)	No	The proposed project is in Notified Industrial Area which is in-line with the requirement of land-use for the project i.e. Industrial Use. Hence, there will be no further change of land-use. However, the proposed site is a vacant land that will be converted to Industrial Unit. Natural topography shall be maintained to maximum possible extent.
1.2	Clearance of existing land, vegetation, and buildings?	No	No tree cutting or clearance work is involved in the proposed project. Few shrubs will be cleared for proposed project.
1.3	Creation of new land uses?	No	The land is for industrial purpose only, hence no further change in land use is required.

1.4	**Pre-construction investigations e.g. bore houses, soil testing?**	Yes	Soil investigation study will be undertaken for the project. Soil quality testing will be done during EIA studies.
1.5	**Construction works?**	Yes	There will be construction of buildings for proposed industrial unit.
1.6	**Demolition works?**	No	None
1.7	**Temporary sites used for construction works or housing of construction workers?**	Yes	Labor will be hired from nearby villages. However, temporary camp sites will be provided with minimum requirement of drinking and sanitation facilities for workers during working hours.
1.8	**Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations**	Yes	Excavation will be carried out for foundation of building. No other excavation work will be carried out at the site. Some of the excavated soil will be used at the site for leveling. Excavated topsoil will be used for landscaping purpose rest shall be disposed as per C&D waste management Rule. Manufacturing unit shall be constructed for the proposed unit.
1.9	**Underground works including mining or tunneling?**	No	Not Applicable
1.10	**Reclamation works?**	No	Not Applicable
1.11	**Dredging?**	No	Not Applicable
1.12	**Offshore structures?**	No	Not Applicable
1.13	**Production and manufacturing processes?**	Yes	Industry shall manufacture pesticides and pesticides specific intermediates. Manufacturing process is given in PFR submitted with this application.
1.14	**Facilities for storage of goods or materials?**	Yes	<u>Construction Phase</u>: Construction material will be stored in temporary sheds. <u>Operation Phase</u>: Facilities for storage of raw material & finished goods will be provided at site separately. Location of storage area has been given in Layout Plan provided in PFR submitted with this application.

1.15	**Facilities for treatment or disposal of solid waste or liquid effluents?**	Yes	**During Construction phase:** Waste generated from the construction activity shall be disposed as per be C&D waste Management Rule. Non-recyclable waste shall be disposed in the nearby C&D waste disposal site. Recyclable waste shall be sold to recyclers. **During Operation Phase:** Operational Phase: The industry shall obtain authorization under Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2021 for the waste generated and categorized under hazardous waste as per Schedule of The Hazardous & Other Waste (Management and Transboundary Movement) Amendment Rules, 2021. The generated hazardous waste will be stored in designated Hazardous waste storage room up to maximum of 90 days and shall be disposed to either TSDF or authorized recyclers. ***Municipal Solid Waste*:** **Construction Phase**: Approx. 24 kg/day solid waste will be generated that will get disposed off to nearest MSW disposal site. Recyclable waste will be sent to authorised recyclers. **Operational Phase**: Approx. 76.5 kg/day of municipal solid waste generated in the plant area will be segregated to biodegradable waste and non-biodegradable waste. 30.6 kg/day non-biodegradable waste will be sold off to recycler.45.9 kg/day biodegradable waste will be disposed off in MSW disposal pit to get converted to manure for horticulture purposes. Solid Waste Management Rules, 2016 shall be followed. **Liquid Waste:** ***Construction Phase*:** 3.2 KLD domestic sewage will be treated in septic tanks followed by soak pits. ***Operational Phase*:** Total Wastewater Generation from the project will be 175KLD

			(169 KLD Industrial Effluent + 6 KLD Domestic Sewage). 6 KLD domestic sewage will be treated in Septic Tank / Soak pit .150 KLD High COD/High TDS Process Effluent along with 35 KLD of process steam will be treated in MEE (Capacity- 220 KLD) and 19 KLD Low COD/ Low TDS effluent will be treated in ETP (Capacity- 60 KLD) which shall be further treated in SBT plant along with MEE condensate. 185 KLD Treated water will be reused in Process , cooling tower makeup water, Washing & Gardening . The project will be a **"Zero-liquid Discharge"** Project.
1.16	**Facilities for long term housing of operational workers?**	No	Local labors will be hired for construction work while staff from nearby villages/town will be preferred during operational phase.
1.17	**New road, rail or sea traffic during construction or operation?**	No	Existing Road / Rail facility will be used. Site is well connected to NH-2 via interconnecting roads internally and surrounding the industrial estate. The transportation of indigenous raw material/finished product will be done by road and imported/export raw material/finished product through sea and road complying with all safety requirements as per MSIHC rule. There will be increase in road traffic due to proposed project.
1.18	**New road, rail, air waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?**	No	No additional transport infrastructure will be required due to the proposed project. Following routes will be used: 1. **Nearest Railway station**: Kosi Kalan Railway Station (5.55 km SSE) 2. **Nearest Highway**: National Highway -2 (1.35 km NE) 3. **Nearest Airport**: Indira Gandhi International Airport (86.24 km, NNW)
1.19	**Closure or diversion of existing transport routes or**	No	Not Applicable

	infrastructure leading to changes in traffic movements?		
1.20	New or diverted transmission lines or pipelines?	No	Not Applicable
1.21	Impoundment, damming, converting, realignment or other changes to the hydrology of watercourses or aquifers?	No	Not Applicable
1.22	Stream crossings?	No	None
1.23	Abstraction or transfers of water form ground or surface waters?	Yes	**Construction Phase**: There will be no abstraction during construction works as water will be supplied by private tankers. However, During **Operational Phase**: Fresh water will be sourced from UPSIDC water supply / borewell after permission from concerned authority i.e. CGWA.
1.24	Changes in water bodies or the land surface affecting drainage or run-off?	No	None
1.25	Transport of personnel or materials for construction, operation or decommissioning?	Yes	The raw material & finished products will be transported through trucks. Construction Phase: Construction material will be transported through Road. Local workforce will be used by Contractor during construction; hence their transportation will not be required. Operational Phase: Workforce will use road for transportation. Site is well connected to NH-2 via interconnecting roads internally and surrounding the industrial estate.
1.26	Long-term dismantling or decommissioning or restoration works?	No	None.
1.27	Ongoing activity during decommissioning which could have an impact on the environment?	No	None

1.28	**Influx of people to an area in either temporarily or permanently?**	Yes	**Construction Phase**: 80 no. of local labour shall be required for proposed project. **Operation Phase**: Total influx of population will be 260 no. including staff and visitors.
1.29	**Introduction of alien species?**	No	None
1.30	**Loss of native species or genetic diversity?**	No	None
1.31	**Any other actions?**	No	None

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):

S. No.	**Information/checklist confirmation**	**Yes/ No**	**Details thereof (with approximate quantities/ rates, wherever possible) with source of information data**
2.1	**Land especially undeveloped or agricultural land (ha)**	Yes	18915.50 m^2 of vacant industrial land area will be developed as pesticide manufacturing unit.
2.2	**Water (expected source & competing users) unit: KLD**	Yes	**<u>Construction Phase</u>**: The total water requirement during construction phase will be 10 KLD out of which 6 KLD of water will be required for construction works and rest of 4 KLD water will be required for domestic purpose. Wastewater generated from domestic usage will be treated in septic tank followed by soak pit. **Source**: Private Tanker Suppliers **<u>Operational Phase</u>**: The total water requirement of the project will be 210 KLD. Out of which, 25 KLD freshwater requirement will be sourced from UPSIDC water supply / borewell after permission from concerned authority i.e. CGWA and the rest will be sufficed by re-using 185 KLD of ETP/MEE treated water. **Source:** UPSIDC water Supply /Borewell (CGWA) & Recycled water from STP/ETP/MEE.
2.3	**Minerals (MT)**	Yes	Cement, stone, steel etc. will be used for construction activities as per the requirements & shall be bought from local market.

2.4	**Construction material – stone, aggregates, sand / soil (expected source – MT)**	Yes	Cement, stone, steel etc. will be used for construction activities as per the requirements & shall be bought from local market.
2.5	**Forests and timber (source – MT)**	No	Not Required
2.6	**Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW)**	Yes	**Power:** **Source:** Uttar Pradesh Power Corporation Limited (UPPCL) **Construction Phase:** One DG Set of capacity 1x500 kVA will be used for power supply during construction works. **Operational Phase**: The total power requirement of the plant will be 1500 kVA which will be met through Uttar Pradesh Power Corporation Limited (UPPCL). **Power Backup (DG Sets):** **Operational Phase**: DG sets of capacity 2x500 kVA (with appropriate stack height as per CPCB norms) will be used for backup purposes. **Fuel:** **Construction Phase:** Approx. 100 lit/hr HSD will be consumed for operation of DG sets. **Operational Phase**: 15 MT/Day Imported Coal / 20 MT/day Bio Briquette will be consumed for Steam Boiler , 10 MT/Day Imported Coal /15 MT/Day Bio Briquette will be use for Thermo Pack and 600 l/hr HSD will be consumed for DG Sets
2.7	**Any other natural resources (Use appropriate standard units)**	No	None

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.

S. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data

3.1	**Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)**	Yes	Hazardous chemicals will be used in the manufacturing of Pesticides as per the requirement of raw material. All the chemicals and substances will be handled as per the MSIHC rules and the hazardous waste rules. Storage & handling will be done carefully by qualified and trained person only.
3.2	**Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)**	No	Suitable drainage and wastewater management measures will be adopted in the plant. This restricts stagnation of water or accumulation of water. No occurrence of diseases is anticipated.
3.3	**Affect the welfare of people e.g. by changing living conditions?**	Yes	During implementation of schemes local people will be benefited due to generation of temporary and indirect employment.
3.4	**Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.,**	No	Not Applicable
3.5	**Any other causes**	No	No other cause

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

S. No.	**Information/Checklist confirmation**	**Yes/ No**	**Details thereof (with approximate quantities/ rates, wherever possible) with source of information data**
4.1	**Spoil, overburden or mine wastes**	No	Not Applicable
4.2	**Municipal waste (domestic and or commercial wastes)**	Yes	**Municipal Solid Waste:** **Construction Phase**: Approx. 24 kg/day solid waste will be generated that will get disposed off to nearest MSW disposal site. Recyclable waste will be sent to authorised recyclers. **Operational Phase:** Approx. 76.5 kg/day of municipal solid waste generated in the plant area will be segregated to biodegradable waste and non-biodegradable waste. 30.6 kg/day non-biodegradable waste will be sold off to recycler.45.9 kg/day biodegradable waste will be disposed off in MSW disposal pit to get converted to manure for

			horticulture purposes. Solid Waste Management Rules, 2016 shall be followed
4.3	**Hazardous wastes (as per Hazardous Waste Management Rules).**	Yes	**Industrial Waste:** **Construction Phase:** Not Applicable **Operational Phase:** The industry shall obtain authorization under Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2021 for the waste generated and categorized under hazardous waste as per Schedule of The Hazardous & Other Waste (Management and Transboundary Movement) Amendment Rules, 2021. The generated hazardous waste will be stored in designated Hazardous waste storage room up to maximum of 90 days and shall be disposed to either TSDF or authorized recyclers.
4.4	**Other industrial process wastes**	Yes	Fly Ash will be generated from Boiler which will be given to the Brick manufacturer. In case Brick manufacturer is not available, ash will be sent to TSDF site.
4.5	**Surplus product**	No	No surplus product.
4.6	**Sewage sludge or other sludge from effluent treatment**	Yes	ETP Sludge being hazardous will not be processed on site and disposed off to nearest TSDF site.
4.7	**Construction or demolition wastes**	Yes	Debris, Scraps, excavated soil, used bags, steel in bits and pieces and cardboards waste shall be generated and disposed properly.
4.8	**Redundant machinery or equipment**	No	None
4.9	**Contaminated soils or other materials**	No	None
4.10	**Agricultural wastes**	No	No agriculture waste will be generated during construction / operation of the plant.
4.11	**Other solid wastes**	Yes	Other solid waste generated will be E-waste, Cut/torn PP bags plastic waste, rubber waste, empty barrels oil, empty containers of chemicals used in processes Waste generated shall be sent to authorized recycler.

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

S. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
5.1	**Emissions from combustion of fossil fuels from stationary or mobile sources.**	Yes	<u>Construction Phase</u>: Vehicular Emissions like CO & HC's and dust generation due to use of construction material transport and activities. <u>Operation Phase</u>: The main sources of emission in the plant will be combustion of fuel for operation of DG Sets, Boiler & plant machineries. All air pollution control techniques and systems will be installed in the plant to reduce the emissions. The plant will be maintaining all emission norms prescribed by MoEF&CC/UPPCB/CPCB. Stacks with appropriate pollution control system shall be introduced in the plants.
5.2	**Emissions from production processes.**	Yes	Likely air pollutants from proposed project shall be PM, NO2, HCl, HBr, Cl2 & SO2 from various process vents. Adequate air pollution equipment like two stage scrubbers, stacks & vents with required height will be provided. Fugitive emissions are also envisaged from proposed project.
5.3	**Emissions from materials handling including storage or transport.**	Yes	Fugitive emission from handling of construction material will be minimized by taking proper precautions. During operation phase, the Fugitive emissions from material handling, loading/ unloading and transport of material will be kept minimal due to closed loop system operated by trained workers. Dust collection systems will be installed to prevent fugitive emissions.
5.4	**Emissions from construction activities including plant and equipment.**	Yes	Construction activities (excavation for foundation, movement of vehicles and other machinery) will lead to emission of dust. Proper environmental measures such as sprinkling of water on roads at construction site, covering of loose material, vehicles only with PUC certificate will be allowed for transportation of

			material etc. will reduce the impact on the air quality.
5.5	**Dust or Odor from handling of materials including construction materials, sewage and waste.**	Yes	The dust shall be generated from vehicular and construction equipment movement (but will be short term and minimal). The emission generated from the process will be thoroughly scrubbed. All appropriate measures will be taken to control odor and dust.
5.6	**Emissions from incineration of waste**	No	No incineration of wastes will be done.
5.7	**Emissions from burning of waste in open air (e.g. slash materials, construction debris)**	No	Not Applicable as there will be no burning of waste in open air
5.8	**Emissions from any other sources**	No	None

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

S. No.	Information/Checklist confirmation	Yes/ No	**Details thereof (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	**Construction Phase**: Noise is expected to be generated during construction phase mainly from application of heavy machinery and traffic. Regular maintenance of machineries will be carried out to prevent noise pollution. PPE's will be provided to workers. **Operation Phase:** **<u>Existing Phase</u>**: The main source of noise pollution will be Boiler, pumps & compressors, grinders, DG sets, vehicular movement etc. To mitigate the impact, few key measures like proper maintenance of vehicles, development of green belt, proper lubrication of construction machinery, provision of PPE to labours will be done. Compressors, blowers, fans will be provided with Acoustic pad insulation / Noise level at

			Boundary Fence will be controlled by providing green belt throughout the boundary wall of plant.
6.2	**From industrial or similar processes**	Yes	Noise is expected to be generated from running machineries in manufacturing process and DG sets but within CPCB limit. All the workers will be equipped with PPE's. to protect them from the noise pollution. All Machinery/Equipment will be installed of latest technology and in such an orientation that noise levels will be within permissible limits. Job rotation practice shall be followed to reduce continuous exposure of individual.
6.3	**From construction or demolition**	Yes	Due to various construction activities, there will be short-term noise impacts in the immediate vicinity of the project site. The construction activities include the following noise generating activities: • Concrete mixing. • Construction equipment operation and heavy vehicle movement. To control noise emissions, machines will be equipped with acoustic enclosures. PPE's will be given to labours and Activities will be limited to daytime only.
6.4	**From blasting or piling**	No	Blasting and piling are not envisaged.
6.5	**From construction or operational traffic**	Yes	During operational phase noise might be generated due to traffic influx in the company premises due to material and personal transport. But it will be minimal and for a short term only. Greenbelt all around the plant will be provided for reducing the noise level.
6.6	**From lighting or cooling systems**	No	Not envisaged.
6.7	**From any other sources**	No	None

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:

S. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data

7.1	**From handling, storage, use or spillage of hazardous materials**	Yes	All chemicals will be handled as per standard practices. Adequate storage area for the safe storage of products, raw materials and hazardous chemicals will be provided within the plant. Also, all the workers shall be trained for proper handling and transportation of hazardous materials as per Hazardous and Other Wastes (Management and Transboundary Movement) Amendment Rules, 2021. All precautions will be taken to avoid spillage from storage and all applicable precautions will be taken during operation phase in storing and handling of hazardous chemicals. Fire accidents will be controlled with fire hydrant system installed within plant. PPEs will be provided to workers.
7.2	**From discharge of sewage or other effluents to water or the land (expected mode and place of discharge).**	No	Sewage/Liquid Effluent: The project will be Zero-liquid Discharge Unit. Solid Waste: The hazardous waste will be sent to nearest TSDF site, recyclable waste shall be sold to authorized recyclers.
7.3	**By deposition of pollutants emitted to air into the land or into water**	No	All possible air pollutants will be scrubbed/ filtered properly by various pollution control equipment before emitting into atmosphere. Adequate height of the stack will be provided to disperse pollutants and avoid deposition of pollutants in significant concentrations at any single location. The norms will be maintained through regular monitoring and analysis of vent gases.
7.4	**From any other sources**	No	Not envisaged
7.5	**Is there a risk of long term build-up of pollutants in the environment from these sources?**	No	No such effect is envisaged.

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

S. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
8.1	**From explosions, spillages, fires etc from storage, handling, use or production of hazardous substances**	Yes	The proposed project envisages handling of flammable and Hazardous materials, which in case of leakage may pose fire and explosion. • However suitable mitigation measures shall be implemented as under: Preventive measures like SOP, Work Permit System, and Physical Monitoring will be taken to eliminate the chance of accident on account of explosion, spillages, fire or hazardous substances etc. • Proper maintenance, operation and leak proof condition of machinery on regular basis will be done. • Sensors and detectors will be provided at strategic locations for early detection of any leak. • Fire hydrant system will be provided as per defined guidelines to fight any emergency. • Emergency vehicle will be made available at the site to provide transportation to hospital in case of any eventuality. • Fire extinguishers will be made available near all machines and all persons are properly trained to extinguish the fire at source itself.
8.2	**From any other causes**	No	Not envisaged
8.3	**Could the project be affected by natural disasters causing environmental damage (e.g. floods, earthquakes, landslides, cloudburst etc)?**	No	The project falls under Seismic Zone-IV (High damage risk zone) and the building will be designed in accordance with that.

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

S. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/ rates, wherever possible) with source of information data

9.1	Lead to development of supporting 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.) • housing development • extractive industries • supply industries • other	No	Common infrastructure facilities will be made available as per development in the Industrial Area.
9.2	Lead to after-use of the site, which could have an impact on the environment	No	None
9.3	Set a precedent for later developments	Yes	This will set a precedent for other manufacturer to explore the possibility of implementing such schemes. This project would encourage other industries to implement such project.
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects	No	Not Applicable.

(III) Environmental Sensitivity

1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	Yes	Kotban Reserved Forest Distance=0.36km,NW
2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	No	There are no areas which are important or sensitive for ecological reasons -Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests

3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	Yes	Kotban Reserved Forest Distance=0.36km,NW
4	Inland, coastal, marine or underground waters	No	There are no Inland, coastal, marine or underground waters
5	State, National boundaries	Yes	There is a state boundary of Haryana (4.68km, NW) in the 10 km Radius area.
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	Yes	NH-2(1.35 km, NE)
7	Defense installations	No	There are no Defense installations the 10 km Radius area.
8	Densely populated or built-up area	Yes	Nabipur (0.33 km,S)
9	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)	Yes	School: 1. MD Jain Public School (3.82 km, SSE) 2. Primary School Naduvas (4.23 km, SSE) Hospital: 1. Chauhan Hospital (4.05 km, SSE) 2. BPL Nursing Home (4.56 km, SSE) 3. Brij Nursing Home and Trauma Centre (4.6 km, SSE) Temple: 1. Prachin Shankar Ji Mandir (3.42 km, SSE) Post Office 1. Post Office, Kosi Kalan (4.99 km, SSE)
10	Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)	No	There are no Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)
11	Areas already subjected to pollution or environmental damage. (Those where existing legal environmental standards are exceeded)	Yes	Mathura industrial area as per CPCB CEPI Score. located at distance of 45.27 km from the project site
12	Areas susceptible to natural hazard which could cause the project to present environmental problems (earthquakes, subsidence, landslides, erosion,	Zone-IV (High Risk Zone)	

	flooding or extreme or adverse climatic conditions)	

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

Date: 07-08-2021
Place: New Delhi

Gupta

Signature of applicant

NAME- SUNIL GUPTA

FULL ADDRESS – CSC, GH-4/FF-5, DDA Market, Meera Apartments, Outer Ring Road, Paschim Vihar, New Delhi - 110063

PRE-FEASIBILITY REPORT (PFR)

for

Proposed Pesticide Manufacturing Plant

at

Plot No. A-4, UPSIDC Industrial Area, Kosi Kotwan Extension -2, Dist- Mathura, Uttar Pradesh – 281403

Type of Project	Greenfield Project
Total Plot Area	18915.50 m^2 (4.67 Acre.)
Total Cost of Project	Rs. 40 Crores
Category as per EIA notification 2006 and its amendments:	5(b), Category- A (Pesticides industry and pesticide specific intermediates (excluding formulations)
Proposed Production Capacity	1050 MTPM (Insecticides, Fungicides, Herbicides, Advanced Specific Pesticide Intermediates, Research and Development based Products ; Formulations-5000 MTPM)
NABET Acc. No.:	NABET/EIA/1922/RA 0197 valid till 23.11.2022

Project Proponent

M/s Amber Crop Science Pvt. Ltd.
CSC,GH-4/FF-5,DDA Market, Meera Apartments,
Outer Ring Road, Paschim Vihar,
New Delhi-110063
Email: ambercrops@gmail.com ; **Phone no.**: 9212678716

UID No.: EQMS/PFR/Amber Crop /5(b)A/PR660/09.08.2021	
Report Release Date: 09/08/2021	**Revision No**: 00

Environmental Consultant:

(Approved Consultant)

EQMS INDIA PVT LTD. (now known as EQMS GLOBAL PVT. LTD.)
QCI/NABET Accredited Consultant
304-305, 3rd Floor, Plot No. 16, Rishabh Corporate Tower,
Community Centre, Karkardooma, Delhi – 110092
Phone: 011-42270087, 43062757 ; Website: www.eqmsglobal.com ; E-mail: eqms@eqmsindia.org

ENCLOSURE NO.	PARTICULARS
1	NABET ACCREDITATION CERTIFICATE
2	AUTHORIZATION OF CONSULTANT
3	LAND DOCUMENTS
4	MANUFACTURING PROCESS
5	RAW MATERIALS LIST
6	LAYOUT PLAN
7	TOPOGRAPHICAL MAP
8	DISTANCE FROM TAJ TRAPEZIUM

1 EXECUTIVE SUMMARY

M/s Amber Crop Science Pvt. Ltd intent to setup a "Proposed Pesticide Manufacturing Project" at Plot No.A-4, Kosi Kotwan Extension-2, Uttar Pradesh State Industrial Development Corporation (UPSIDC) Industrial Area, Mathura, Uttar Pradesh- 281403. It is a greenfield project. The proposed unit will be engaged in production of insecticide, herbicide, fungicide, plant growth regulator, advanced pesticide specific intermediates and research & development based products. The **total capacity of the plant will be 1050 MT/Month (excluding formulation). The plant also proposes formulation unit with a total capacity of 5000 MT/month.** Since, environmental clearance has been exempted for formulation units as per EIA Notification, 2006 and further amendments, formulation capacity for the plant has not been added.

As per the Government of India (Ministry of Environment, Forests & Climate Change (MoEF&CC),) EIA Notification 2006 and further amendments, the proposed project involves production of "Pesticide and pesticide specific intermediates" and hence falls under **Activity 5(b); Category "A" of EIA notification.** Thereby, the project requires environmental clearance from MoEF&CC, New Delhi. The project is **not located in the critically polluted area**, Mathura industrial area is critically polluted area which is located at a distance of 45.27 km SSE from the project site. Also, the Project site is **11.53 km away from the Taj Trapezium Zone (TTZ) area**. Since, the project falls in notified Industrial Area i.e. Kosi Kotwan Extension-2, UPSIDC Industrial Area, Mathura, Uttar Pradesh, **Public Hearing is exempted** for the project.

Details of proposed products is mentioned below in ***Table 1.1.***

Table 1.1 Details of Proposed Product Capacity

Sr.no.	Name of Products	Cas No.	Quantity (MT/month)
HERBICIDE GROUPS			
Group 1- ALS-IMIDAZOLINONE/ UREAS / ALS-SULFONYLUREA- CONT / ALS-OTHERS			
1	Imazethapyr	81335-77-5	100
2	Bensulfuron	83055-99-6	
3	Metsulfuron	74223-64-6	
4	Chlorimuron	90982-32-4	
5	Pyrazosulfuron	93697-74-6	
6	Sulfosulfuron	141776-32-1	
7	Trifloxysulfuron	199119-58-9	
8	Bispyribac-Sodium	125401-92-5	
9	Penoxsulam	219714-96-2	

Sr.no.	Name of Products	Cas No.	Quantity (MT/month)
Group 2 -AMINO ACIDS / UREAS/CYCLOHEXANDIONES/ DINITRO ANILINEES / ACETAMIDES			
10	Glufosinate	77182-82-2	75
11	Glyphosate	1071-83-6	
12	Clethodim	99129-21-2	
13	Pendimethalin	40487-42-1	
14	Pretilachlor	51218-49-6	
Group 3 -ARYLOXYPHENOXYPROPIONATES / PPO- DIPHENYL ETHERS			
15	Clodinafop	105512-06-9	50
16	Quizalofop	100646-51-3	
17	Fenoxaprop	71283-80-2	
18	Oxyfluorfen	42874-03-3	
Group 4 -HPPD INHIBITORS/ OTHERS/ TRIAZINES / PGR			
19	Pinoxaden	243973-20-8	75
20	Propanil	709-98-8	
21	Clomazone	81777-89-1	
22	Bentazone	25057-89-0	
23	Atrazine	1912-24-9	
24	Metribuzin	21087-64-9	
25	Ethopen	16672-87-0	
FUNGICIDE GROUPS			
Group 5 -SDHIs / OTHERS-CONT			
26	Boscalid	188425-85-6	25
27	Fluxapyroxad	907204-31-3	
28	Thifluzamide	130000-40-7	
29	Carpropamid	104030-54-8	
30	Isoprothiolane	50512-35-1	
31	Cyazofamid	120116-88-3	
Group 6 -STROBILURINS / SBI-TRIAZOLE / SBI-Other DMIs / MULTICITE			
32	Azoxistrobin	131860-33-8	100
33	Picoxystrobin	117428-22-5	
34	Pyraclostrobin	175013-18-0	
35	Trifloxystrobin	141517-21-7	
36	Hexaconazole	79983-71-4	
37	Propiconazole	60207-90-1	
38	Epoxiconazole	135319-73-2	
39	Tebuconazole	107534-96-3	
40	Tetraconazole	67915-31-5	

Sr.no.	Name of Products	Cas No.	Quantity (MT/month)
41	Difenoconazole	119446-68-3	
42	Tricyclazole	41814-78-2	
43	Mancozeb	2234562	
44	Propineb	12071-83-9	
INSECTICIDE GROUPS			
Group 7 ACARICIDES COMPOUNDS / BENZOYLUREA / Other IGRs			
45	Pyridaben	96489-71-3	50
46	Diafenthiuron	80060-09-9	
47	Spiromesifen	283594-90-1	
48	Lufenuron	103055-07-8	
49	Novaluron	116714-46-6	
50	Buprofezin	69327-76-0	
51	Methoxyfenozide	16150-58-4	
52	Pyriproxyfen	95737-68-1	
Group 8- NATURAL PRODUCTS			
53	Thiocyclam	31895-21-3	25
Group 9- NEONICOTINOIDS			
54	Acetamiprid	135410-20-7	100
55	Clothianidin	210880-92-5	
56	Dinotefuran	165252-70-0	
57	Imidacloprid	138261-41-3	
58	Nitenpyram	150824-47-8	
59	Thiacloprid	111988-49-9	
60	Thiamethoxam	153719-23-4	
61	Pymetrozine	123312-89-0	
Group 10- SYNTHETIC PYRETHROIDS			
62	Lamda-Cyhalothrin	68085-85-8	150
63	Bifenthrin	82657-04-3	
64	Cypermethrin	52315-07-8	
65	Deltamethrin	52918-63-5	
Group 11 ORGANOPHOSPHORUS & OTHERS			
66	Chlorantraniliprole	500008-45-7	50
67	Tetraniliprole	1229654-66-3	
68	Indoxacarb	144171-61-9	
69	Flonicamid	158062-67-0	
70	Flubendiamide	272451-65-7	
Group 12 Advanced Specific Pesticide Intermediates			

Sr.no.	Name of Products	Cas No.	Quantity (MT/month)
71	2- Chloro 5- Chloromethyl Pyridine (CCMP)	70258-18-3	150
72	N- Nitro Imino Imidazolidine (NII)	5465-96-3	
73	2- Chloro 5- Chloromethyl Thiazole (CCMT)	105827-91-6	
74	2- Methyl 5- Nitro 1,3,5 Oxidiazine(MNIO)	153719-38-1	
75	4 -Hydroxy Phenyl Propionic Acid (4HPPA)	67648-61-7	
76	1,1-Di ChloroPinacolin	22591-21-5	
77	Thiocarbo Hydrazine	2231-57-4	
78	2- Hydroxy 4- Methyl Benzotioate (HMBT)	20174-68-9	
79	2,3 Difluoro 5- Chloro Pyridine	589402-43-7	
80	Triazinone- 4- Amino 3- Mecapto- 6-t-Butyl -1,2,4-triazine-5-one (AMBT)	33509-43-2	
81	Research & Development Based Products		100
Total			**1050**

Project at a Glance is given in **Table 1.2.**

Table 1.2: Project at a Glance

S. No.	Particulars	Unit	Details
1.	Project Cost	Rs. (in Crores)	Rs 40 Crores
	AREA DETAILS		
2.	Total Plot Area	sqm	18915.50
3.	Green Area	sqm	6268.15 (33.14 % of total plot area)
4.	**POPULATION/EMPLOYMENT**		
a)	Workers	No.	Permanent- 100 Temporary-150
b)	Visitors	No.	10
c)	Total Population	No.	260
	SERVICE DETAILS & ENVIRONMENTAL ASPECTS		

S. No.	Particulars	Unit	Details
5.	Total Water Requirement	KLD	210
6.	Fresh Water Requirement	KLD	25
7.	Wastewater Generation (Including Domestic Sewage & Industrial Effluent)	KLD	(Domestic Sewage- 6 KLD, Industrial Effluent- 169 KLD)
8.	Wastewater Treatment Schemes	KLD	ETP- 60 KLD MEE- 220 KLD SBT- 200 KLD
9.	Power Requirement	kVA	Proposed: 1500 KVA Source: Uttar Pradesh power corporation Ltd
10.	DG Sets (Backup)	kVA	2x500 KVA

1.1 Plant location and area classification

The project site is located at Plot No.A-4, Kosi Kotwan Extension-2, Uttar Pradesh State Industrial Development Corporation (UPSIDC) Industrial Area, Mathura, Uttar Pradesh-281403 by **M/s Amber Crop Science Pvt. Ltd.**

Allotment letters are issued vide reference no. ***SER20201130/1000/781/9759/SIDC-IA/Kosi Kotwan Extn.***-2 dated 23.12.2020 ***(Allotment Letter have been attached as Enclosure-1).*** Project Location (Google Earth Image) has been depicted as ***Figure 3.2.*** .

The total plot area of the project will be **18,915.5 m²**. Out of total, **6268.15 m²** i.e. 33.14% of total plot area will be developed as Green Area. Detailed land-use breakup of the plant is shown in ***Table 1.3.*** **and** ***Figure 1.1. Layout Plan is shown in Figure 3.3.***

Table 1.3: Land Breakup of Project Site

Sr. No.	Land Breakup	Area in Sq. Mt.	Area Percentage (%)
1	Ground Coverage	7382.355	39.03
2	Green Belt	6268.15	33.14
3	Road & Open Area	5265	27.83
	Total	**18915.505**	**100**

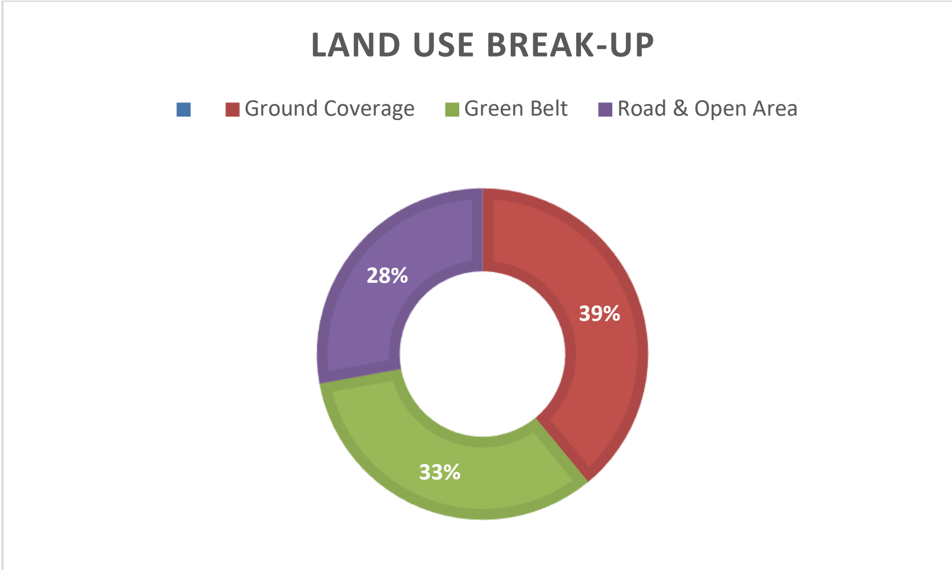


Figure 1.1 Land-use Breakup of Proposed Project

1.2 Green belt

To mitigate and minimize the environmental impacts, arising due to project especially from air pollution, noise pollution, soil erosion etc. a dense Greenbelt shall be developed all around the proposed site. A greenbelt will be developed in **6268.15** m^2 ***i.e. 33.14% of total plot***. The industry shall put in serious effort to create the greenery since the number of trees, plants, shrubs, and herbs to get increased considerably. Also, an effort apparently will be made to increase the percent of survival in subsequent years.

Approx. **1567 *no. of trees/shrubs*** (considering 2500 nos. of trees/Ha) shall be planted under the greenbelt in their unit.

1.3 Water requirement

Construction Phase: The total water requirement during construction phase will be 10 KLD out of which 6 KLD of water will be required for construction works and rest of 4 KLD water will be required for domestic purpose. Wastewater generated from domestic usage will be treated in septic tank followed by soak pit.

Operation Phase: The total water requirement of the project will be 210 KLD. Out of which, 25 KLD freshwater requirement will be sourced from UPSIDC water supply / borewell after permission from concerned authority i.e. CGWA and the rest will be sufficed by recycling 185 KLD of treated effluent

Details have been provided in Section 3.6

1.4 Power requirement & supply/ source

Construction Phase: One DG Set of capacity 1x500 kVA will be used for power supply during construction works.

Operation Phase: The total power requirement of the plant will be 1500 kVA which will be met through Uttar Pradesh Power Corporation Limited (UPPCL). DG sets of capacity 2x500 kVA (with appropriate stack height as per CPCB norms) will be used for backup purposes.

1.5 Effluent Management

Construction Phase: 3.2 KLD domestic sewage will be treated in septic tanks followed by soak pits.

Operational Phase: Total Wastewater Generation from the project will be 175 KLD (169 KLD Industrial Effluent + 6 KLD Domestic Sewage). 6 KLD domestic sewage will be treated in Septic Tank / Soak pit .150 KLD High COD/High TDS Process Effluent along process steam (35 KLD) will be treated in MEE (Capacity- 220 KLD) and 19 KLD Low COD/ Low TDS effluent will be treated in ETP (Capacity- 60 KLD) which shall be further treated with MEE condensate in SBT unit 185 KLD Treated water will be reused in Process, cooling tower makeup water, Washing & Gardening.

The project will be a **"Zero-liquid Discharge"** Project.

The details of effluent and sewage management plan are provided in **Section 3.6 & 3.7.**

1.6 Air emission & Management

Construction Phase: The main sources of air pollution will be Construction vehicular movement, emissions from construction machinery and activities as well from DG sets (1x500 kVA). DG sets will be installed as per CPCB guidelines and manufacturer's instructions to keep the emissions within limits of CPCB. Stack height will be provided as per CPCB guidelines for adequate dispersion of released pollutants and to have negligible GLCs in the surrounding area. Water Sprinkling shall be carried out to reduce the dust emission due to construction activity. Construction material movement (vehicular movement) shall be planned and carried out during non-peak hours to avoid traffic congestion.

Operational Phase: The main sources of emission in the plant will be combustion of fuel for operation of DG Sets & Boiler utilities and process emissions from process reactor vents.

Air pollution control systems will be installed in the plant to reduce the emissions. The plant will be maintaining all emission norms prescribed by MoEF&CC/UPPCB/CPCB.

Stacks with appropriate pollution control system shall be installed in the plants. **Details of proposed stacks are given below in Section 3.8.**

1.7 Solid & Hazardous waste management

Construction Phase: Solid waste generation in construction waste will be excavated soil, construction debris and scrap which will be managed as per C&D Waste Management Rules.

Operational Phase: The industry shall obtain authorization under Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2021 for the waste generated and categorized under hazardous waste as per Schedule of The Hazardous & Other Waste (Management and Transboundary Movement) Amendment Rules, 2021. The generated hazardous waste will be stored in designated Hazardous waste storage room up to maximum of 90 days and shall be disposed to either TSDF or authorized recyclers.

Approx. 76.5 kg/day of municipal solid waste generated in the plant area will be segregated to biodegradable waste and non-biodegradable waste. 30.6 kg/day non-biodegradable waste will be sold off to recycler.45.9 kg/day biodegradable waste will be disposed off in MSW disposal pit to get converted to manure for horticulture purposes. Solid Waste Management Rules, 2016 shall be followed. **Details have been provided in Section 3.7.3.**

1.8 Noise Management

Construction Phase: The most common sources of noise pollution will be activities like foundation, piling, operation of construction machinery such as pillier, DG sets and vehicular movement. However, magnitude of the impact will depend upon the type and nature of the machinery, time schedule of operations, construction method and management practices followed during activities.

To mitigate the impact, following steps will be taken:

- The construction activity will be carried out mostly during daytime.
- Proper maintenance of noise generating transport vehicles.
- Regular maintenance of heavy earth vehicles may be adopted to reduce noise levels.
- All the construction machinery and equipment used shall be provided with adequate noise mufflers and noise suppression equipment. Proper lubrication and maintenance of the machinery & equipment and vehicle will be carried out to minimize the noise generation due to abrasion
- Noise level from loading & unloading of material will be reduced by usage of various types of cranes & placing material on sand or sandy bag beds.

- Noise monitoring shall be carried out to ensure the effectiveness of mitigation measures and develop a mechanism to record and respond to complaints on noise.
- Adequate parking space will be provided at the project site to minimize the honking requirement due to congestion and jams and restricting the speed limits.
- Protection devices (earplugs or earmuffs) shall be provided to those workers who cannot be isolated from the source of noise and reducing the exposure time of workers to the higher noise levels by job rotation.
- Construction material vehicular movement shall be planned during non-peak hours to avoid traffic congestion in the area.

Operational Phase: The main sources of noise generation in the proposed project are various types of ID fans, Boiler, pumps & compressors, grinders, DG sets, vehicular movement etc. To reduce impact in the project site and nearby habitations, following mitigation measures will be done.

- Equipment meeting standard of noise shall be used.
- All engineering control practice shall be undertaken during installation of machinery to maintain noise level.
- Acoustical Enclosures and Mufflers will be provided at all required locations.
- Vibration pads and foundation will be provided at all heavy machinery areas.
- Noise generating units like machinery area, canteen etc. will be well insulated with enclosed doors.
- Earmuffs will be used while in high noise areas. Separate cabins will be provided.
- Acoustic treatment rooms will be provided at appropriate location.
- Well- developed road will be constructed within plant, for smooth and hassle-free movement of personnel.
- Proper and timely maintenance of machineries and preventive maintenance of vehicles will be done.
- Plantation will be done all over the plant area to provide noise barrier.
- Important Instructions will be displayed all over the plant area.

2 INTRODUCTION

Environment and Social Standard 5 (E & SS5) by Food and Agriculture Organization (FAO) defines pesticide as:

"As any substance, or mixture of substances of chemical or biological ingredients intended for repelling, destroying or controlling any pest, or regulating plant growth. E&SS5 recognizes that pesticides can contribute to effective crop and food protection during production and in storage. Pesticides are also used in forestry, livestock production and aquaculture to control pests and diseases. At the same time pesticides are designed to be toxic to living organisms, if intentionally dispersed in the environment and are applied to food crops."

Pesticides represent the last input in an agricultural operation and are applied for preventing the spoilage of crops from pests such as insects, fungi, weeds, etc., thereby increasing the agricultural productivity. The significance of pesticides has been rising over the last few decades catalyzed by the requirement to enhance the overall agricultural production and the need to safeguard adequate food availability for the continuously growing population in the country. In India, pests and diseases, on an average eat away around 20-25% of the total food produced.

Being cognizant of the latest trends in pesticide industry and market demand in the country, **M/s Amber Crop Science Pvt. Ltd.** has planned to setup new ***"proposed Pesticide Manufacturing Project"*** located at Plot No.A-4, Kosi Kotwan Extension-2, Uttar Pradesh State Industrial Development Corporation (UPSIDC) Industrial Area, Mathura, Uttar Pradesh- 281403.

2.1 Identification of Project & Project Proponent

2.1.1 Identification of Project Proponent:

M/s Amber Crop Science Pvt. Ltd. deals in Manufacturing of chemicals and chemical products. Contact details of the project proponent is as mentioned below:

Project Proponent:	**M/s Amber Crop Science Pvt. Ltd**
Registered Address:	**CSC,GH-4/FF-5,DDA Market, Meera Apartments Outer Ring Road, Paschim Vihar, New Delhi-110063**
Authorized Signatory:	**Mr. Sunil Gupta**
Designation:	**Director**
Email Id:	**ambercrops@gmail.com**
Mobile No.:	**9212678716**

2.1.2 Identification of Project Proponent:

The company has proposed to setup a " Proposed Pesticide Manufacturing Project" at Plot No. A-4, Kosi Kotwan Extension-2, Uttar Pradesh State Industrial Development Corporation (UPSIDC) Industrial Area, Mathura, Uttar Pradesh- 281403 by **M/s Amber Crop Science Pvt. Ltd**. involved in production of pesticides manufacturing. The project will be involved in production of insecticide, herbicide, fungicide, plant growth regulator, advanced pesticide specific intermediates and research & development based products. The **total capacity of the plant will be 1050 MT/month (excluding formulation).** The plant also proposes formulation unit with a total capacity of 5000 MT/month. Since, environmental clearance has been exempted for formulation units as per EIA Notification, 2006 and further amendments, formulation capacity for the plant has not been added.

Details of proposed products are given in **Table 1.1.**

2.2 Brief description of nature of Project

The proposed project introduces new Pesticide Technical & Intermediates Manufacturing Plant which falls under item no 5(b)i.e. pesticide and pesticide specific intermediates as per the EIA notification, Sept. 14, 2006 (as amended time to time), it is to be treated as Category 'A', and needs to obtain the prior Environmental Clearance from MoEF&CC, New Delhi.
As the site falls in approved industrial area, public hearing/public consultation is exempted for the proposal.

2.3 Need for the project and its importance to the country:

Indian Agrochemicals Market

The Indian pesticides market was worth INR 197 Billion in 2018. The market is further projected to reach a value of INR 316 Billion by 2024, growing at a CAGR of 8.1% during 2019-2024.
With the growing global populations constantly challenging food production, agrochemicals offer a means towards meeting the challenge of more food, less land. The role of agrochemicals is not limited to protection from pests and diseases that threaten our food supply; they help in yield enhancement as well.
The agrochemicals industry has played a great role since first green revolution to transform India's ship-to mouth economy to a farm-to ship economy. At an estimated size of 2.8 Billion USD in 2019, Indian agrochemicals is the second largest and a fast-growing segment in the Indian agri-input industry.

Vision of Indian Economy by 2025

Use of agrochemicals contributes not only to healthy growth of crops but also to improved farm work efficiency and stable supply of tasty agricultural produce. The onset of agrochemicals era transformed Indian agriculture from food deficient to food surplus country. Going ahead, increase in agricultural yields itself will contribute ~60% towards the vision of doubling farmer income by 2025 (NITI Aayog). Doubling of farmer income will result in a significant increase in rural disposable income and hence spending, which is integral to push economic growth. Also, exports of agrochemicals in India have been growing at a CAGR of 12.8% during 2014-18. Furthermore, agrochemicals worth USD 4.1 Billion USD will be off patent by 2020, which will further boost Indian generic agrochemical production ability. Therefore, agrochemicals industry, through increase in yields and contribution to exports will play a major role in achieving the vision of 5 Trillion USD economy.

Need of Pesticides

The global population currently stands at 7.2 billion and is expected to rise to 9.3 billion by 2050. This will lead to an increased demand for food. The dietary needs in emerging countries will change as economy grows. To meet the food & nutrition needs of a growing population a sustainable approach is required, that puts thrust on increasing productivity against the background of lower yields & decreasing farm sizes. It requires a push from all stakeholders – the farmer, the government and the agrochemical/agro industry collectively so that the changing needs of the society are met. Around 25% of the global crop output is lost due to attacks by pests, weeds and diseases which doesn't augur well for farming given the critical challenges ahead and thus agrochemicals have an increasing role to play. The proposed project will provide the appropriate pesticide in the market to increase the crop output.

Benefits of the proposed project

- It will fulfill the demand supply gap of pesticides and related intermediates.
- It will maintain stability in Indigenous / domestic market for pesticides.
- It will ease the dependency of import of pesticides within the country.

2.4 Demand/Supply gap:

The plant will reduce the elevated demand supply gap of agricultural products.

2.5 Imports vs. Indigenous production

The proposed project will help in decreased dependency on import for the pesticides and elevate the status of country in the agricultural and related markets worldwide.

2.6 Export possibility

M/s Amber Crop Science Pvt. Ltd. proposes to provide supply of pesticides and related intermediates to every corner of the country and would thrive for satisfaction of intra-national demands of agrochemical products.

2.7 Domestic/Export Markets

The products shall cater to major domestic markets.

2.8 Employment Generation (Direct and Indirect) due to the project

The Proposed project will generate direct and indirect employment.

Construction Phase: The project will provide employment to 80 no. of local labours for construction works and establishment of the proposed unit.

Operational Phase: Total population projection of the project will be 260 that would consist of 100 Permanent workers and 150 contractual workers. 10 no. of daily visitors is expected in its operational phase.

It will aid in development of surrounding area and there will be upliftment of Socio-economic standards. People from nearby villages will be preferred.

3 PROJECT DESCRIPTION

The proposed project involves the production of pesticide, technical grade pesticide & intermediates along with formulation unit.

Table 3.1 Product Details of Proposed Project

Type	Quantity (MT/Month)
Insecticides	375
Fungicides	125
Herbicide	300
Intermediate Products	150
R&D product	100
Total	**1050**
Formulation	5000

3.1 Type of Project including interlinked and interdependent projects, if any

The proposed project involves the production of pesticide, technical grade pesticide & intermediates along with formulation unit. As the Environmental Clearance is exempted for the formulation units, therefore production of formulation is not taken in the application. The technical grade pesticide & intermediates production unit is proposed along with formulation unit. There is no interlinked project with this project. The project falls in Category A-5 (b) as per EIA notification, 2006.

3.2 Location (specific location and project boundary & project lay out) with coordinates

The proposed project is located in Plot no. A-4, Industrial area ,Uttar Pradesh State Industrial Development Corporation Ltd (UPSIDC), Kosi Kotwan(Extension-2) District-Mathura, Uttar Pradesh. The establishment of pesticide manufacturing unit will be done over a total land area of 18915.50 m^2. The coordinates of center of the site are **Latitude:** 27°49'31.19"N and **Longitude:** 77°24'22.51"E.

The Google image showing Project boundary and 10 km area map is shown in **Figure 3.1** & **Figure 3.2,** respectively. Plant layout is shown in **Figure 3.3.**

Figure 3.1: Project Boundary with Site Coordinates

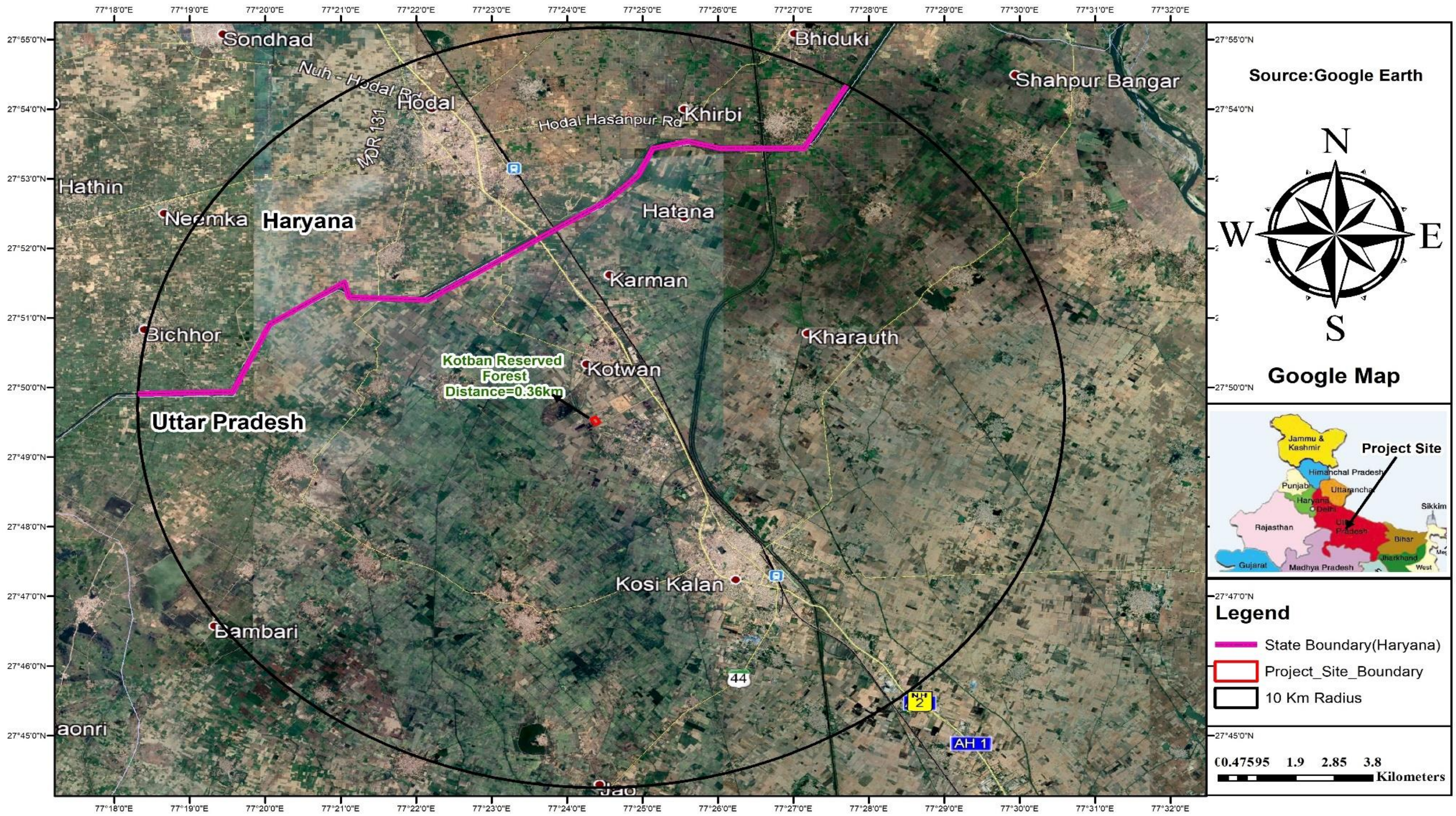


Figure 3.2 Google Image of the Project Site

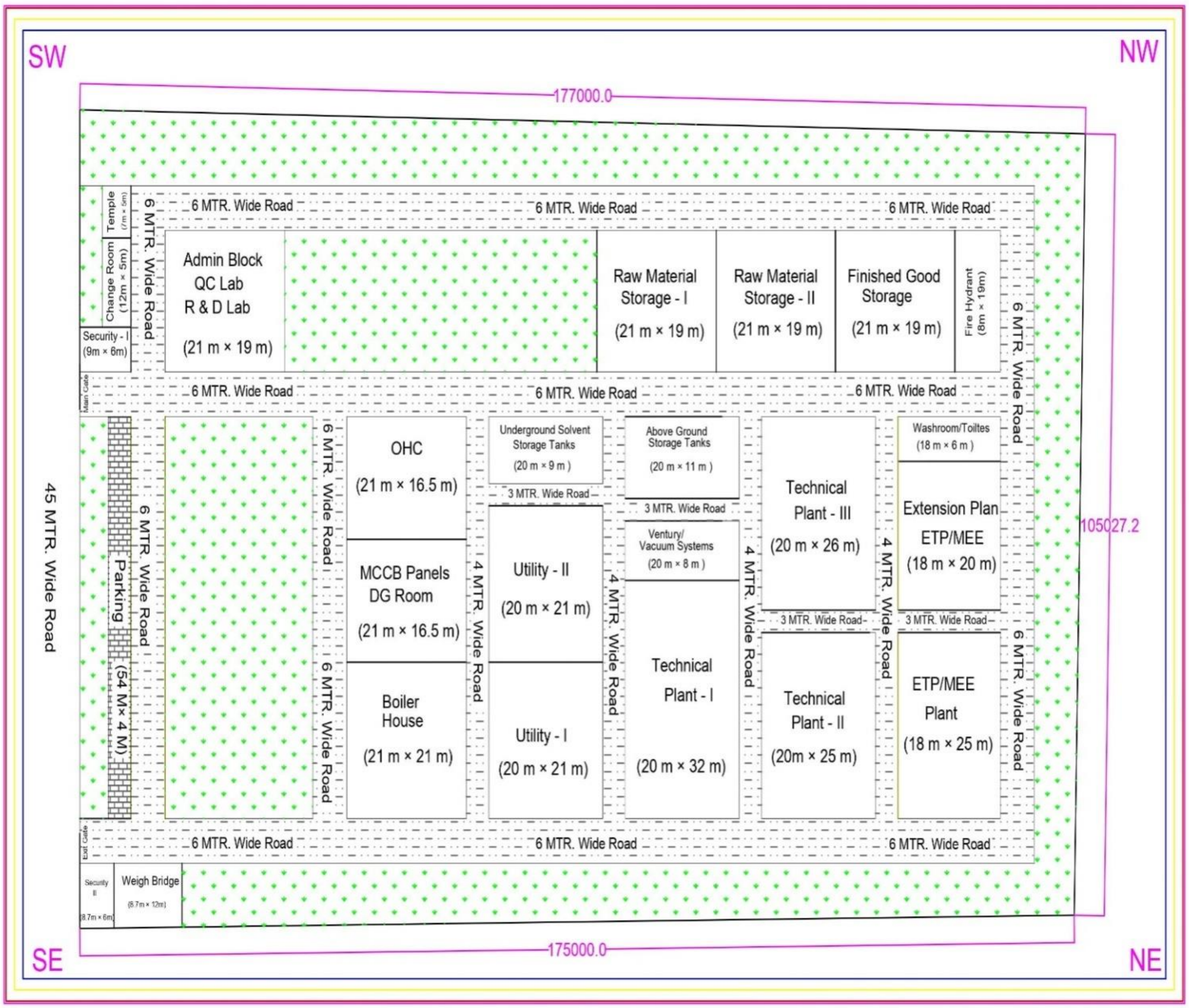


Figure 3.3: Plant Layout showing the land distribution

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

The proposed project is located within a Notified Industrial Area i.e. Kosi Kotwan Extension-2, UPSIDC Industrial Area, Mathura, Uttar Pradesh- 281403. Thus, alternative sites have not been considered. All the offsite and onsite facilities are already developed in the industrial estate area that will prove a convenience for the proposed project. The site is located about 45.27 km, SSE from the Mathura city and well connected with National Highway-2 (1.35 km, NE direction) via interconnecting roads internally and surrounding the industrial estate. Nearest Railway station is Kosi Kalan Railway Station which is located at 5.55 km in SSE direction from the Project Site. Nearest Airport from the project site is Indira Gandhi International Airport located at 86.24 km in NNW direction. Nearest Town is Kosi Kalan (3.85km , SSE), Nearest City is Mathura (45.27 km, SSE) and nearest village is Nabipur (0.33 km, S) from the Project site.

The project is not likely to cause any significant impact to the ecology of the area since adequate preventive measures are proposed to be adopted to control various pollutants within permissible limits.

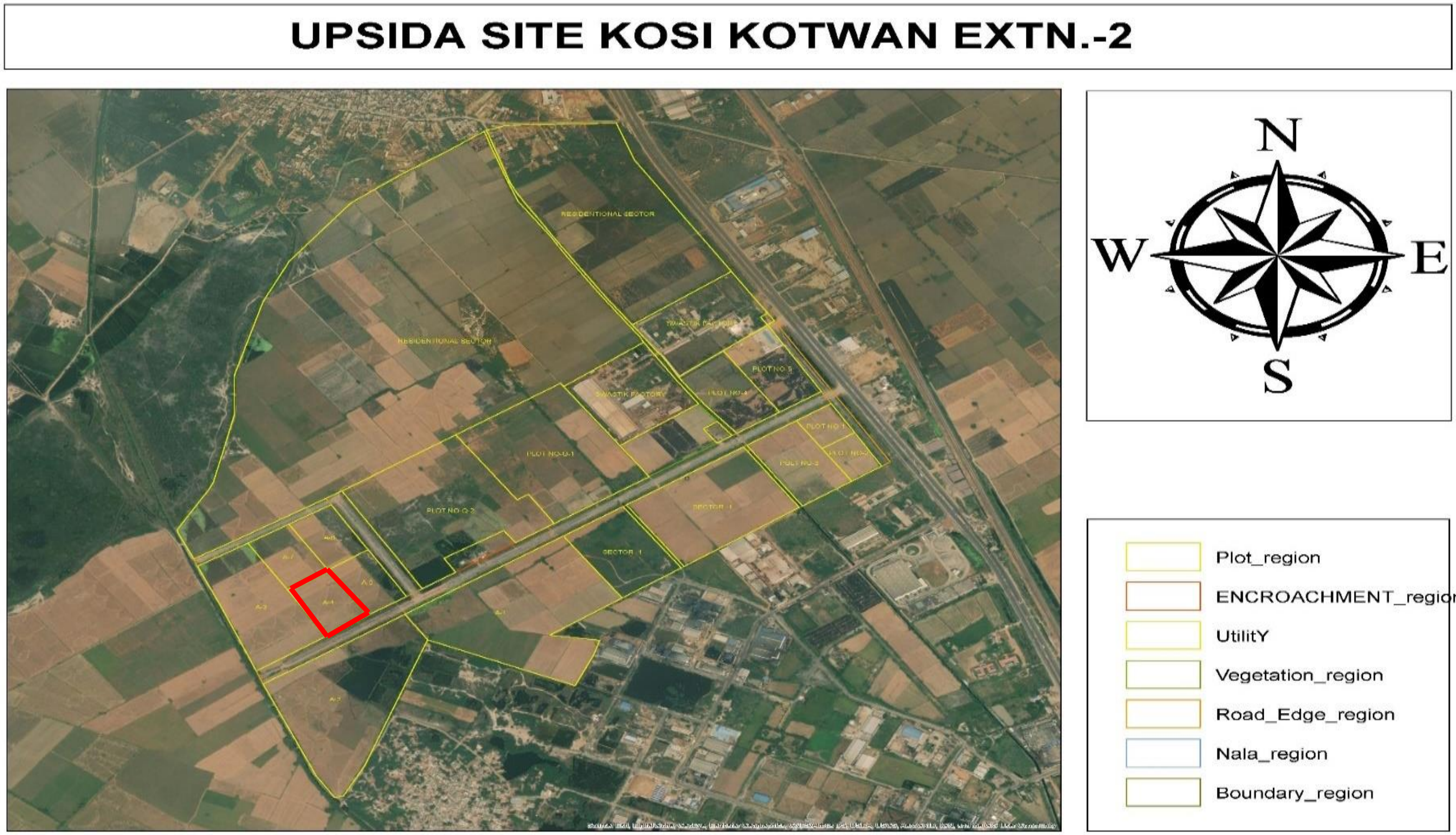


Figure 3.4: Master Plan of UPSIDC , Kosi Kotwan Extn-2 showing the location of project site

Major Factor involved in the selection of site are listed below

- The project site is in industrial area
- Site is connected with national and state highway for easy transport of product.
- Availability of sufficient land for the setup of required utilities
- Availability of water, electricity facilities
- Raw materials will be easily available
- Availability of skilled and unskilled manpower
- TDSF site is available near the site.

Table 3.2 Environmental Sensitivity of Project

S. No.	Environmental Features	Within 500 m-2 km area around Project Site	Within 2.0-5 km area around Project Site	Within 5-10 km area around Project Site
1.	**Ecological Environment**			
A	Presence of Wildlife Sanctuary/ National Park/Biosphere Reserves	None	None	None
B	Reserved /Protected Forests	Kotban Reserved Forest (0.36 km, NW)	None	None
C	Wetland of state and national interest	None	None	None
D	Migratory route for wild animals	None	None	None
E	Presence of Schedule-I Fauna	None	None	None
F	Critically Polluted Area	None in 10 km (Mathura industrial area is critically polluted area located at a distance of 45.27 km from the project site)		
2.	**Physical Environment**			
G	Road Connectivity	National Highway -2 (1.35 km, NE)	None	None
H	Rail Connectivity	None	None	Kosi Kalan Railway Station (5.55 km, SSE)
I	Defence Installation	None	None	None
J	Densely	Nabipur (0.33 km, S)	Kosi Kalan	

	Populated Area		(3.85 km SSE	
K	Other village close to Plant Site	1. Dahgaon (2.81 km, WNW) 2. Kotwan (1.23 km, N)		
L	Topography	undulated elevation ranges between 186 to 191 amsl		
M	Seismicity	Seismic Zone-IV (High- Risk Zone)		
N	Surface Water Resources (Rivers)	None	None	None
3.	**Social Environment**			
Q	Physical Setting	Industrial and rural	Industrial and rural	Urban, rural and agricultural
R	Physical Sensitive Receptors	None	School, Hospitals, Temple etc.	School, Hospitals, Temple etc.
S	Archaeological Monuments	None	None	None

3.4 Size or Magnitude of Operation

List of products and associated by-products to be manufactured at the site are mentioned in **Table 3.3.**

Table 3.3: List of Products

Sr.no.	Name of Products	Cas No.	Quantity (MT/month)
HERBICIDE GROUPS			
Group 1 ALS-IMIDAZOLINONE/ UREAS / ALS-SULFONYLUREA- CONT / ALS-OTHERS			
1	Imazethapyr	81335-77-5	**100**
2	Bensulfuron	83055-99-6	
3	Metsulfuron	74223-64-6	
4	Chlorimuron	90982-32-4	
5	Pyrazosulfuron	93697-74-6	
6	Sulfosulfuron	141776-32-1	
7	Trifloxysulfuron	199119-58-9	
8	Bispyribac-Sodium	125401-92-5	
9	Penoxsulam	219714-96-2	
Group 2 AMINO ACIDS / UREAS/CYCLOHEXANDIONES/ DINITRO ANILINEES / ACETAMIDES			
10	Glufosinate	77182-82-2	**75**
11	Glyphosate	1071-83-6	
12	Clethodim	99129-21-2	

13	Pendimethalin	40487-42-1	
14	Pretilachlor	51218-49-6	
Group 3 ARYLOXYPHENOXYPROPIONATES / PPO- DIPHENYL ETHERS			
15	Clodinafop	105512-06-9	50
16	Quizalofop	100646-51-3	
17	Fenoxaprop	71283-80-2	
18	Oxyfluorfen	42874-03-3	
Group 4 HPPD INHIBITORS/ OTHERS/ TRIAZINES / PGR			
19	Pinoxaden	243973-20-8	75
20	Propanil	709-98-8	
21	Clomazone	81777-89-1	
22	Bentazone	25057-89-0	
23	Atrazine	1912-24-9	
24	Metribuzin	21087-64-9	
25	Ethopen	16672-87-0	
FUNGICIDE GROUPS			
Group 5 SDHIs / OTHERS-CONT			
26	Boscalid	188425-85-6	25
27	Fluxapyroxad	907204-31-3	
28	Thifluzamide	130000-40-7	
29	Carpropamid	104030-54-8	
30	Isoprothiolane	50512-35-1	
31	Cyazofamid	120116-88-3	
Group 6 STROBILURINS / SBI-TRIAZOLE / SBI-Other DMIs / MULTICITE			
32	Azoxistrobin	131860-33-8	100
33	Picoxystrobin	117428-22-5	
34	Pyraclostrobin	175013-18-0	
35	Trifloxystrobin	141517-21-7	
36	Hexaconazole	79983-71-4	
37	Propiconazole	60207-90-1	
38	Epoxiconazole	135319-73-2	
39	Tebuconazole	107534-96-3	
40	Tetraconazole	67915-31-5	
41	Difenoconazole	119446-68-3	
42	Tricyclazole	41814-78-2	
43	Mancozeb	2234562	
44	Propineb	12071-83-9	
INSECTICIDE GROUPS			
Group 7 ACARICIDES COMPOUNDS / BENZOYLUREA / Other IGRs			
45	Pyridaben	96489-71-3	50

46	Diafenthiuron	80060-09-9	
47	Spiromesifen	283594-90-1	
48	Lufenuron	103055-07-8	
49	Novaluron	116714-46-6	
50	Buprofezin	69327-76-0	
51	Methoxyfenozide	16150-58-4	
52	Pyriproxyfen	95737-68-1	
Group 8 NATURAL PRODUCTS			
53	Thiocyclam	31895-21-3	**25**
Group 9 NEONICOTINOIDS			
54	Acetamiprid	135410-20-7	**100**
55	Clothianidin	210880-92-5	
56	Dinotefuran	165252-70-0	
57	Imidacloprid	138261-41-3	
58	Nitenpyram	150824-47-8	
59	Thiacloprid	111988-49-9	
60	Thiamethoxam	153719-23-4	
61	Pymetrozine	123312-89-0	
Group 10 SYNTHETIC PYRETHROIDS			
62	Lamda-Cyhalothrin	68085-85-8	**150**
63	Bifenthrin	82657-04-3	
64	Cypermethrin	52315-07-8	
65	Deltamethrin	52918-63-5	
Group 11 ORGANOPHOSPHORUS & OTHERS			
66	Chlorantraniliprole	500008-45-7	**50**
67	Tetraniliprole	1229654-66-3	
68	Indoxacarb	144171-61-9	
69	Flonicamid	158062-67-0	
70	Flubendiamide	272451-65-7	
Group 12 Advanced Specific Pesticide Intermediates			
71	2- Chloro 5- Chloromethyl Pyridine (CCMP)	70258-18-3	150
72	N- Nitro Imino Imidazolidine (NII)	5465-96-3	
73	2- Chloro 5- Chloromethyl Thiazole (CCMT)	105827-91-6	
74	2- Methyl 5- Nitro 1,3,5 Oxidiazine(MNIO)	153719-38-1	
75	4 -Hydroxy Phenyl Propionic Acid (4HPPA)	67648-61-7	

76	1,1-Di ChloroPinacolin	22591-21-5	
77	Thiocarbo Hydrazine	2231-57-4	
78	2- Hydroxy 4- Methyl Benzotioate (HMBT)	20174-68-9	
79	2,3 Difluoro 5- Chloro Pyridine	589402-43-7	
80	Triazinone- 4- Amino 3-Mecapto- 6-t-Butyl -1,2,4-triazine-5-one (AMBT)	33509-43-2	
81	Research & Development Based Products		100
Total			**1050**

3.5 Project description with process details (a schematic diagram/flow chart showing the project layout, components of the project etc. should be given)

Manufacturing Process

The mass balance and the process description of all the proposed products are attached as ***Enclosure-2.***

3.6 Raw material required along with estimated quantity, likely source, marketing area of final products, mode of transport of raw material and finished product.

Raw materials required along with estimated quantity, likely source for production has been provided in ***Enclosure-3.***

Transportation

- The transportation of indigenous raw material/finished product are being done by road and import/export raw material/finished product through road complying with all safety requirements as per MSIHC rule.
- All solid / powder / granular raw materials/finished product are transported in bags / drums through road transport. Liquid materials in road tankers (bulk) or in drums through road.

Storage

The raw materials will be procured, and stored / inventory will be maintained as per market requirement of the products and production schedule. Products will be changed as per market demand. The solid raw materials in bags will be stored in go down. Separate entry/exit gate will be used for movement of trucks carrying materials.

Separate storage areas will be provided for hazardous materials handled in the plant, based on their nature and degree of hazard. Storage of all chemicals shall not exceed their threshold limit, if any. All instructions as per MSIHC Rules 1989 shall be followed as required for the chemicals falling in the list of rules. MSDS will be displayed at all the prominent sites.

Chemical Handling

- Do and Don't instructions shall be displayed near the chemical storage.
- Regular training shall be given to the operator, safety rules and check lists will be provided.
- All the toxic chemicals will be pumped in closed loop to the reactors to avoid fugitive emission.
- All the storage / reactor vents shall be connected with scrubber.
- Local Exhaust ventilation facility shall be available at strategic locations of all plants where chemicals being handled / packing done to remove traces of chemical vapours / dust.
- PPE shall be given to all workers handling the chemicals
- Regular workplace monitoring shall be done to check presence of toxic chemicals

Chemical Storage

- Chemicals will be kept away from the any type of flame, heat, etc.
- Chemicals will be stored in a cool place as per their properties.
- Ventilation system and de-dusting system shall be provided in the storage area.
- Storage area will be provided with all safety equipment's.
- SOP shall be developed for handling of material.

3.7 Resource optimization/recycling and reuse envisaged in the project, if any, should be briefly outlined.

India's industrial competitiveness and environmental future depends on Industries such as Pesticides Industry and Pesticide Specific Intermediates adopting energy and resource efficient technologies. Recycling and reuse of materials is critical. To keep pace with changing technologies and needs of sustainable development, M/s Amber Crop Science Pvt. Ltd. shall adapt adequate measures for resource conservation and reuse within the project. Cleaner production is one of the tools, which has lot of bearing on environmental pollution control. It is also seen that the approach is changing with time i.e., dumping-to control- to-recycle-to-prevention.

Promotion of cleaner production principles involves an insight into the production processes not only to get desired yield but also to optimize on raw material consumption i.e., resource conservation and implications of the waste treatment and disposal.

Following are the key steps proposed within the premises-:

- The concept of utilization of wastes as a by-product to the extent possible i.e., Recycle, Recover, Reuse, Recharge will be adopted.
- Shipping containers of raw materials will be triple rinsed directly into formulation to prevent water contamination.
- Production will be scheduled to minimize cleanouts.
- Segregation of equipment's will be done based on individual products, solvent based versus water-based formulations and products containing similar active ingredients in different concentrations etc.
- Wastewater generated from plant will be segregated in high & low TDS and further will be treated in appropriate treatment scheme. The treated water will be reused within the plant to reduce the freshwater demand.
- Housekeeping practices like preventive maintenance on valves will be done.
- Drip pans will be placed on leaky valved & fittings or under any valves or fittings where hoses or lines are routinely connected/disconnected.
- Spill cleaning or leaks in outdoor bulk contaminant areas will be done to prevent contamination of wastewater.
- Equipment's that promote pollution prevention by reducing or eliminating wastewater generation like low volume/high pressure hoses, spray nozzle attachments, squeezes & mops, low volume/recirculating floor scrubbing machines, portable steam cleaners etc. will be installed.
- Dry-cleaning methods will be done in the premises.
- There will be proper segregation of solid wastes.
- Where multiple washings in a reaction are involved, each cycle wash water to be stored and used in subsequent batches.
- Solvent recovery system shall be installed for recovery of solvent.
- Agro waste briquettes will be used, to reduce coal consumption and ash generation.
- Rainwater from administrative buildings will be stored and reused in the plant after pre-treatment to reduce the freshwater demand.

Energy Conservation Measures

- Energy efficient drives / LED lights to be used.
- Reduction of lighting power consumption by optimum use of electrical lights in plants by installing timers.
- Use of variable frequency drive in plant.
- Enough care will be taken to prevent/minimize energy losses at each stage.
- Periodic Energy Audit will be done.
- Zero liquid discharge will be maintained for reduction in freshwater consumption.
- Use of Energy Efficient Lighting, Transformers, HVAC system, Use of Energy Efficient Motors, electrical appliances to minimize the energy consumption in addition to Process Planning.

- Solar panels and other equipment's for solar energy use shall be installed in the premises.

3.8 Availability of water its source, energy/power requirement and source should be given

3.8.1 Water Source

Construction Phase: The total water requirement during construction phase will be 10 KLD out of which 6 KLD of water will be required for construction works and rest of 4 KLD water will be required for domestic purpose. Wastewater generated from domestic usage will be treated in septic tank followed by soak pit.

Operation Phase: The total water requirement of the project will be 210 KLD. Out of which, 25 KLD freshwater requirement will be sourced from UPSIDC water supply / borewell after permission from concerned authority i.e. CGWA and the rest will be sufficed by re-using 185 KLD of ETP/MEE treated water. Details are given below in **Table 3.4.**

Table 3.4 Details of Water Requirement

Particulars	Fresh Water (KLD)	Recycled Water (KLD)	Total Water Requirement (KLD)	Wastewater Generation (KLD)
Process	5	113	118	150
Scrubbing	4	0	4	4
washing	0	8	8	8
Boiler Makeup	8	17	25	5
Cooling Tower	0	41	41	2
Gardening	0	6	6	0
Domestic	8	0	8	6
Total	**25**	**185**	**210**	**175**

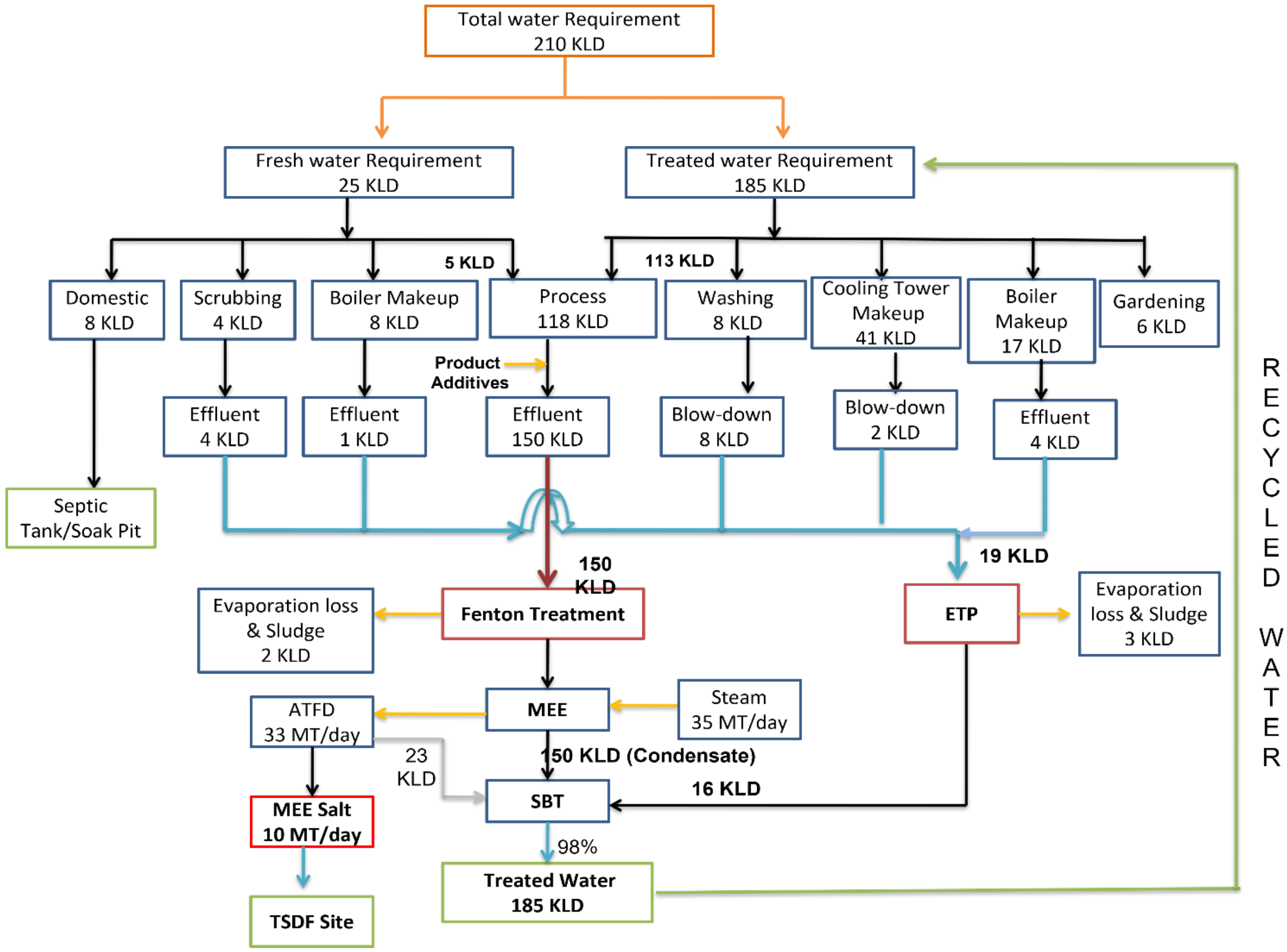


Figure 3.5: Water Balance Diagram

3.8.2 Electricity & Fuel Requirements

Construction Phase: One DG Set of capacity 1x500 kVA will be used for power supply during construction works.

Operation Phase: The total power requirement of the plant will be 1500 kVA which will be met through Uttar Pradesh Power Corporation Limited (UPPCL). DG sets of capacity 2x500 kVA (with appropriate stack height as per CPCB norms) will be used for backup purposes.
The details of Power requirement and fuel requirement are given in **Table 3.5.**

Table 3.5: Power & Fuel requirement and backup

S. No.	Particulars	Unit	Details
1.	Power Requirement	kVA	1500
2.	Power Backup (DG Sets)	kVA	2x 500
3.	**Fuel Requirement**		
a.	Steam Boiler (Imported Coal or Bio Briquette)	MT/day	15 MT/ Day & 20 MT/day
b.	DG Sets (High Speed Diesel)	lit/hr	600
c.	Thermo Pack (Imported Coal or Bio Briquette)	MT/Day	10 MT/Day & 15 MT/Day

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

3.9.1 Wastewater generation & Management plan

The sources of wastewater from the proposed plant will be from construction site during construction phase and process, boiler, cooling tower, washings, canteen facilities and admin building during operation phase.

The domestic wastewater will be discharge to soak pit followed by septic tank.

For industrial effluent Zero Liquid Discharge (ZLD) will be proposed. Wastewater streams will be segregated into two stream i.e., Concentrated stream from process waste- Stream I and Diluted stream from scrubbing, washing, boiler and cooling – stream 2. The entire operation will be in a closed system.

Stream 1 will be treated with Fenton treatment and then sent to MEE. MEE condensate will be sent to SBT for further treatment and recycled back to Industrial usage. Steam 2 will be treated in ETP (primary treatment) and then treated water further will be sent to SBT(Soil Biotechnology)for further treatment and disposal. Treated water from SBT will be recycled to Industrial purpose inside factory premises.

There will be no process effluents discharged. All the treated effluent will be recycled in process and other utilities. The ETP sludge will be temporarily stored and treated at the site and further will be disposed at the TSDF site. Hence impact on water quality from the proposed project is insignificant. The brief of Effluent management plan as mentioned below:

Sources of Wastewater

The wastewater generation streams are:

1. Process
2. Washing
3. Scrubbing
4. Boiler blow down
5. Cooling tower blow downs
6. Domestic (canteen and toilets)

Table 3.6 Equipment Used For Wastewater Treatment (ZLD):

Sr. No.	Name of unit	Capacity	No.	MOC/ Remark
		Stream-I (Low COD)		
1.	Equalization cum Neutralization tank	2.0 x 2.0 (2.0+0.5)	1	RCC M25+A/A Bk. Lining
2.	Flash Mixer	1.0 x 1.0 (1.0+0.5)	1	RCC M25
3.	Primary Clarifier	1.5 Dia (2.5 +0.5)	1	MSEP
4	Aeration Tank	20.0 x 8.0 (6.0+0.5)	1	RCC M25
5.	Secondary Clarifier	3.5 Dia (3.0 +0.5)	1	MSEP
6.	Treated Effluent Sump	6.0 x 6.0 (5.0+0.5)	1	RCC M25
7.	Sludge Sump	3.0 x 3.0 (3.0+0.5)	1	RCC M25
8.	Filter Press-01	40 m^3/D	1	MSEP
9.	Lime Dosing Tank	5000 Lit	1	HDPE
10.	Alum Dosing Tank	5000 Lit	1	HDPE
11.	Poly Dosing Tank	2500 Lit	1	HDPE
12.	Nutrient Dosing Tank	2000 Lit	1	HDPE
		Stream-II (High COD)		
1.	Collection cum Reaction tanks-	8.0 x 5.0 (2.5 .0+0.5)	2	RCC M25+A/A Bk. Lining

2.	Neutralization Tank	8.0 x 5.0 (2.5+0.5)	1	RCC M25
3.	Filter Press-02	$35m^3/D$	1	MSEP
4.	MEE Feed Tank	10.0 x 4.0 (3.0+0.5)	1	RCC M25
5.	Multi Effect Evaporator with Solid Dryer	2 Nosx60 M^3/D	1	SSTi
6.	Condensate Storage Tank	8.0 x 5.0 (5.0+0.5)	1	RCC M25

Table 3.7: Inlet and Outlet Characteristics of Wastewater

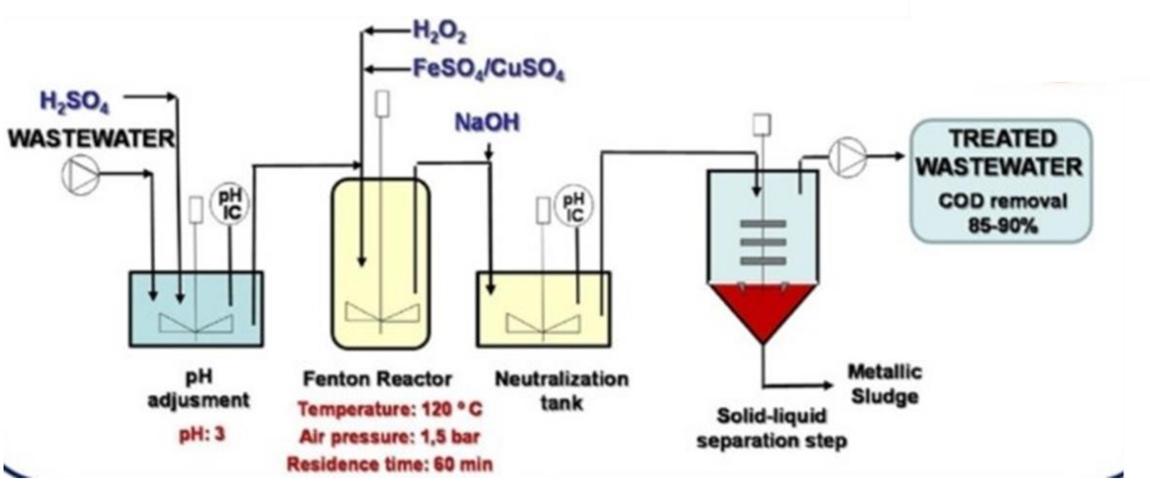
PARAMETER	Inlet to MEE	MEE Outlet	Inlet to ETP	ETP Outlet	SBT Inlet	SBT Outlet
pH	6.8-7.2	6.8-7.2	6.8-7.2	6.8-7.2	6.8-7.2	7.1-7.25
Total Suspended Solids	5 ppm	1ppm	5ppm	<50 ppm	<50 ppm	<15 ppm
TDS	100000 ppm	<100 ppm	1000 ppm	1000 ppm	100 ppm	70 ppm
Oil & Grease	1 ppm	NIL	NIL	NIL	NIL	NIL
Phenolic Compounds	50 ppm	75 ppm	NIL	NIL	75 ppm	NIL
Ammonical Nitrogen	100 ppm	175 ppm	NIL	NIL	175 ppm	<25 ppm
Phosphate	ND	ND	ND	ND	ND	ND
Nitrate	ND	ND	ND	ND	ND	ND
COD	80000 ppm	3500-5000 Ppm	1000 ppm	500-700 ppm	3500-5000 ppm	200 ppm
BOD (3 Days 27°C)	8000-10000 Ppm	500-1500 Ppm	10 ppm	5 ppm	500-1500 ppm	<30 ppm
Cyanides	10 ppm	10ppm	Nil	NIl	10ppm	NIl

PARAMETER	Inlet to MEE	MEE Outlet	Inlet to ETP	ETP Outlet	SBT Inlet	SBT Outlet
Total Chromium	ND	NIL	NIL	NIL	NIL	NIL
Hexavalent Chromium	ND	NIL	NIL	NIL	NIL	NIL
Insecticides/Pesticides	0.2 ppm	NIL	NIL	NIL	NIL	NIL
Bio-Assay Test						Yes

3.9.2 Process Description for Different Wastewater Treatment Schemes

1. Fenton Treatment and Neutralization

Concentrated effluent from the various stages of process shall be collected in underground collection-cum-reaction tank. Two such underground tanks shall be provided, having holding capacity of about one day effluent. Once one of the tanks is full, effluent is diverted to the other tank. Here, first effluent pH is adjusted to 4-4.5 by addition of Acid (if required). After adjustment of acidic pH effluent is subjected to Fenton treatment by addition of first FeSO4 as catalyst. Then H2O2 solution is added for destruction of phenolic compound. This reaction takes about 6-8 hrs. For thorough mixing, air is provided through twin lobe air blower. After reaction is complete treated effluent is neutralized by addition of lime powder/soda ash. Neutral effluent is then pumped to through filter press for removal for sludge. Clear filtrate from filter press shall be subjected to MEE. The dewatered sludge is collected and packed in HDPE/plastic bags and stored in a proper sludge storage area.



2. Multi Effect Evaporator (MEE)

Industry has proposed to install Multi Effect Evaporator for the treatment of industrial effluent having capacity of 2 Nos x 110 KL/Day.

Neutral effluent from Primary Treatment Plant is passed through 4 - Stages Evaporator System and the evaporated water shall be collected in a Collection Tank and then forwarded to SBT plant along with Primary treated dilute effluent.

Multistage evaporator (4 - stages) is a long tube forced circulation type evaporators where in the first effect high pressure steam of 7.0 kg/cm2 is used to evaporate wastewater. The evaporated water in the form of steam at 2.0 kg/cm pressure is used for evaporating the effluent in the second stage at atmospheric pressure. Evaporated water from the second stage is used for evaporating wastewater in the third stage under vacuum of 650- 720 mmHg.

Finally evaporated water from the third stage is condensed in the steam condenser using cooling water on other side. Condensate from all the three stages is collected in condensate receiving tanks.

Concentrated mass is directly forwarded to ATFD system whereby the remaining water is evaporated, and salt is isolated. This salt is disposed off at Common TSDF site.

3. Effluent Treatment Plant (ETP)

An effluent treatment plant consisting of primary , secondary & advance treatment units. The details of ETP are as follows.

First all non-toxic and biodegradable streams (low & medium COD) of wastewater shall be collected in Equalization cum Neutralization tank-01 (ENT-01) where the continuous addition and stirring of Alkali solution is done to maintain neutral pH of wastewater from Lime Dosing Tank (LDT-01) as per requirement by gravity. Mixer is provided at bottom of the ENT-01 to keep all suspended solids in suspension and for proper mixing.

Then after, neutralized wastewater shall be pumped to Flash Mixer (FM-01). Alum and Polyelectrolyte shall be dosed from Alum Dosing Tank (ADT-01) and Polyelectrolyte Dosing Tank (PEDT-01) respectively into FM-01 to carry out coagulation by using a Flash Mixer. Then after, coagulated wastewater shall be settled in Primary Clarifier-01 (PCL-01) where solids are settled at bottom and clear supernatant from PCL-01 shall be passed in Aeration Tank (AT-01).Here, Condensate from MEE through condensate storage tank (CST-01) mix with effluent.

Here, biodegradation of organic matter of the wastewater shall be carried out by bacteria (suspended growth) in the AT-01 and for that oxygen shall be supplied by 2 nos. of air blowers (B-02) through diffusers. Air blowers also keep MLSS in suspension. Then after, wastewater shall go to Secondary Clarifier-1 (SCL-01). Here, the suspended solids shall be settled. Sludge shall be removed from bottom of SCL-01 and pumped to AT-1 to maintain MLSS and excess activated sludge shall be sent to Sludge Sump (SS-01).Clear effluent is the collected in Treated Effluent Sump (TES-01) before transferring to SBT treatment plant

Sludge settled in PCL-01 and excess sludge from SCL-01 shall be collected in Sludge Sump (SS-01) where mixer is provided to prevent and settling. Then sludge shall be sent to Filter Press (FP-01) for dewatering. Then dry cake shall be stored in HWSA before final disposal to TSDF. Leachate from Filter Press shall be sent back to ENT-01 for further treatment.

Block Diagram of ETP scheme is given in **Figure 3.6.**

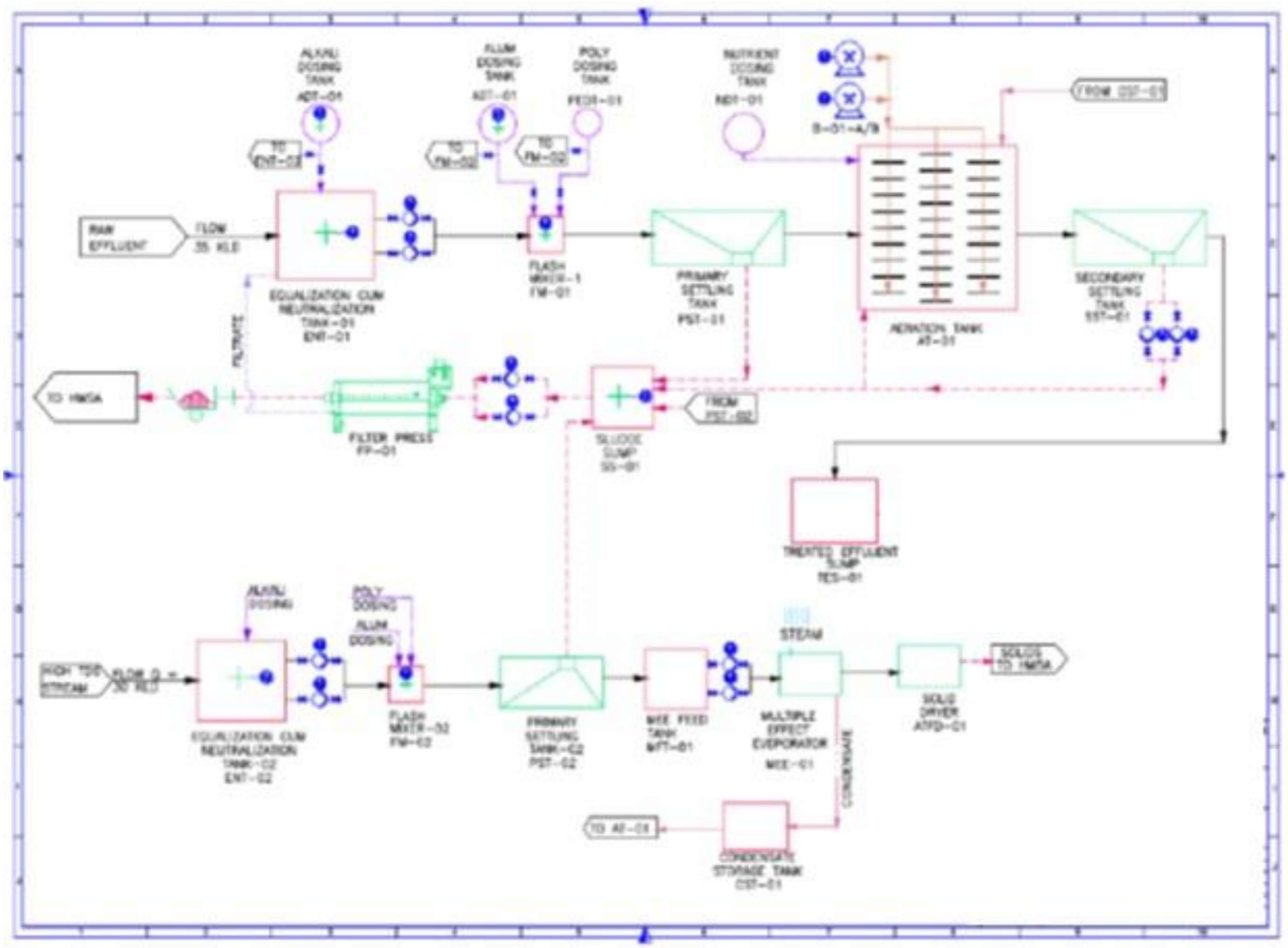


Figure 3.6: Block Diagram of Proposed ETP System

4. SBT

Incoming pH is in the range of 6.0-7.0 and has to be adjusted with lime treatment before taking to the filter. Catalytic Advance Oxygen System is given as pre-treatment. The process is a batch processes in which wastewater is pumped and applied onto the top surface of the Bioreactor as shown in Figure. The design has suitable provision for manual removal of suspended solids from the bio-filter surface. Distribution of wastewater over the media is achieved via pumping, piping and distribution arrangements Separate distribution lines are provided for raw wastewater as well as recycle water. There are two modes of suspended solids handing. In one types, suspended solids can be applied on the surface directly and can be scrapped out manually may be once in a month. The top 2-inch layer can be replaced with the additive material which is easily available in the local open market. The suspended solids are filtered out which includes additives that combine with organic of waste to produce manure. In the second mode, solids can be retained in the settling tank and then can be removed mechanically. Water first percolates through the bioreactor media which in-houses cultured media in 40-60 min and gets collected into the collection tank. It can then be pumped onto the media again(recycling) in order to achieve maximum solid liquid contact. There circulation mode is provided for further polishing of the effluent. Dissolved organic and inorganic are oxidized, and the water is purified further.

This treated water will be meeting the norms of M/s. Uttar Pradesh State Pollution Control Board- Mathura (UPSPCB) & hence will be recycled back for Industrial purpose. Block Diagram of SBT system is given in **Figure 3.7.**

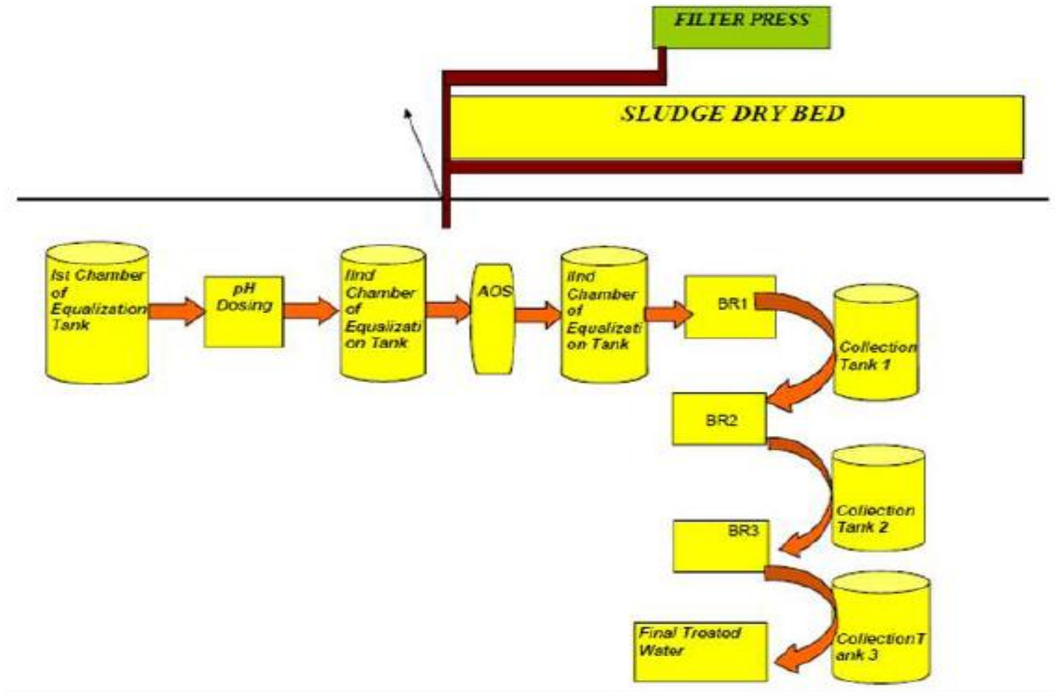


Figure 3.7: Block Diagram of Proposed SBT System

3.9.3 Solid & Hazardous waste generation & Management plan

Construction Phase: Solid waste generation in construction waste will be excavated soil, construction debris and scrap will be treated as per C&D Waste Management Rules.

Operational Phase: The industry shall obtain authorization under Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2020 for the waste generated and categorized under hazardous waste as per Schedule of The Hazardous & Other Waste (Management and Transboundary Movement) Amendment Rules, 2021. The generated hazardous waste will be stored in designated Hazardous waste storage room up to maximum of 90 days and shall be disposed to either TSDF or authorized recyclers.
Approx. 76.5 kg/day of municipal solid waste generated in the plant area will be segregated to biodegradable waste and non-biodegradable waste. 30.6 kg/day non-biodegradable waste will be sold off to recycler.45.9 kg/day biodegradable waste will be disposed off in MSW disposal pit to get converted to manure for horticulture purposes. The Type, source, mode of storage and treatment and disposal of hazardous waste is shown in **Table 3.8.**

Table 3.8: List of Hazardous Waste

Sr.No	Name of Waste	Source of Generation	Category No. (As per Sch-I II 2016)	Quantity (MT/Annum)	Mode of Treatment & Disposal Method
1	Discarded Containers/ Bags /Liners	Storage & Handling of Raw Materials	Sch-I/33.1	120	Collection, Storage, Transportation, Decontamination & Disposal by selling to registered recycler.
2	Used/Spent Oil	Used/Spent Oil	Sch-I/5.1	100	Collection, Storage, Transportation, Decontamination & Disposal by selling to registered recycler.
3	ETP Sludge	In-house ETP	Sch-I/35.3	100	Collection, Storage, Transportation and disposal at common nearest TSDF site
4	Distillation Residue	Distillation	Sch-I/36.1	780.0	Collection, Storage, Transportation and sent for co-processing in cement industries or nearest incineration site.
5	MEE Salt	MEE	Sch-I/35.3	3650	Collection, Storage, Transportation and disposal at common nearest TSDF site
6	Ash Generation	Boiler	-	800	It shall be given to Brick/ cement manufacturer. If it is not available; ash will be sent to TSDF site.
Process Waste					
7	Spent Solvent	Process	Sch-I/28.6	600	Collection, Storage, management & recovery within the premises and will reuse in plant premises.
8	Spent Catalyst	Process	Sch –I (28.2)	3	Collection, Storage, Transportation Disposal at Co-processing or common

Sr.No	Name of Waste	Source of Generation	Category No. (As per Sch-I II 2016)	Quantity (MT/Annum)	Mode of Treatment & Disposal Method
					incineration site.
9	Spent Sulphuric Acid	Process	Sch-I/ 28.1	500	Collection, Storage & reuse in plant for manufacturing of MPBAD & excess quantity will be sold to end users having Rule 9 Permission.
10	KCl (Inorganic Salt)	Process	Sch-I/ 28.1	3550	
11	HCl % Solution	Process	Sch-II- Class B(15)	10000	
12	Sodium Sulphite Solution (20%)(Na_2SO_3)	Process	Sch-I/28.1	2068.0	Collection, Storage, Transportation & Disposal by selling to authorized end user, registered under Rule-9.
13	Sodium Sulphate Solution(Na_2SO_4)	Process	Sch-I/28.1	2958	
14	Aluminum Chloride 28 -30 %	Process	Sch-I/28.1	2050	
15	NaCl Salt	Process	Sch-I/28.1	11153	
16	Phosphoric Acid(H_3PO_4)	Process	Sch-I/28.1	1050	
17	34% Calcium Chloride Solution	Process	Sch-I/28.1	1800	
18	Potassium Nitrate	Process	Sch-I/28.1	1270	
19	Ammo nium Acetate	Process	Sch-I/28.1	58	
20	Sodium Bromide	Process	Sch-I/28.1	1270	
21	Hydro Bromic Acid	Process	Sch-I/28.1	1258	
22	Sodium Sulfate Solution	Process	Sch-I/28.1	2959	
23	Acetic Acid	Process	Sch-I/28.1	144	

Sr.No	Name of Waste	Source of Generation	Category No. (As per Sch-I II 2016)	Quantity (MT/Annum)	Mode of Treatment & Disposal Method
24	KCl Slat % Solution	Process	Sch-I/28.1	3550	
25	KHCO3 Salt	Process	Sch-I/28.1	3550	
26	Ammonium Chloride	Process	Sch-I/28.1	365	
27	Sodium	Process	Sch-I/28.1	2099	
28	Potassium Bromide	Process	Sch-I/28.1	530	
29	20 % Sodium Methyl Sulphate	Process	Sch-I/28.1	960	

3.1 Air Emission & Management

Construction Phase: The main sources of air pollution will be Construction vehicular movement, emissions from construction machinery and activities as well from DG sets (1x500 kVA). DG sets will be installed as per CPCB guidelines and manufacturer's instructions to keep the emissions within limits of CPCB. Stack height will be provided as per CPCB guidelines for adequate dispersion of released pollutants and to have negligible GLCs in the surrounding area. Water Sprinkling shall be carried out to reduce the dust emission due to construction activity. Construction material movement (vehicular movement) shall be planned and carried out during non-peak hours to avoid traffic congestion.

Operational Phase: The main sources of emission in the plant will be combustion of fuel for operation of DG Sets, Boiler & plant machineries, and process reactor vents.

Air pollution control techniques and systems will be installed in the plant to reduce the emissions. The plant will be maintaining all emission norms prescribed by MoEF&CC/UPPCB/CPCB. Stacks with appropriate pollution control system shall be introduced in the plants.

Details of proposed stacks are given below in ***Table 3.9.***

Table 3.3 Air Emissions and Pollution Control Measures

S. No.	Stack Attached to	Fuel Used	APCM	Stack (m)	Expected Pollutants	Maximum Emission (mg/Nm^3)
1	Steam Boiler – 5.0 MT/hr	Imported Coal / Bio Briquette	ESP System	**30**	PM, SO_2&NO_x	PM< 800
2	Thermo Pack – 1000 U	Imported Coal / Bio Briquette	ESP System	11	PM, SO_2& NO_x	-
3	DG Set – 2 x 500KVA	HSD	-	**11**	PM, SO_2& NO_x	PM<0.2 g/KW-hr CO<3.5 g/KW-hr NOx+HC<4 .0 g/KW-hr
Process Stacks / Vents						
1	Process Reactor – Vents	-	Two stage water scrubber	11	HCl	HCl < 20
2	Process Reactor – Vents	-	Two stage water scrubber	**11**	HBr	HBr < 5
3	Process Reactor – Vents	-	Two stage Alkali Scrubber (1st Stage- Water & 2nd Stage- Alkali)-	**11**	HCl & SO_2	HCl < 20
4	Process Reactor – Vents	-	Two stage Alkali Scrubber (1st Stage- Water & 2nd Stage-Alkali)	**11**	HCl & Cl_2	HCl < 20 Cl_2 < 5

All the emission standards given in Environment (Protection) Rules, 1986 and MoEF&CC vide notification G.S.R 446 (E) dated 13th June 2011 for pesticide industry shall be followed. Emission standards are given below in* ***Table 3.10*

Table 3.4 Emission Standards for Pesticide Industry

S. No.	Parameter	Not to exceed (mg/Nm^3)
1	HCl	20
2	Cl_2	05
3	H_2S	05
4	P_2O_5 (as H_3PO_4)	10
5	NH_3	30
6	Particulate matter within the form of pesticide compounds	20
7	CH_3Cl	20
8	HBr	05

Measures for Pollution Prevention from Boiler Emissions:

- Green fuel like bio briquettes shall be used.
- Fuel shall be fired uniformly.
- The damper adjustment shall be done by the boiler operator through the boiler operation for achieving optimized combustion & preventing pollution.
- ESP shall be installed as air pollution control system to boiler.
- Fire bed and soot deposits in tubes shall be cleaned from time to time
- Good quality feed water shall be used in the boiler for better efficiency
- CO_2 shall be frequently checked to ensure the boiler operation and take corrective actions.

Gaseous and Fugitive Emission Control:

Gaseous and Fugitive emissions are expected to be generated during construction and operation stages of the proposed project. During construction stage, main source of fugitive emission is dust which is expected mainly due to movement of vehicles carrying construction material and vehicles used for construction. During operation stage, evaporation from solvent leakage through valves, pumps, emission from open drum containing chemicals, open feeding; storage tanks, poor housekeeping etc. are the major sources of fugitive emissions of organic chemicals and VOCs. Excess use of solvent may also result fugitive emission from the process vessels. Following measures will be adopted to prevent and control fugitive emissions:

- Proper selection of material of construction of scrubbing system to eliminate any leakages during the operation, graphite at most of the places for getting optimum results will be provided.
- Continuous monitoring of resulting concentrations as well as pH control during the scrubbing of gases like HCl & SO_2 will help to get saleable by-products like 30% HCl Solution and 20% Sodium Sulfite solution.

- All the reactors involved in scrubbing operations will be provided with mechanical seal which eliminates the possibility of any leakages.
- All the heat exchangers used for this operation will be provided with primary as well as secondary systems with the provision of cooling water as well as Chilled / Brine circulation.
- All the pumps used for scrubbing systems will be provided with mechanical seal which eliminates the possibilities of any leakages and thus reduces the waste generation.
- Airborne dust at all transfers operations/ points will be controlled either by spraying water or providing enclosures.
- Bag Filters and ID fans will be provided for collecting fugitive emissions
- Care will be taken to store construction material properly to prevent fugitive emissions, if any.
- Regular maintenance of valves, pumps and other equipment will be done to prevent leakages and thus minimizing the fugitive emissions of VOCs.
- Entire process will be carried out in the closed reactors with proper maintenance of pressure and temperature.
- Periodic monitoring of work area will be carried out to check the fugitive emission.
- Breather Valves will be used in the solvent storage.
- Solvent tank vents will be connected to vent chillers.
- During transfer of material, steps shall be taken to reduce and prevent splashes and spills. Any liquid or dry material spilled shall be cleaned as expeditiously as possible.
- Close feeding system will be provided for centrifuges. Centrifuge and filtrate tank vents will be connected to vent chillers.
- Product filling stations will be equipped with vacuum duct hoods.
- Good Housekeeping shall be maintained in the plant.

VOC Reduction & Odour Control Measures

- Optimization of process parameters.
- Change in utility services
- Recycle / Reduction of Aqueous layer
- Increase in settling time
- Stripping of Aqueous layer
- Solvent input quantity reduction
- When any solvent/reaction mixture will be transferred from one equipment to other equipment then Vapors displace from destination vessel and fill in the space vacated in the source vessel not allowing any solvent vapors to escape
- Mechanical seal/seal less pumps will be used for solvents
- In unit operations/processes involving vacuum, vacuum will be controlled by recycle of vent gases from vacuum pump vent line
- Storage tanks and plant tanks will be connected to same venting system. So, no escape of solvent during transfer

- Appropriate design of condensers during detailed engineering phase of project. (Ensuring sufficient line size and thereby flow rate)
- Annual cleaning of condensers to remove scaling (shutdown activity)
- Storage of volatile liquids at lower temperature than boiling point to avoid losses into the atmosphere. (Brine will be used for the same)
- Annual inspection and maintenance of scrubber. (Internals like distribution plate, packings, spray nozzles etc.)
- All reaction vessels will be provided with suitable sizes of primary heat exchanger with cooling water and secondary heat exchanger with chilled brine circulation to control organic vapors effectively.
- Vents of secondary heat exchangers will be connected to three stage scrubbing system consisting of a graphite tube scrubber, a venture and a packed bed scrubber.
- Further the plant will be surrounded with the thick greenbelt which will include odour control plant species like Neem, Indian cork tree, Karanj.
- When monitoring results indicate VOC above permissible limit repairing should be done immediately. The repair should be conducted in such a way that there is no fugitive emission from the particular component.

3.2 Noise Pollution & Management

***Construction Phase*:**

The most common sources of noise pollution will be activities like foundation, operation of construction machinery and vehicular movement. However, magnitude of the impact will depend upon the type and nature of the machinery, time schedule of operations, construction method and management practices followed during activities.

To mitigate the impact, following steps will be taken:

- The construction activity will be carried out mostly during daytime.
- Proper maintenance of noise generating transport vehicles.
- Regular maintenance of heavy earth vehicles may be adopted to reduce noise levels.
- All the construction machinery and equipment used shall be provided with adequate noise mufflers and noise suppression equipment. Proper lubrication and maintenance of the machinery & equipment and vehicle will be carried out to minimize the noise generation due to abrasion
- Noise level from loading & unloading of material will be reduced by usage of various types of cranes & placing material on sand or sandy bag beds.
- Noise monitoring shall be carried out to ensure the effectiveness of mitigation measures and develop a mechanism to record and respond to complaints on noise.
- Adequate parking space will be provided at the project site to minimize the honking requirement due to congestion and jams and restricting the speed limits.

- Protection devices (earplugs or earmuffs) shall be provided to those workers who cannot be isolated from the source of noise and reducing the exposure time of workers to the higher noise levels by rotation.
- Construction material vehicular movement shall be planned during non-peak hours to avoid traffic congestion in the area.

Operational Phase:

The main sources of noise generation in the proposed project are various types of ID fans, Boiler, pumps & compressors, grinders, DG sets, vehicular movement etc. To reduce impact in the project site and nearby habitations, following mitigation measures will be done.

- Equipment meeting standard of noise shall be used.
- All engineering control practice shall be undertaken during installation of machinery to maintain noise level.
- Acoustical Enclosures and Mufflers will be provided at all required locations.
- Vibration pads and foundation will be provided at all heavy machinery areas.
- Noise generating units like machinery area, canteen etc. will be well insulated with enclosed doors.
- Earmuffs will be used while in high noise areas. Separate cabins will be provided.
- Acoustic treatment rooms will be provided at appropriate location.
- Well- developed road will be constructed within plant, for smooth and hassle-free movement of personnel.
- Proper and timely maintenance of machineries and preventive maintenance of vehicles will be done.
- Plantation will be done all over the plant area to provide noise barrier.

Important Instructions will be displayed all over the plant area.

4 SITE ANALYSIS

4.1 Connectivity

- **Nearest Railway station:** *Kosi Kalan Railway Station (5.55 km SSE)*
- **Nearest Highway**: *National Highway-2 (1.35 km NE)*
- **Nearest Airport**: *Indira Gandhi International Airport (86.24 km, NNW)*

**All distances are Aerial Distance.*

Figure 4.1: Connectivity of Proposed plant

4.2 Land form, Land Use and Land Ownership

The project site is located at Plot No.A-4, Kosi Kotwan Extension-2, Uttar Pradesh State Industrial Development Corporation (UPSIDC) Industrial Area, Mathura, Uttar Pradesh-281403 by **M/s Amber Crop Science Pvt. Ltd.**

Allotment letters are issued vide reference no. ***SER20201130/1000/781/9759/SIDC-IA/Kosi Kotwan Extn.-2*** dated 23.12.2020 ***(Allotment Letter have been attached as Enclosure-1).*** Project Location (Google Earth Image) has been depicted as ***Figure 3.1.*** The land use of the site being in Industrial area is already identified as industrial land. However existing land cover of the project site is a vacant land.

4.3 Topography

The topography of proposed site is **slightly undulated**. The site elevation ranges between 186 to 191 amsl. The topographical map showing the project site has been depicted in Figure below and the environment sensitivity is shown in ***Table 3.2.***

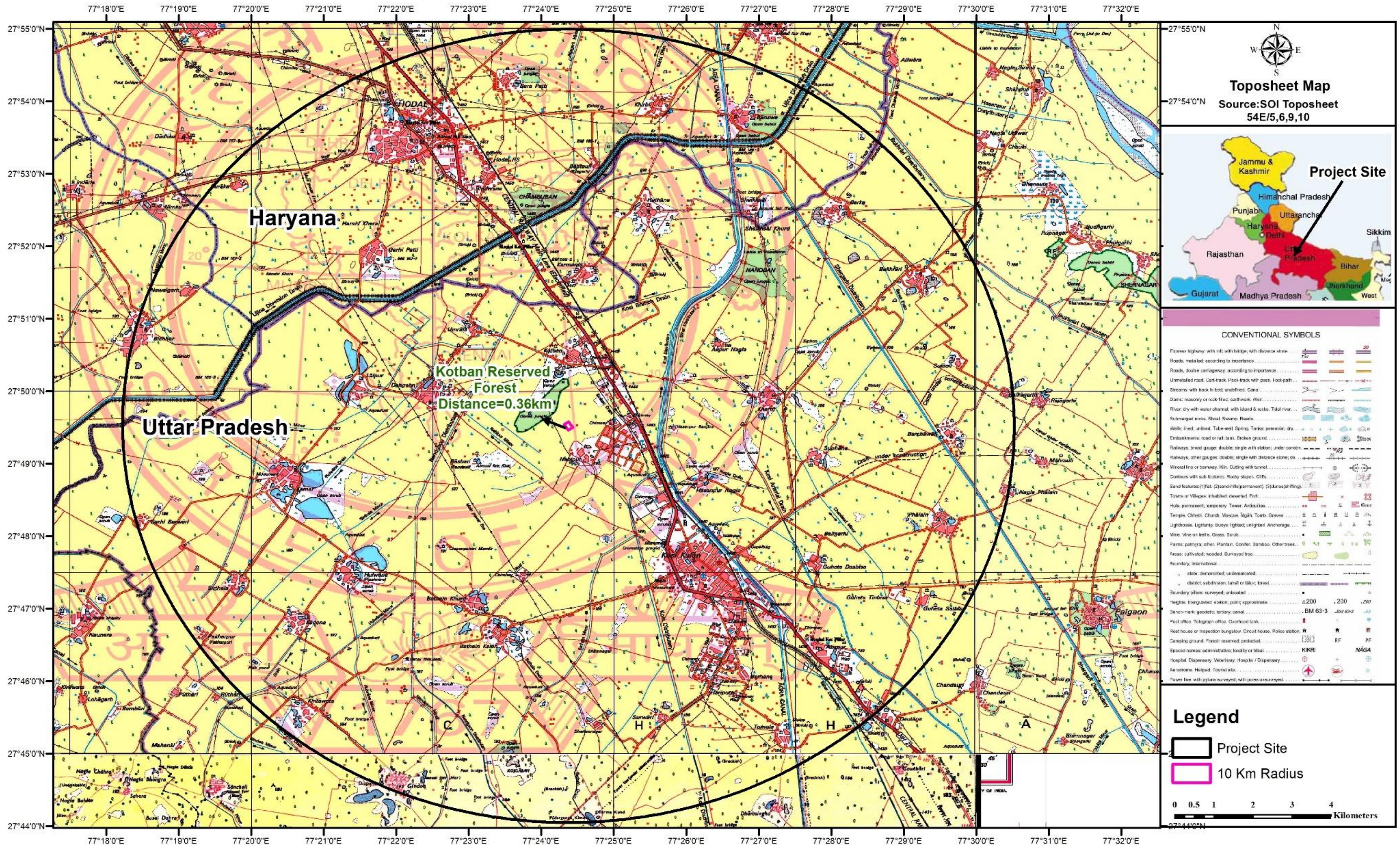


Figure 4.2: Topographical map showing the proposed Project site

4.4 Existing land use pattern

Since, the proposed project site is in a "Notified Industrial Area" i.e. Kosi Kotwan Extension-2, Uttar Pradesh State Industrial Development Corporation (UPSIDC) Industrial Area, Mathura, Uttar Pradesh- 281403, the existing land-use, of the site is Industrial use.

4.5 Existing Infrastructure

The development of industrial area is still under progress, common facilities for industrial area will be developed. Apart from Plant utility and manufacturing area, R&D lab, Canteen, Admin, drinking water, Water treatment, etc facilities are provided within the plant. All the other required utilities like steam, cooling water, boiler, etc. will be available in the Plant.

The site is located about 45.27 km from the Mathura city and well connected with National Highway-2 (1.35km, NE direction) via interconnecting roads internally and surrounding the industrial estate. Nearest Railway station is Kosi Kalan Railway Station which is located at 5.55 km in SSE direction from the Project Site. Nearest Airport from the project site is Indira Gandhi International Airport located at 86.24 km in NNW direction. Nearest Town is Kosi Kalan (3.85km , SSE), Nearest City is Mathura (45.27 km, SSE) and nearest village is Nabipur (0.33 km, S) from the Project site. Few industries have also been located nearby proposed project site. List of the same has been detailed in following **Table 4.1**

Table 4.1 List of nearby Industries from Project Site

S.No.	Name of Industry	Type of Industry	Distance & Direction from Project Site
1	Sarvottam Industries	Rubber Processing Oil and Carbon Black Manufacturer	0.82Km, SE
2	Swastik Pipe Ltd	Steelwork manufacturer	0.87Km, NE
3	Singhal Sintered Private Limited	Engineering Components	1.20Km, ESE
4	IWL India Limited, Kosi Kalan Plant	Asphalt mixing plant	1.26 km, SSE
5	Vacmet India Limited	Polyester Manufacturing	1.66 km, SE
6	GTM Industries Pvt. Ltd.	Textile mill	1.78 km, SE
7	Chemester Food Industry Pvt Ltd	Food Stuff Manufacturer	1.47Km, NE
8	Satya Processors	Factory Equipment Supplier	4.92Km, SSE
9	Brij Enterprises	Iron and Steel Industry	5.10Km, SSE
10	Mahalakshmi Engineers and Traders	Machinery Parts Manufacturer	5.24Km, SSE

4.6 Climatic data from secondary sources

Historical meteorological data was obtained from nearest IMD station located at Mathura at the Collectorate Office. The predominant wind direction is northwest direction in all seasons. Details provided in ***Table 4.2.***

Table 4.2: Climatological Data

Month	Temperature (°C)		Relative Humidity (%)		Cloud Amounts (All Cloud)		Rainfall (mm)	Rainy Days	Predominant Wind Direction (From)	
	Max	Min	8:30	17:30	8:30	17:30			8:30	17:30
January	25.2	3.2	76	65	0.9	0.7	10.4	0.9	NW,SW	NW,NE
February	29.5	4.4	70	59	1.2	0.8	13.6	1.3	NW,SE	NW,NE
March	35.2	8.8	63	53	0.9	0.8	6.8	1	NW,SE	NW,NE
April	41.7	13	56	48	0.6	0.5	10.1	0.9	NW,NE	NW,NE
May	44.9	18.2	47	39	0.4	0.6	17.8	1.5	NW,NE	NW,SE
June	45.4	21.8	49	43	1.2	1.2	35..5	3	NW,SE	NW,SE
July	40.8	22.4	72	67	2.9	2.7	164.7	9	NW,SE	NW,SE
August	38.3	22.9	76	72	2.5	2.3	205.2	9.1	NW,NE	SE,SW
September	37.1	20.6	75	71	1.6	1.4	105	4.9	NW,NE	NW,SE

Month	Temperature (°C)		Relative Humidity (%)		Cloud Amounts (All Cloud)		Rainfall (mm)	Rainy Days	Predominant Wind Direction (From)	
	Max	Min	8:30	17:30	8:30	17:30			8:30	17:30
October	36.8	14	67	63	0.5	0.4	18	0.9	NW,SE	NW,SE
November	32.8	7.9	65	56	0.5	0.4	3.9	0.3	NW,SE	NW,NE
December	27.5	4.5	72	60	0.8	0.7	9	1.1	NW,SE	NW,NE
Annual Total / Mean	45.7	3.1	65	58	1.1	1	600.1	33.9	NW,NE	NW,NE

4.7 Social Infrastructure available

The Social infrastructure is available near the site, details are given below in **Table 4.3.**

Table 4.3: Social Infrastructure near the site

Features	Description
Near-by Residential Area	1. Nabipur (0.33 km, S) 2. Kotwan (1.23 km, N) 3. Dahgaon (2.81 km, WNW) 4. Kosi Kalan (3.85 km SE)
Nearest Educational institute	1. MD Jain Public School (3.82 km, SSE) 2. Primary School Naduvas (4.23 km, SSE)
Nearest Hospital	1. Chauhan Hospital (4.05 km, SSE) 2. BPL Nursing Home (4.56 km, SSE) 3. Brij Nursing Home and Trauma Centre (4.6 km, SSE)
Nearest Temples	1. Prachin Shankar Ji Mandir (3.42 km, SSE)
Nearest Post Office	1. Post Office, Kosi Kalan (4.99 km, SSE)

5 PLANNING BRIEF

5.1 Planning Concept (type of industries, facilities, transportation etc) Town and Country Planning/Development authority classification.

The proposed project is Pesticide Technical & intermediates manufacturing plant located in Uttar Pradesh State Industrial Development Corporation (UPSIDC) Industrial Area. Project conform the T&CP and other authority classification.

5.2 Population Projection

Construction Phase: The project will provide employment to 80 no. of local labors for construction works and establishment of the proposed unit.

Operational Phase: Total population projection of the project will be 260 that would consist of 100 no. of permanent workers and 150 number of temporary workers. There will be about 10 no. of visitors in its operational phase.

Table 5.1: Population projection

S. No.	Particular	Number
1	Temporary Employees	150
2	Permanent Employees	100
3	Visitor	10
	Total	**260**

5.3 Land use Planning (breakup along with green belt etc.)

The land distribution of the project is shown in **Table 5.2** below

Table 5.2: Land distribution

Sr. No.	Land Breakup	Area in Sq. Mt.	Area Percentage (%)
1	Plant Area	1660	8.78
2	Finished Good storage area	399	2.11
3	Under Ground Storage tank	180	0.95
4	Raw Material Storage	798	4.22
5	Overhead Tank Storage	220	1.16
6	Green Belt	6268.15	33.14
7	ETP Area & MEE	810	4.28
8	Utility	840	4.44
9	Road & Open Area	5265	27.83
10	Parking	216	1.14
11	Administrative Office, QC Lab, R & D Building	399	2.11
12	Others	1860.355	9.84
	Total	**18915.50**	**100**

5.4 Assessment of Infrastructure Demand (Physical & Social)

All facilities will be developed in the plant area for proposed production.

5.5 Amenities/Facilities

Proper site services such as First Aid with Occupational Health Centre, Canteen, Drinking Water, Training Facilities, etc. will be provided to the workers.

The Company is more concern for the safety and health of its people, including the larger community outside of the company and the environment. All employees will be trained to work on sites in the safest possible manner and shall be made aware of the consequences of unsafe act. Company will also provide the shelter, safe drinking water, sanitation facility. The company will allocate adequate budget for safety and Occupational health management of the employees.

6 PROPOSED INFRASTRUCTURE

6.1 Industrial Area (processing area)

The total plot area of the project will be 18915.50 m^2.

6.2 Residential Area (non-processing area)

No, residential area proposed in project

6.3 Green belt

To mitigate and minimize the environmental impacts, arising due to project especially from air pollution, noise pollution, soil erosion etc. a dense Greenbelt shall be developed all around the proposed site. A greenbelt will be developed in **6268.15** m^2 ***i.e. 33.14% of total plot***. The industry shall put in serious effort to create the greenery since the number of trees, plants, shrubs, and herbs to get increased considerably. Also, an effort apparently will be made to increase the percent of survival in subsequent years.
Approx. **1567** ***no. of trees/shrubs*** shall be planted under the greenbelt in their unit.

6.4 Social Infrastructure

All basic social infrastructures will be available within the industrial area as the developmental works are in progress and few facilities will be arranged from nearby project site. Thus, no additional Social Infrastructure is proposed. Additional infrastructure development and environmental social activities shall be undertaken in the buffer zone after assessment.

6.5 Connectivity

The site is located about 45.27 km from the Mathura city and well connected with National Highway-2 (1.35km, NE direction) via interconnecting roads internally and surrounding the industrial estate. Nearest Railway station is Kosi Kalan Railway Station which is located at 5.55 km in SSE direction from the Project Site. Nearest Airport from the project site is Indira Gandhi International Airport located at 86.24 km in NNW direction. Nearest Town is Kosi Kalan (3.85km , SSE), Nearest City is Mathura (45.27 km, SSE) and nearest village is Nabipur (0.33 km, S) from the Project site.

6.6 Drinking water management (source & supply of water)

Drinking water will be taken from Borewell /UPSIDC Water Supply.

6.7 Sewerage system

Expected Sewerage generation from site is 6 KLD which will be domestic in nature and discharge to soak pit followed by Septic tank.

6.8 Industrial waste management

The industry shall obtain authorization under Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2021 for the waste generated and categorized under hazardous waste as per Schedule of The Hazardous & Other Waste (Management and Transboundary Movement) Amendment Rules, 2021. The generated hazardous waste will be stored in designated Hazardous waste storage room up to maximum of 90 days and shall be disposed to either TSDF or authorized recyclers. The brief of Industrial hazardous waste is mentioned in **Section 3.**

6.9 Solid Waste Management

***Construction Phase*:** Solid waste generation in construction waste will be excavated soil, construction debris and scrap will be treated as per C&D Waste Management Rules.

***Operational Phase*:** The industry shall obtain authorization under Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2021 for the waste generated and categorized under hazardous waste as per Schedule of The Hazardous & Other Waste (Management and Transboundary Movement) Amendment Rules, 2021. The generated hazardous waste will be stored in designated Hazardous waste storage room up to maximum of 90 days and shall be disposed to either TSDF or authorized recyclers.
Approx. 76.5 kg/day of municipal solid waste generated in the plant area will be segregated to biodegradable waste and non-biodegradable waste. 30.6 kg/day non-biodegradable waste will be sold off to recycler.45.9 kg/day biodegradable waste will be disposed off in MSW disposal pit to get converted to manure for horticulture purposes

6.10 Power requirement & supply/ source

***Construction Phase*:** One DG Set of capacity 1x500 kVA will be used for power supply during construction works.

***Operation Phase*:** The total power requirement of the plant will be 1500 kVA which will be met through Uttar Pradesh Power Corporation Limited (UPPCL). DG sets of capacity 2x500 kVA (with appropriate stack height as per CPCB norms) will be used for backup purposes.

7 REHABILITATION AND RESETTLEMENTS (R& R) PLAN

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

The site being in notified industrial area, R&R is not applicable. The total area of land is in possession of M/s Amber Crop Science Pvt. Ltd.

8 PROJECT SCHEDULE AND COST ESTIMATE

8.1 Likely date of start of construction and likely data of completion (time schedule for the project to be given)

Construction will be started after getting all approval from concern department. Construction and installation of machinery will be completed in 1-2 years after start of construction.

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

The expected Cost of the proposed project shall be around ***Rs 40 Crores.***

9 ANALYSIS OF PROPOSAL (FINAL RECOMMENDATIONS)

9.1 Financial and social benefits with special emphasis on the benefit to be local people including tribal population, if any, in the area.

The project will be beneficial to nearby people. The company management will be committed to improve infrastructural facilities for the local people in field of Environmental, Medical, and Transportation etc. Based on the preliminary site visit, the infrastructure demand in the villages will be assessed on the basis of need and priority.

- Employment would be as per prevailing norms of state government for skilled and unskilled people for the proposed project activity. Unit will give employment to approx. 80 local labors for construction phase and 100 no. of permanent and 150 no. of temporary workers during operation phase.
- Social Welfare
- Cordial relation with the industry shall be established and representation shall be made to villagers for help for creation of facilities related to health, education, etc.
- Establishment and operation of the proposed project will contribute significantly to the revenue of the state and central governments in the form of different types of taxes like sales tax on inputs, outputs and fuel, income tax of employees, excise duty on the product, service tax, etc.

Annexure I
NABET Accreditation Certificate

Quality Council of India

National Accreditation Board for Education & Training

CERTIFICATE OF ACCREDITATION

EQMS India Pvt Ltd.

305, 3rd Floor, Plot No. 16, Rishabh Towers, Community Centre, Karkardooma, Delhi – 110 092

The organization is accredited as Category-A under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –

Sl. No.	Sector Description	Sector (as per) NABET	Sector (as per) MoEFCC	Cat.
1.	Mining of minerals- opencast only	1	1 (a) (i)	A
2.	Offshore and onshore oil and gas exploration, development & production	2	1 (b)	A
3.	River valley projects	3	1 (c)	A
4.	Thermal power plants	4	1 (d)	A
5.	Cement plants	9	3 (b)	B
6.	Chemical fertilizers	16	5 (a)	A
7.	Pesticides industry and pesticide specific intermediates	17	5 (b)	A
8.	Synthetic organic chemicals industry	21	5 (f)	A
9.	Pulp & paper industry excluding manufacturing of paper from wastepaper and manufacture of paper from ready pulp without bleaching	24	5 (i)	A
10.	Isolated storage & handling of Hazardous chemicals	28	-	B
11.	Airports	29	7 (a)	A
12.	Industrial estates/ parks/ complexes/areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes	31	7 (c)	A
13.	Bio-medical waste treatment facilities	32A	7 (d a)	A
14.	Ports, harbours, break waters and dredging	33	7 (e)	A
15.	Highways	34	7 (f)	A
16.	Common Municipal Solid Waste Management Facility	37	7 (i)	B
17.	Building and construction projects	38	8 (a)	B
18.	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes dated Jan 22, 2021 posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/21/1661 dated March 15, 2021. The accreditation needs to be renewed before the expiry EQMS India Pvt Ltd, New Delhi following due process of assessment.

Sr. Director, NABET	**Certificate No.**	**Valid till**
Dated: March 15, 2021	**NABET/EIA/1922/RA 0197**	**Nov 23, 2022**

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.

Annexure II
AUTHORIZATION OF CONSULTANT

Annexure III
LAND DOCUMENTS

U.P. State Industrial Development Corporation Ltd.

Regional Office, AGRA
EPIP,Shastripuram
Agra
Tel No. : 0562-2641924
Email ID: rmagra@upsidc.com
Website: www.onlineupsidc.com

Ref.No:SER20201130/1000/781/9759**/SIDC-IA/**Kosi Kotwan Extn.-2 **Date:**23/12/2020

To,

AMBER CROP SCIENCE PVT LTD
R-92A VANI VIHAR UTTAM NAGAR WEST DELHI

Subject:- Allotment of land in Industrial AreaKosi Kotwan Extn.-2

Dear Sir,

With reference to your application dated **30/11/2020** for allotment of land in Industrial Area **Kosi Kotwan Extn.-2** at regional office **AGRA**. we are pleased to allot you plot no **A-4** in the Industrial Area on the conditions mentioned below for setting up an industrial unit to manufacture **CHEMICAL PROCESSING AND PESTICIDES FORMULATION**

1. Area of plot is 18915.5 sq. mtr. The precise measurement and the area of the plot is as per site layout attached herewith

2. Date of issuance of this letter will be treated as the date of allotment of the above plot in your favour.

3. The interest chargeable as per clause 5 below on the (total) balance outstanding premium will be computed from the date of allotment as defined in clause 2 above and payable half yearly on 1st day of January and 1st day of July each year. The first of such payment will be due on 01/07/2021

a. There are construction of value 0 existing on the plot, which shall have to be paid by you along with reservation money as mentioned in clause 4 below.

4. You shall deposit an amount of Rs 7914954.53125 (Earnest Money of Rs4870741.25 has been adjusted) towards reservation money in respect of the above plot latest by 22/01/2021 . This amount together with Earnest money is approximately equal to 15 percent of the total premium of the plot at provisional rate of Rs 2575 per sq. mtr. and locational charges @ Rs 128.75 per sq. mtr. for the first five acres and is subject to adjustment according to actual measurement of the plot. If the payments are not made as stipulated above this allotment will stand automatically cancelled and an amount of 1 % shall be deducted from the Earnest Money deposited by you and same shall stand forfeited by this Corporation. However, if the area of land allotted either exceeds the area applied for or falls short of the area applied for by an area more than 20%, the deductions in Earnest Money shall not be done if the allotment is not accepted, provided an intimation is sent to us in this respect by date stipulated above.

Note: - The premium mentioned herein is provisional and is liable to be increased on account of increased compensation or additional infrastructure development.

5. The remaining 75% of the provisional premium shall have to be paid by you in 12 equal half yearly instalments each of which will be due for payment on 1st day of january and 1st day of july each year. The first instalment of such payment will fall due for payment on 01/07/2021. The second and subsequent instalments of premium will fall due on 1st day of January and 1st day of July each year.

An interest @ 14% per annum shall be charged on the outstanding (balance) premium with effect from the date of allotment and shall be payable along with instalment of premium as stipulated in clause 3 above. A rebate of 2% per annum on payment of interest shall be allowed if the instalment is deposited on or before the stipulated date and if there are no arrears of dues. The amount of the balance premium and the interest due thereon from time to time shall remain first charge on the land and the building and machinery erected thereon till it is (they are) paid in full.

6. The stamp duty, the registration charges and legal expenses involved in the execution of the Lease Deed and other agreements from time to time shall be borne by you.

7. You shall have to execute a Lease deed within 60 days by submitting following documents:-

a. Valid Udyog Adhar registration for the item of manufacturing and plot for which this allotment is made

b. Clear all dues upto the date of Lease Deed as mentioned in clause -3, 4 and 5 of this letter.

c. Detailed statement showing shareholders/ director position duly certified by CA.

d. Necessary stamp papers/e-stamp/ Bank Guarantee (as per Govtt order)

e. Any other formalities/ papers as required.

8. You will have to take over possession of the land within 30 days of executing the Lease deed.

9. You shall have to get the maps approved within 90 days of taking possession. The formalities to be done in this regard are available on website onlineupsidc.com. .

10. You shall have to start construction within 30 days of approval of map.

11. You shall have to start production on the plot within 11.00 months from date of allotment and intimate the corporation of the same..

12. The plot has been allotted on as it is where it is basis and levelling etc. if any, is to be undertaken by you at your expenses. You will pay to the U.P. State Industrial Development Corporation Ltd. within 30 days from the date of the demand made by this Corporation from time to time such recurring fee in the nature of service and/or maintenance charges as determined by this Corporation. In case of default you will be liable to pay interest @14 % p.a. on the amount due.

13.

- You will adhere and submit to the rules of Municipal or other authority now existing or hereinafter to exist insofar as the same relate to the immovable property in the Industrial Area or so far as they affect the health, safety and convenience of the others inhabitants of the place, and will not release any obnoxious gaseous, liquid or solid effluents from the unit in any case.
- You will establish at your own cost an appropriate and efficient effluent treatment system/ plant and will ensure that it is ready and functional as per the norms and specifications expected laid down or stipulated by the State Effluent Board/U.P. Pollution Control Board and any other authority establishedby law for the time being in force before the production is commenced in the unit set up on the plot
- Whenever the industrial area is included in the jurisdiction of Municipal Corporation or Board, Cantonment Board, Zila Parishad, Town Area or (any) other local bodies (body), you will become liable to pay and discharge all rates, taxes, charges, claims and outgoing chargeable imposed and assessment of every description, which may be assessed, charged or imposed upon then by the local body and will abide by the laws rules and direction of the local body.
- You will make appropriate arrangements at your own cost for proper disposal of waste water produced in your unit

14. You will have to apply for and obtain power connection from the local agency /U.P. State Electricity Board as the case may be at your end and cost.

15. The allotment will be cancelled if and when any one of the following mentioned violations happens and further action after cancellation shall be taken up as mentioned in clause 16 below.

a. If you fail to comply to any of the conditions 7-12 above within the time stipulated above, the time duration mentioned being of essence.

OR

b. If you fail to make payment of interest and/ or premium on or before the due date(s) as mentioned in clause 5 of this letter

OR

c. If you fail to comply clause 23, 24 and 26 mentioned here in below

16. In the event of cancellation of allotment on account of any default on your part, the following will stand forfeited to the

a. Interest @ 14 % per annum from the date of allotment on the total unpaid premium from time to time till the date of cancellation of allotment without allowing rebate in interest, mentioned in clause 5 above irrespective of the fact whether the dues had been paid in time or not.

AND

b. Use and Occupation charges/ Lease Rent from the date of allotment upto the date of cancellation.

AND

c. In the case of constructed sheds allotted by UPSIDC Ltd 2 % of the cost of shed towards depreciationThe Balance amount, if any, out of the deposits made by you till then, after deducting the amounts to be forfeited as above, will be refundable. In case the total of the amounts paid is less than the amounts to be forfeited you shall be liable to pay the difference and the same shall be recoverable by the Corporation from you

17. In the event of surrender of the allotment the following amounts will stand forfeited to the U.P. State Industrial Development Corporation Ltd.

a. Interest @ 14 % per annum from the date of allotment upto the date of surrender of the allotment on the total balance (unpaid), premium from time to time allowing the rebate (in interest) irrespective of the fact whether the payments were made in time or not.

AND

b. Use and Occupation charges/ Lease Rent from the date of allotment till the date of surrender.

AND

c. 0 % Of the cost of shed towards depreciation in case of constructed sheds allotted by UPSIDC.

The Balance amount, if any, out of the deposits made by you till the date of surrender after deducting the amounts to be forfeited as above, will be refundable. In case the total of the amounts paid is less than the amount to be forfeited, you shall be liable to pay the difference and the same shall be recoverable by the corporation from you

18. You shall not employ in the unit any process generating smoke or fumes or involving use of chimney and any use of fossil fuel in the process which may cause atmospheric pollution and / or would not discharge liquid effluent which may be obnoxious by nature or cause pollution. Your unit should not involve any significant emission of particles and / or gaseous substance in the air.

19. In employing labour for the industry, skilled, semi skilled or unskilled, shall give preference to one or two able - bodied persons from the families whose land has been acquired for the purpose of the said Industrial Area.

20. You will pay use and occupation charges/ lease rent at the rate of Rs. 1/- per square meter per year during the first thirty years, Rs.2.5/- per square meter per year during the next thirty years after expiry of the first thirty years and Rs. 5/- per square meter per year during the next thirty years after expiry of the first sixty years. Use and occupation charges are payable till the date lease is granted to you whereafter lease rent will have to be paid.

21. The allottee / lessee will mention in the postal address of his correspondence letters invariably the name of UPSIDC Industrial Area.

22. All the payments to the Corporation should be either online or through Bank Draft / pay order in favour of UPSIDC Ltd. payable at AGRA No payments in cash or through cheques would be accepted.

23. You will utilise minimum 30% area of the plot by covering it by roof/ permanent shed within the above specified period failing which the allotment of the plots(s) will be cancelled.

24. It will be your sole responsibility to get No Objection Certificate from UPPCB (U.P. Pollution Control Board) and if it is not furnished to this Corporation, you will be liable for action according to law and UPSIDC would not be responsible for any of your act or omissions which may be in contravention to the U. P. Pollution Control Board rules environmental laws.

25. If the Corporation fails to hand over possession within 6 months entire deposits made by you shall be refunded alongwith interest @6%.

26. Any Reconstitution/ project change/ name change/ mortgage without prior approval in writing to this Corporation shall result in automatic cancellation of the allotment..

27. You shall make arrangements for rain water harvesting and all other laws framed by the Govt. to protect environment.

28. If it is found that you have misrepresented or submitted wrong information for getting this allotment, the allotment shall be void and the entire amount deposited by you shall be forfeited.

29. Additional clauses as mentioned below are also remain part of the terms of allotment and binding on you.

S.NO	List Of Additional Clauses
1	**1. You shall ensure investment on building plan plant and machinery Employment as mentioned in application form 2. You shall submit NOC from UPPCB at the time of Lease deed execution. You shall have to established ETP plant if required**

Your's Faithfully,
For U.P. STATE INDL. DEV. CORPN. LTD.

VINOD KUMAR Digitally signed by VINOD KUMAR Date: 2020.12.23 14:34:34 +05'30'

Vinod Kumar
(Regional Manager)

No: SER20201130/1000/781/9759 **SIDC-IA: Kosi Kotwan Extn.-2** **Plot No.: A-4** **Date: 23/12/2020**

Copy forwarded for information and necessary action to:-

1.Chief Manager I.A, UPSIDC LTD, Kanpur

U.P. STATE INDUSTRIAL DEVELOPMENT CORPORATION Ltd.
CIN No - U26960UP1961SGC002834, Head Office, Kanpur
A-1/4, Lakhanpur, Kanpur-208024
Telephone No-0512-2582851-53(PBX), Fax No.-0512-2580797
Website:- www.onlineupsidc.com

Installment Schedule

Installment No.	Due Date Of Installment	Interest Due (With Rebate)	Interest Due (Without Rebate)	Premium Due	Total Amount (With Rebate)	Total Amount (Without Rebate)
1	01/07/2021	₹2,395,694.27	₹2,794,976.64	₹3,196,423.95	₹5,592,118.22	₹5,991,400.59
2	01/01/2022	₹2,126,979.31	₹2,481,475.86	₹3,196,423.95	₹5,323,403.26	₹5,677,899.81
3	01/07/2022	₹1,902,091.18	₹2,219,106.38	₹3,196,423.95	₹5,098,515.13	₹5,415,530.33
4	01/01/2023	₹1,740,255.80	₹2,030,298.43	₹3,196,423.95	₹4,936,679.75	₹5,226,722.38
5	01/07/2023	₹1,521,672.94	₹1,775,285.10	₹3,196,423.95	₹4,718,096.89	₹4,971,709.05
6	01/01/2024	₹1,353,532.29	₹1,579,121.00	₹3,196,423.95	₹4,549,956.24	₹4,775,544.95
7	01/07/2024	₹1,144,424.57	₹1,335,162.00	₹3,196,423.95	₹4,340,848.52	₹4,531,585.95
8	01/01/2025	₹964,167.22	₹1,124,861.76	₹3,196,423.95	₹4,160,591.17	₹4,321,285.71
9	01/07/2025	₹760,836.47	₹887,642.55	₹3,196,423.95	₹3,957,260.42	₹4,084,066.50
10	01/01/2026	₹580,085.26	₹676,766.14	₹3,196,423.95	₹3,776,509.21	₹3,873,190.09
11	01/07/2026	₹380,418.23	₹443,821.27	₹3,196,423.95	₹3,576,842.18	₹3,640,245.22
12	01/01/2027	₹193,361.75	₹225,588.71	₹3,196,423.95	₹3,389,785.70	₹3,422,012.66

Note : 2 % rebate on interest is applicable when all the installments are paid on or before due date

Regional Manager

Annexure IV
MANUFACTURING PROCESS

Manufacturing Process , Mass Balance & Process Flow

1. **Imazethapyr :-**

Manufacturing Process

Stage1

5-ethyl-3-pyridine carboxylic acid (EPCA) is reacted with 4,5 Dihydro-4 methyl 4 (1 methyl ethyl)-5-oxo-1 H-imidazoline in present of catalyst and DMF solvent. The Hydrochloric acid, which is formed during the reaction, is scavenged by putting Sodium carbonate as acid scavenger.

Stage2

The resulting mass is diluted by water and filtered to remove the salts of Sodium Chloride(NaCl) & Sodium bicarbonate. The organic mass is the treated with water and finally solvent is removed by distillation.

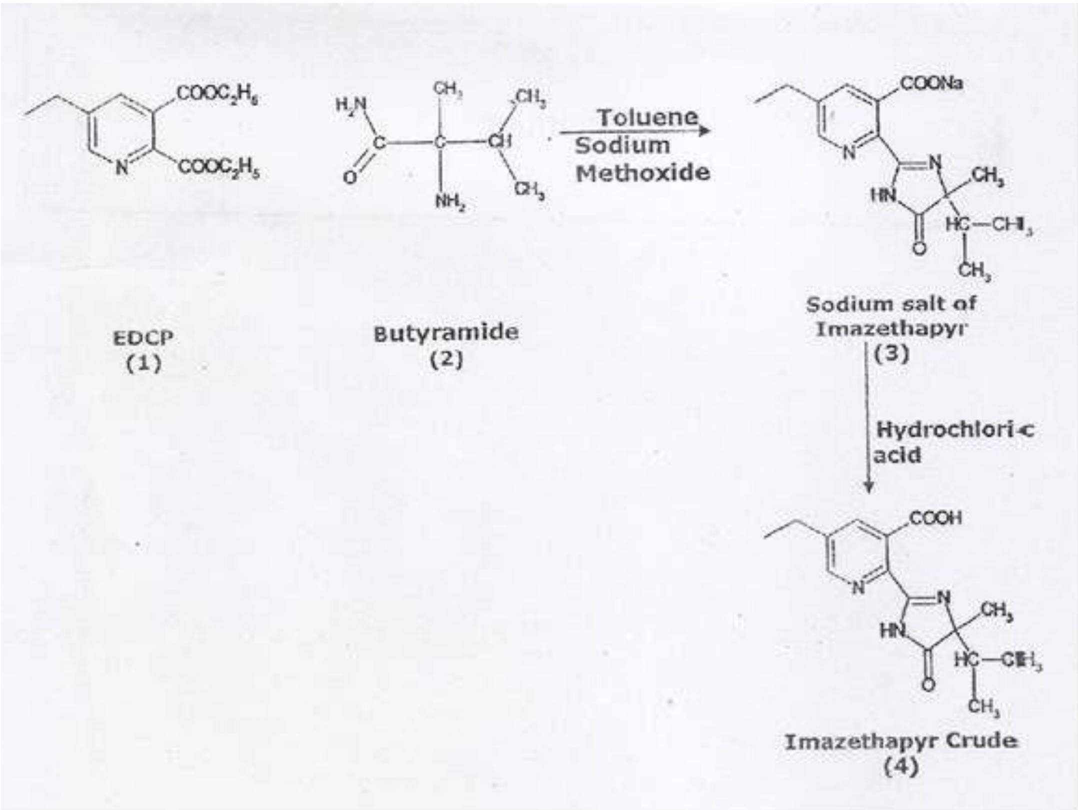
Stage3

The concentrated mass is the crystallized to get pure product –Imazethapyr technical.

Stage4

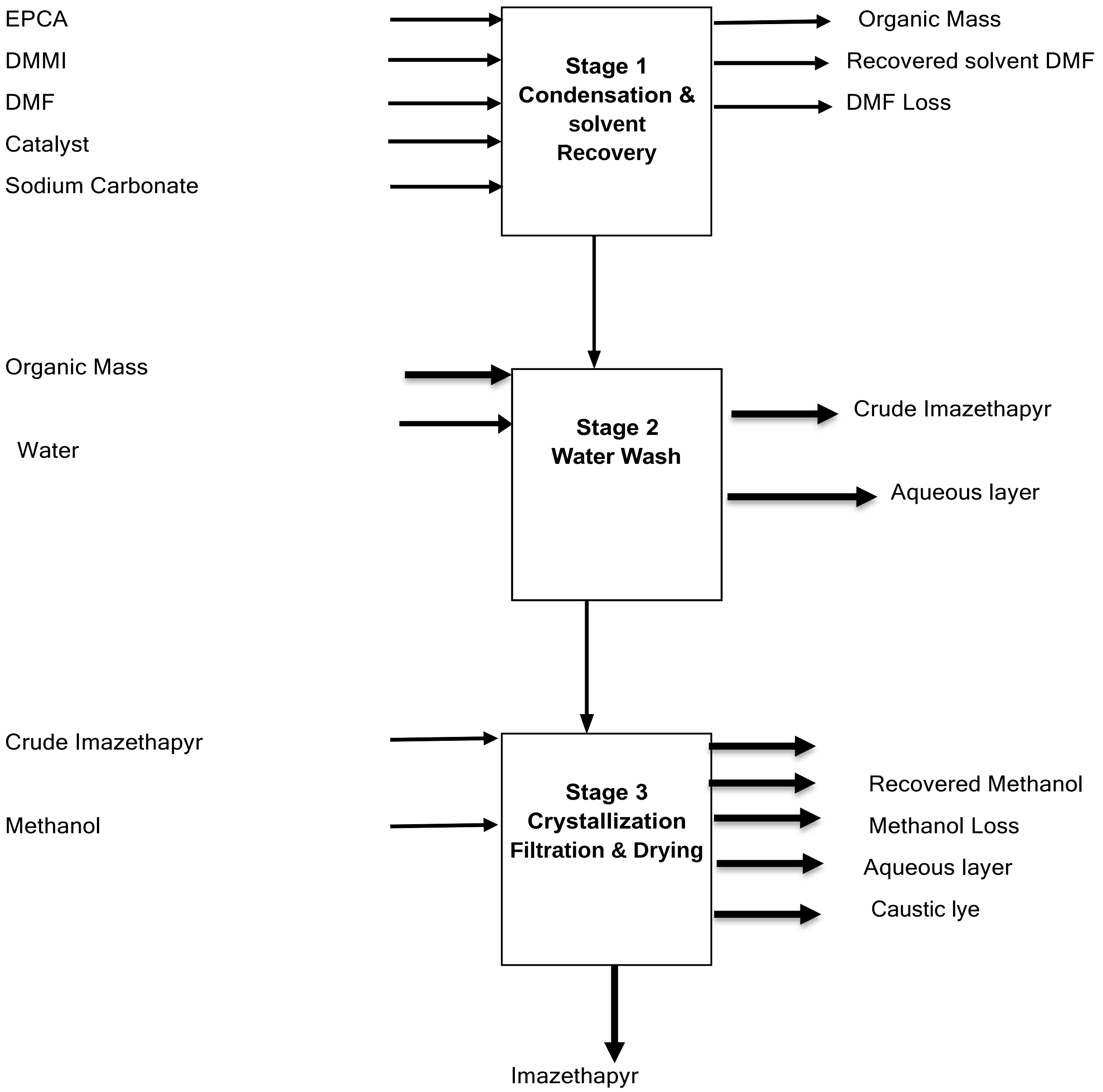
Finally toxic effluent, which contains traces of pesticides, is taken to hydrolysis stage for detoxification. Where aqueous mass is treated at high temperature by Alkali for the rapid hydrolysis of pesticides to simpler non-toxic compounds.

Chemical Reaction:



Process Flow :

Process Flow



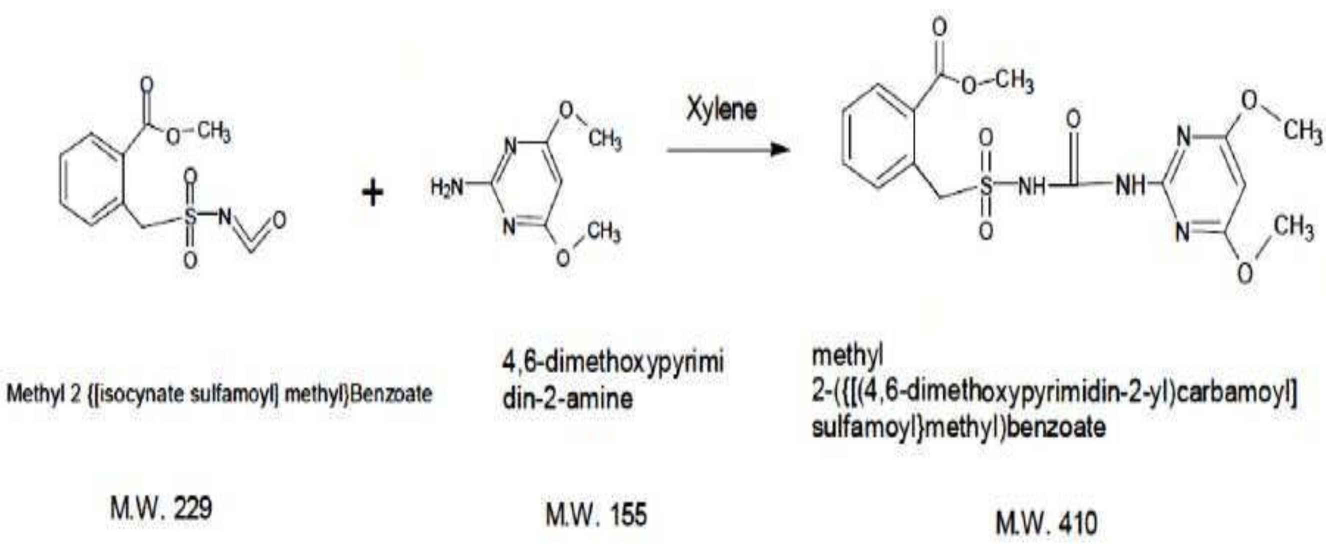
Mass Balance :

	Material / Mass Balance of Imazethapyr All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	EPCA	1900		Organic Mass	**2410**
2	DMMI	750		Recovered solvent DMF	2040
3	DMF	2900		DMF Loss	110
4	Catalyst	12		Crude Imazethapyr	1468
5	SodiumCarbonate	700		Aqueous layer	1942
6	OrganicMass	2500		Imazethapyr	1100
7	Water	1000		Recovered Methanol	380
8	Crude Imazethapyr	1668		Methanol Loss	20
9	Methanol	400		Organic mass	368
10				Caustic lye	50
				Aqueous layer	1942
	TOTAL	**11830**		**TOTAL**	**11830**

2. **Bensulfuron Methyl:-**

Brief Manufacturing Process :-

Methyl-2- {[Isocyanate Sulfamoyl] Methyl} Benzoate reacted with 4,6-Dimethoxypyrimidin-2-amine in presence of Solvent Xylene. This reaction gives out Bensulfuron Methyl (Methyl-2-({[4,6-Dimethoxypyrimidin-2-yl)Carbomoyl]Sulfamoyl}Methyl)Benzoate.



Mass Balance:

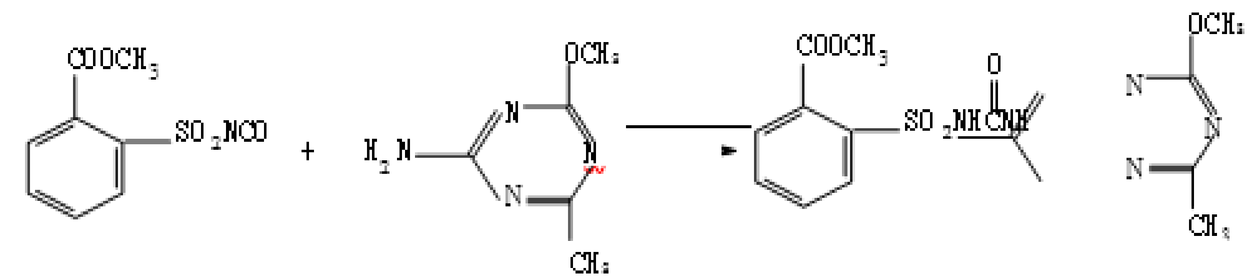
	Material / Mass Balance of BENSULFURON METHYL All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	4, 6- Dimethoxy Pyrimidine -2-Amine	418		Bensulfuron	**1000**
2	Methyl-2- {[Isocyanate sulfamoyl] Methyl} Benzoate	620		Recovered Xylene	1565
3	Xylene	1600		Xylene Loss	35
4	Methanol	2000		Recovered Methanol	1970
5				Loss Methanol	30
6				Residue	38
	TOTAL	**4638**		**TOTAL**	**4638**

3. Metsulfuron :

Brief Manufacturing Process :-

Desired quantities of o-Carboxy methyl phenyl isocyanate (CMPI) and acetonitrile are added along with Triethyl amine & 2-amino-4-methoxy-6-methyl-1,3,5-triazine in to the reactor &mixture is stirred at desired temp. until the desired conversion of the product, then the reaction mass is cooled & filtered. The crude product is washed with water & chilled solvent to get desired quality of the Product. Solvent is recovered and recycled.

Chemical Reactions:-



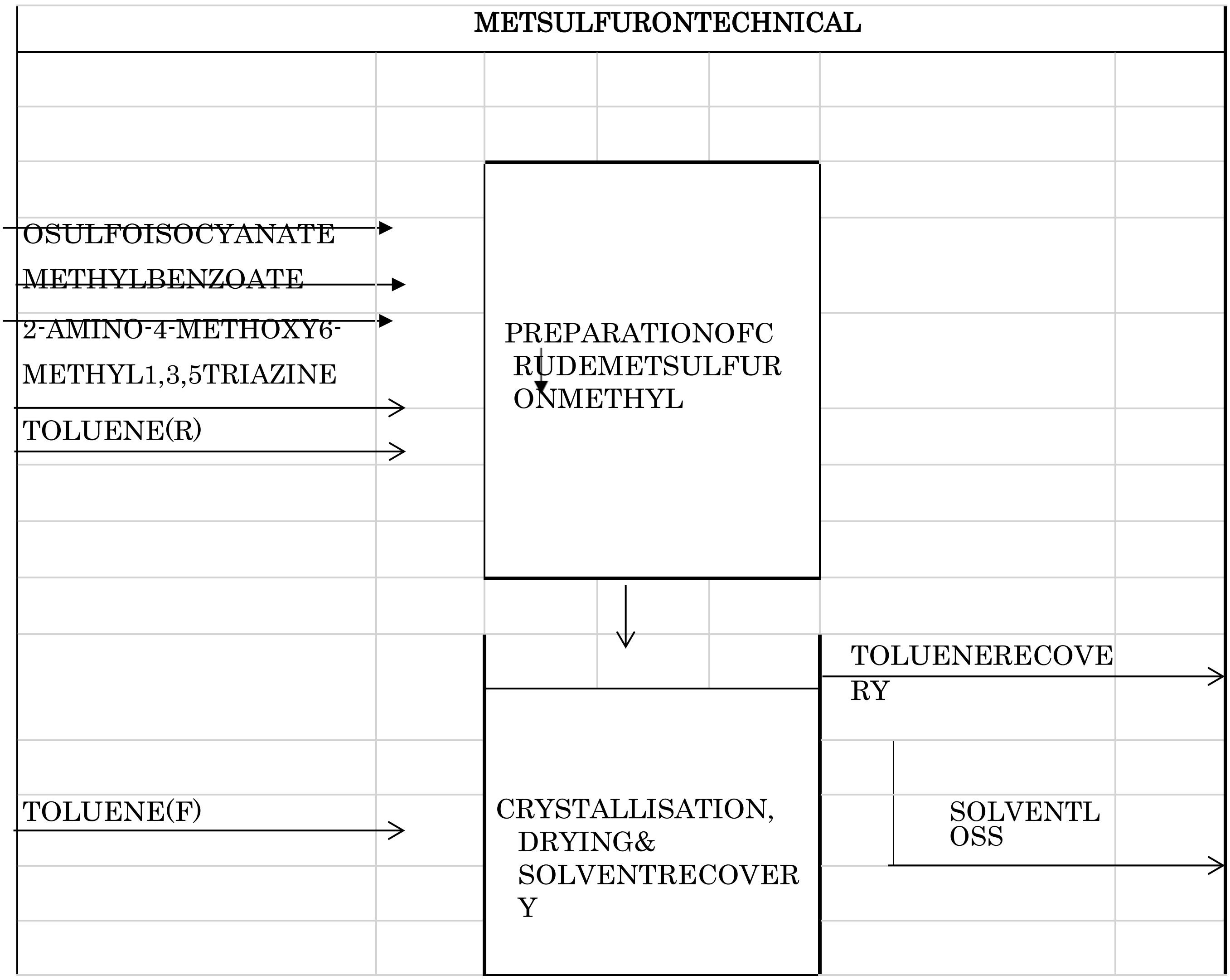
O-carboxymethyl Phenylisocyanate
MF= $C_9H_7NO_5S$
FW=241.22

2-amino-4-methoxy-6-methyl-1,3,5- triazine
MF= $C_5H_8N_4O$
FW=140.14

Metsulfuron methyl
MF= $C_{14}H_{15}N_5O_6S$
FW=381.36

	Material / Mass Balance METSULFURON All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Ortho-Carboxy Methyl Phenyl Isocyanate	680		Metsulfuron	1000
2	2-Amino-4-Methoxy-6-Methyl-1,3,5-Triazine	395		Acetonitrile Recovered	3088
3	Triethyl amine	210		Residue	75
4	Acetonitrile	3250		Aq. Layer	2310
5	Water	2100		Acetonitrile loss	162
	TOTAL	**6635**		**TOTAL**	**6635**

Process Flow Diagram:

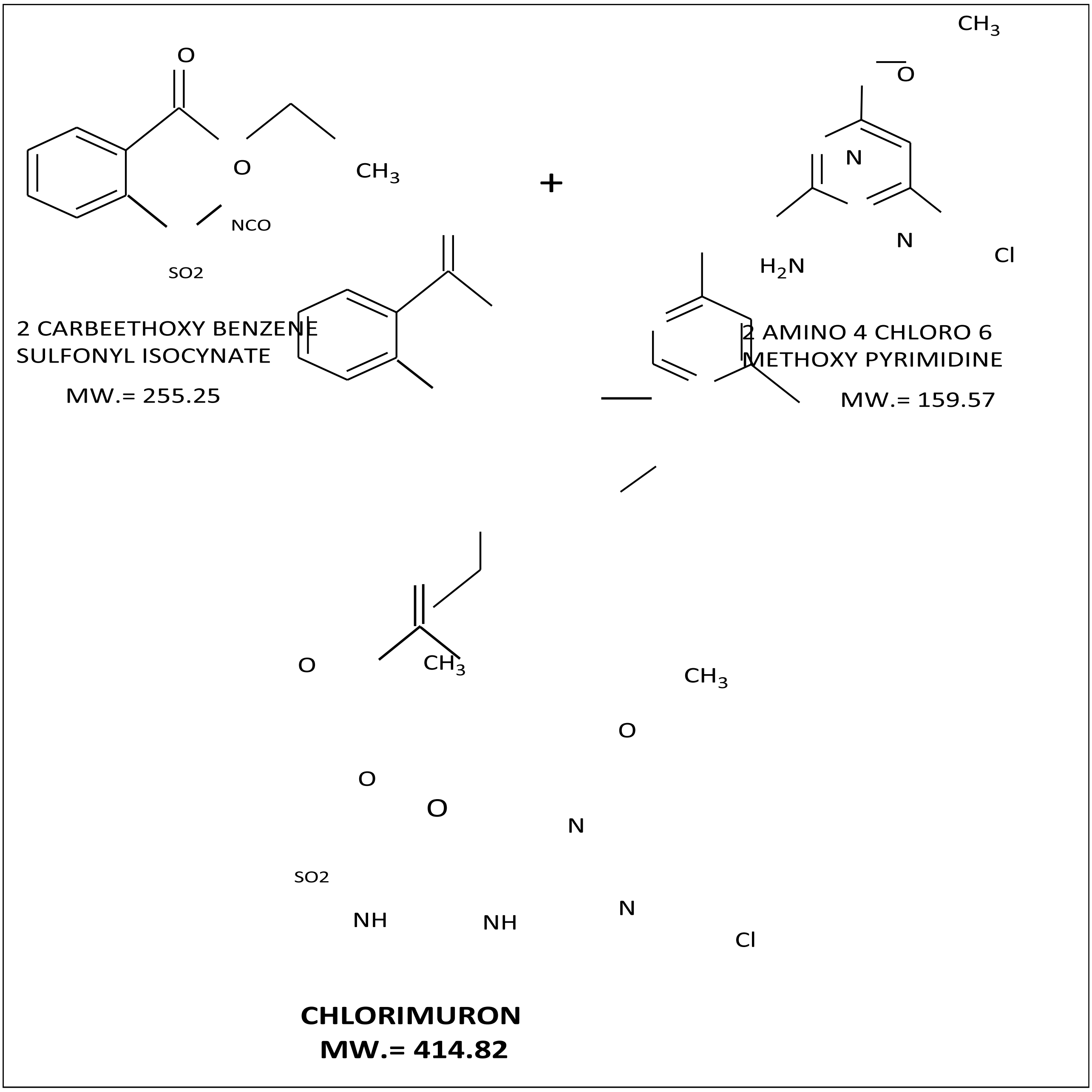


METSULFURON

4. **CHLORIMURURON ETHYL :**

Process Description:

Isocyanate and ACMP are reacted in presence of toluene solvent at controlled conditions of 65 – 70°C. Cool the mass obtained from reaction which, is then centrifuged and dried to obtain technical grade Chlorimuron.

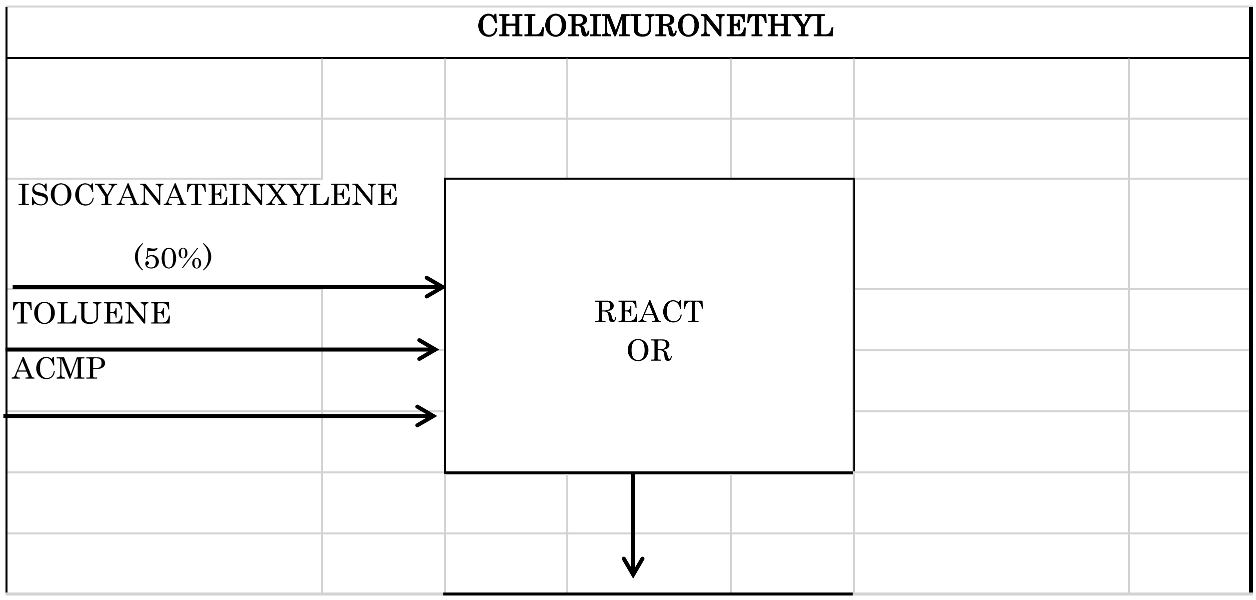


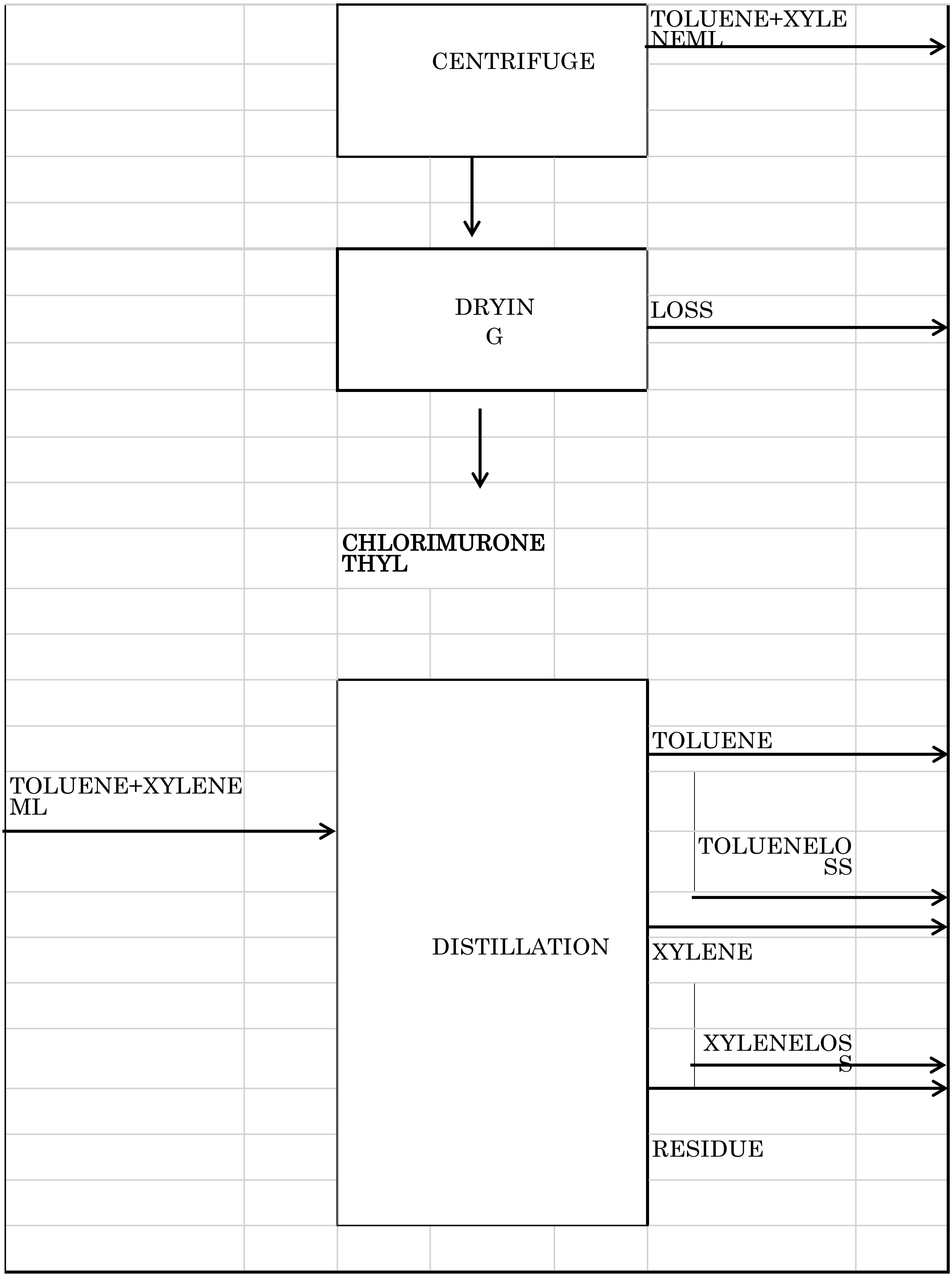
Material Balance:

Material Balance for Chlorimuron Ethyl		
S. No.	Raw Materials	Input/MT of Product (KG)
1	Isocyanate in Xylene (50%)	1542
2	Toluene	770
3	ACMP	459
Total		2771

S. No.	Output/MT of Product (KG)					Remarks
	Product	Liquid Effluent	Air Emission/ loss	Recovery	Solid Waste	
1	Chlorimuron	-	-	1000	-	Product
2	Toluene	-	30	740	-	Recycle
3	Xylene		41	731	-	Recycle
4	Drying Loss	-	19	-	-	To atmosphere
5	Residue	-	-	-	210	To Incineration
Total		-	90	2471	210	
		2771				

Process Flow Diagram :-

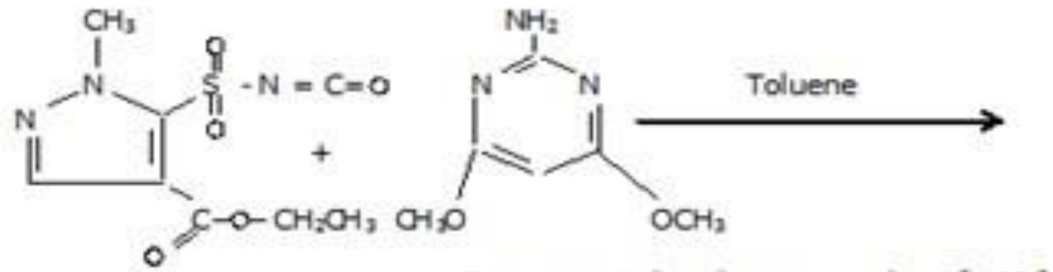




5. **Pyrazosulfuron Ethyl:**

Brief Manufacturing Process:-

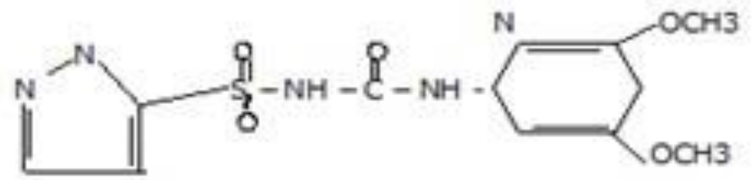
Ethyl-1-methyl-5-Sulfenamideisocyanate-1H-pyrazole-4-carboxylate is reacted with 2- amino-4,6-dimethoxy pyrimidine in presence of Toluene. Crude Pyrazosulfuron is purified by methanol to get pure Pyrazosulfuron.



2-amino-4,6-dimethoxy pyrimidine [155]

Ethyl-1-methyl-5-sulfenamide isocyanate-1H-pyrazole-4-carboxylate

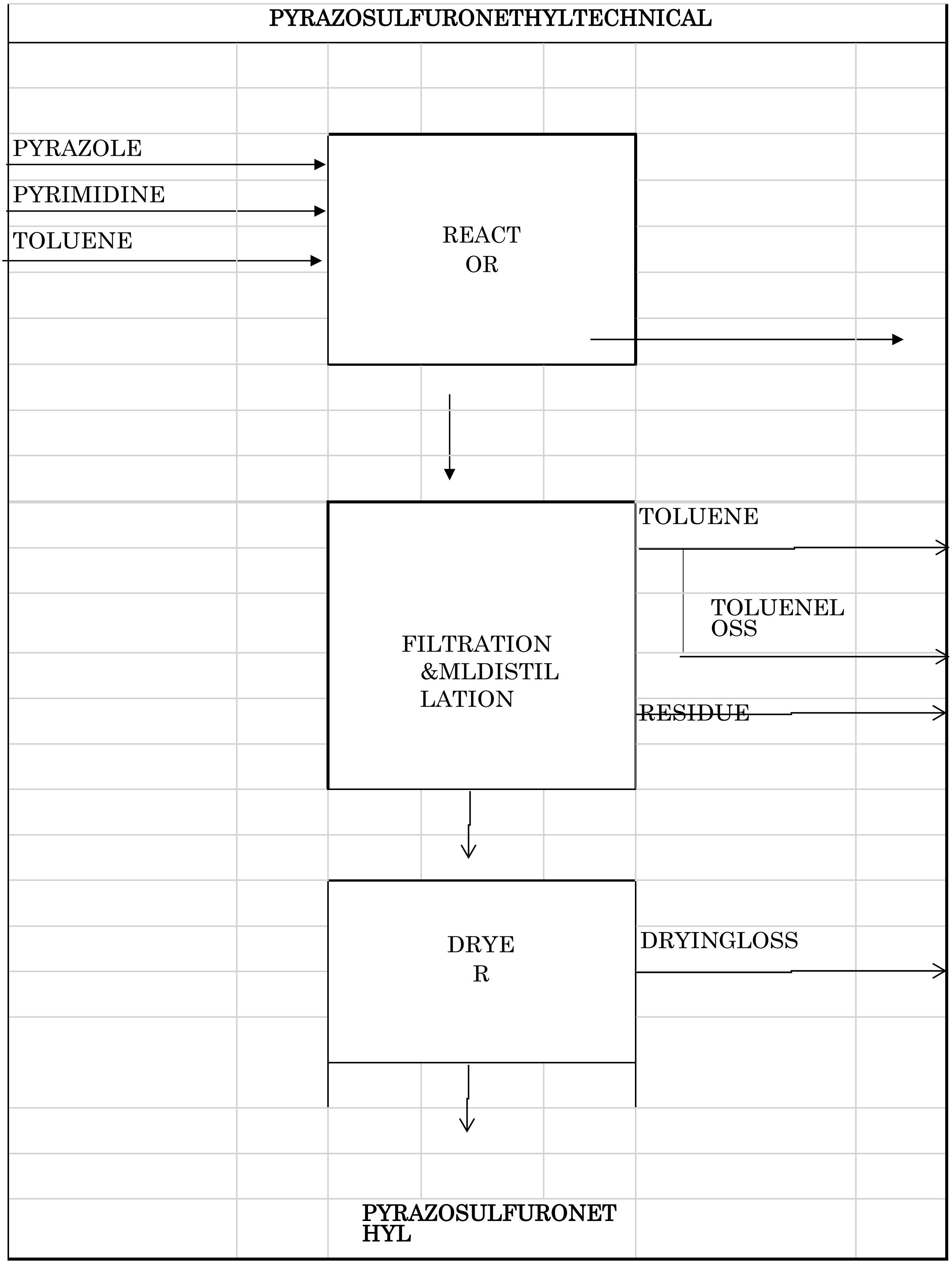
MW=259



Pyrazosulfuron

MW=414

	Material / Mass Balance of PYRAZOSULFURON ETHYL All Quantities are in kg)				
	INPUT			OUTPUT	
Sr.No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Ethyl-1-Methyl -5-Sulphanamide Isocyanide-1- H Pyrazole-4-Carboxylate	800		Pyrazosulfuron Ethyl	**1000**
2	2- Amino -4,6-Dimethoxy Pyrimidine	490		Toluene	2900
3	Toluene	3000		Methanol	1930
4	Methanol	2000		Uncondensed Vapor (Toluene)	100
5				Uncondensed Vapor (Methanol)	70
6				Residue	290
	TOTAL	**6290**		**TOTAL**	**6290**



6. **SULFOSULFURON:**

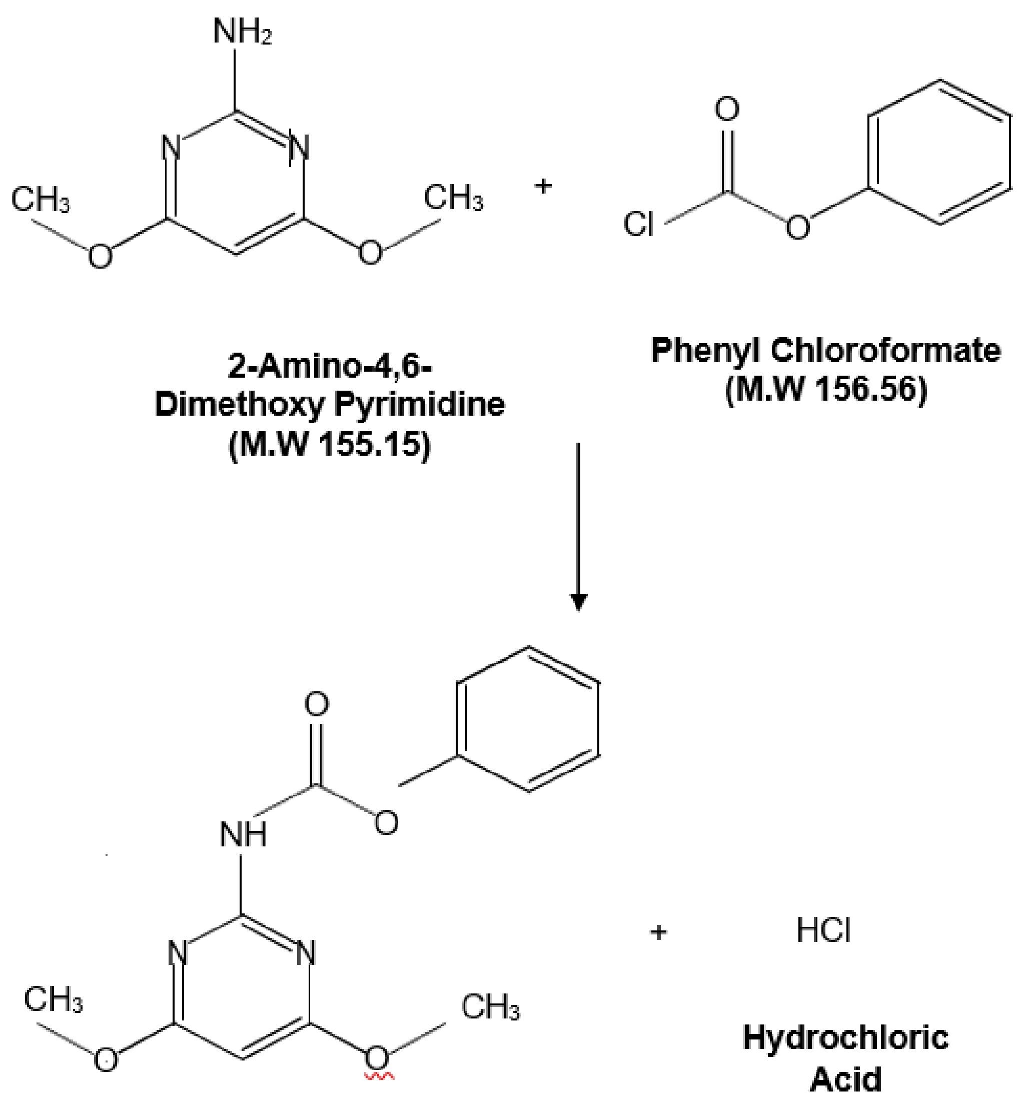
Brief Manufacturing Process:-

Step 1 :- 2-amino-4,6- Dimethoxy pyrimidine is dissolved in 1,4-dioxane to which N,N-dimethylaniline is added. The temperature is cooled to 5° C and phenyl chloroformate is added to it with temperature not exceeding 20° C. The reaction mixture was stirred overnight and filtered. The precipitate is further washed with water and dried to obtain the titled product. 1,4-dioxane is separated from water by distillation. The remaining aqueous mixture is neutralized by causticand N,N-dimethyl alinine is separated by layer separation.

Step 2 :-Toamixtureof2-ethylsulfonylimidazo[1,2-A]pyridinesulphonamideand4,6-dimethoxy-2-((Phenoxy carbonyl) amino) pyrimidine in EDC is added potassium hydroxide flakes and heated to 60° C. After formation of the titled product, organic layer is washed with water. EDC is recovered by distillation and product is recrystallized from methanol. Phenol is formed as by-product which is recovered from aqueous layer after neutralization by extraction with EDC.

Chemical Reaction :

Step 1 :-



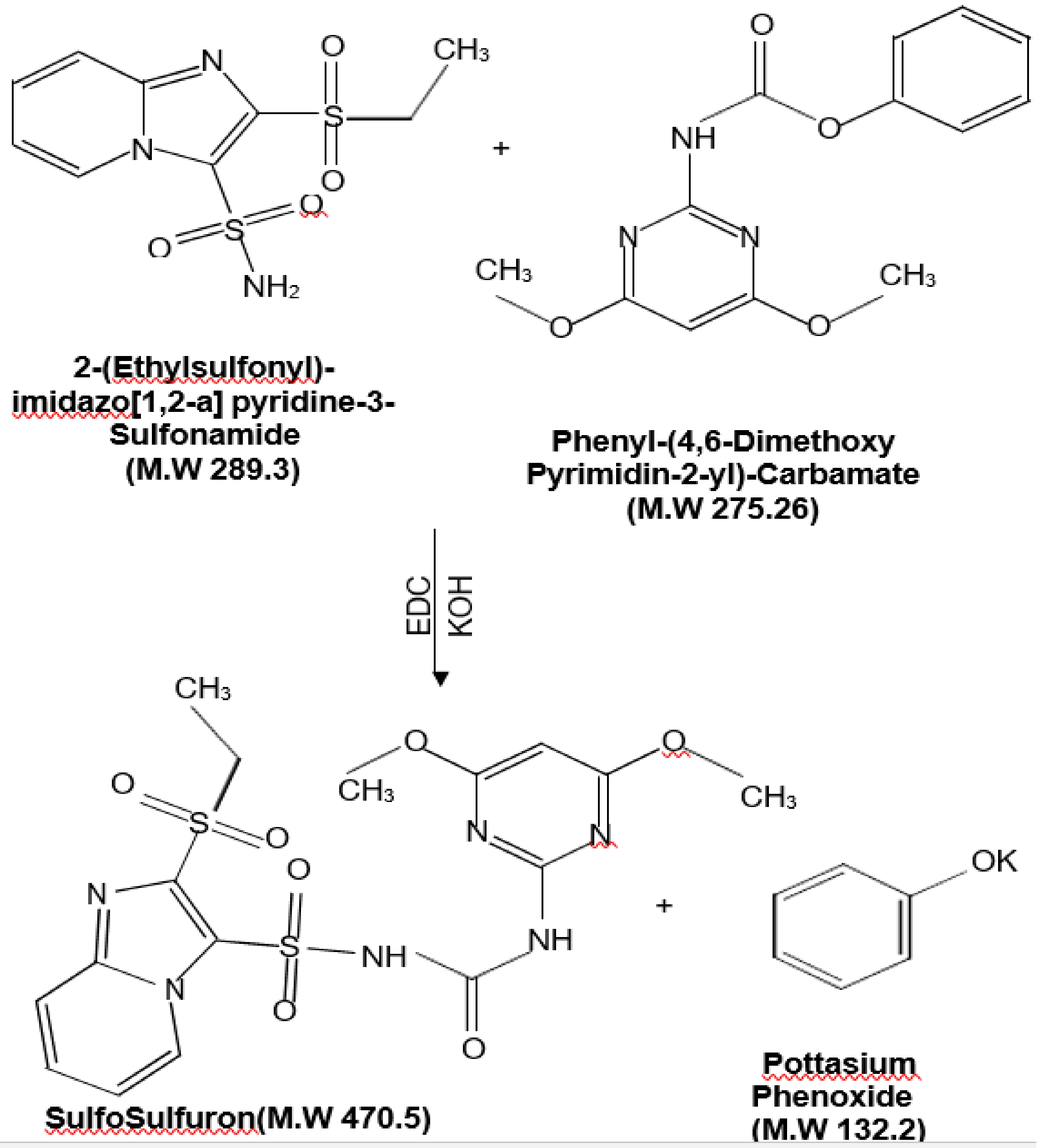
2-Amino-4,6-Dimethoxy Pyrimidine (M.W 155.15)

Phenyl Chloroformate (M.W 156.56)

Phenyl-(4,6-Dimethoxy Pyrimidin-2-yl)-Carbamate (M.W 275.26)

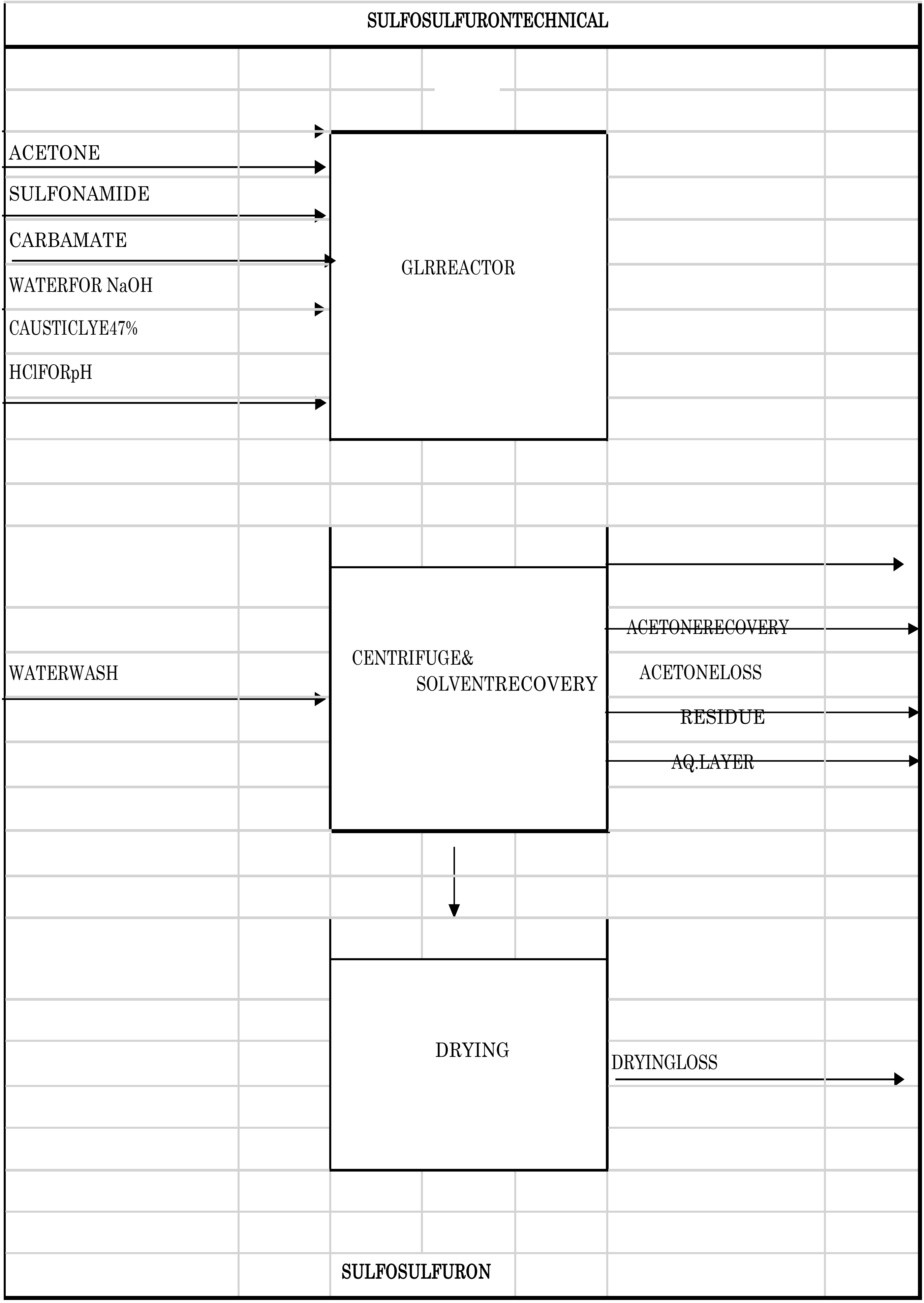
Hydrochloric Acid (M.W 36.5)

Step :2


2-(Ethylsulfonyl)-imidazo[1,2-a] pyridine-3-Sulfonamide
(M.W 289.3)
Phenyl-(4,6-Dimethoxy Pyrimidin-2-yl)-Carbamate
(M.W 275.26)
EDC
KOH
SulfoSulfuron(M.W 470.5)
Pottasium Phenoxide
(M.W 132.2)

	Material/Mass Balance SULFOSULFURONAll Quantities are in kg)				
	Input			**Output**	
Sr. No.	**Raw Materials/Items**	**Kg/Batch**		**Product/Byproduct**	**Kg/Batch**
1	2-Amino-4,6-Dimethoxy Pyrimdine	396		Sulfosulfuron	**1000**
2	PhenylChloroformate	400 4166		HydrochloricAcid	77
3	2-Ethylsulfonylimidazo[1,2-A]PyridineSulfonamide	835		PotassiumPhenolate	270
4	PotassiumHydroxide	142		PotassiumChloride	150
5	EthyleneDichloride(EDC)	13900		MethanolRecovered	3230
6	N,N-Dimethylaniline(DMA)	309		MethanolLoss	20
7	Methanol	3400		Methanolto Wastewater	34
8	Water	2900		MethanolinResidue	115
9	Caustic	85		EDCRecovered	13622
10	HydrochloricAcid	92		EDC Loss	22
11				EDCinResidue	256
12				DMARecovered	304
13				DMALoss	1
14				DMAinResidue	4
15				2-Amino-4,6-Dimethoxy Pyrimidine	66
6				PhenylChloroformate	66
17				2-Ethylsulfonylimidazo [1,2-A]PyridineSul phonamide	139
18				Wastewater	2959
19				SodiumChloride	124
	TOTAL	**22459**		**TOTAL**	**22459**

Process Flow Diagram:



7. **Trifloxystrobin:**

Brief Manufacturing Process :-

Step 1 :- 2-Methyl Aniline is reacted with Sodium Nitrite and Hydrochloric acid to give 2-Methyl benzene Diazonium salt by diazotization.

Step 2 :- 2-Methyl Benzene Diazonium salt further reacted with Glyoxylic Acid methyl ester Oxime to give 2-Methyl phenyl glyoxalin acid methyl ester Oxime.

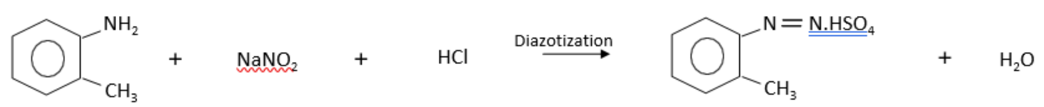
Step 3 :- 2-Methyl Phenyl Glyoxylic Acid methyl ester Oxime reacted with Dimethyl sulfate in presence of Sodium Hydroxide to give 2-Methyl Phenyl Glyoxylate-o-methyl Oxime.

Step 4 :- 2-Methyl Phenyl Glyoxylate-o-methyl Oxime further on chlorination with chlorine gas in presence of Solvent – EDC gives 2-Methyl phenyl Glyoxylate-o-methyl Oxime.

Step 5 :- 2-Methyl Phenyl Glyoxylate-o-methyl Oxime reacted with Sodium [-1- [3-(Trifluoromethyl) Phenyl] Ethylene] Amine] Oxidanide in presence of Solvent – DMF to give final product Trifloxystrobin.

Chemical Reactions: -

STEP:1



2-Methyl Aniline 107

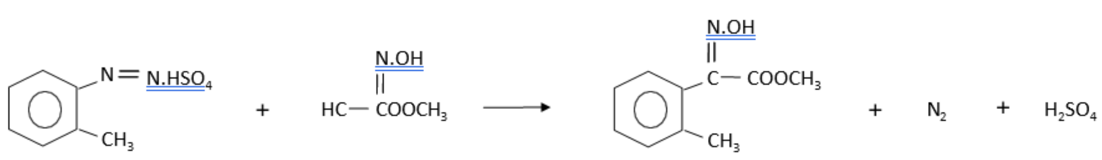
Sodium Nitrite 69

Hydrochloric acid 36.5

2-Methyl Benzene Diazonium salt 216

18

STEP:2



216

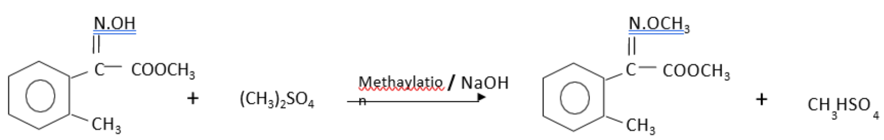
Glyoxylic Acid Methyl Ester Oxime 103

2-Methyl Phenyl Glyoxylic Acid Methyl Ester Oxime 193

28

98

STEP:3



2-Methyl Phenyl Glyoxylic Acid Methyl Ester Oxime 193

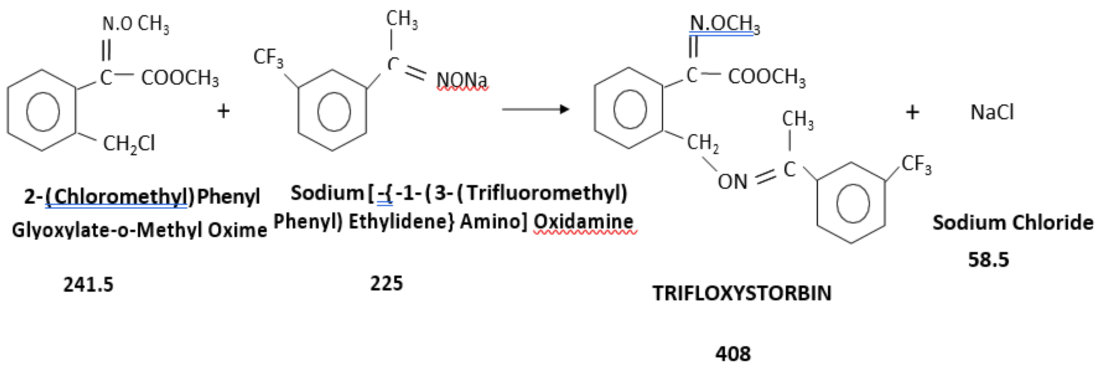
Dimethyl Sulfate 126

2-Methyl Phenyl Glyoxylate-O-Methyl Oxime 207

Methyl Bisulfate 112

STEP:4

STEP:5



Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2- Methyl Aniline	275		Trifloxystrobin	1000
2	Sodium Nitrite	177		Sodium Chloride	450
3	30 % Hydrochloric Acid	338		Nitrogen Gas	71
4	Glyoxylic Acid Methyl Ester Oxime	259		Sodium Sulphate	366
5	Sodium Hydroxide	306		Recovered Solvent - EDC	1160
6	Di Methyl Sulphate	160		Solvent Loss EDC	40
7	Chlorine Gas	190		30 % Hydrochloride Solution	310
8	Solvent – EDC	1200		Solvent Recovered – DMF	1360
9	Sodium [1- {(3- Trifluoro Methyl) Phenyl} Ethylidene Amino] Oxidanide	518		Solvent Loss – DMF	40
10	Solvent – DMF	1400		Aqueous Layer to ETP	3700
11	Water	3692		Distillation Residue	18
	TOTAL	**8515**		**TOTAL**	**8515**

8. BispyribacSodium:

Brief Manufacturing Process :-

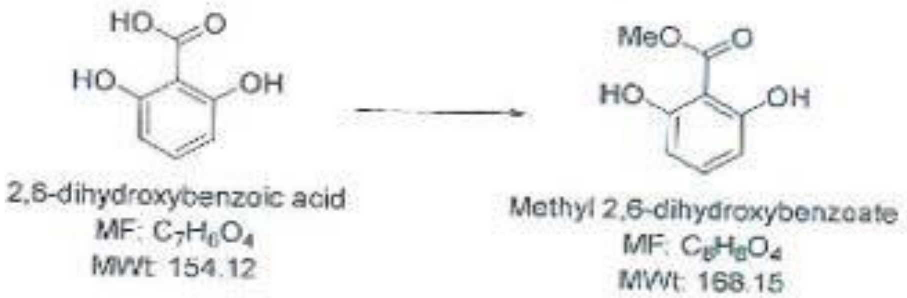
Step 1 :- 2,6 Dihydroxy Benzoic Acid converted to Benzoate by methylation by Dimethyl Sulphate (DMS) in presence of solvent-1 and base.

Step 2 :- Condensation of 2,6 Dihydroxy Benzoate & 4,6 Dimethyl -2-(Methyl sulfonyl) Pyrimidine in presence of Solvent-2 as well as Inorganic Base to get intermediates product as Bispyribac Base.

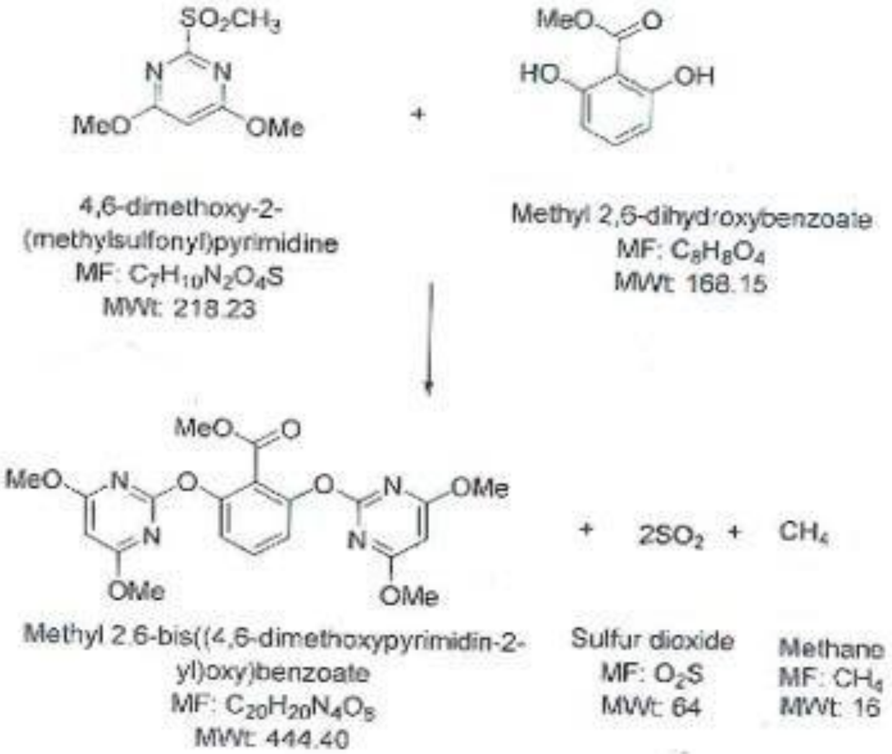
Step 3 :- Bispyribac Base is finally converted to Sodium Salt of by the reaction of Sodium Hydroxide in presence of solvent-3.

Chemical Reactions :-

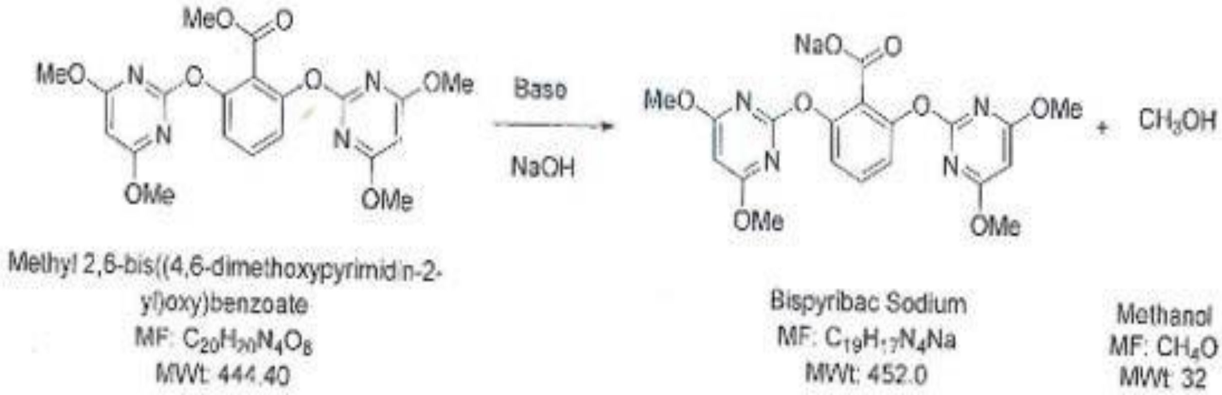
Step 1:-


2,6-dihydroxybenzoic acid
MF: $C_7H_6O_4$
MWt: 154.12
Methyl 2,6-dihydroxybenzoate
MF: $C_8H_8O_4$
MWt: 168.15

Step 2:-

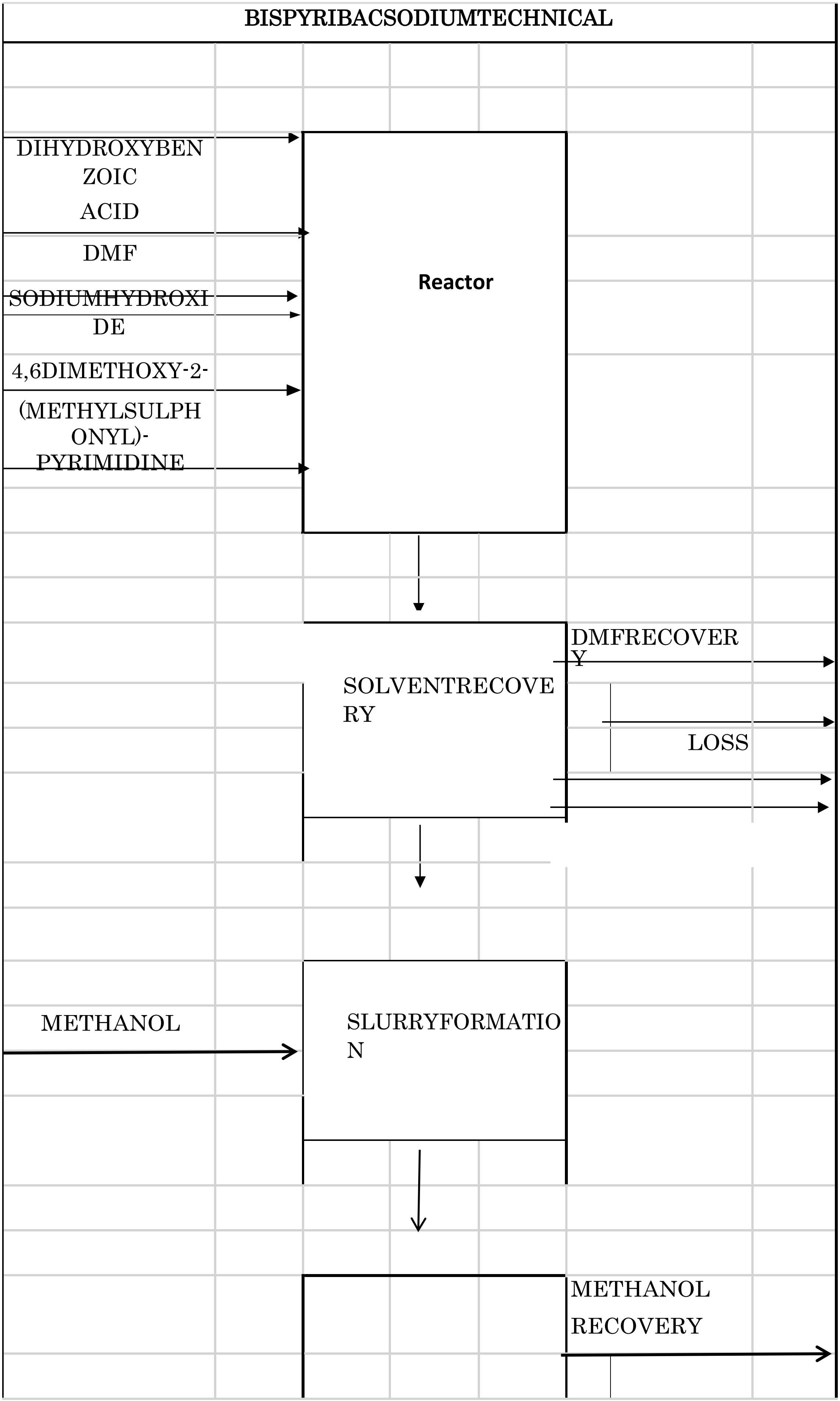

4,6-dimethoxy-2-(methylsulfonyl)pyrimidine
MF: $C_7H_{10}N_2O_4S$
MWt: 218.23
Methyl 2,6-dihydroxybenzoate
MF: $C_8H_8O_4$
MWt: 168.15
+ 2SO₂ + CH₄
Methyl 2,6-bis((4,6-dimethoxypyrimidin-2-yl)oxy)benzoate
MF: $C_{20}H_{20}N_4O_8$
MWt: 444.40
Sulfur dioxide
MF: O_2S
MWt: 64
Methane
MF: CH_4
MWt: 16

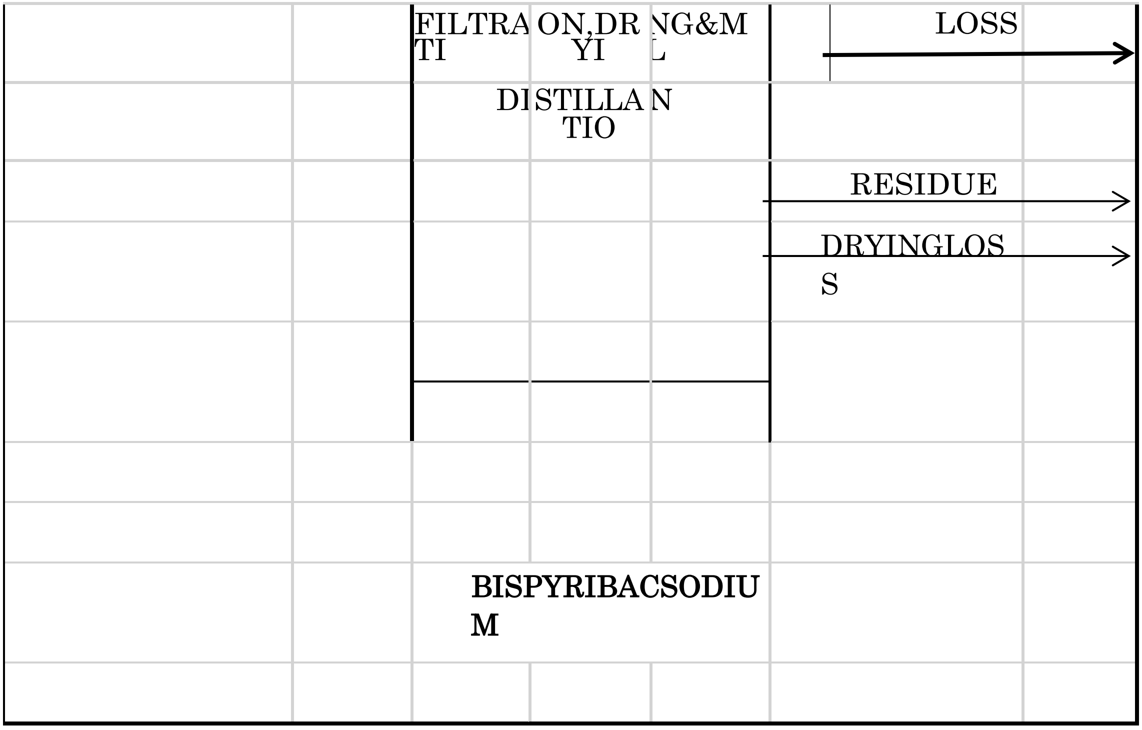
Step 3:-



	Material / Mass Balance of BISPYRIBAC-SODIUM All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2,6 DihydroxyBenzoic Acid	599		Bispyribac-Sodium	**1000**
2	Acetone	25040		Recovered Acetone	24063
3	$NaHCO_3$	1557		Acetone Loss	977
4	Dimethyl Sulphate (DMS)	958		Salt	3900
5	Water	1000		Aqueous Layer to ETP	5862
6	$NaHCO_3$ 10% Solution	1500		Recovered Methanol	2800
7	Water for Washing	800		Methanol Loss	200
8	Acetone for salt washing	1200		Distillation Residue	325
9	K_2CO_3	1868		Recovered IPA	12384
10	4,6 Dimethoxy 2-Methyl Sulfonyl Pyrimidine	1473		IPA Loss	516
11	Methanol	3000			
12	Iso Propyl Alcohol	11800			
13	NaOH Flakes	132			
14	IPA for Washing	1100			
	TOTAL	**52027**		**TOTAL**	**52027**

Process Flow Diagram:





9. **Penoxsulam:**

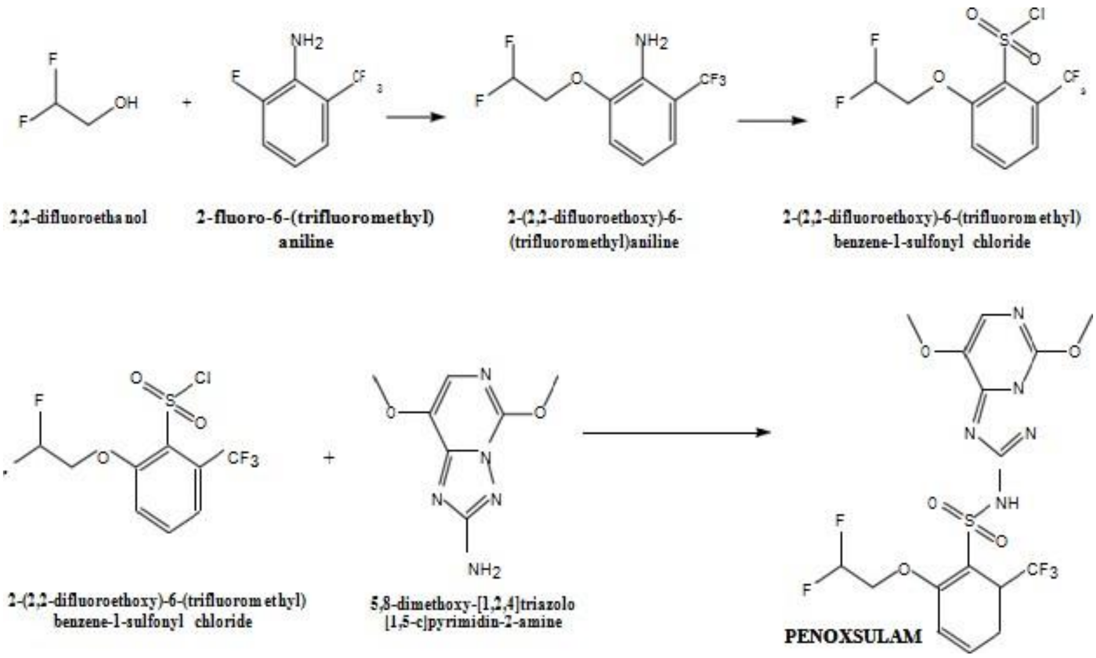
Manufacturing Process:

Charge2-fluoro-6-(trifluoromethyl)aniline(2FTFMA),catalyst sodium methoxide and solvent methanol. Rise to 50^{o}Candadd2, 2-difluoroethanol slowlyfor4hours.Rise to reflux and reflux for 3 hours. Distil out the mass to recover methanol and obtain 2-(2, 2-difluoroethoxy)-6-(trifluoromethyl)aniline (2-DFETFMA).

Charge water, hydrochloric acid and 2-DFETFMA. Cool to 0^{o}C and add sodium nitrite lot-wise. After 2 hours add sodium Sulphite solution at0^{o}C for 4 hours. Rise to 30^{o}Candmaintain for 3 hours. Add Dichloroethane and extract. Separate the aqueous phase. Distil out the organic phase to recover Dichloroethane partially.

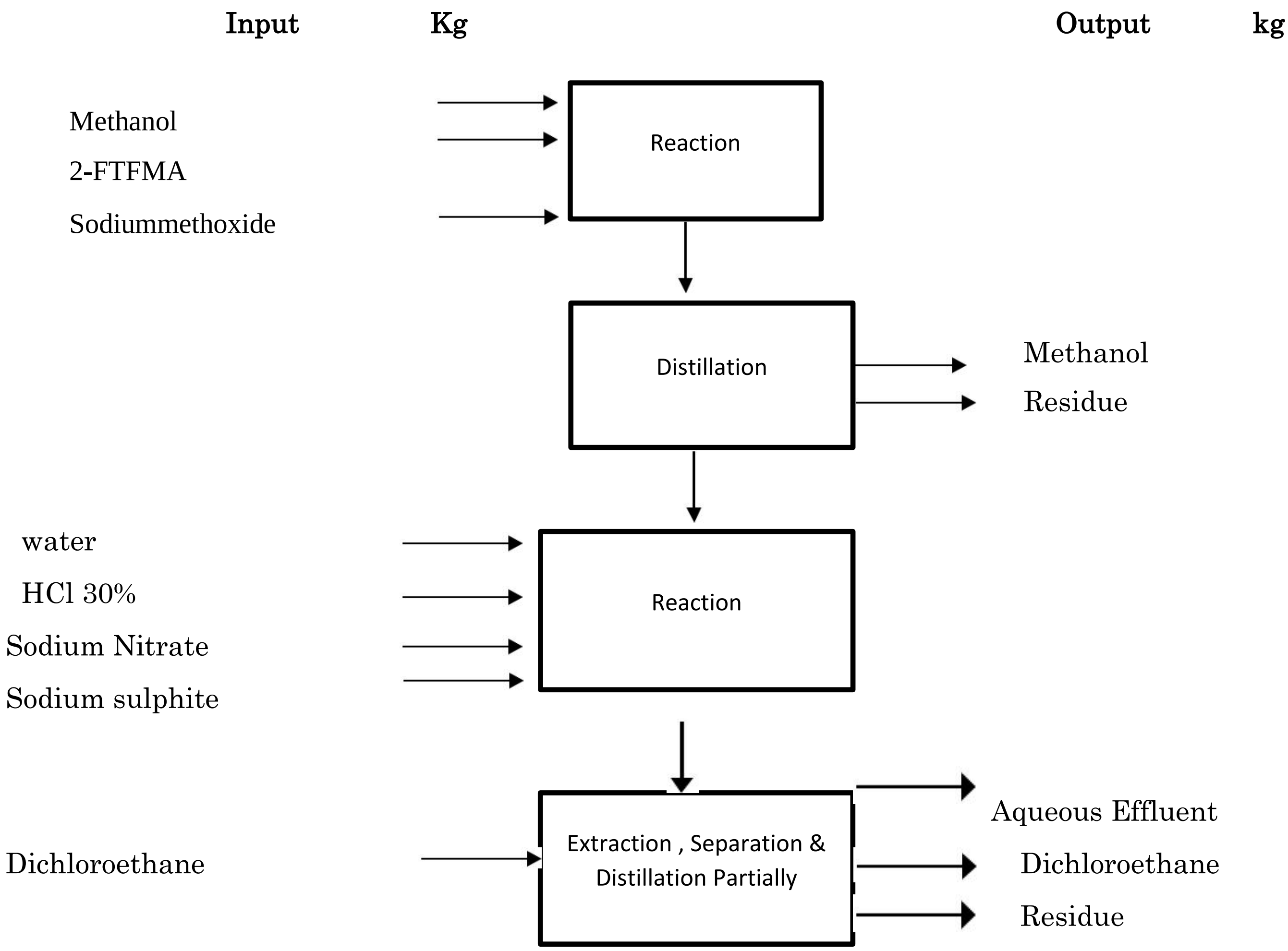
Add 5,8-dimethoxy-[1,2,4]-triazolo[1,5-c] pyrimidin-2-amine (5,8-DMTPA) slowly lot-wise at30^{o}C for 3 hours. Rise to reflux and reflux for 3 hours. Cool to 30^{o}C and add water. Separate the aqueous phase. Cool the organic phase to 0^{o}C and filter the slurry. Dry the wet cake to obtain Penoxsulam Technical.

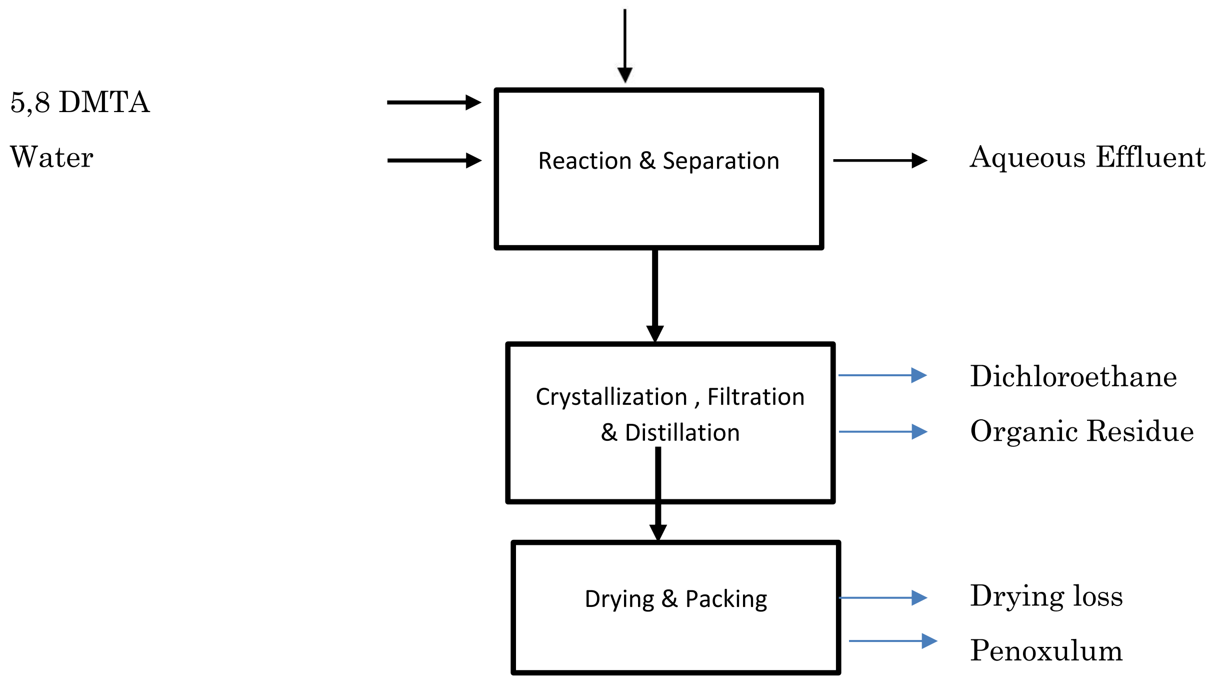
Chemical Reaction:



Flow Diagram

Penoxulam





Mass Balance:

	Material / Mass Balance of Penoxulam All Quantities are in kg)			
	IN – PUT		OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch	Product / By product	Kg/Batch
1	Methanol	2000	Methanol	1950
2	2-FTFMA	400	Residue	50
3	Sodium methoxide	12	Aqueous effluent	1672
4	water	1000	Dichloro ethane	500
5	HCl 30%	310	Residue	17
6	Sodium nitrite	175	Aqueous effluent	525
7	Sodium sulfite	415	Dichloroethane	2440
8	Dichloro ethane	3000	OrganicResidue	43
9	5,8 DMTPA	505	Dryingloss	120
10	water	500	**Penoxulam**	1000
	TOTAL	**8317**	**TOTAL**	**8317**

10. Glufosinate Ammonium:

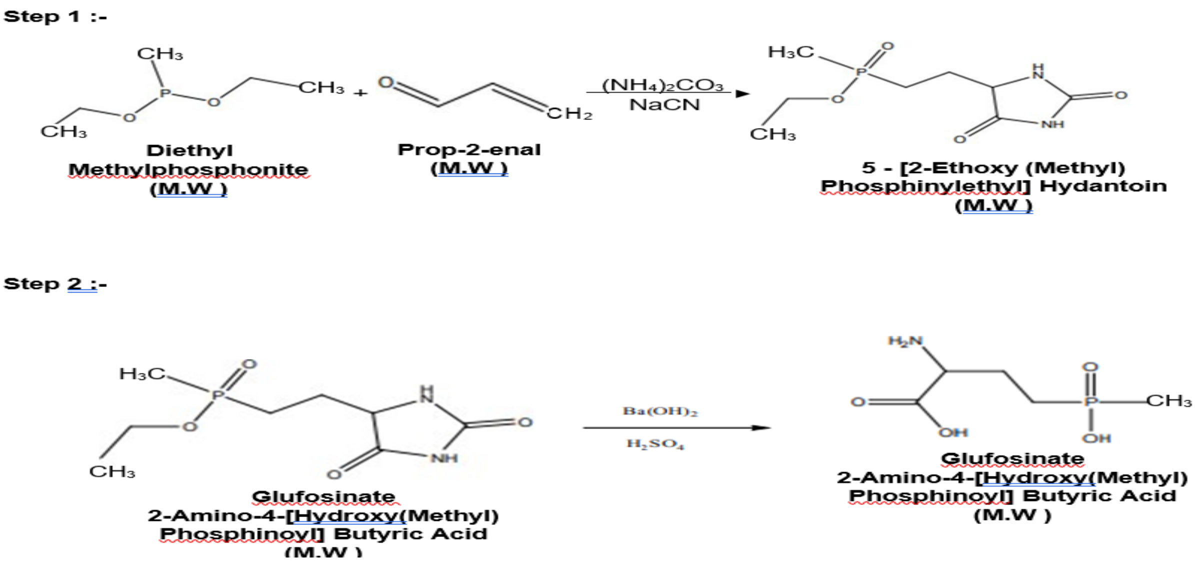
Brief Manufacturing Process:-

When Acrolein & Diethyl Methyl Phosphonate are reacted in Presence of Solvent Ethanol & reaction mass is stirred at room temperature for 1 hour. Then the resulting product is further under goes cyanation by reaction of Sodium Cyanide in presence of Ammonium Carbonate. Reaction mass is then kept for Reflux for 4 hours and filter. Solvent is the distilled out to get 5- [2-ethoxy(methyl) Phosphinylethyl) hydantoin. Then Barium Hydroxide and Water are charged. Temperature is the raised to 60oC and stir for 1 hour. Cool to room temperature and add 30% Sulfuric Acid to neutralize. Filter and wash with water.

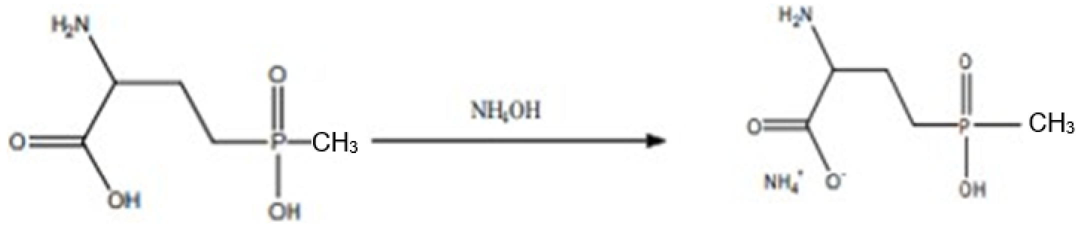
Charge the filtrate and add Ammonium Hydroxide to pH 12. Filter the slurry to obtain

Glufosinate Ammonium

Chemical Reactions:-



Step 3 :-



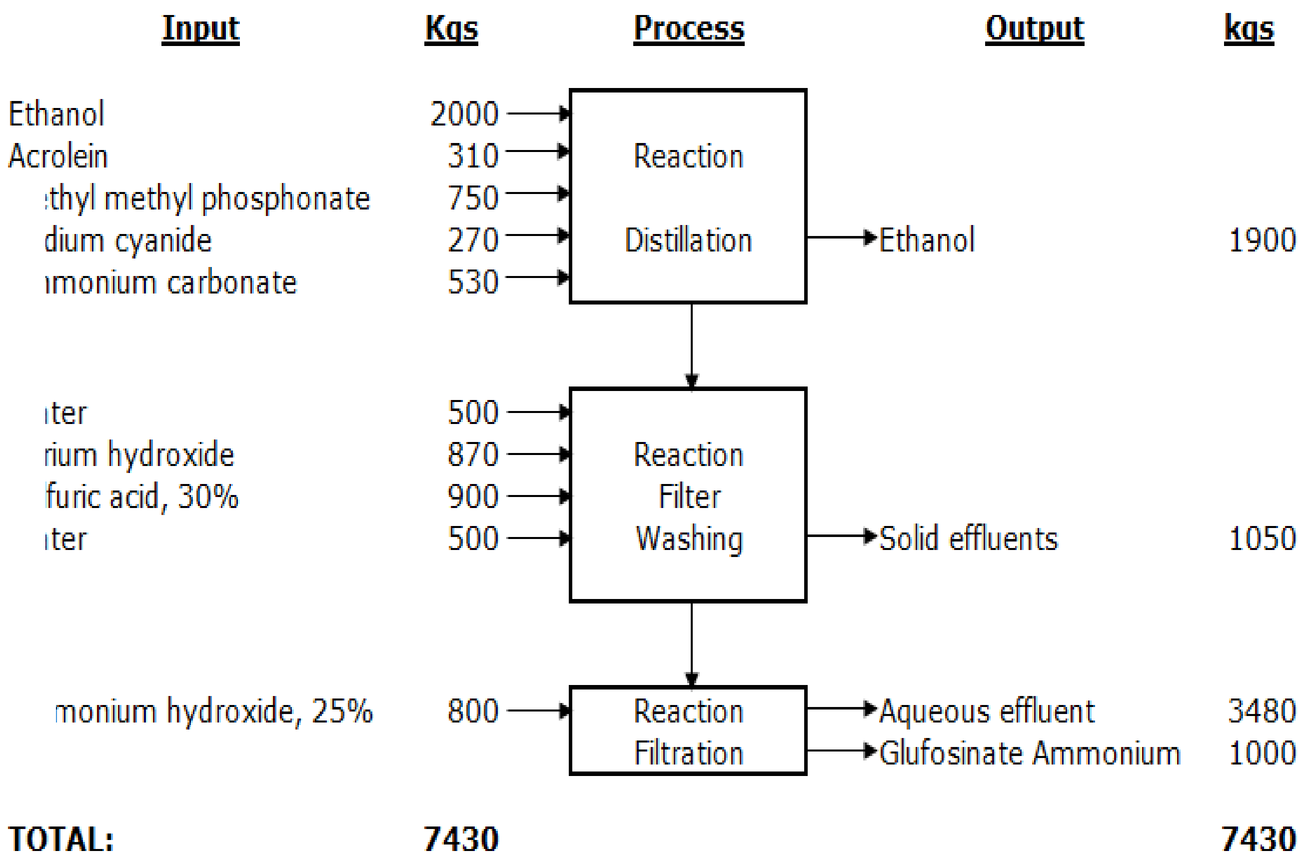
Glufosinate
2-Amino-4-[Hydroxy(Methyl) Phosphinoyl] Butyric Acid
(M.W)

Glufosinate Ammonium
2-Amino-4- [Hydroxy (Methyl) Phosphinoyl Butyric Acid Mono AmmoniumSalt
(M.W)

	Material / Mass Balance of GLUFOSINATE AMMONIUM All Quantities are in kg)			
	IN – PUT		OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch	Product / By product	Kg/Batch
1	Ethanol	2000	Glufosinate Ammonium	**1000**
2	Acrolein	310	Ethanol Recovered	1900
3	Diethyl Methyl Phosphonate	750	Ethanol Loss	100
4	Sodium Cyanide	270	Solid Effluents	1050
5	Ammonium Carbonate	530	Aqueous Effluent	3380
6	Water	1000		
7	Barium Hydroxide	870		
8	30% Sulfuric Acid	900		
9	Ammonium Hydroxide	800		
	TOTAL	**7430**	**TOTAL**	**7430**

Flow Diagram:

Mass balance of Glufosinate ammonium



11. **Glyphosate:**

Brief Manufacturing Process:-

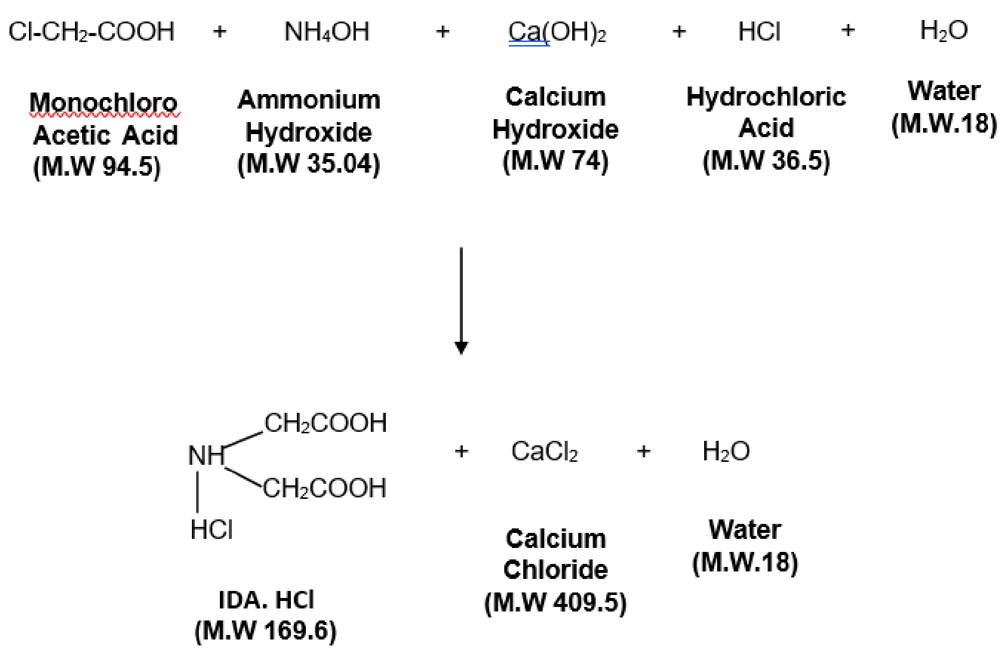
Step 1 :- Mono Chloro Acetic Acid is reacted with Ammonia in presence of Calcium Hydroxide forming Hydrochloric Acid Salt of Imino Di Acetic Acid (IDA) and carrying out the reaction at 45°C under atmospheric condition. Hydrochloric Acid (HCl) is mixed to make slurry of Imino Di Acetic Acid (IDA). IminoDiacetic Acid (IDA) if further reacted with Formaldehyde as well as Ortho Phosphorous Acid at elevated temperature to form an intermediate, Phosphono Methyl Amino DiaceticAcid(PMIDA).

Step 2 :- PMIDA is reacted with liquor Ammonia to convert it to Ammonium Salt of PMIDA, which on further undergoes oxidation reaction by molecular Oxygen in presence of Water as well as Catalyst as Activated Charcoal to give Ammonia Salt of Glyphosate.

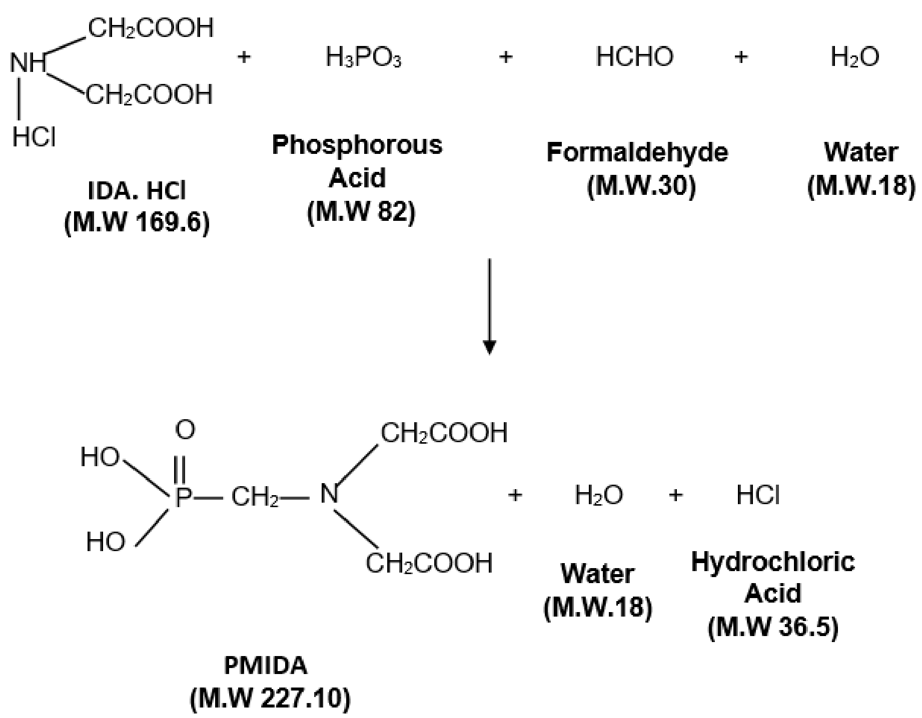
During the reaction Carbon Dioxide (CO_2) as well as Formaldehyde gases are generated which are scrubbed to Water as we as Caustic solution. The resulting Mass is acidified by Sulfuric Acid & Product is crystallised at low temperature at 5°C to get the final product Glyphosate Acid.

Chemical Reactions:-

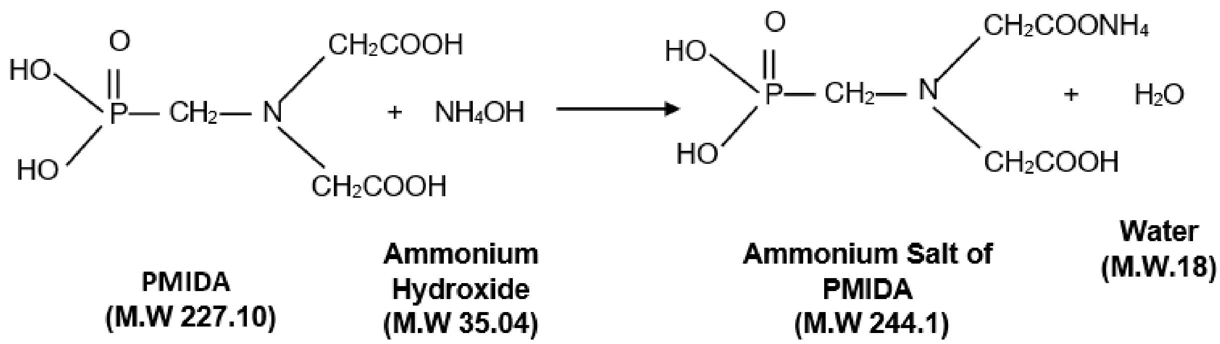
Step 1 :-



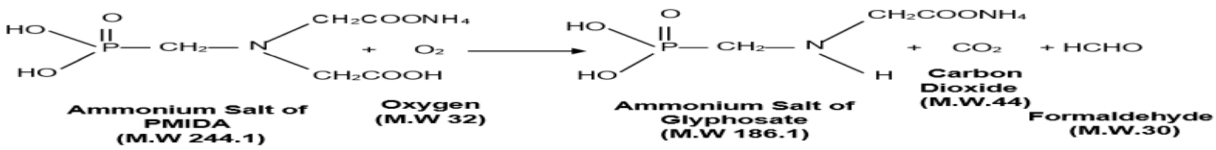
Step 1 (A) :-



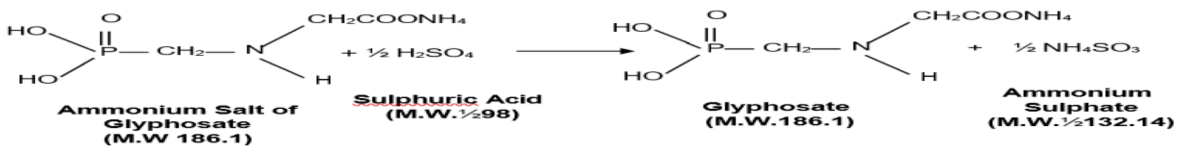
Step 2 :-



Step 2 (A) :-



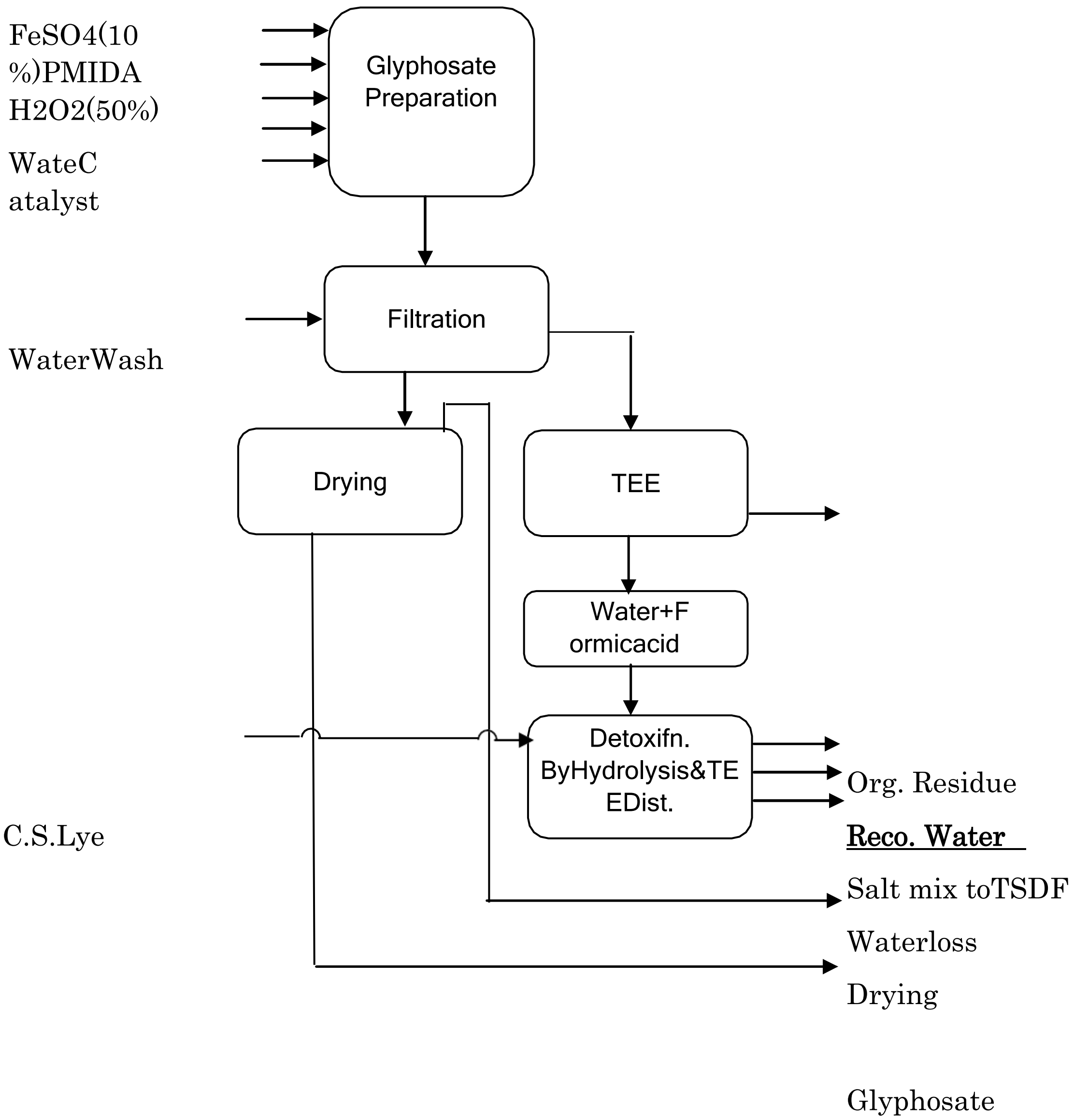
Step 2 (B) :-



	Material / Mass Balance of GLYPHOSATE All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Mono Chloro Acetic Acid	1332		Glyphosate	**1000**
2	20 % Ammonia Solution	120		34% Calcium Chloride Solution	2338
3	Calcium Chloride	522		Evaporation Loss	18
4	Hydrochloric Acid (HCl)	257		Aqueous Layer to ETP	2128
5	Water for Process	3324		Water Evaporated & Recycled	2784
6	Water for CaCl2 Dilution	1816			
7	Ortho Phosphoric Acid	558		CO2 Gas	310
8	37 % Formaldehyde Solution	211		HCHO	211

9	30 % HCl Solution	1410		Catalyst Recovered as wet Cake	50
10	Activated Charcoal	50		Excess Oxygen to Air	33
11	Oxygen Gas	113		Mother Liquor to ETP	1150
12	Sulphuric Acid	345		Drying Loss	36
	TOTAL	**10058**		**TOTAL**	**10058**

Flow diagram Glyphosate



12. Clethodim :-

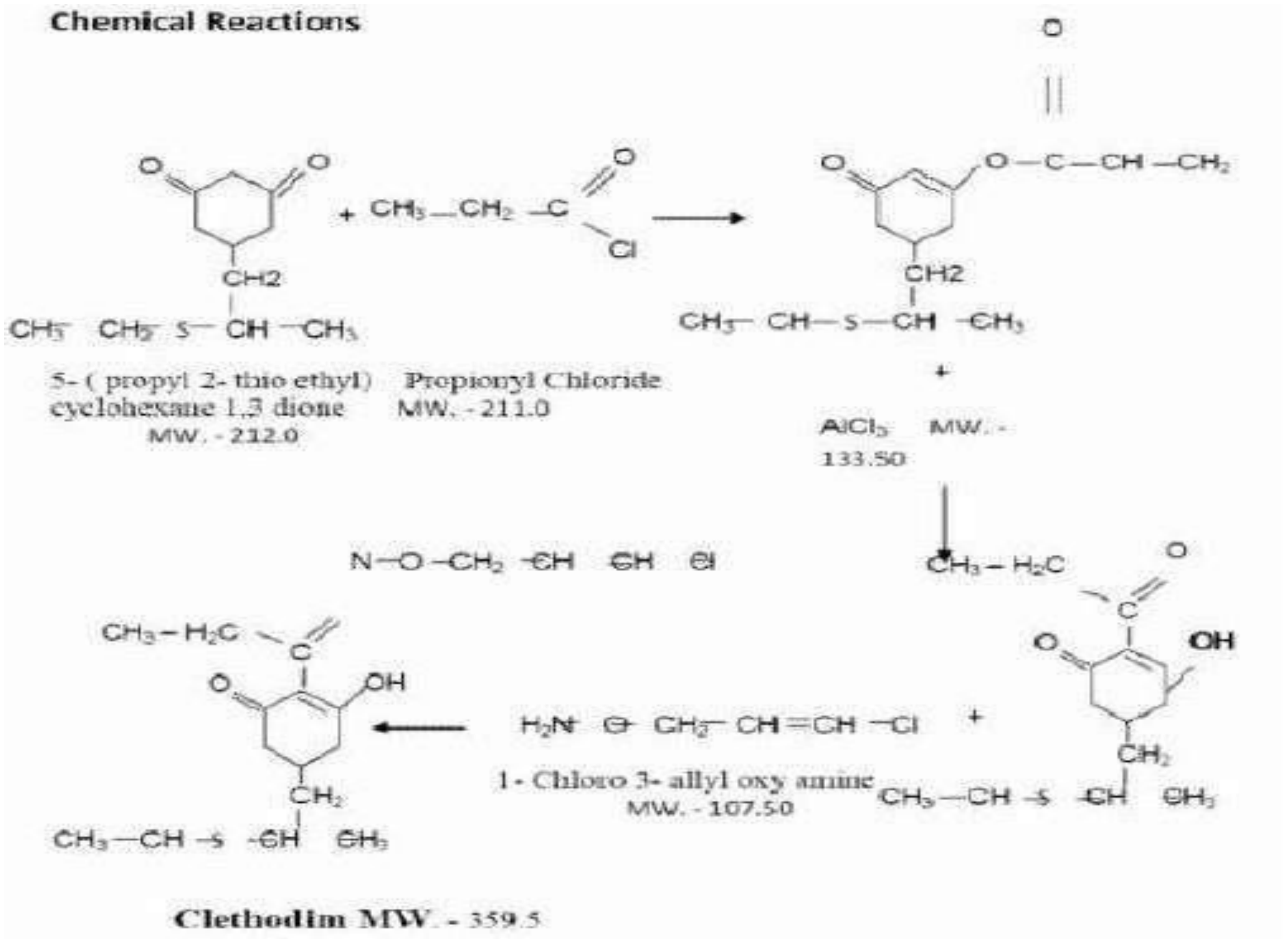
Brief Manufacturing Process :-

Step 1 :- 5-(Propyl-2-Thio Ethyl) Cyclohexane 1,3-Dione is reacted with Propionyl Chloride to form the Intermediate-1.

Step 2 : - Intermediate-1 undergoes Isomerization in presence of Aluminum Chloride gives the Intermediate-2.

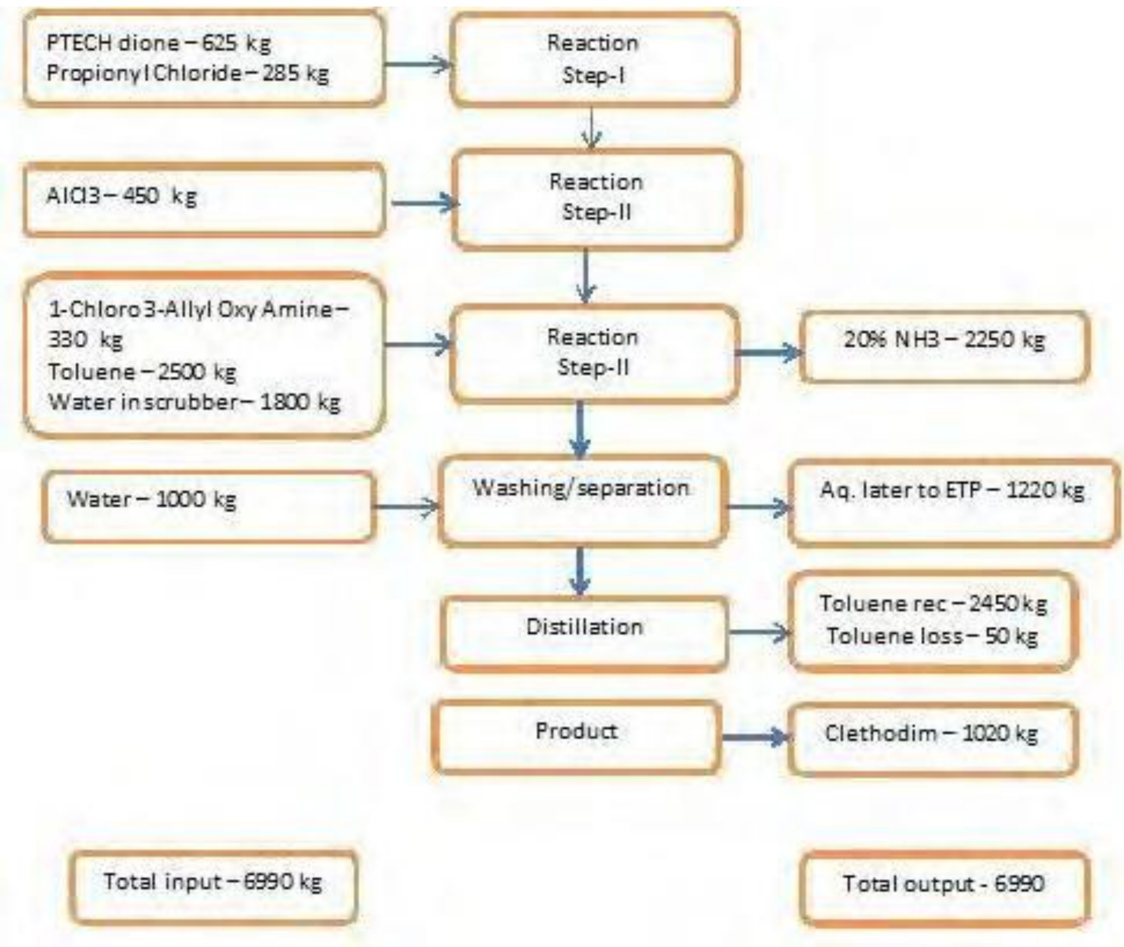
Step 3:-Intermediate-2 is reacted with 1-Chloro-3-allyl Oxy Amine in presence of Solvent. This reaction gives out the final product Clethodim.

Chemical Reactions :-



	Material / Mass Balance of CLETHODIM All Quantities are in kg)				
	INPUT			OUT PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	5- Propyl 2- Thio Ethyl Cyclohexane 1,3 Dione	625		Clethodim	**1000**
2	Propionyl Chloride	285		Recovered Toluene	2450
3	Aluminium Chloride (Anhydrous)	450		Toluene Loss	50
4	1- Chloro 3-Allyl Oxy Amine	330		20 % Aluminium Solution for Sale to Actual User	2250
5	Solvent - Toluene	2500		Aq. Washings to ETP	1240
6	Water	2800			
	TOTAL	**6990**		**TOTAL**	**6990**

Flow Diagram of Clethodim



13. Pendimethalin:-

Brief Manufacturing Process:-

Step 1 :- Hydrogenation

In an autoclave reactor system 4-Nitro Ortho Xylene, diethyl ketone, pt/C (as catalyst) and naphthalene-2-sulfonic acid (as promoter) were charged. Temperature was raised to 70-72

°C. Hydrogen gas pressure (4 kgs) was applied to the autoclave reactor system. After completion of reaction, mass was filtered and subjected for separation. Recover diethyl ketone. N-alkylated Xylidine (NAX) intermediate thus obtained is used in 2nd step.

Step 2 :- Nitration

First prepare mixed acid with nitric acid, sulfuric acid and water in a reactor. Prepare a mixture of NAX with EDC solvent. Add slowly this mixture in mixed acid at 40 °C. Maintain thistemperatureforfewhours.Checksampleforcompletionofreaction.Aftercompletionofreactio n stopagitationandsettleitfor6hrs.Separatespentacidfromthebottomlayer.Givewaterwash to organic mass and again separate water layer from organic layer. Aq. Ml thus obtained will be acidic in nature.

Step 3 :- Denitrosation

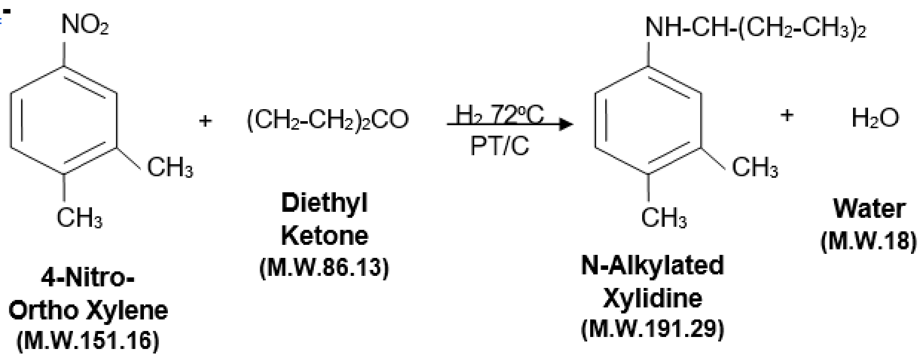
Charge organic mass into the glass line reactor and add acetone and 30% hydrochloric acid. Raise the temperature to 70 °C and maintain temperature about 70° C for 6 hr sza check sample for completion of reaction. After completion of reaction separate organic layer from aq. layer. Give sodium hydroxide wash to the organic layer. Distilled this organic mass to recover EDC at atmospheric and under vacuum. Final product thus obtained is Pendimethalin.

Step 4 :- Purification

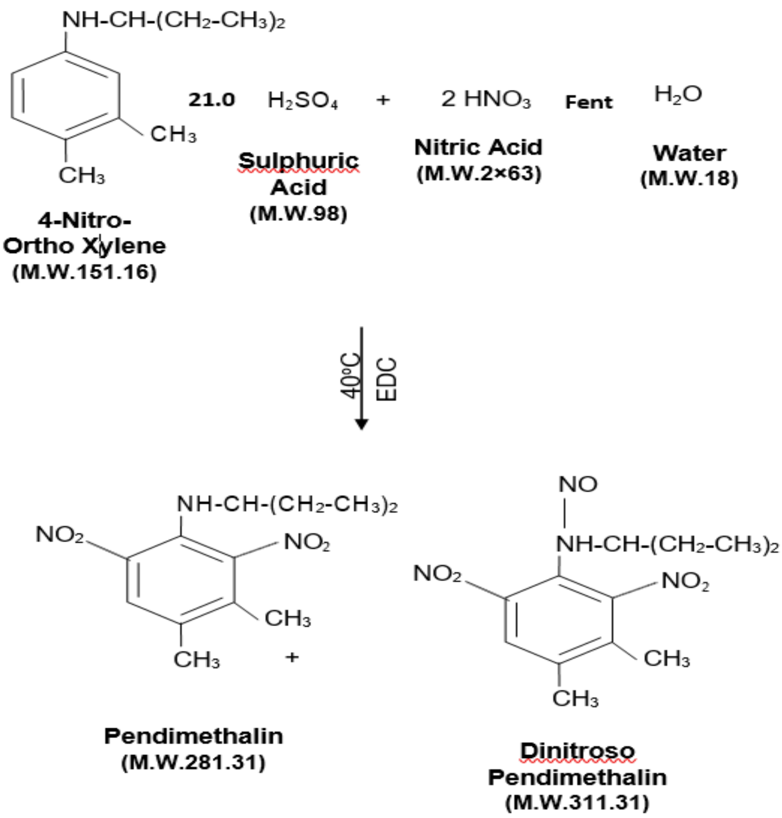
Pendimethalin thus obtained from step-3 is taken into a reactor and n-hexane is charged. The reaction mass is than heated to reflux at 68 –70 °C for few hours. Hexane is recovered (distilled off) to produce pure Pendimethalin of desired specification.

Chemical Reactions :-

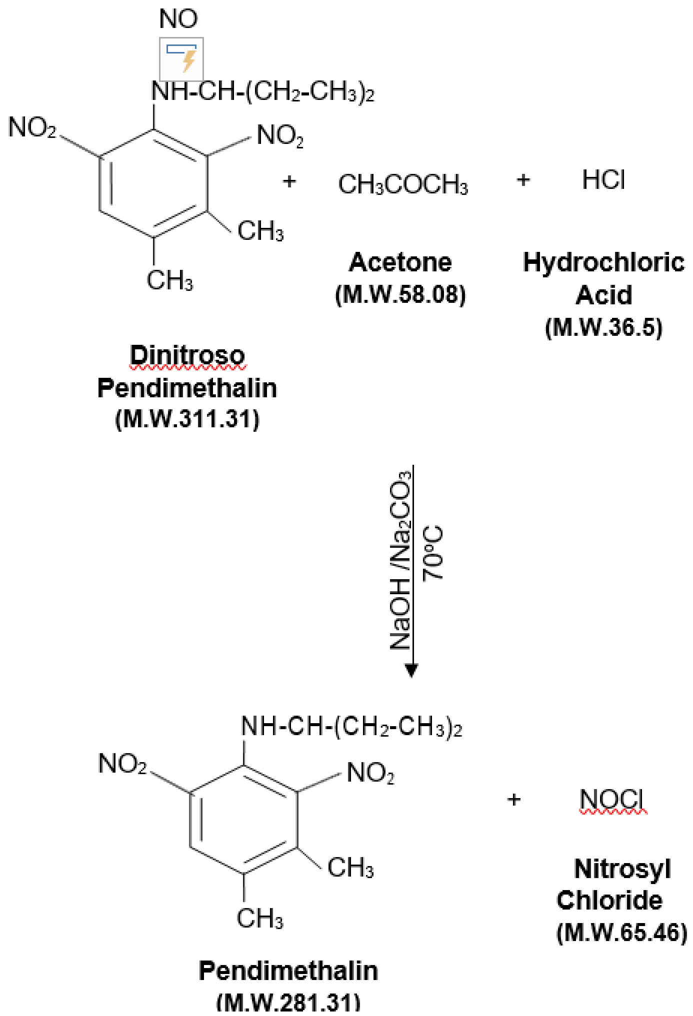
Step 1 :-



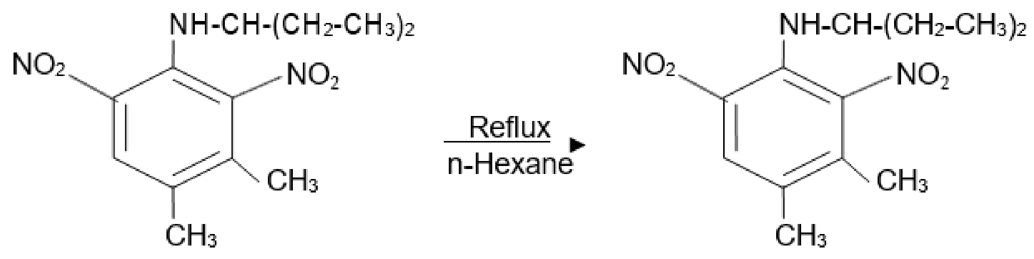
Step 2 :-


NH-CH-(CH2-CH3)2
CH3
CH3
4-Nitro-
Ortho Xylene
(M.W.151.16)
21.0
H2SO4
+
2 HNO3
Fent
H2O
Sulphuric
Acid
(M.W.98)
Nitric Acid
(M.W.2×63)
Water
(M.W.18)
40°C
EDC
NH-CH-(CH2-CH3)2
NO2
NO2
CH3
CH3
+
Pendimethalin
(M.W.281.31)
NO
NH-CH-(CH2-CH3)2
NO2
NO2
CH3
CH3
Dinitroso
Pendimethalin
(M.W.311.31)

Step 3 :-


NO
NH-CH-(CH2-CH3)2
NO2
NO2
CH3
CH3
+
CH3COCH3
+
HCl
Dinitroso
Pendimethalin
(M.W.311.31)
Acetone
(M.W.58.08)
Hydrochloric
Acid
(M.W.36.5)
NaOH /Na2CO3
70°C
NH-CH-(CH2-CH3)2
NO2
NO2
CH3
CH3
+
NOCl
Pendimethalin
(M.W.281.31)
Nitrosyl
Chloride
(M.W.65.46)

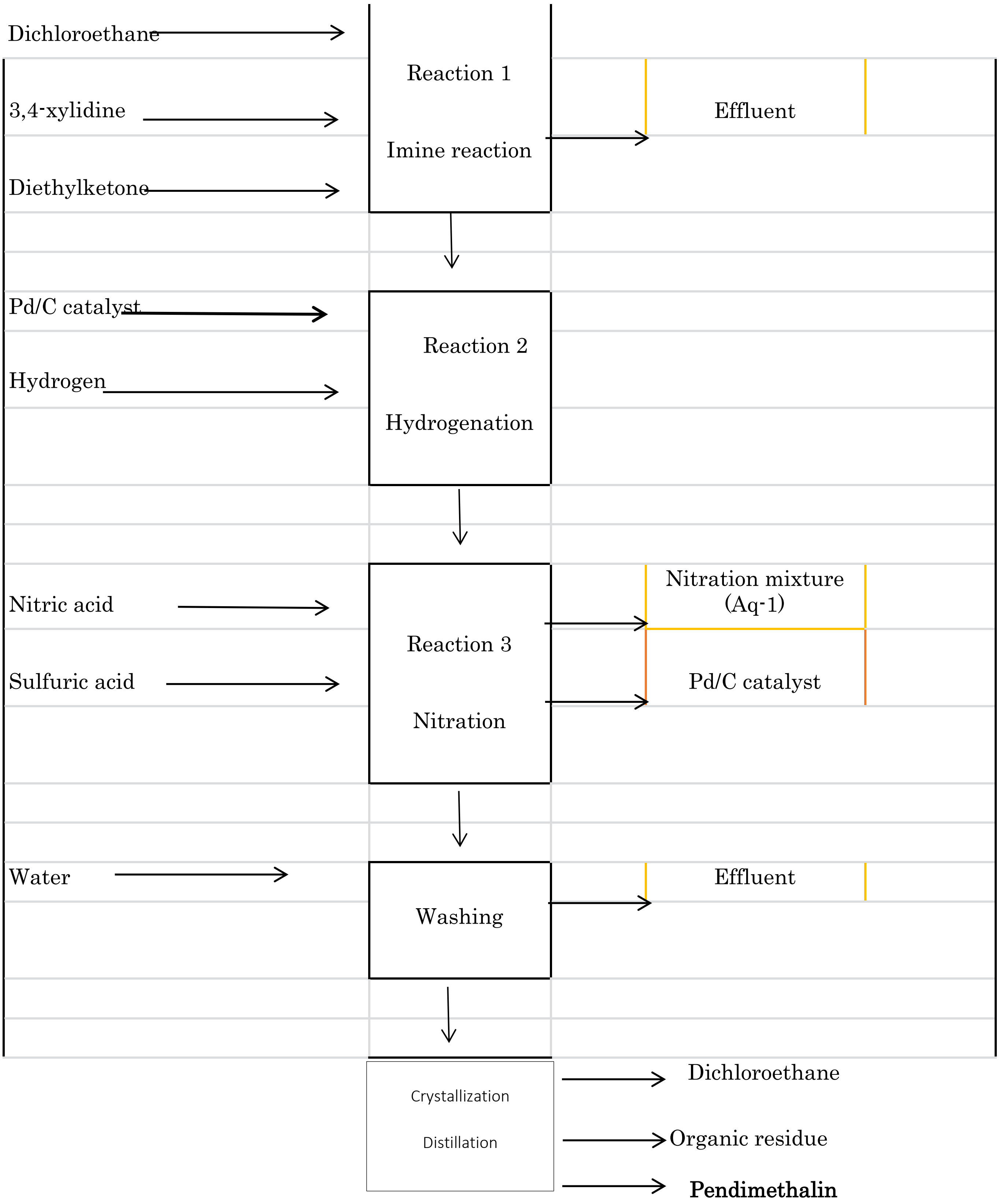
Step 4 :-



Pendimethalin **(M.W.281.31)** → **Pendimethalin** **(M.W.281.31)**

	Material / Mass Balance of PENDIMETHALIN All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	4- Nitro Ortho Xylene	580		Pendimethalin	**1000**
2	Diethyl Ketone	360		Reaction water	210
3	Hydrogen gas	40		EDC Loss	100
4	Nitric Acid	1010		EDC Recovered	1900
5	Sulfuric acid	710		Spent Sulfuric acid (45%)	1500
6	Ethylene Dichloride	2000		Aqueous Effluent	1980
7	HCl	190		O-Xylene Loss	45
8	Acetone	52		O-Xylene Recovered	955
9	Caustic	20		Organic Impurities	72
10	Ortho-Xylene	1000			
11	Water	1800			
	TOTAL	**7762**		**TOTAL**	**7762**

Flow Diagram of PENDIMETHALIN:



14. Pretilachlor:-

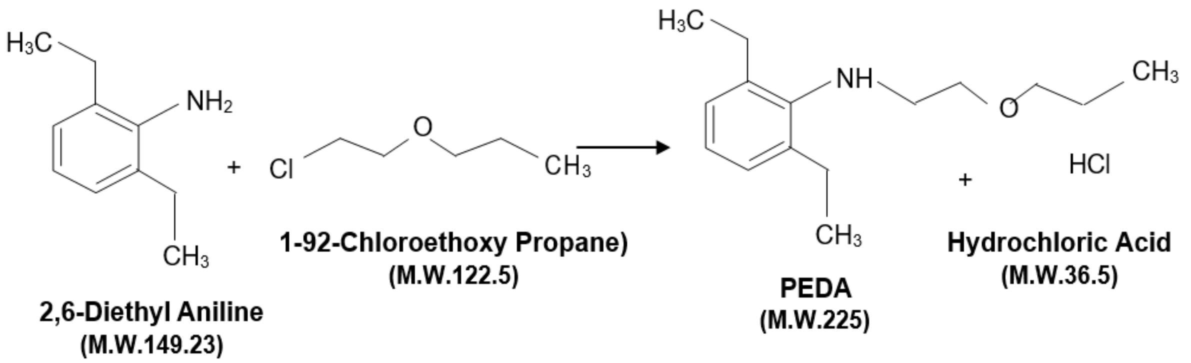
Brief Manufacturing Process :-

Step 1 : - 2,6 Diethyl Aniline (DEA) is reacted with Chloro Propoxy Ethane to give intermediate N Propoxy ethyl 2,6 Diethyl aniline hydrochloride at 130° C. After reaction, reaction mass is neutralized with caustic at room temperature up to pH 7.0 Aqueous layer containing NaCl is separated out and organic layer PEDA.

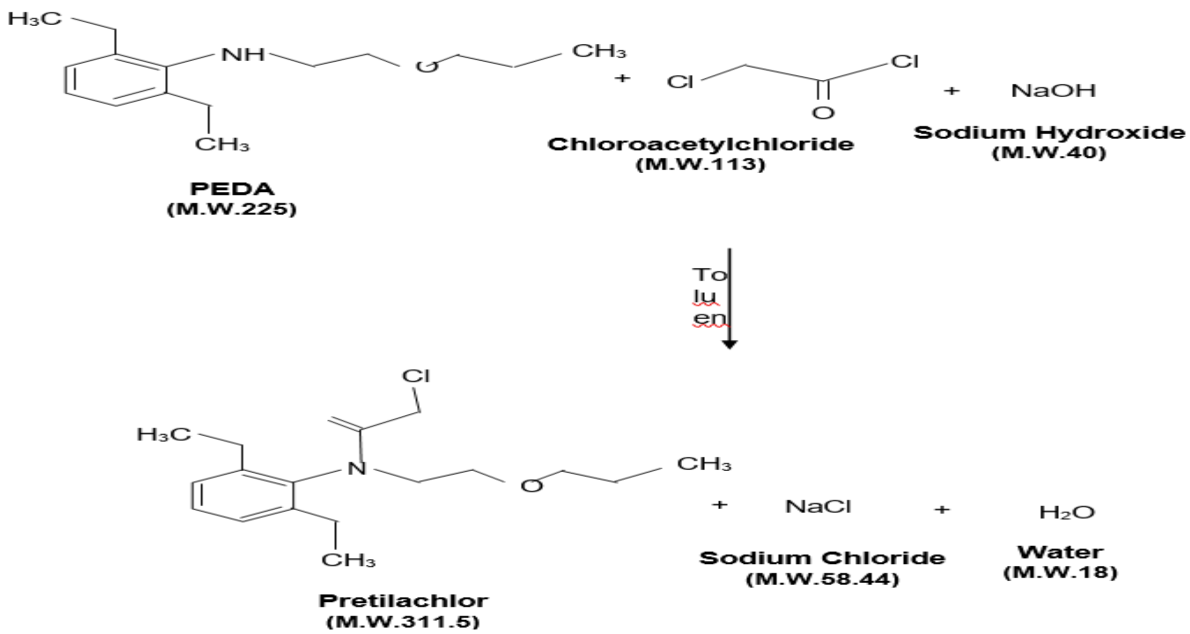
Step 2 :- PEDA is reacted with chloro acetyl chloride in presence of solvent Toluene at 60° C temperature. After the reaction, reaction mass is neutralized with Sodium Hydroxide. The Aqueous layer is separated and organic layeris taken for concentration.

Chemical Reactions :-

Step 1 :-

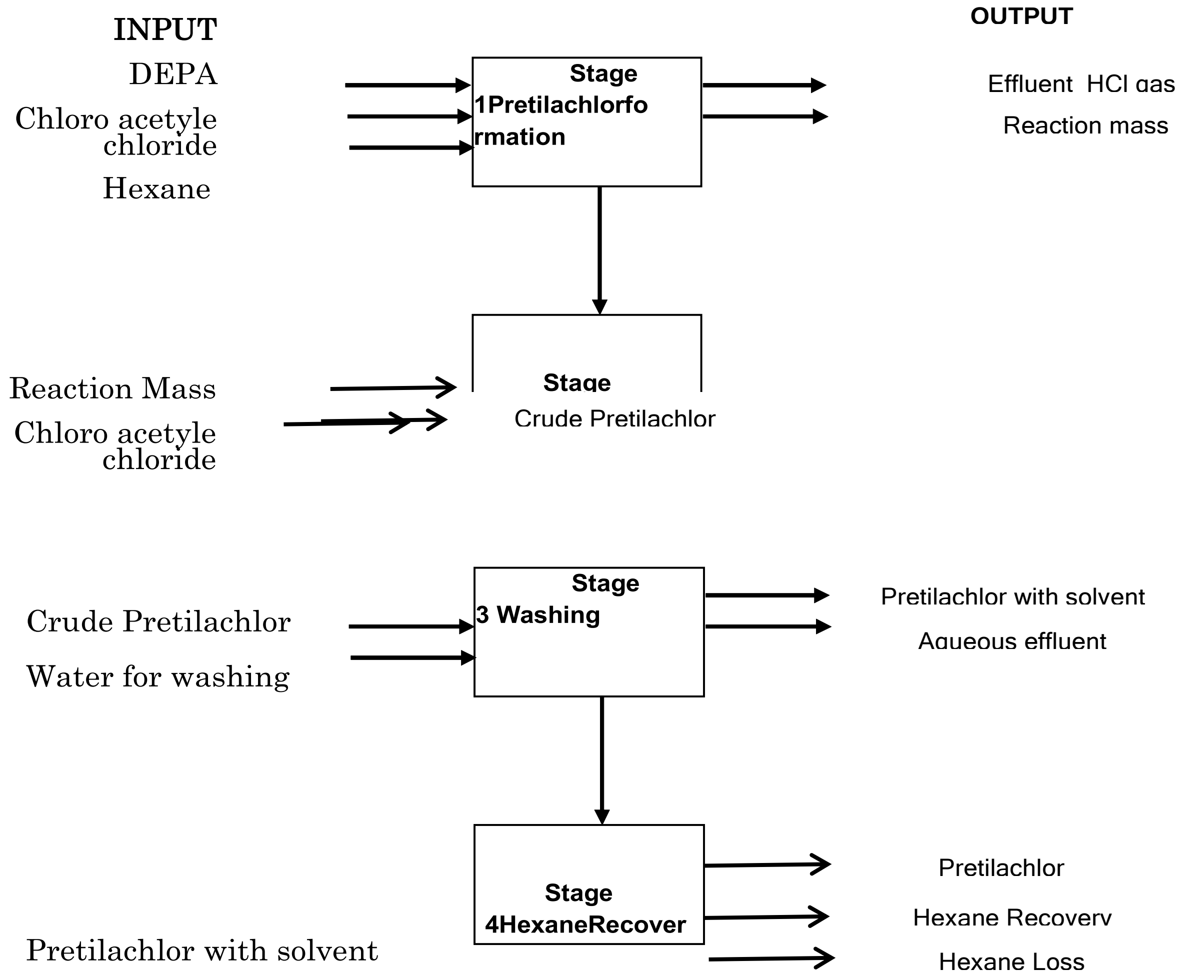


Step 2 :-



	Material / Mass Balance of PRETILACHLOR All Quantities are in kg)				
	INPUT			OUTPUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2,6 Diethyl Aniline (2,6-DEA)	575		Pretilachlor	**1000**
2	1-(2-Chloro Ethoxy) Propane	471		Hydrogen Chloride	117
3	Chloroacetyl Chloride	435		Sodium Chloride	188
4	Sodium Hydroxide	154		Water formed in reaction	58
5	Water	3600		Toluene Recovered	2572
6	Toluene	2640		Toluene Loss	8
7				Toluene to Wastewater	5
8				Toluene in Residue	55
9				2,6 Diethyl Aniline (DEA)	96
10				1-(2-Chloro Ethoxy) Propane	78
11				Chloroacetyl Chloride	73
12				Sodium Hydroxide	25
13				Water	3600
	Total	**7875**		**Total**	**7875**

Flow diagram



15. Clodinafop & Clodinafop Propargyl:

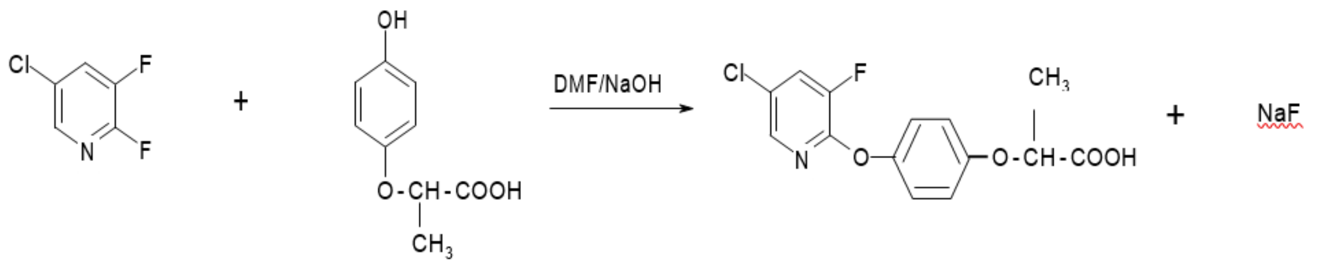
Brief Manufacturing Process:-

Step 1 :- 2,3 – Di Fluoro -5 - Chloro Pyridine is reacted with 2 - (4- Hydroxy Phenoxy) Propionic Acid in presence of Solvent - Di Methyl Formamide (DMF) and Sodium Hydroxide to form 2- [-4 – {(5 Chloro -3- Fluoro -2- Pyridinyl) Oxy} Phenoxy] Propionic Acid.

Step 2 : - 2- [-4 – {(5 Chloro -3- Fluoro -2- Pyridinyl) Oxy} Phenoxy] Propionic Acid is reacted with Propargyl chloride in Presence of Sodium Hydroxide as well as Solvent -Toluene to form final product as Clodinafop**Propargyl.**

Chemical Reactions:-

Step 1 :-



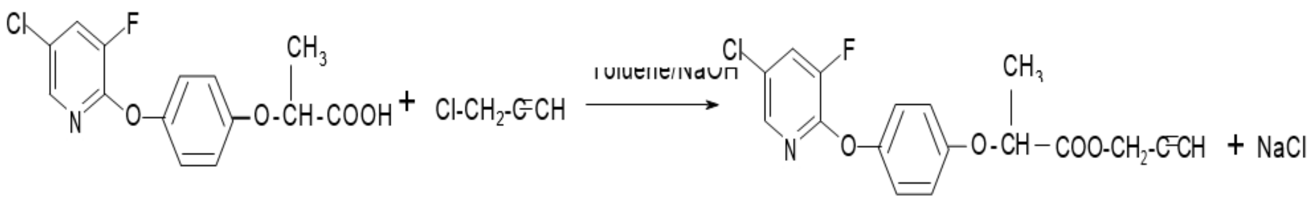
2,3-Difluoro-5-Chloro Pyridine — M.Wt=149.00

2-(4-Hydroxy Phenoxy) Propionic Acid — M.Wt=182.00

2-[4-[(5-Chloro-3-Fluoro-2-Pyridinyl) oxy] Phenoxy]Propanoic Acid — M.Wt=311.50

Sodium Fluoride — M. Wt=42.00

Step 2 :-



2-[4-[(5-Chloro-3-Fluoro-2-Pyridinyl)oxy] Phenoxy]Propanoic Acid — M.Wt=311.50

Propargyl Chloride — M.Wt=74.5

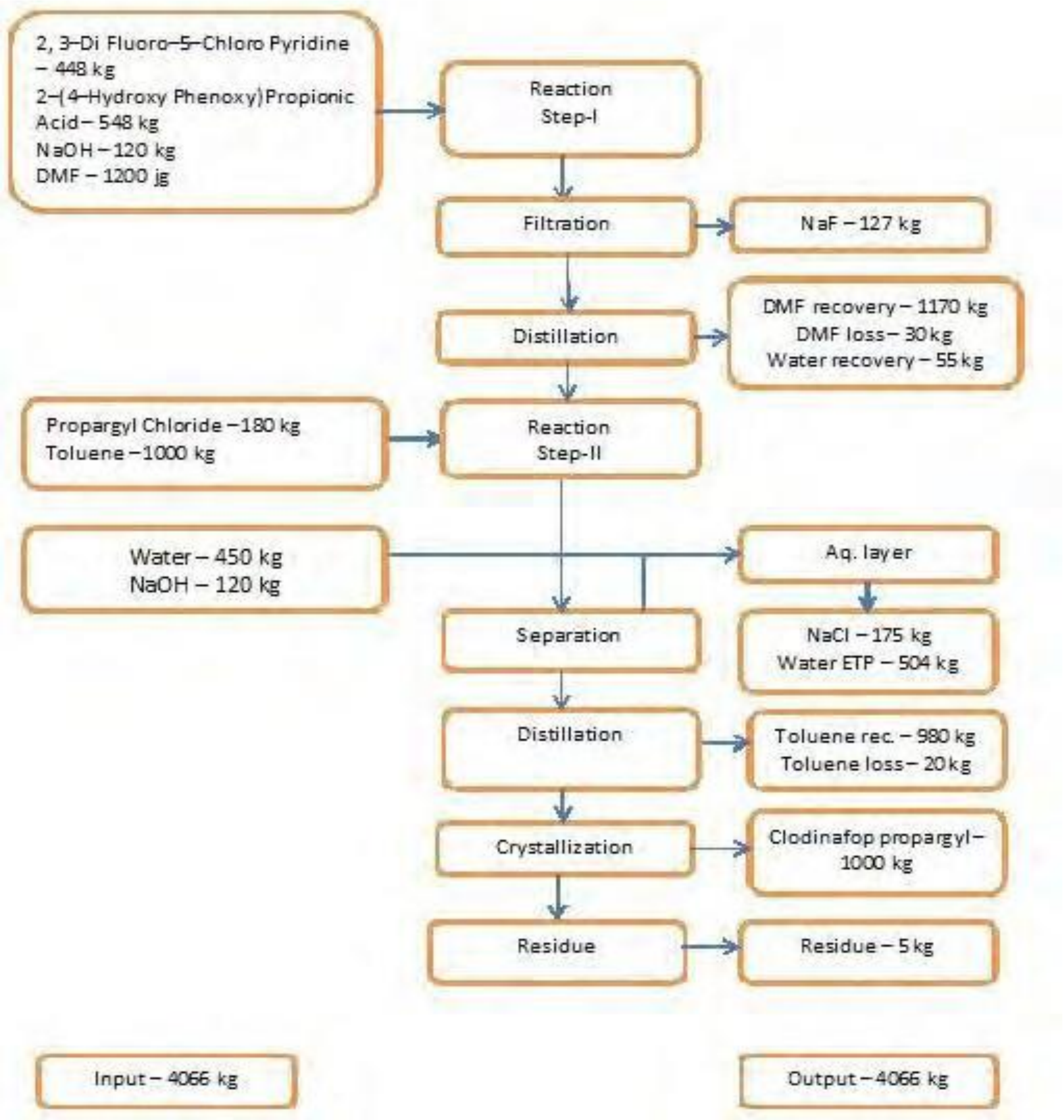
Clodinafop Propargyl — M.Wt=349.00

Sodium Chloride — M.Wt=58.5

	Material / Mass Balance of Clodinafop&Clodinafop Propargyl (All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2,3-Di Fluoro -5-Chloro Pyridine	448		Clodinafop	**1000**
2	2- (4- Hydroxy Phenoxy) Propionic Acid	548		Recovered Solvent – DMF	1165
3	Sodium Hydroxide	240		Solvent Loss (DMF)	35
4	Solvent -Di Methyl Formamide (DMF)	1200		Sodium Chloride	180
5	Propargyl Chloride	180		Sodium Fluoride	128
6	Solvent – Toluene	1000		Recovered Solvent – Toluene	980
7	Water	450		Solvent loss (Toluene)	20
8				Aqueous Layer to ETP	537
9				Distillation Residue	21

	TOTAL	4066		TOTAL	4066

Flow Diagram:



16. Quizalofop Ethyl:

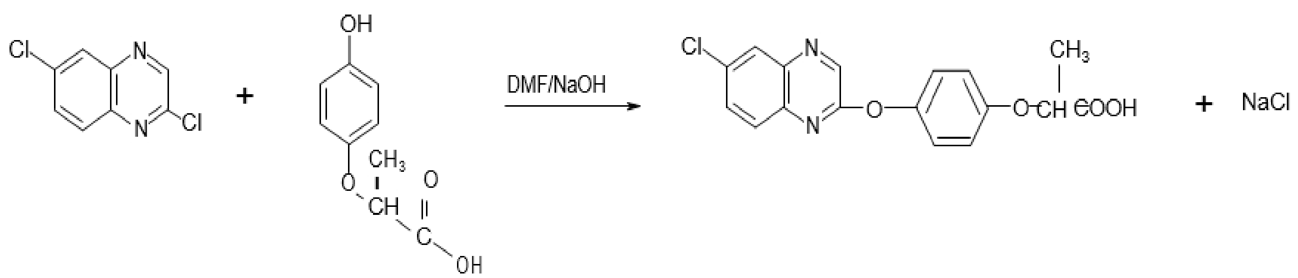
Brief Manufacturing Process:-

Step 1 :- 2 ,6 - Dichloro Quinoxaline is reacted with 2- (4- Hydroxy Phenoxy) Propionic Acid in presence of Sodium Hydroxide as well as Solvent - Di Methyl Formamide (DMF) to form 2 – [4 – {(6- Chloro 2 – Quinoxalinyl) Oxy} Phenoxy] Propionic Acid.

Step 2 :- 2 ,6 - Dichloro Quinoxaline is reacted with 2- (4- Hydroxy Phenoxy) Propionic Acid in presence of Sodium Hydroxide as well as Solvent - Di Methyl Formamide (DMF) to form 2 – [4 – {(6- Chloro 2 – Quinoxalinyl) Oxy} Phenoxy] Propionic Acid.

Chemical Reactions:-

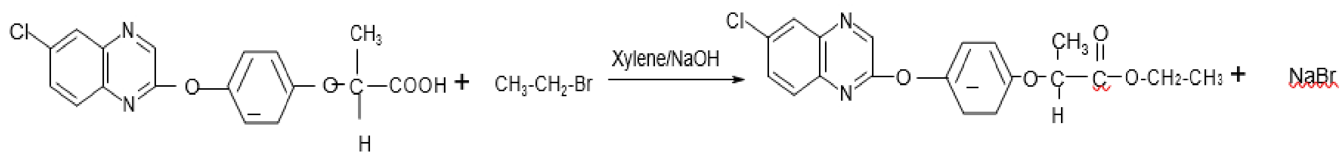
Step 1 :-



2,6-Dichloro Quinoxaline | 2-(4-Hydroxy Phenoxy) Propionic Acid | 2-[4-[(6-Chloro-2-Quinoxylinal)Oxy] Phenoxy]Propanoic Acid | Sodium Chloride

M.Wt=199.00 | M.Wt=182.00 | M.Wt=344.50 | M.Wt=58.50

Step 2 :-

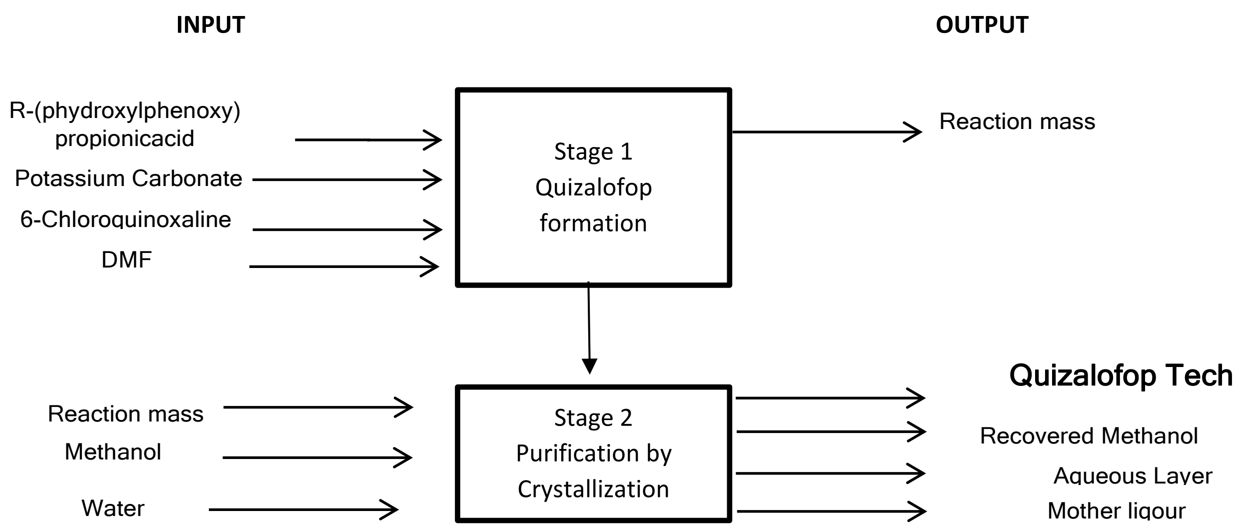


2-[4-[(6-Chloro-2-Quinoxylinal)Oxy] Phenoxy]Propionic Acid | Ethyl Bromide | Quizalofop-Ethyl | Sodium Bromide

M.Wt=344.50 | M.Wt= 109.00 | M.Wt=372.50 | M.Wt=103.00

	Material / Mass Balance of QUIZALOFOP ETHYL All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2,6 –Dichlor Quinoxaline	580		Quizalofop	**1000**
2	2- (4 – Hydroxy Phenoxy) Propionic Acid	525		Recovered Solvent - DMF	1070
3	Sodium Hydroxide	230		Solvent Loss - DMF	30
4	Solvent – Di Methyl Formamide	1100		Sodium Chloride	180
5	Ethyl Bromide	311		Sodium Bromide	305
6	Solvent – Xylene	1000		Recovered Solvent - Xylene	975
7	Water	624		Solvent loss - Xylene	25
8				Aqueous Layer to ETP	767
9				Distillation Residue	18
	TOTAL	**4370**		**TOTAL**	**4370**

Flow Diagram of QUIZALOFOP ETHYL :



17. Fenoxaprop P Ethyl:

Brief Manufacturing Process:-

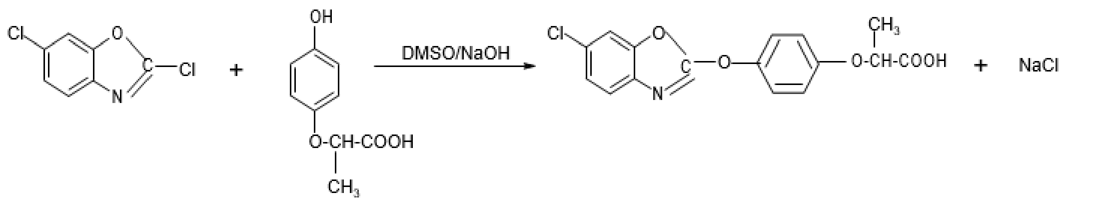
Step 1 :- 2,6 - Dichloro Benzoxazole is reacted with 2- (4- Hydroxy Phenoxy) Propionic Acid in presence of Sodium Hydroxide as well as Solvent – Di Methyl Sulfoxide (DMSO) to form 2 – [4 - (6 – Chloro -2- Benzoxazole) Phenoxy] Propionic Acid.

Step 2 :- 2 – [4 - (6 – Chloro -2- Benzoxazole) Phenoxy] Propionic Acid undergoes chlorination by Thionyl Chloride in presence of Solvent – Toluene to form 2- [4 - (6 – Chloro -2- Benzoxazole) Phenoxy] Propionic Acid Chloride.

Step 3 :- 2 – [4 - (6 – Chloro -2- Benzoxazole) Phenoxy] Propionic Acid Chloride is finally reacted with Sodium Ethoxide in presence of Solvent – Toluene to form the Final Product as Fenoxaprop P Ethyl.

Chemical Reactions :-

Step 1 :-



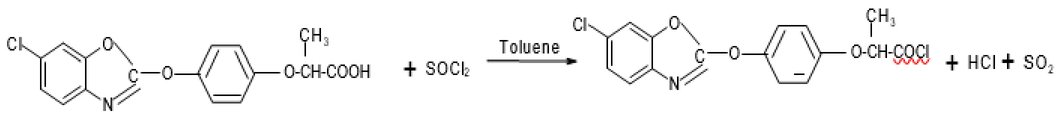
2,6-Dichloro Benzoxazole M.Wt=188.00

2-(4-Hydroxy Phenoxy) Propionic Acid M.Wt=182

2-[4-(6-Chloro-2-Benzoxazolyl)Phenoxy]PropionicAcid M.Wt=333.50

Sodium Chloride M.Wt=58.50

Step 2 :-



2-[4-(6-Chloro-2-Benzoxazolyl)Phenoxy]Propionic Acid M.Wt=333.50

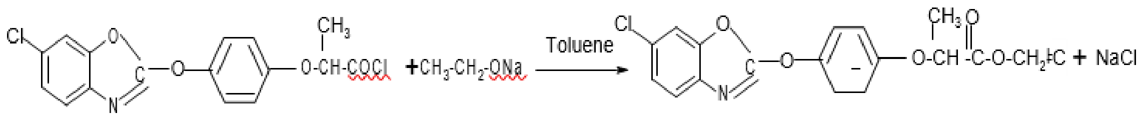
Thionyl Chloride M.Wt=119.00

2-[4-(6-Chloro-2-Benzoxazolyl)Phenoxy] Propinyl Chloride M.Wt=352.00

Hydrochloric Acid M.Wt=36.50

Sulphuric Acid M.Wt=64

Step 3 :-



2-[4-(6-Chloro-2-Benzoxazolyl)Phenoxy] Propinyl Chloride M.Wt=352.00

Sodium salt of Ethanol M.Wt=68

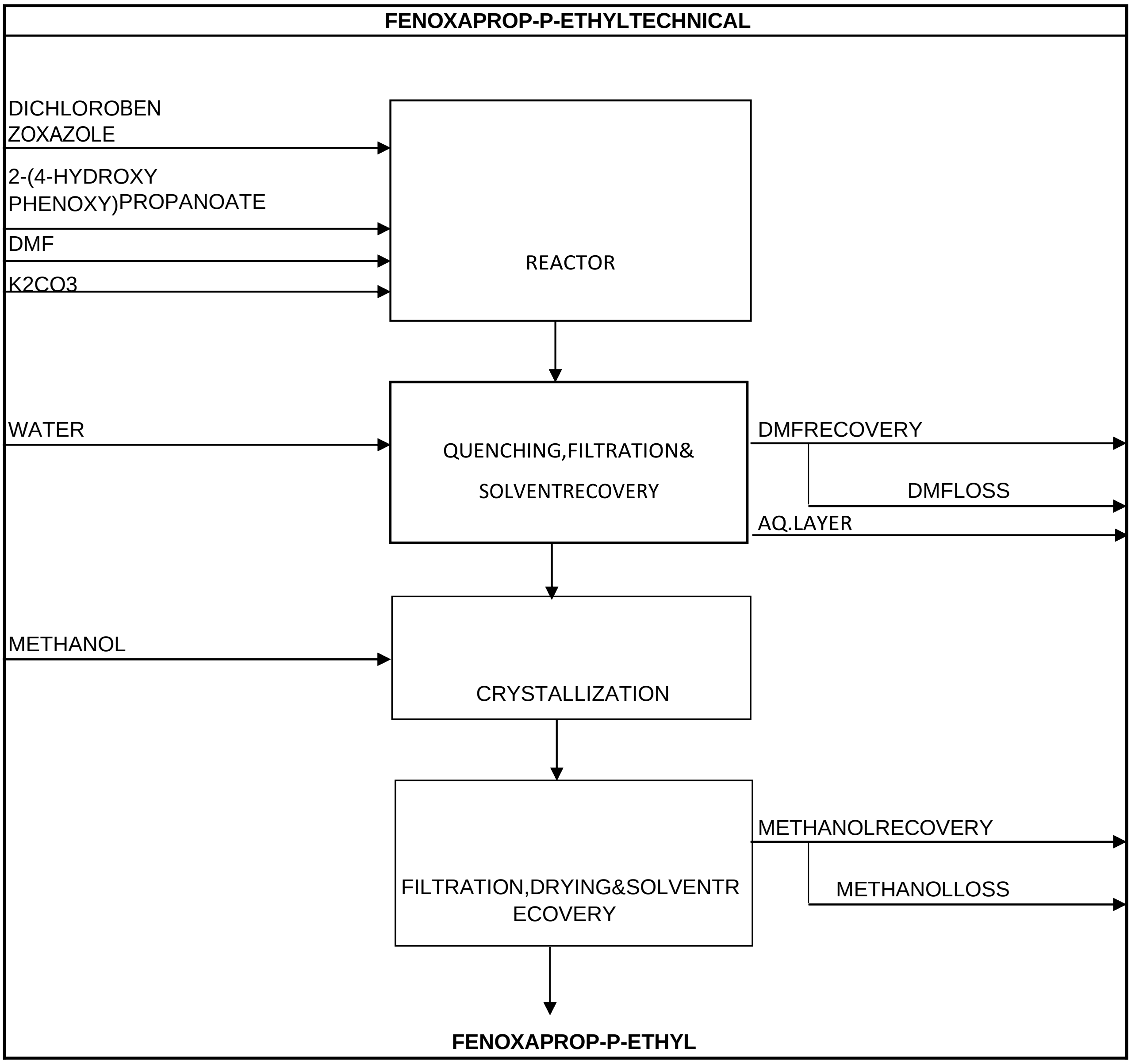
Fenoxaprop P Ethyl M.Wt=361.5

Sodium Chloride M.Wt=58.5

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

1	3,6 - Di Chloro Benzoxazole	610		Fenoxaprop P Ethyl	**1000**
2	2- (4 – Hydroxy Phenoxy) Propionic Acid	590		Recovered Solvent - DMSO	1360
3	Sodium Hydroxide	130		Solvent Loss - DMSO	40
4	Solvent – Di Methyl Sulfoxide	1400		Sodium Bisulphate	340
5	Thionyl Chloride	384		Sodium Chloride	380
6	Solvent – Toluene	1250		30 % Hydrochloric Acid	398
7	Sodium Ethoxide	222		Recovered Solvent - Toluene	1210
8	Water	920		Solvent loss - Toluene	40
9				Aqueous Layer to ETP	716
10				Distillation Residue	22
	TOTAL	**5506**		**TOTAL**	**5506**

Process Flow Diagram



18. **Oxyfluorfen:**

Brief Manufacturing Process :-

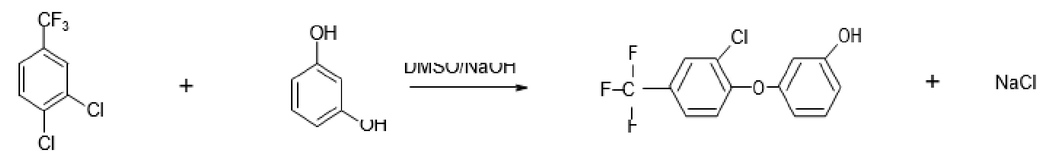
Step 1 :- Resorcinol is reacted with 3,4 - Di Chloro Benzo trifluoride in presence of Sodium Hydroxide as well as Solvent - Di Methyl Sulfoxide (DMSO) to form 3 - (2 – Chloro – 4 - (Trifluoromethyl) Phenoxy)Phenol.

Step 2 :- 3-(2- Chloro -4-(Trifluoromethyl) Phenoxy) Phenol is further reacted with Ethyl Bromide in presence Sodium Hydroxide as well as Solvent - Toluene to form 3-(2- Chloro -4- (Trifluoromethyl) Phenoxy) Ethoxy Benzene.

Step 3 :- 3-(2- Chloro -4- (Trifluoromethyl) Phenoxy) Ethoxy Benzene is finally reacted with Nitric Acid in presence of Solvent - EDC to form the Final Product as Oxyfluorfen.

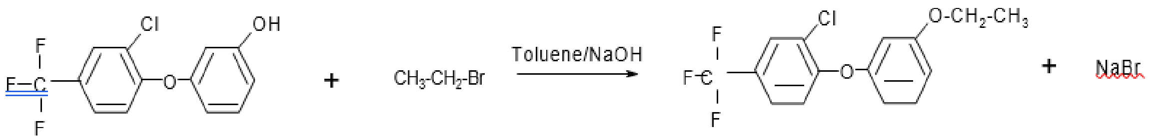
Chemical Reactions :-

Step 1:



3,4-Dichloro Benzotrifluoride	Resorcinol	3-2-Chloro-4-(Trifluoromethyl) Phenoxy]Phenol	Sodium Chloride
M.Wt=215.00	M.Wt=110	M.Wt=288.50	M.Wt=58.50

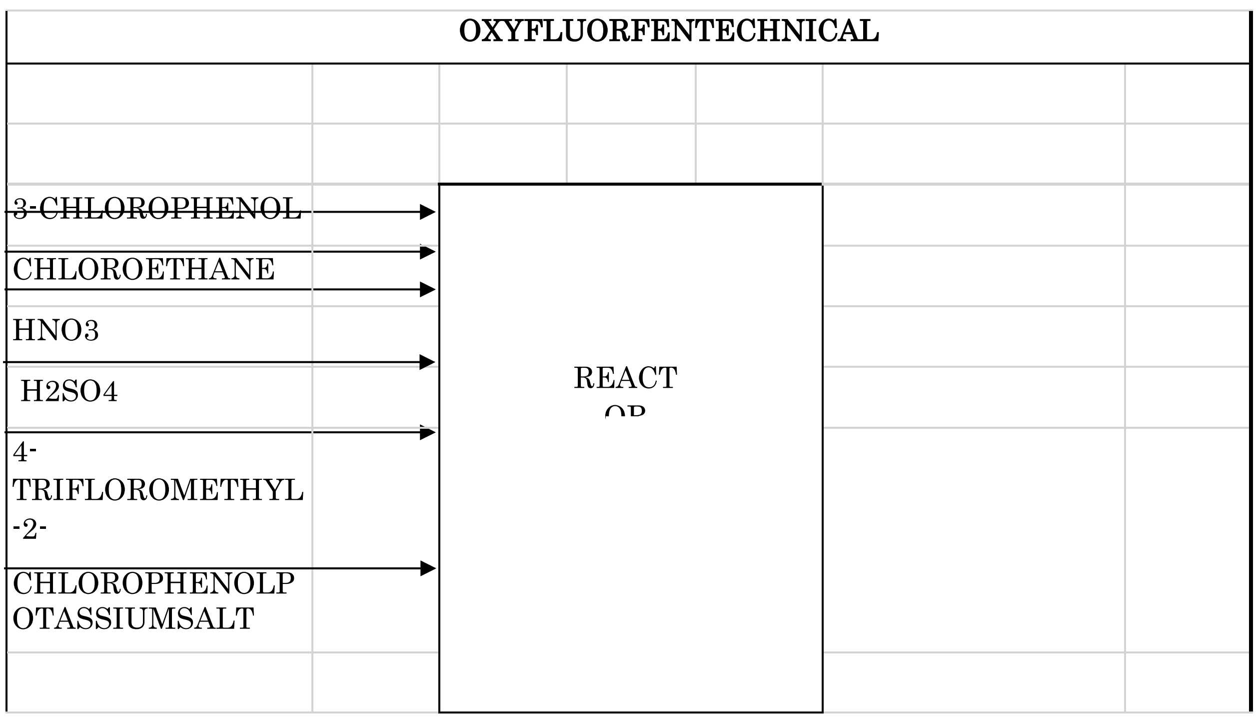
Step 2 :-

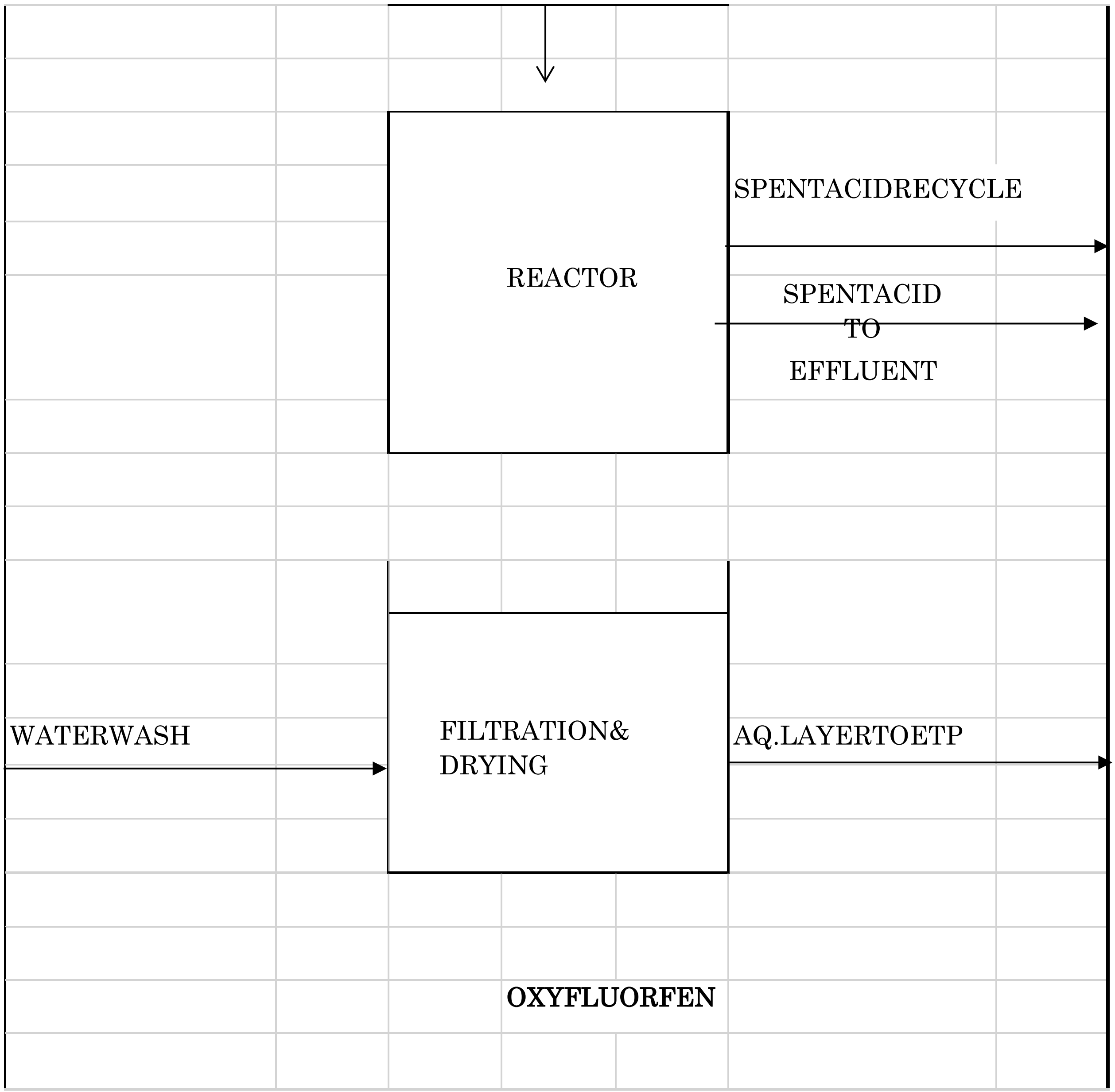


3-2-Chloro-4-(Trifluoromethyl) Phenoxy]Phenol	Ethyl Bromide	3-[2-Chloro-4-(Trifluoromethyl) Phenoxy)Ethoxy Benzene	Sodium Bromide
M.Wt=288.50	M.Wt= 108.00	M.Wt=316.50	M.Wt=103.00

	Material / Mass Balance of OXYFLUORFEN All Quantities are in kg)				
	IN –PUT			OUT –PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	3,4-Dichloro Benzotrifluoride	614		Oxyfluorfen	**1000**
2	Resorcinol	317		Recovered Solvent – DMSO	1075
3	Sodium Hydroxide	233		Solvent Loss – DMSO	25
4	Solvent – Di Methyl Sulfoxide	1100		Sodium Chloride	173
5	Ethyl Bromide	306		Sodium Bromide	300
6	Nitric Acid	180		Recovered Solvent Toluene	980
7	Solvent – Toluene	1000		Solvent loss – Toluene	20
8	Solvent – EDC	800		Recovered Solvent – EDC	775
9	Water	800		Solvent Loss – EDC	25
10				Aqueous Layer to ETP	956
11				Distillation Residue	21
	TOTAL	**5350**		**TOTAL**	**5350**

Process Flow Diagram:



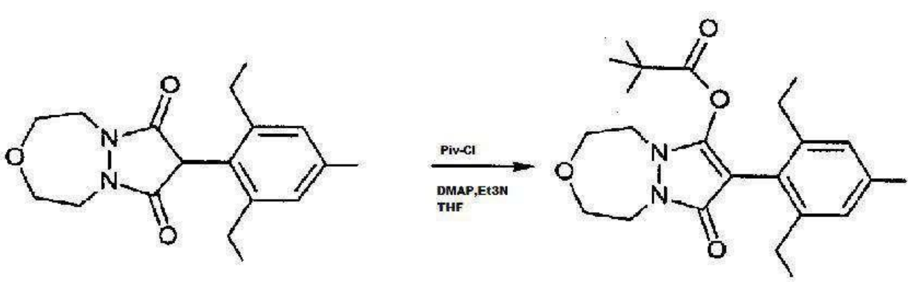


19. Pinoxaden:

Brief Manufacturing Process :-

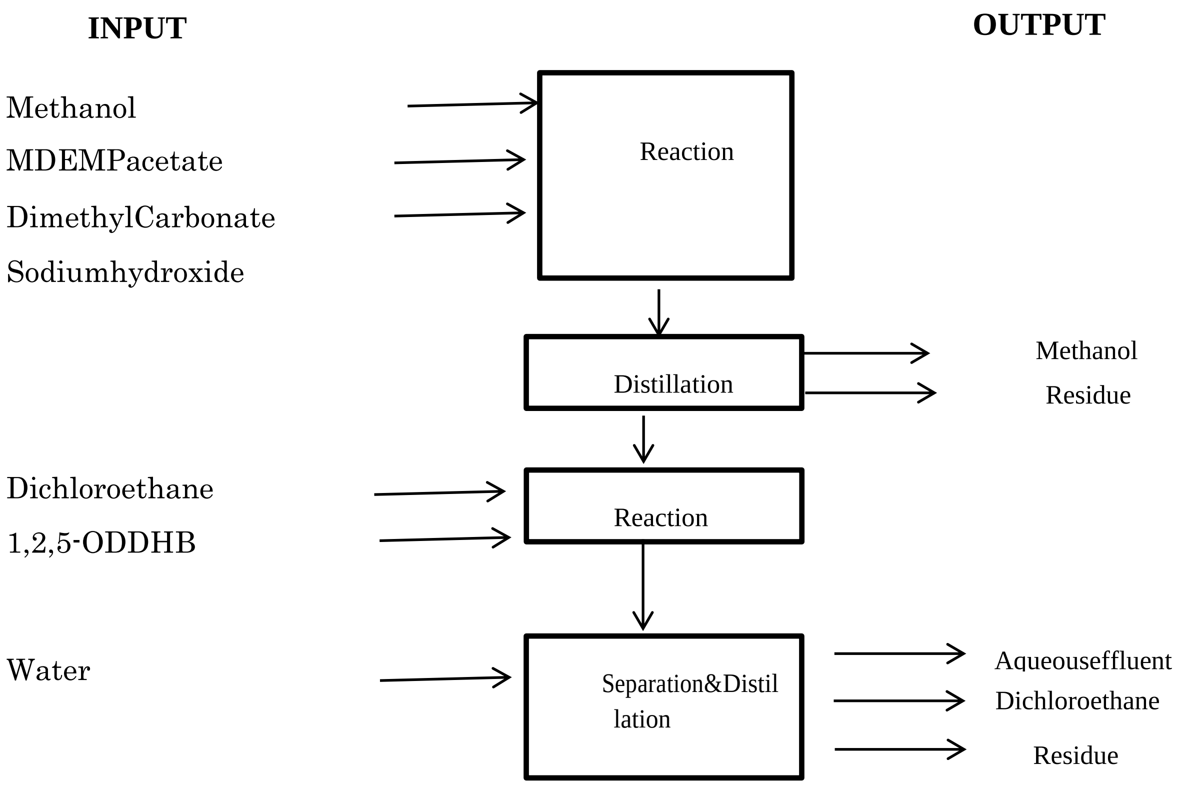
Pinoxaden will be prepared by the reaction of 8-(2,6-Diethyl-4-methylphenyl) tetrahydro-7H-pyrazolo[1,2-d] [1,4,5] oxadiazepine-7,9(8H)-dione (oxadiazepine compound) and pivaloyl chloride in the catalytic presence of 4-dimethylaminopyridine and triethylamine in tetrahydrofuran (THF). The mixture will have stirred at a temperature of 0 °C to 25 °C. After reaction THF will distilled out and the reaction mass will be diluted with tert-butyl methyl ether (MTBE), which then poured into saturated aqueous sodium chloride solution. Further layer separation and crystallization result into the desired product Pinoxaden Technical.

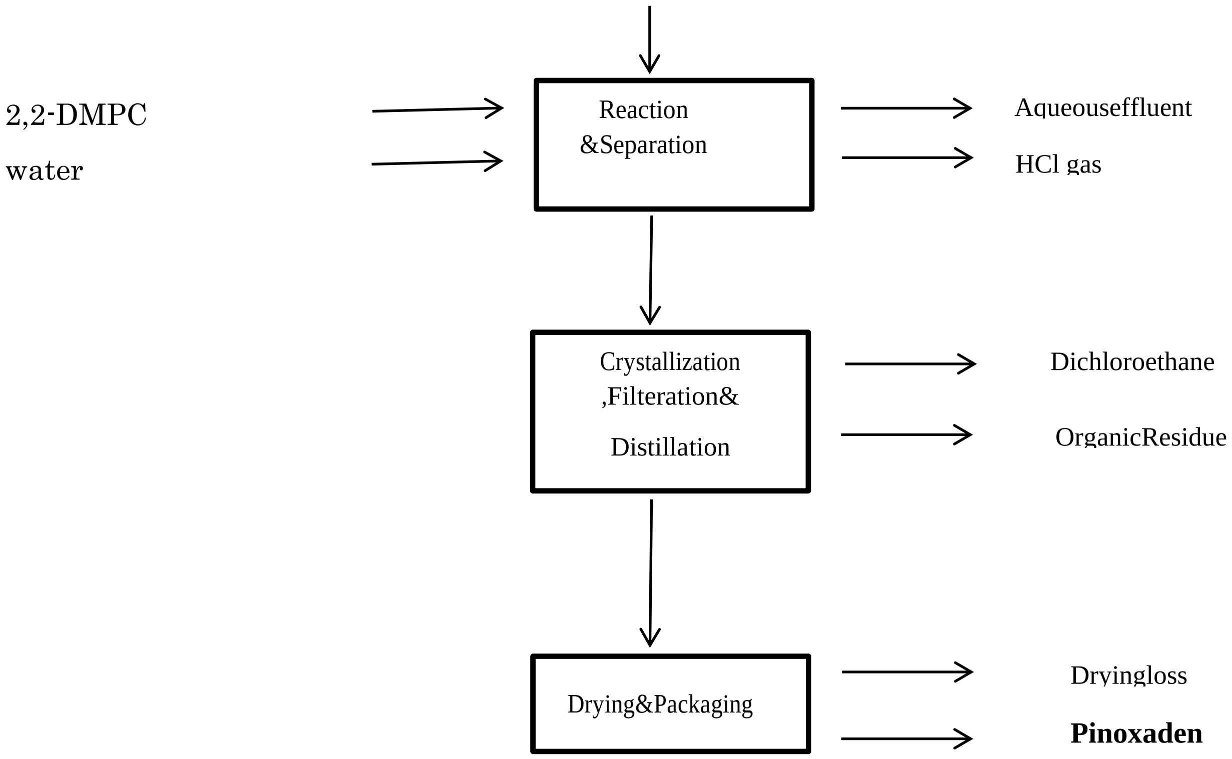
Chemical Reactions :-



	Material / Mass Balance of PINOXADEN All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product By product	Kg/Batch
1	Oxadiazepine Compound	934		Pinoxaden	1000
2	Pivaloyl chloride	458		THF Loss	350
3	4-Dimethylaminopyridine (4- DMAP)	18		THF Recovered	650
4	Triethylamine	607		MTBE Loss	300
5	Tetrahydrofuran (THF)	1000		MTBE Recovered	700
6	Tert-Butyl Methyl Ether (MTBE)	1000		Water Waste	1000
7	20% Sodium Chloride solution (NaCl solution)	250		Salt	60
8	Water	200		Organic waste	407
	TOTAL	**4467**		**TOTAL**	**4467**

Flow Diagram of Pinoxaden



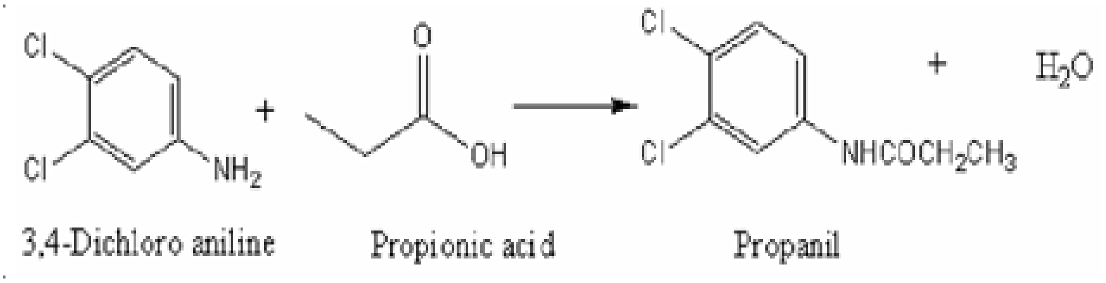


20. Propanil:

Brief Manufacturing Process :

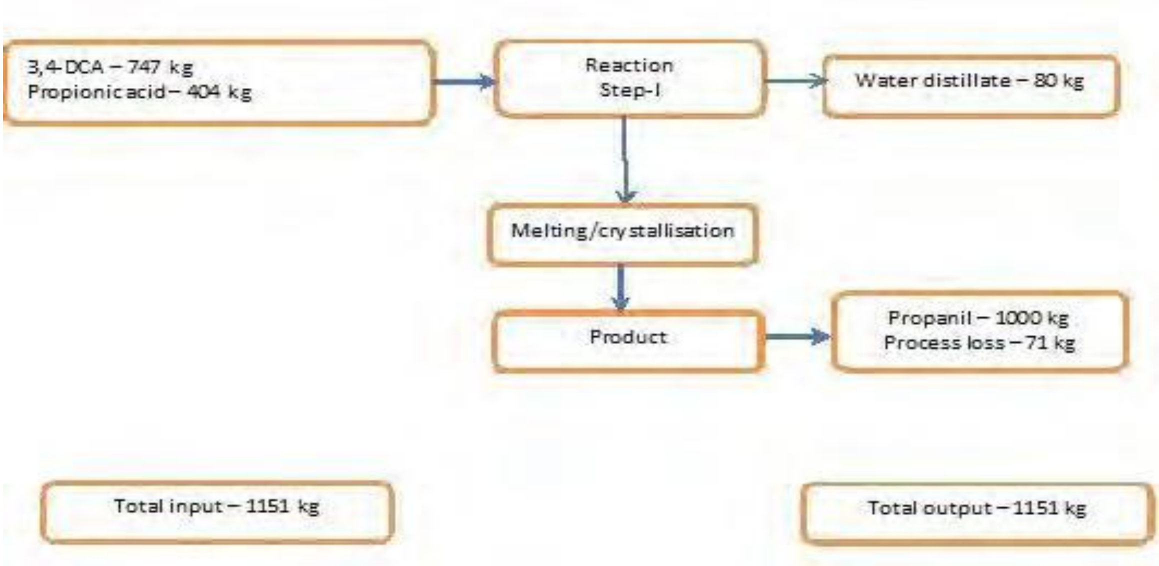
193, 4- Dichloroaniline (DCA) with propionic acid at 140-150°C. Water is formed during the course of reaction. Excess propionic acid and azeotropic water are removed. The residual mass thus obtained in molten state is Propanil technical.

Chemical Reactions :-



	Material / Mass Balance of PROPANIL All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	3,4 - Dichloro Aniline (3,4-DCA)	747		Propanil	1000
2	Propionic acid	403		Reaction water	82
3				Organic Impurity	68
	TOTAL	1150		TOTAL	1150

Process Flow Diagram



21. Clomazone:

Brief Manufacturing Process:-

Step 1 :- Charge water and hydroxylamine HCl and adjust pH to 7–8 with caustic lye. Add 3CPC and caustic lye simultaneously. Filter solid and use for next step.

Step2:-Chargewaterandstep–1solidandunderstirringaddcausticlye&adjustpH8–9,maintain for 4–5. Use 4, 4 DMI solutions forstep–3.

Step3:-Charge4,4DMIsolutionandaddOCBCandmaintainfor5–6hrs.Coolreactionmassand separate aqueous layer and organicmass. Dry HCL gas is passed in organic mass and maintains for 4–5 hrs, add sodium carbonate and caustic lye and heat mass and add water and maintain temp 70–90^{0}C for 30 minute, separate organic and aqueous layer. Dehydrate organic mass by distillation to get Clomazone Tech.

Step 1 :

	$C_5H_{10}ClNO_2$		NaOH		$C_5H_9NO_2$		NaCl		H_2O
	3Chloro–N–Hydroxy 2,2–Dimethylpropanamide	+	Caustic		4,4–Dimethyl isoxazolidin –3–one (4,4–DM)	+	Sodium Chloride	+	Water
MW	151.5		40		115		58.5		18

Step 2 :-

Step 3 :-

	$C_5H_9NO_2$		$C_7H_6Cl_2$		NaOH		$C_{12}H_{14}NO_2Cl$		NaCl		H_2O
	4,4–Dimethyl isoxazolidin–3–one (4,4–DM)	+	O–Cgloro Benzylchloride	+	Caustic		Clomazoneisomer	+	Sodium Chloride	+	Water
MW	115		161		40		239.5		58.5		18

	$C_5H_8Cl_2O$		$NH_2OH.HCl$		2NaOH		$C_5H_{10}ClNO_2$		2NaCl		$2H_2O$
	3Chloro–2,2–Dimethylpropanoyl Chloride	+	Hydroxy–lamineHydrochloride	+	Caustic		3Chloro–N–Hydroxy 2,2–Dimethyl propanamide	+	Sodium Chloride	+	Water
MW	155		69.5		80		151.5		117		36

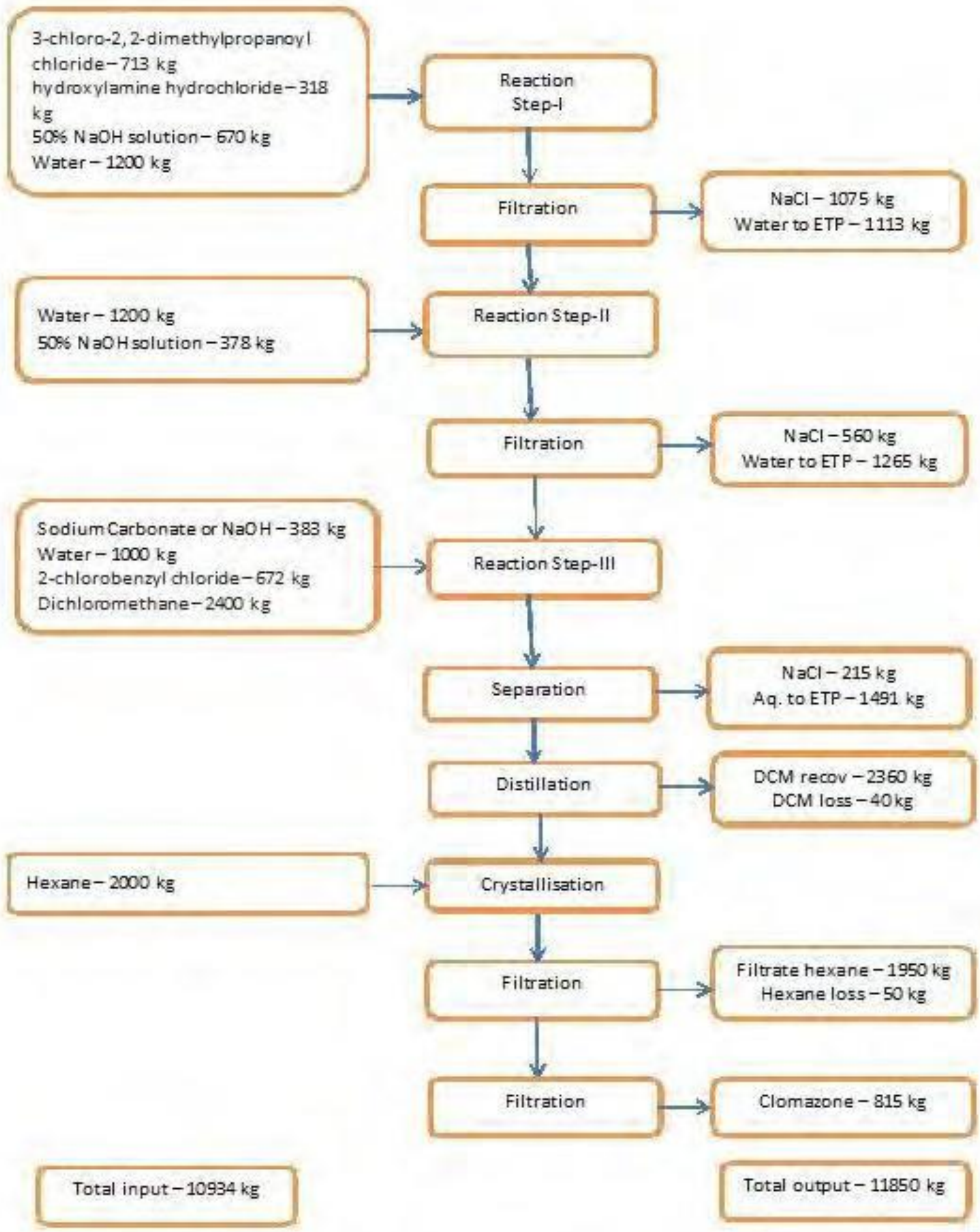
	$C_5H_8Cl_2O$		$NH_2OH.HCl$		2NaOH		$C_5H_{10}ClNO_2$		2NaCl		$2H_2O$
	3Chloro–2,2–Dimethylpropanoyl Chloride	+	Hydroxy–lamineHydrochloride	+	Caustic		3Chloro–N–Hydroxy 2,2–Dimethyl propanamide	+	Sodium Chloride	+	Water
MW	155		69.5		80		151.5		117		36

Step 4 :-

	$C_{12}H_{14}NO_2Cl$		HCl		NaOH		$C_8H_5Cl_2NaO_3$		NaCl		H_2O
	Clomazone isomer	+	Hydrochloric Acid	+	Caustic		Clomazone	+	Sodium Chloride	+	Water
MW	239.5		36.5		40		239.5		58.5		18

	Material / Mass Balance of CLOMAZONE All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Caustic Flakes	968		Clomazone	**1000**
2	Water for Caustic	2258		Salt Evaporation 1	699
3	3-Chloro−2,2−Dimethylpropanoyl Chloride	830		Salt Evaporation 2	898
4	Hydroxylamine Hydrochloride	460		Organic Residue	218
5	Water	150		Evaporation Losses 1	1075
6	Catalyst	8		Evaporation Losses 2	1708
7	O−Cgloro Benzyl chloride	705			
8	HCl Gas (Dry)	200			
9	Na2CO3	19			
	TOTAL	**5598**		**TOTAL**	**5598**

FLOW Diagram :

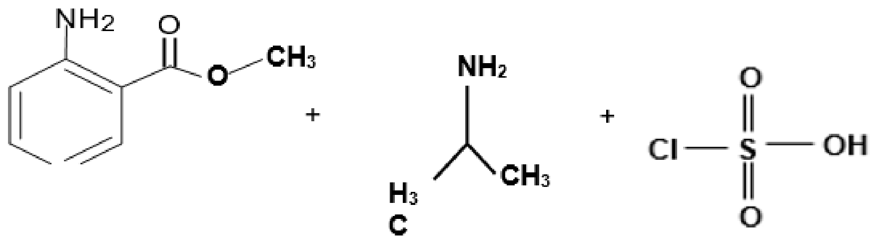


22. Bentazone:

Brief Manufacturing Process:-

2-Amino benzoic acid is charged in to ethylene dichloride and reacted with isopropyl amine and chlorosulphonic acid at room temperature for 6 h. Washed with water and concentrate EDC under vacuum and filtered dried to get the desired product.

Chemical Reactions:-



2-Amino Benzoic   Isopropyl Amine   Chloro Sulphonic

	Material / Mass Balance of BENTAZONE All Quantities are in kg)				
	IN – PUT			OUT –PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Amino Benzoic Acid	741		Bentazone	1000
2	Isopropyl Amine	304		Recovery EDC	2046
3	Chlorosulphonic Acid	628		Loss EDC	177
4	EDC	2223		Aqeous Waste	1837
5	Water	1500		HCl	178
6				Methanol	158
	TOTAL	5396		TOTAL	5396

23. Atrazine:-

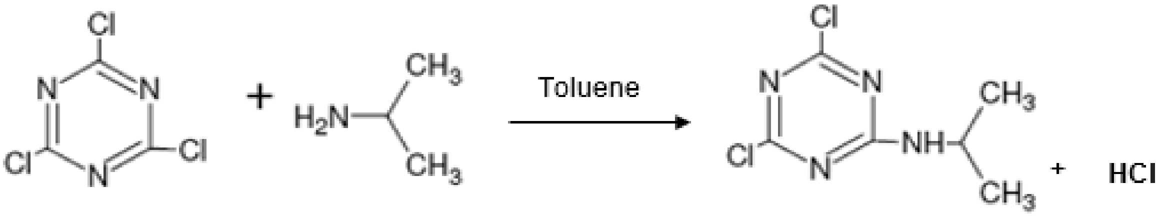
Brief Manufacturing Process:-

Required quantity of Toluene is taken in to reactor; Cyanuric chloride is charged and stirred so that Cyanuric chloride dissolved in the solvent completely. Isopropyl amine is charged slowly. SodiumhydroxideischargedtoneutralizeHydrochloricacidwhichisgeneratedinreaction. Ethyl amine is charged slowly. Sodium hydroxide is charged to neutralize Hydrochloric acid which is generated in reaction.

Aqueous phase is separated out, fresh water is charged and Toluene is distilled out azeotropically in presence of live steam. Product is filtered off. Centrifuged, dried and pulverized and pack as per requirement.

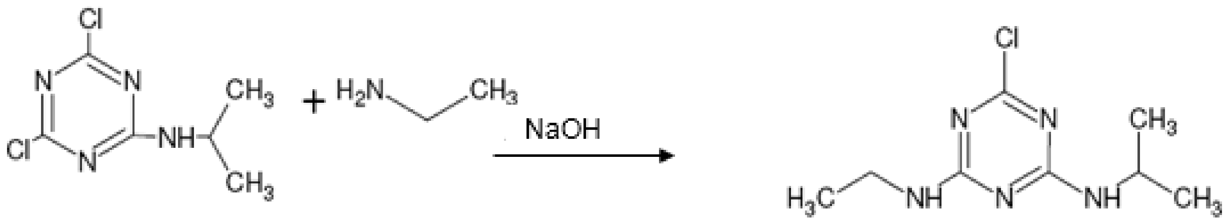
Chemical Reactions :

Step 1:-



Cynuric Chloride (M.W.184.41) | Isopropyl Amine (M.W.59.11) | Intermediate 1 (M.W.207.02) | Hydrochloric Acid (M.W.36.5)

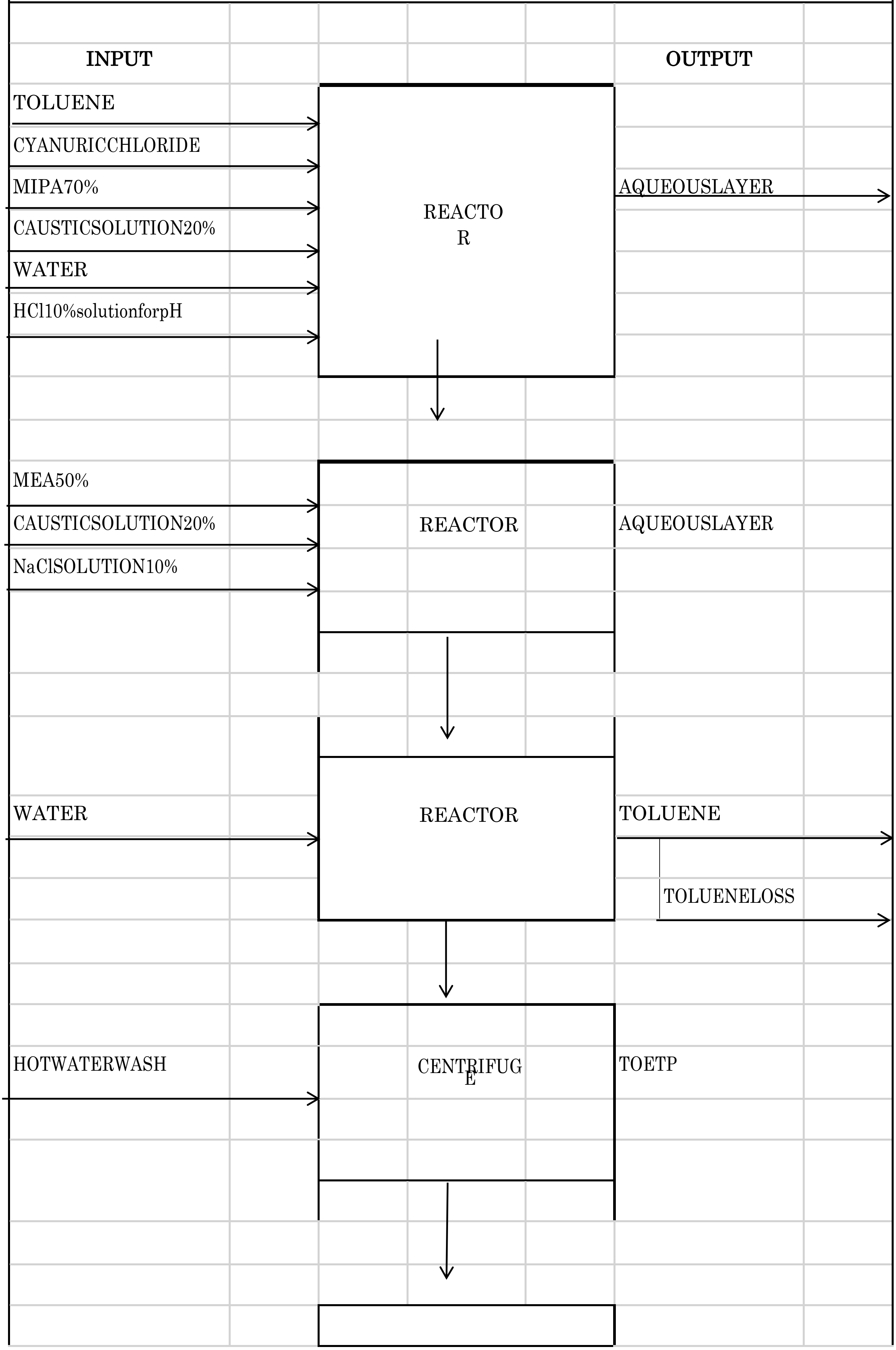
Step 2:-



Intermediate 1 (M.W.207.02) | Ethyl Amine (M.W.45.08) | Atrazine (M.W.215.68)

	Material/Mass Balance of ATRAZINE All Quantities are in kg)				
	IN–PUT			OUT–PUT	
Sr. No.	Raw Materials/Items	Kg/Batch		Product/Byproduct	Kg/Batch
1	Toluene	6950		Atrazine	1000
2	Cyanuric Chloride	900		Toluene Recovery	6900
3	Isopropyl Amine	435		Toluene Loss	50
4	NaOH	410		Waste Water	4930
5	Mono Ethyl Amine	320		Drying Loss	85
6	Water	3950			
	TOTAL	12965		TOTAL	12965

Flow Diagram of ATRAZINE TECHNICAL



DRYER

DRYINGLOSS

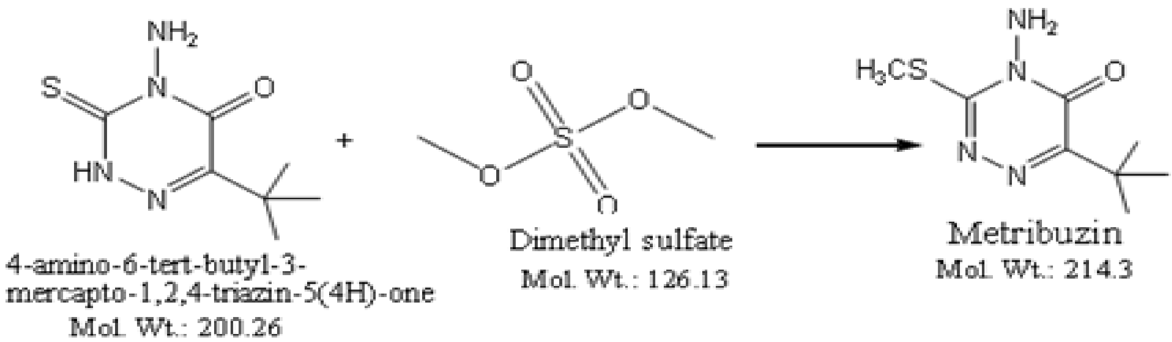
ATRAZINE

24. Metribuzine:

Brief Manufacturing Process:-

Step 1 :-4-Amino-6-Tert-Butyl-3-Mercapto-1,2,4-Triazin-5(4H) -one (ATMT) reacted with Dimethyl Sulphate in presence of Sulphuric Acid to give Metribuzine.

Chemical Reactions :-



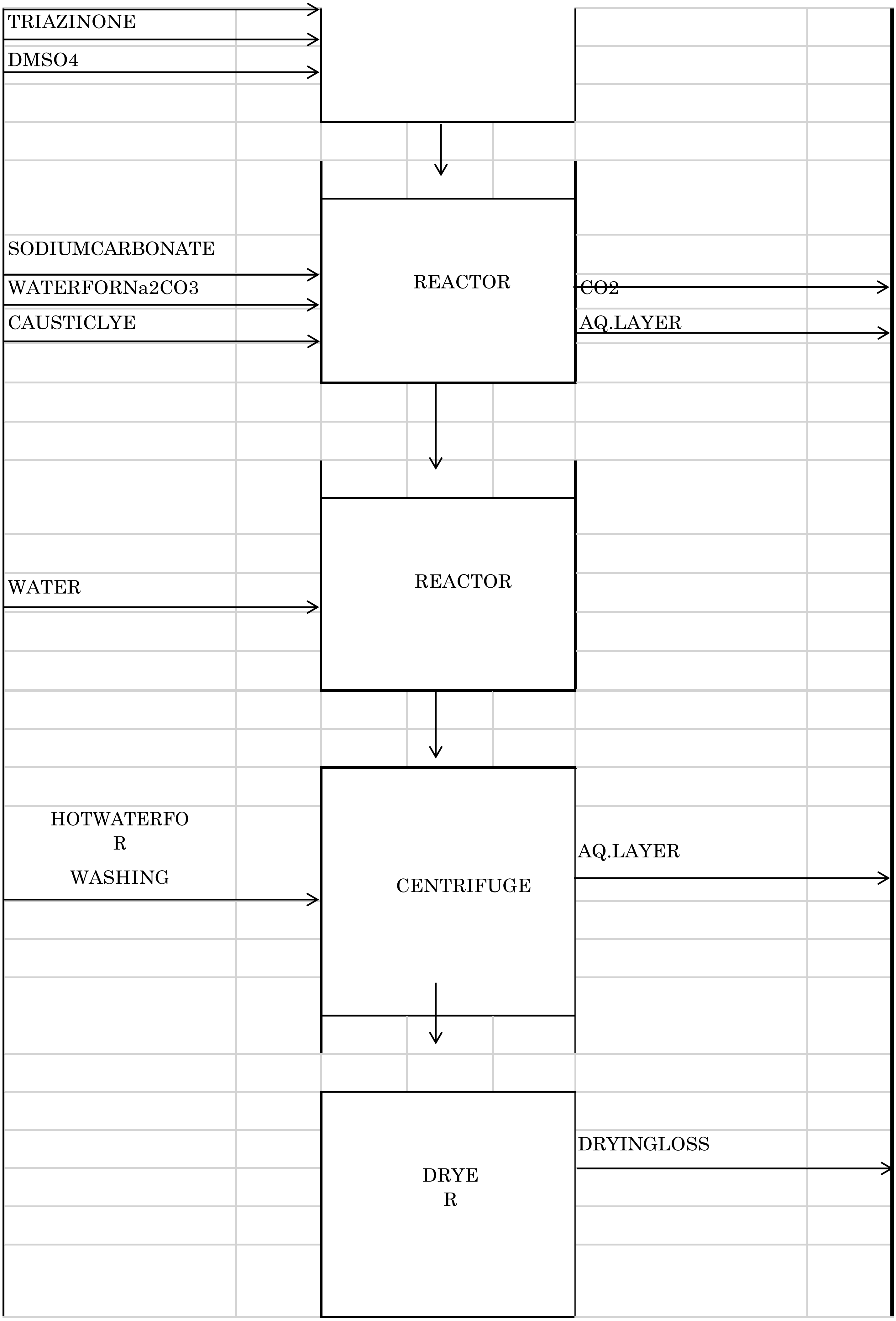
	Material / Mass Balance of METRIBUZIN All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	4-Amino-6-Tert-Butyl-3-Mercapto-1,2,4-Triazin-5(4H)-one (ATMT)	1000		Metribuzine	**1000**
2	Di Methyl Sulphate	652		Sodium Sulphate	2130
3	Sulphuric Acid	1274		Organic Impurities	512
4	Soda Ash	1600		Carbon Dioxide Gas	664
5	Caustic Soda Flakes	30		Aqueous Layer to ETP	4750
6	Water	4500			
	TOTAL	**9056**		**TOTAL**	**9056**

Flow Diagram METRIBUZINTECHNICAL

WATER

H2SO4

REACTOR


TRIAZINONE
DMSO4
SODIUMCARBONATE
WATERFORNa2CO3
CAUSTICLYE
REACTOR
CO2
AQ.LAYER
WATER
REACTOR
HOTWATERFOR WASHING
CENTRIFUGE
AQ.LAYER
DRYER
DRYINGLOSS

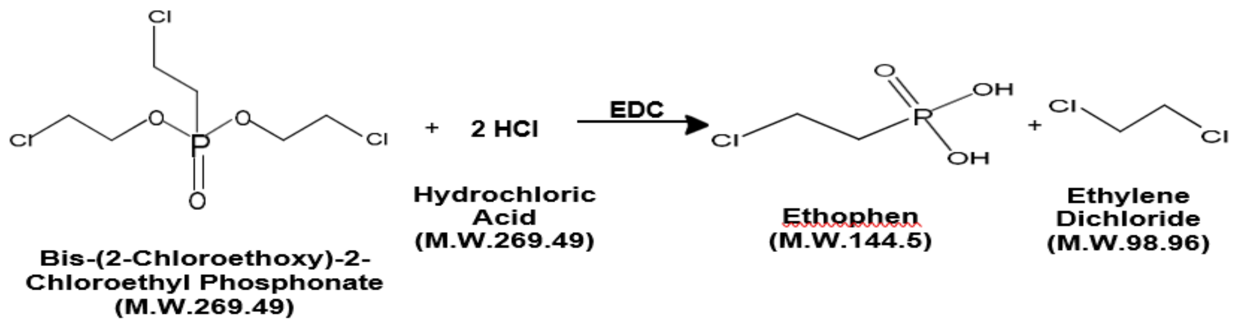
		METRIBUZ IN			

25. Ethephon :

Brief Manufacturing Process :-

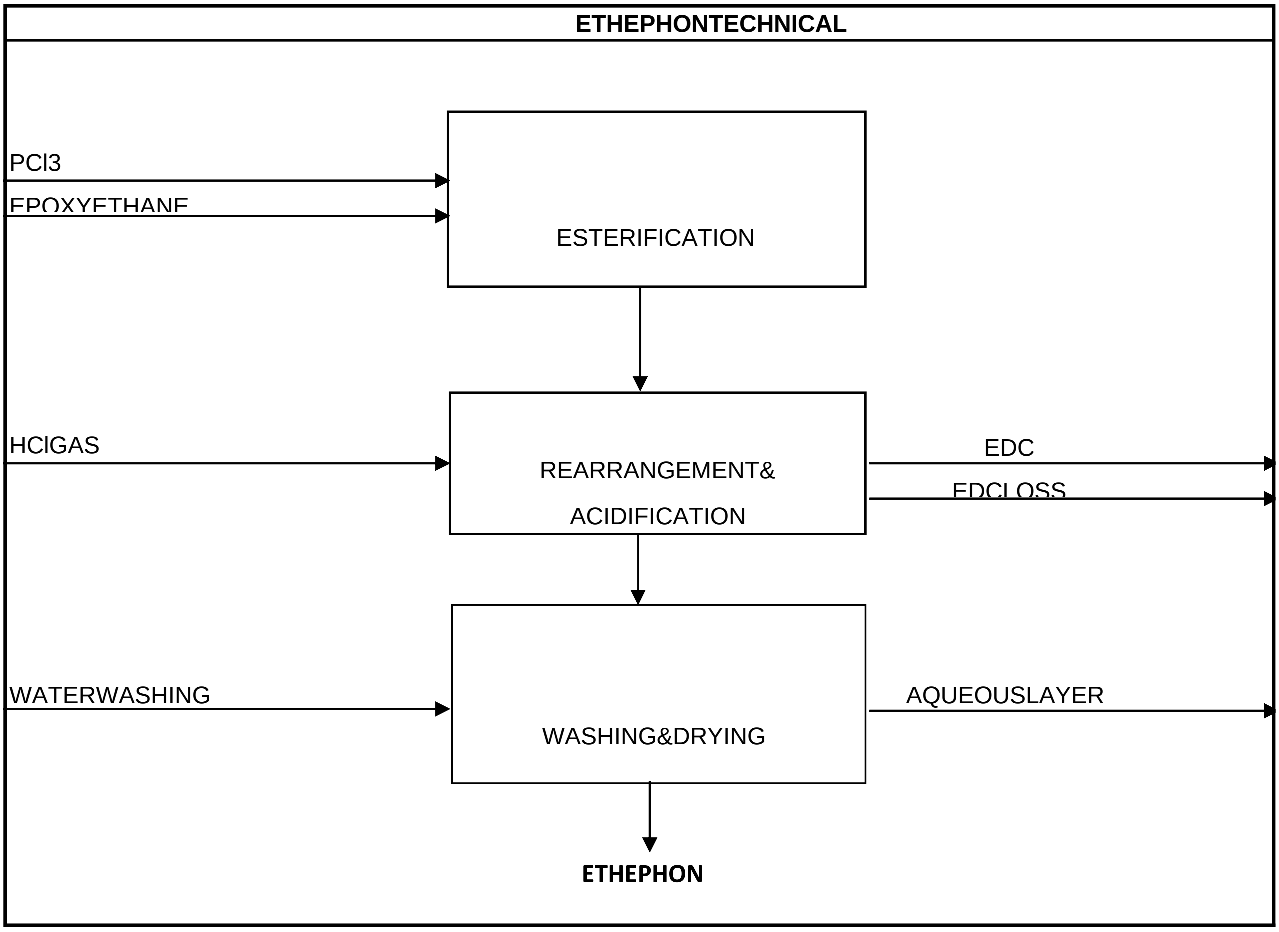
Bis-(2-chloroethoxy) 2-chloroethyl phosphonate heated to 80 deg C, hydrogen chloride (HCl) gas is introduced through sparger at fixed rate until the reaction mixture turns pale yellow. EDC formed during the reaction is distilled off under vacuum and the residue crystallized in 1:3 mixture of toluene and methanol.

Chemical Reactions :-



	Material / Mass Balance of ETHEPHON All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Bis (2-Chloroethyl) 2 Chloro Ethyl Phosphonate	1942		Ethephon	**1000**
2	Hydrogen Chloride	526		Ethylene Dichloride	1369
3	Toluene	1000		Toluene Recovered	960
4	Methanol	1666		Toluene loss	5
5				Toluene in Residue	35
6				Methanol Recovered	1596
7				Methanol loss	11
8				Methanol in Residue	59
9				Bis (2-Chloroethyl) 2 Chloro Ethyl Phosphonate	78
10				Hydrogen Chloride	21
	TOTAL	**5134**		**TOTAL**	**5134**

Flow Diagram of Ethephon :-


ETHEPHONTECHNICAL
PCl3
EPOXYETHANE
ESTERIFICATION
HClGAS
REARRANGEMENT&
ACIDIFICATION
EDC
EDCLOSS
WATERWASHING
WASHING&DRYING
AQUEOUSLAYER
ETHEPHON

Fungicide Group

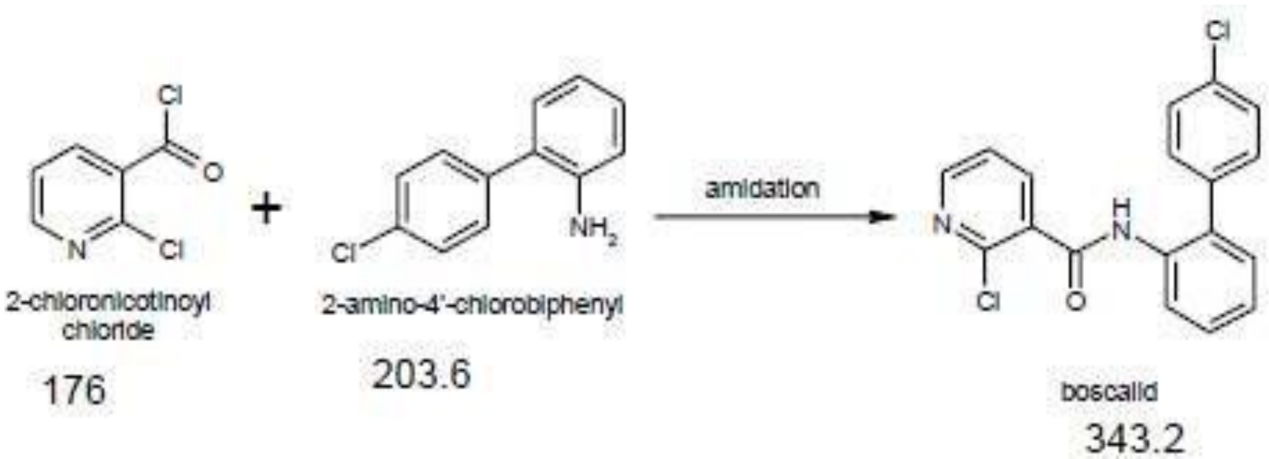
26. Boscalid:

Brief Manufacturing Process:-

Step 1 :- 2-Chloro-3-Nicotinic Acid (CNA) is taken in toluene and is reacted with Thionyl chloride and the gases are removed by nitrogen purging.

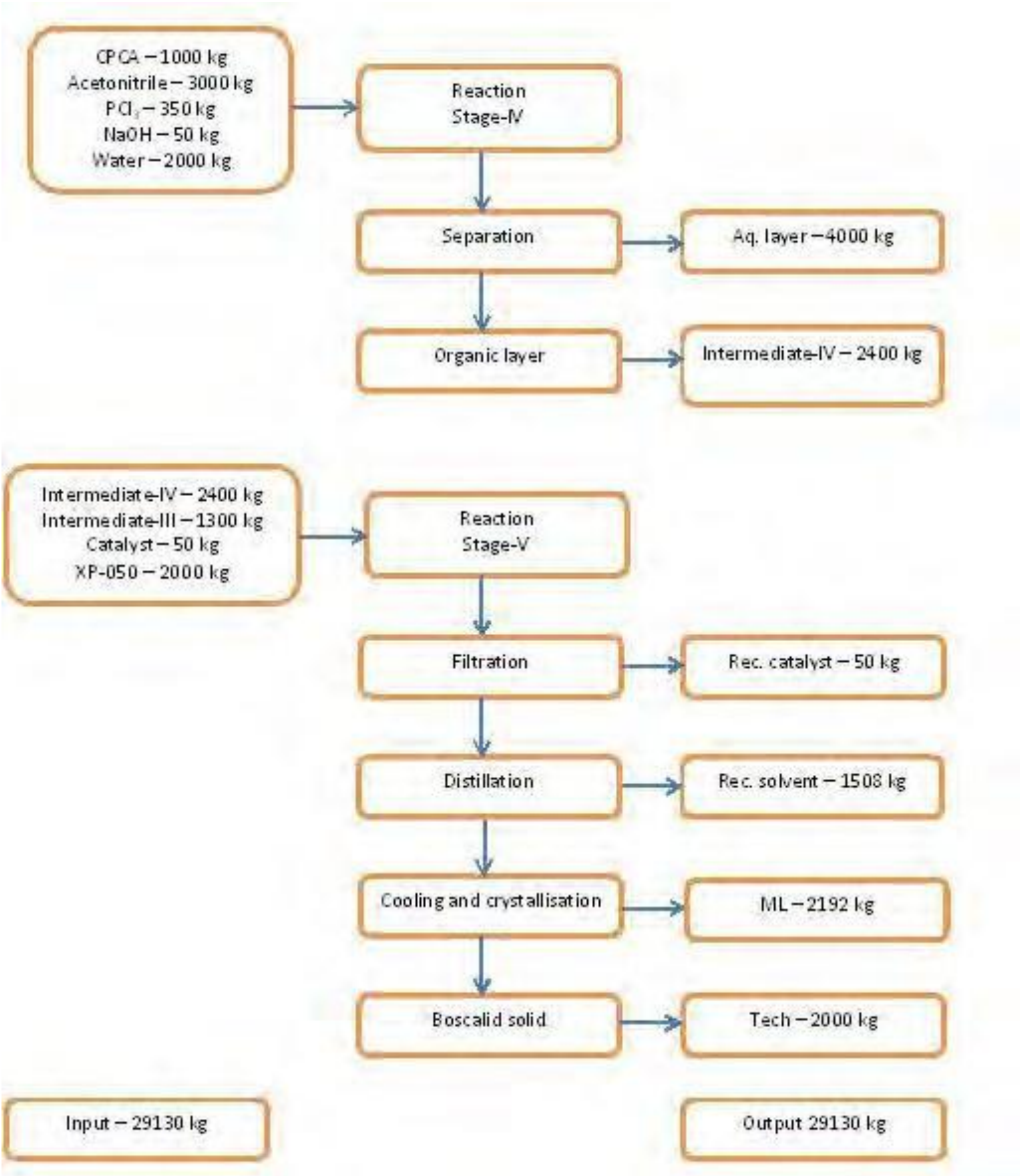
Step 2 :- The Acid Chloride is coupled with 2- Amino-4'-Chlorobiphenyl (ACBP) at room temperature and the product is filtered, washed and dried to get theproduct.

Chemical Reactions :-



	Material / Mass Balance of BOSCALID All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2-Chloronicotinoyl Chloride	537		Boscalid	**1000**
2	2-Amino-4'-Chlrobiphenyl	594		HCl	106
3	Toluene	1500		Water	700
4	Water	1500		Recovered Toluene	1350
5	Water washing	500		Toluene losses	150
6				Aqueous ML	960
7				Water Washing	300
8				Organic Impurities	65
	TOTAL	**4631**		**TOTAL**	**4631**

Flow Diagram of Bosaclid :



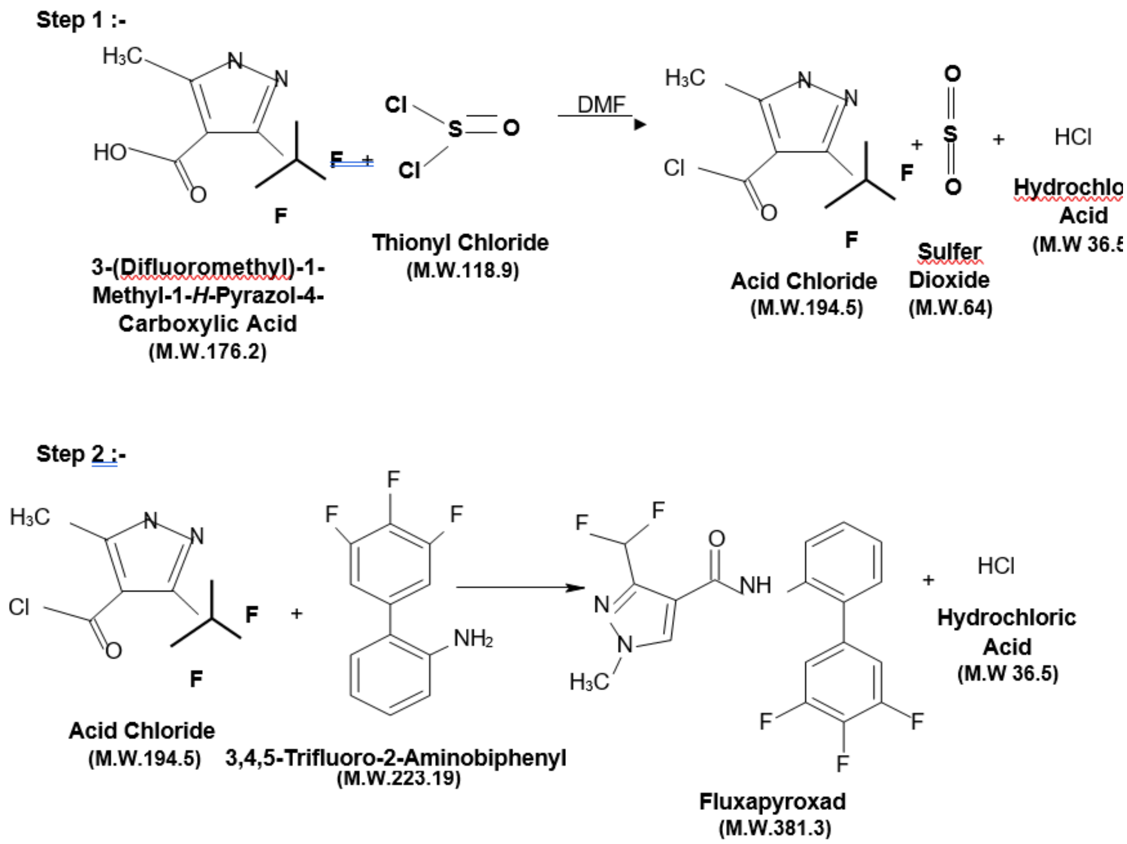
27. Fluxapyroxad:

Brief Manufacturing Process:-

Step-1: 3-(Difluoromethyl)-1-methyl-1-*H*-pyrazol-4-carboxylic acid, is taken in toluene and is reacted with Thionyl chloride, evolved gases are removed by nitrogen purging.

Step-2: The acid chloride is coupled with 3,4,5-trifluoro-2-aminobiphenyl at room temperature and the product is filtered, washed and dried to get the desired product.

Chemical Reactions :-



	Material / Mass Balance of FLUXAPYROXAD All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	3-(Difluoromethyl)-1-Methyl-1-H- Pyrazol-4-Carboxylic Acid	554		Fluxapyroxad	**1000**
2	Thionyl Chloride	393		Recovery Toluene	1498
3	DMF	5		Loss Toluene	166
4	3,4,5-Trifluoro-2-Aminobiphenyl	702		Loss Thionyl Chloride	19
5	Potassium Carbonate	425		Recovery Thionyl Chloride	374
6	Toluene	1664		Organic Waste	190

7				Aqueous Waste	268
8				SO2	101
9				HCl	127
	TOTAL	**3743**		**TOTAL**	**3743**

28. Thifluzamide:

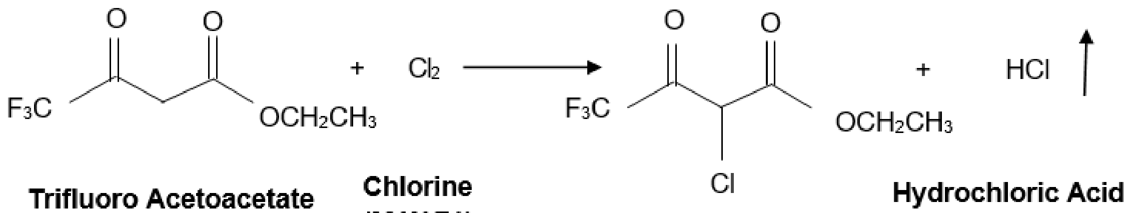
Brief Manufacturing Process:-

Step 1:- Ethyl Trifluoroacetate (ETFFA) is Chlorinated at low temperature and the chlorinated compound is thioacetamide in presence of solvent and finally reacted NaOH and acidified to get Thiazole Acid. The acid is chlorinated by Thionyl Chloride in toluene.

Step 2:- Finally the Thiazole Acid Chloride is reacted with 2,6-Dibromo-4-Trifluoromethoxyaniline in presence of solvent. The product is isolated by filtration and washing and drying.

Chemical Reactions:-

Step 1 :-



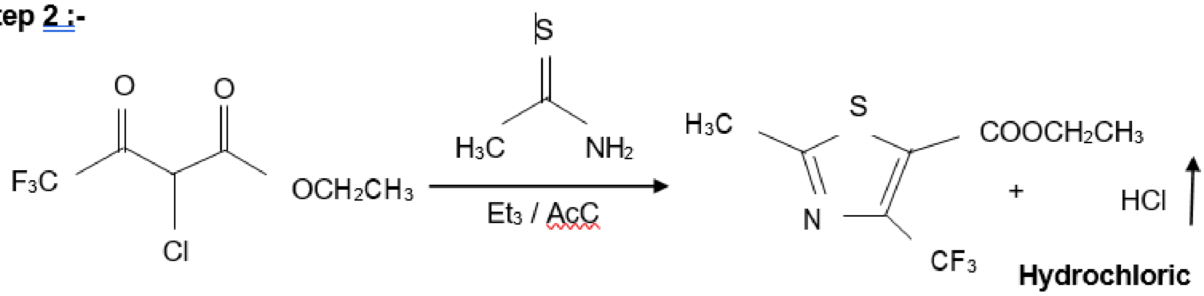
Trifluoro Acetoacetate (M.W 184)

Chlorine (M.W.71)

Ethyl-4,4,4-Trifluoro-2-Chloro Acetoacetate (M.W 218.5)

Hydrochloric Acid (M.W 36.5)

Step 2 :-

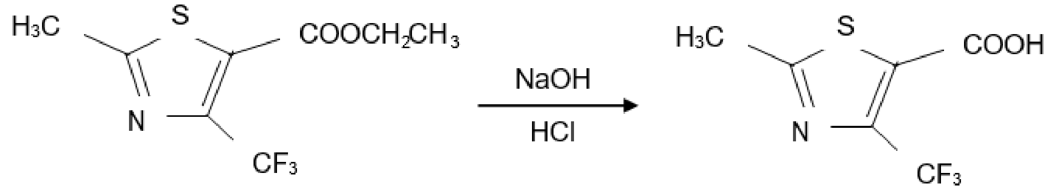


Ethyl-4,4,4-Trifluoro-2-Chloro Acetoacetate (M.W 218.5)

Hydrochloric Acid (M.W 36.5)

2-Methyl-4-Trifluoromethyl-5-Thiazole (M.W 239)

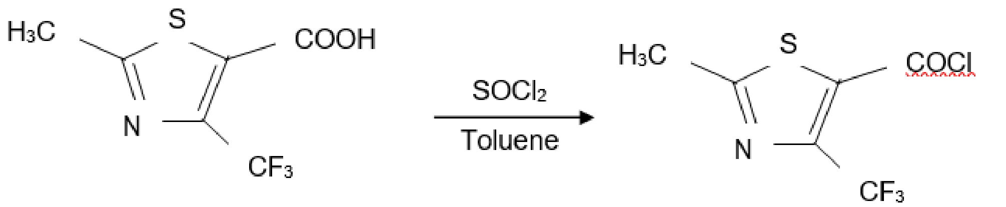
Step 3:-



2-Methyl-4-Trifluoromethyl-5-Thiazole (M.W 239)

2-Methyl-4-Trifluoromethyl-5-Thiazole Carboxylic Acid (M.W 211)

Step 4:-



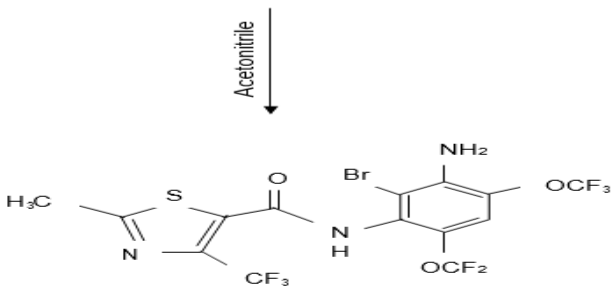
2-Methyl-4-Trifluoromethyl-5-Thiazole Carboxylic Acid (M.W 211)

2-Methyl-4-Trifluoromethyl-5-Thiazole Carboxylic Acid Chloride (M.W 229.5)

Step 5 :-

2-Methyl-4-Trifluoromethyl-5-Thiazole Carboxylic Acid Chloride

2,6-Dibromo-4-(Trimethoxy) Aniline (M.W.335)



N-(2,6-Dibromo-4-Trifluoromethoxy) Phenyl)-2-Methyl-4-Trifluoromethyl-5-Thiazolecarboxamid [Thifluzamide] (M.W.528)

Material Mass Balance :-

	Material / Mass Balance of THIFLUZAMIDE All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Trifluoro Acetoacetate	465		Ethyl 4,4,4 Trifluoro 2-Chloro Acetoacetate	**531**
2	Solvent - Toluene	2530		Recovered Solvent	2403
3	Catalyst	25		Solvent Loss	127
4	Chlorine	190		30% HCl Solution	309
5	Water for Washing	1265		Aqueous Layer to ETP	1320
6	Water for 30% HCl formation	215			
	TOTAL	**4690**		**TOTAL**	**4690**

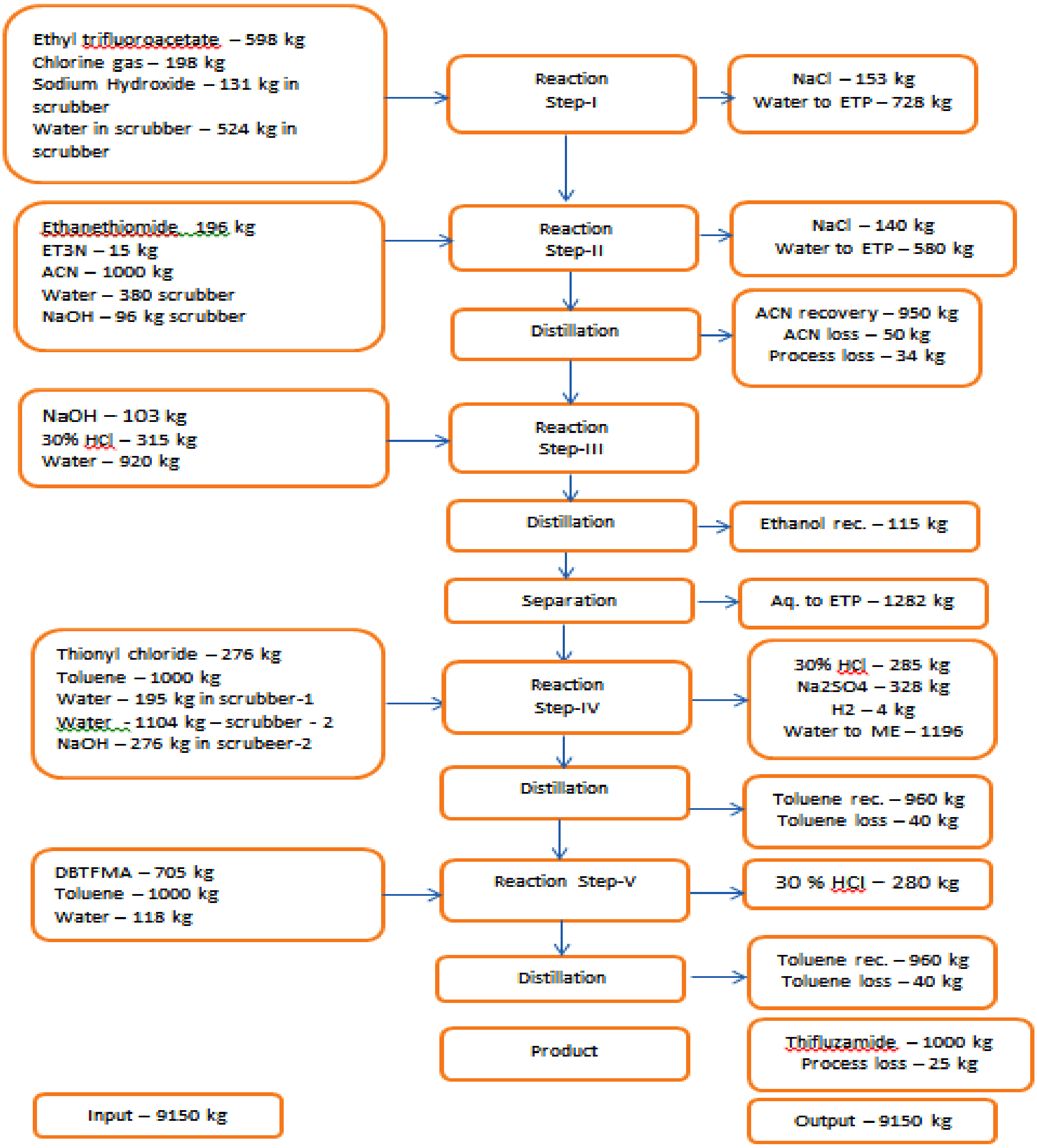
	Material / Mass Balance of THIFLUZAMIDE All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Ethyl 4,4,4 Trifluoro 2-Chloro Acetoacetate	531		2-Methyl 4-Trifluoro Methyl 5-Thiazole Carboxylic Acid Ethyl Ester	**493**
2	Thio Acetamide	192		Recovered TEA	227
3	Triethylamine	245		TEA Loss	17
4	Solvent	2783		Aqueous Layer to ETP	1855
5	Acetic Acid	245		Recovered Solvent	1070
6	Water for Reaction	379		Solvent Loss	713
	TOTAL	**4375**		**TOTAL**	**4375**

	Material / Mass Balance of THIFLUZAMIDE All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2-Methyl 4-Trifluoro Methyl 5- Thiazole Carboxylic Acid Ethyl Ester + Solvent	3276		2-Methyl 4-Trifluoro Methyl 5-Thiazole Carboxylic Acid + Solvent	**3195**
2	48% Caustic Soda Lye	475		Aqueous Layer to ETP	809
3	30% HCl Solution	253			
	TOTAL	**4004**		**TOTAL**	**4004**

	Material / Mass Balance of THIFLUZAMIDE All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Organic Mass of 2-Methyl 4- Trifluoro Methyl 5-Thiazole Carboxylic Acid	3195		Acid Chloride	**455**
2	Thionyl Chloride	255		Recovered Toluene	2700
3	DMF Catalyst	24		Toluene Loss	83
4	Caustic Lye 15% for 20% Na_2SO_3	1194		20% Na_2SO_3 Solution	1332
5	Water for 30% HCl Solution	182		30% HCl Solution	280
	TOTAL	**4850**		**TOTAL**	**4850**

	Material / Mass Balance of THIFLUZAMIDE All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Acid Chloride	455		**THIFLUZAMIDE**	**1000**
2	Solvent Acetonitrile	2250		Recovered Solvent	2200
3	PTC catalyst	20		Solvent Loss	50
4	2,6 Dibromo 4-(Trifluoromethyl) Aniline	663		Aqueous Layer to ETP	1120
5	Water for Washing	1000		Distillation Residue	18
	TOTAL	**4388**		**TOTAL**	**4388**

Flow Diagram THIFLUZAMIDE:-

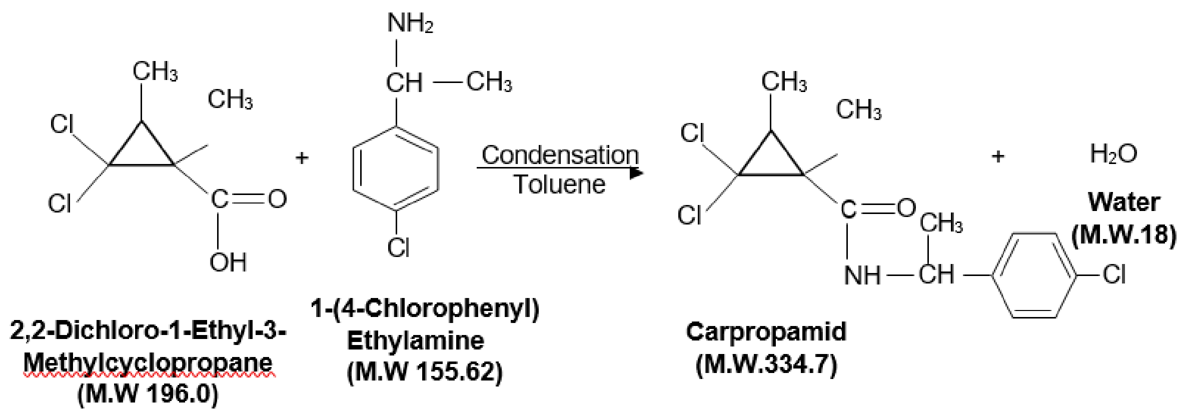


29. Carpropamid:

Brief Manufacturing Process:-

2,2-Dichloro-1-Ethyl-3-Methylcyclopropane is undergoes formal Condensation reaction with 1-(4- Chlorophenyl) Ethylamine in presence of Solvent Toluene as well as Catalyst. It forms the final product Carpropamid. Solvent is recovered which is reused in process.

Chemical Reactions :-



	Material / Mass Balance of CARPROPAMID All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2,2-Dichloro 1-Ethyl 3-Methylcyclopropane Carboxylic Acid	616		Carpropamid	**1000**
2	1-(4-ChloroPhenyl) Ethyl Amine	490		Recovered Solvent	2130
3	Solvent - Toluene	2200		Loss Solvent	70
4	Catalyst - TBAB	18		Waste Water	1374
5	Water for Reaction	1250			
	TOTAL	**4574**		**TOTAL**	**4574**

30. Isoprothiolane:

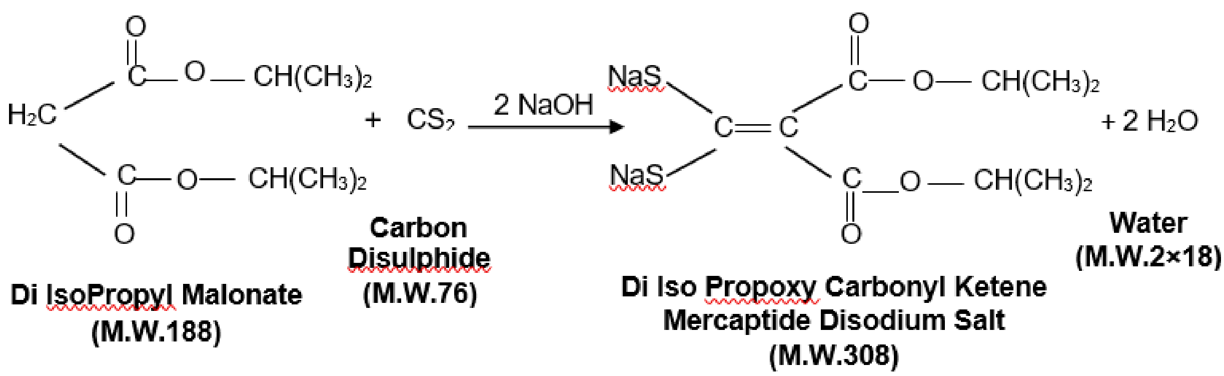
Brief Manufacturing Process:-

Step 1 :- Di Isopropyl Malonate is reacted with Carbon Disulphide in alkaline medium, it gives an intermediate Di Iso Propoxy Carbonyl Ketene Mercaptide Disodium Salt.

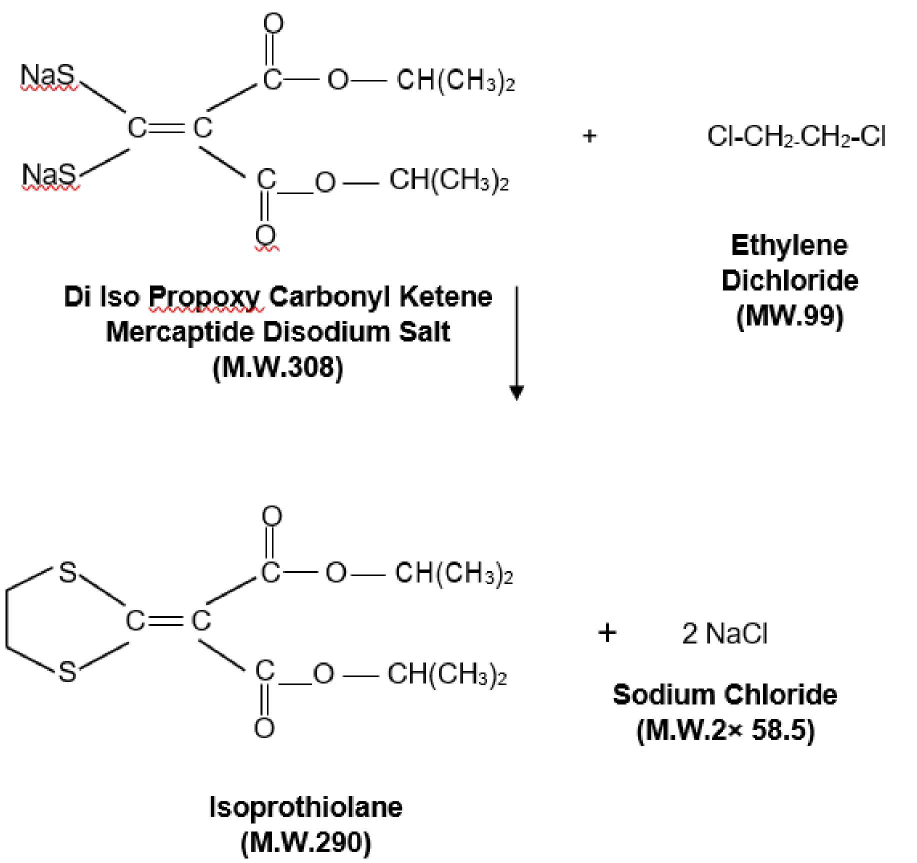
Step 2 :- Above intermediate reacted with Ethylene Dichloride to get crude product as Isoprothiolane. This crude Isoprothiolane is purified by crystallization with Solvent n-Heptane to get Isoprothiolane (Technical).

Chemical Reactions:-

Step 1 :-

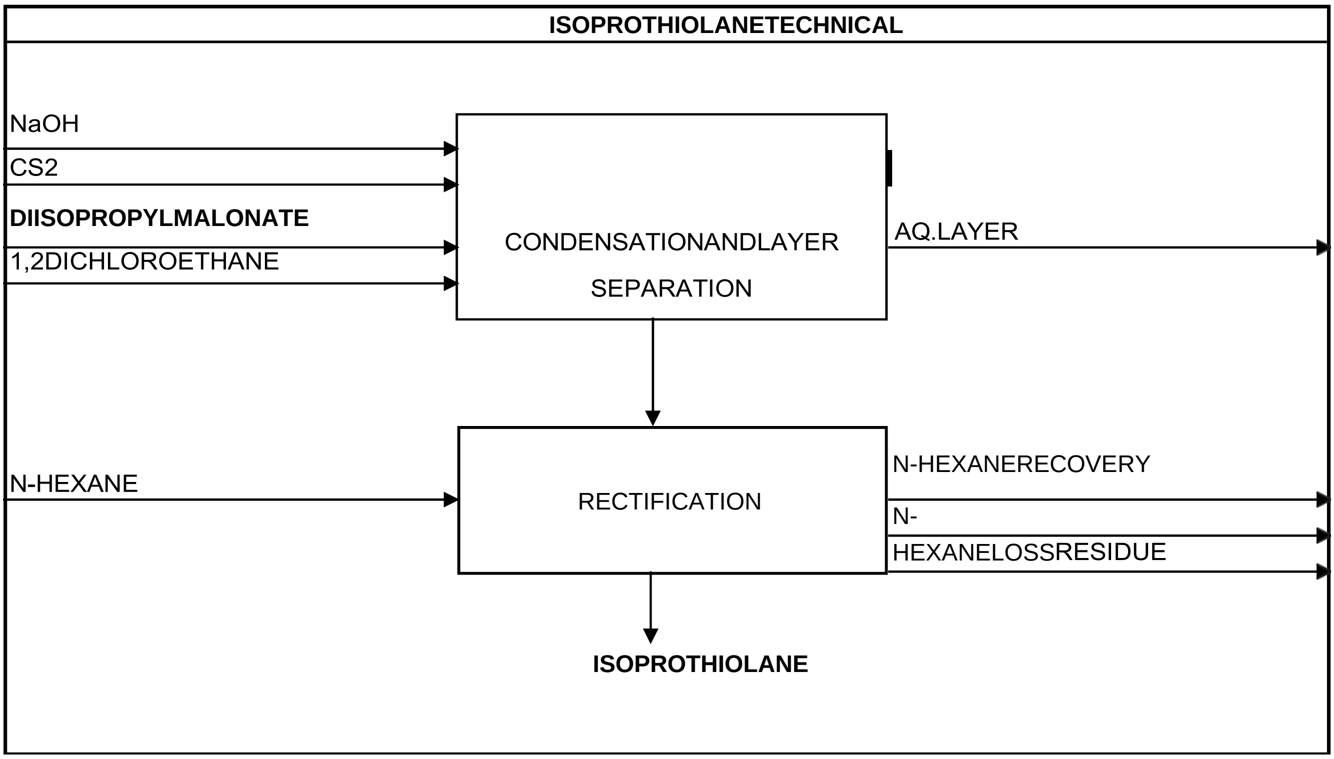


Step 2 :-



	Material / Mass Balance of ISOPROTHIOLANE All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Di Isopropyl Malonate	715		Isoprothiolane	**1000**
2	Carbon Disulphide	290		Aqueous Effluent to ETP	2438
3	Caustic Soda Solution (47%)	710		Recovered EDC	1080
4	Water for reaction	2000		Loss EDC	360
5	Ethylene Dichloride	1440		Recovered Heptane	2375
6	Solvent – n-Heptane	2500		Heptane Loss	125
7				Sodium Chloride Salt Wet Cake	252
8				Distillation Residue	25
	TOTAL	**7655**		**TOTAL**	**7655**

FLOW Diagram of ISOPROTHIOLANE :-

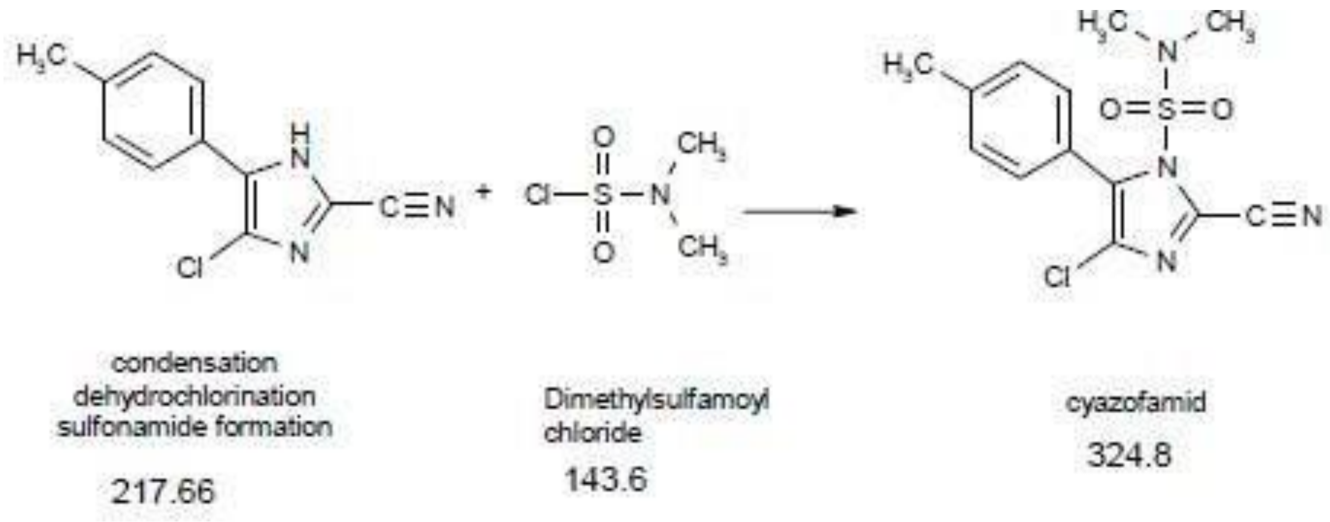


31. **Cyazofamid:**

Brief Manufacturing Process :-

4-Chloro-2-cyano-5-p-tolylimidazole (CCDTI) is reacted with Dimethylsulfamoyl Chloride in presence of Solvent Toluene at elevated temperature. After completion of the reaction, the organic layer is washed with water and the aqueous layer is separated. The organic layer is taken for the recovery of solvent and the crude is sent through ATFE to remove the impurities.

Chemical Reactions :-

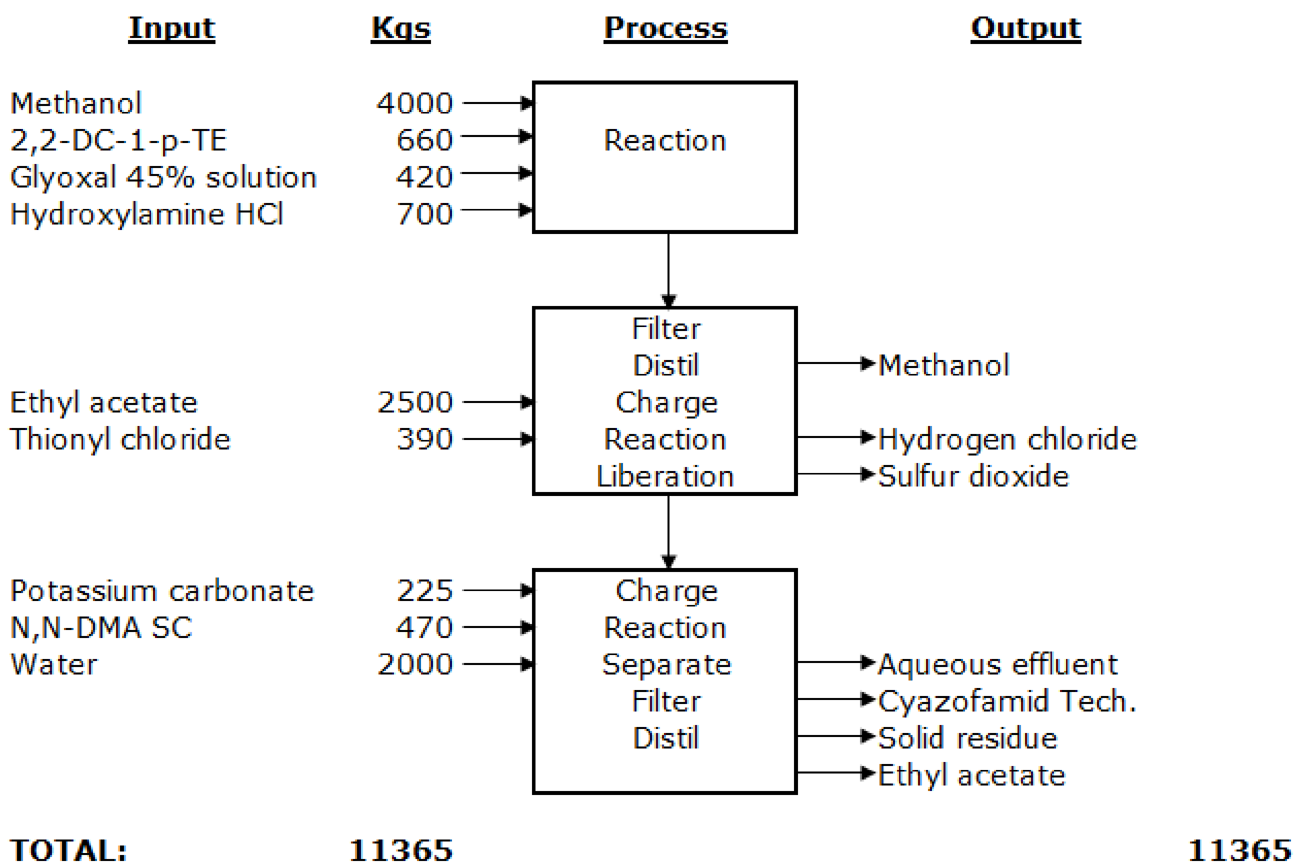


	Material / Mass Balance of CYAZOFAMID All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	4-Chloro-2-Cyano-5-p-Tolylimidazole (CCDTI)	656		Cyazofamid	**1000**
2	Dimethylsulfamoyl Chloride	441		Loss Acetonitrile	1530
3	K2CO3	430		Recovered Acetonitrile	170
4	Acetonitrile	1700		Water	1000
5	Toluene	2000		KCl	165
6	Water wash	1000		KHCO3	290
7				K2CO3	4

8				Toluene Recovered	1950
9				Organic Impurities	68
10				Toluene losses	50
	TOTAL	6227		TOTAL	**6227**

Flow Diagram of CYAZOFAMID :

Mass balance of Cyazofamid



32. **Azoxystrobin :-**

Brief Manufacturing Process:-

Step 1 :- Phthalide is reacted with methyl format in presence of Di methyl Carbonate and Sodium Hydride as well as Solvent -Toluene to form 3- Methoxy Methylene -1- Benzo furan -2-(3-H) – One

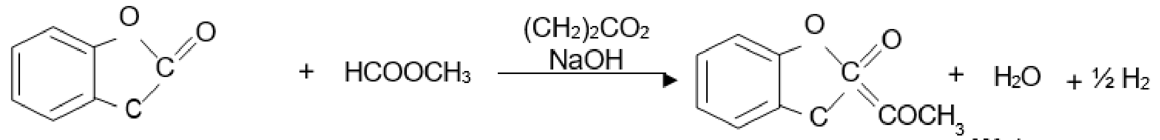
Step 2 :- 3- Methoxy Methylene -1- Benzofuran -2-(3-H) – One reacted with Sodium Methoxide in presence of Solvent – EDC to form Sodium -2- [1,3 Dimethoxy -3- Oxoprop -1- en -2- yl] Phenolate.

Step 3 :- Sodium -2- [1,3 Dimethoxy -3- Oxoprop -1- en -2- yl] Phenolate is reacted with 4,6 – Dichloro Pyrimidine in presence of Solvent – Toluene to give Methyl -2- [2- {(6- Chloro Pyrimidine - 4 –yl)} Oxy Phenyl] -3- methoxyprop -2- Ethanoate.

Step 4 :- Methyl -2- [2- { (6- Chloro Pyrimidine -4 –yl)} Oxy Phenyl] -3- methoxyprop -2- Ethanoate O- Cyano Phenol in presence of Potassium Hydroxide and Solvent – Di Methyl Formamide to give the Final product as Azoxystrobin.

Chemical Reactions: -

Step 1 :-



Phthalide (M.W.132)

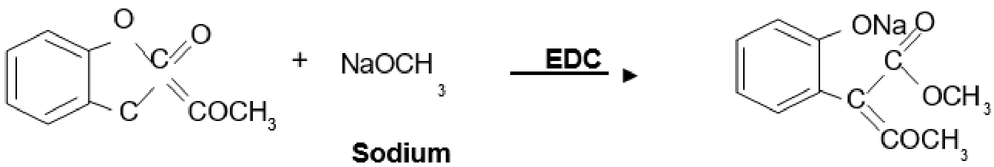
Methyl Formate (M.W.60)

3-Methoxymethylidene-1-Benzofuran-2-One (M.W.175)

Water (M.W.18)

Hydrogen (M.W. ½ 2)

Step 2 :-

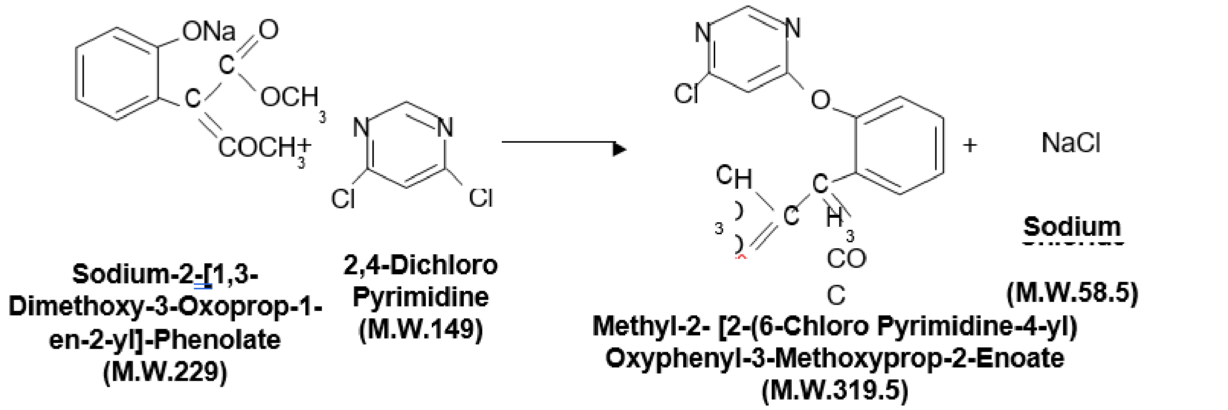


3-Methoxymethylidene-1-Benzofuran-2-One (M.W.175)

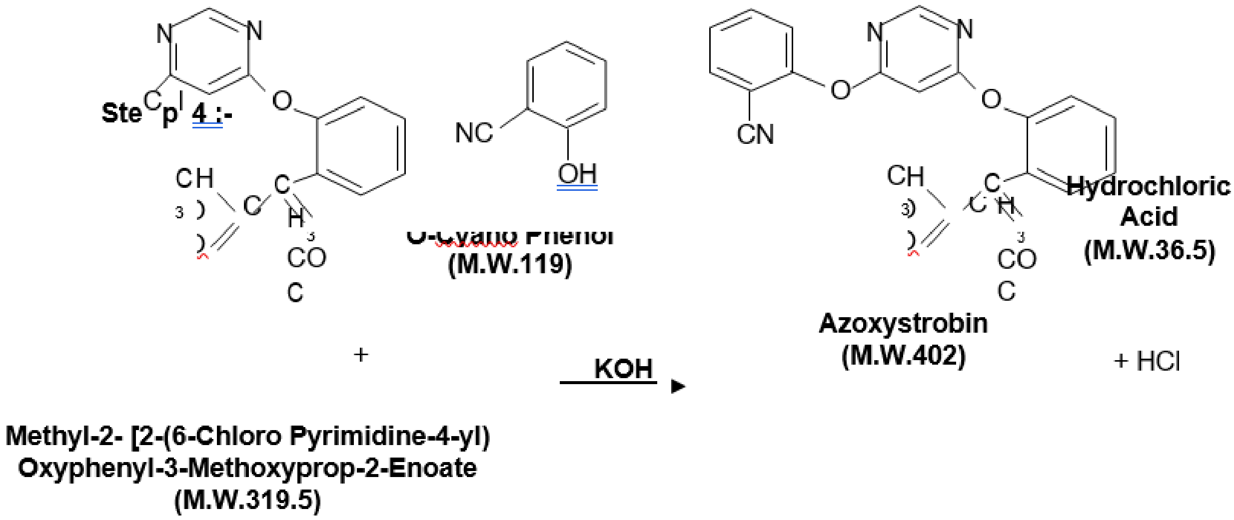
Sodium Methoxide (M.W.54)

Sodium-2-[1,3-Dimethoxy-3-Oxoprop-1-en-2-yl]-Phenolate (M.W.229)

Step 3 :-



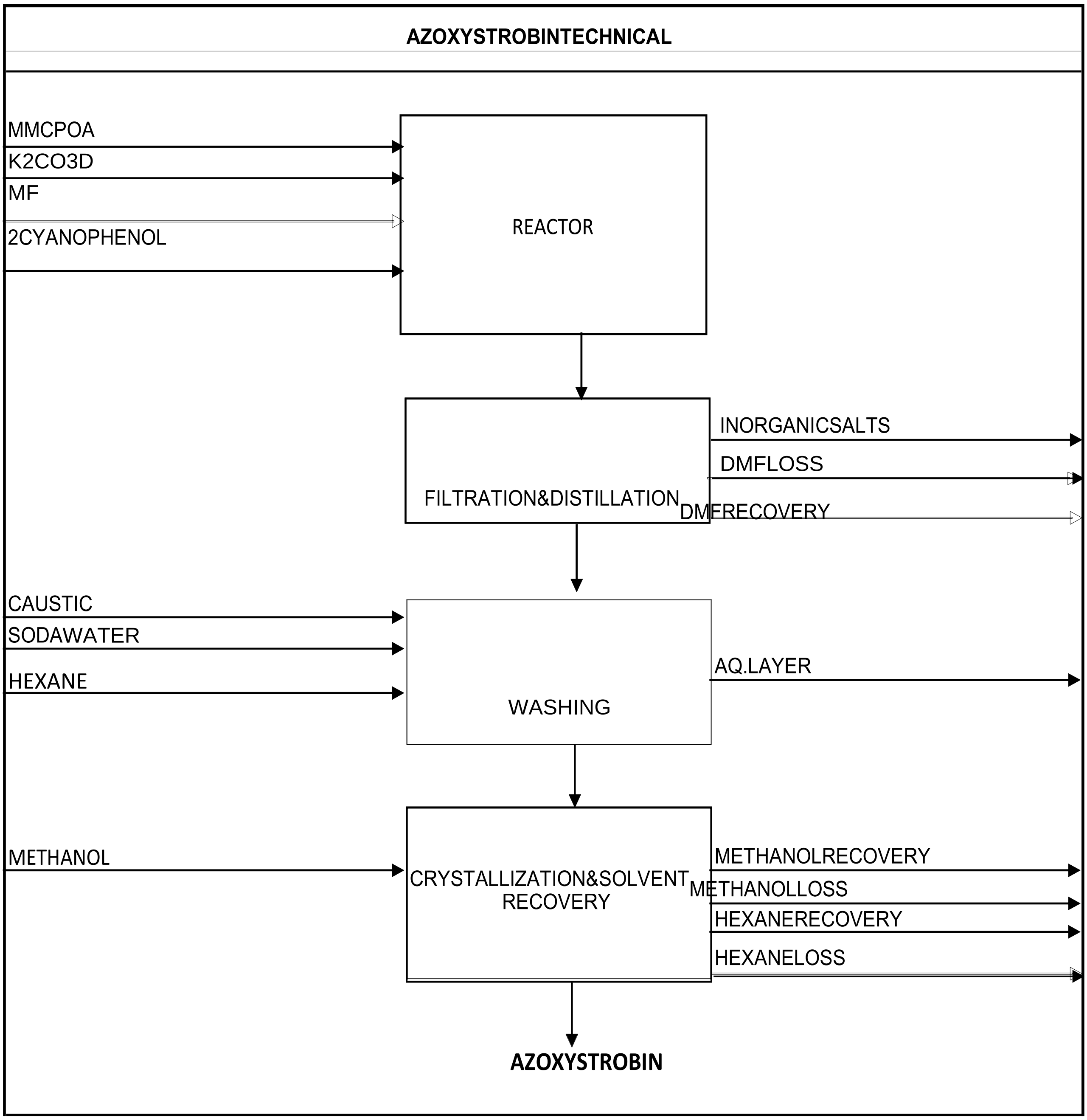
Step 4 :-



	Material / Mass Balance of AZOXYSTROBIN All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By Product	Kg/Batch
1	Phthalate	320		Azoxy Strobin	1000
2	Methyl Formate	142		Recovered SolventToluene	1370
3	Di Methyl Carbonate	216		Solvent Loss (Toluene)	30
4	Sodium Hydride	58		Sodium Chloride	140
5	Solvent – Toluene	1400		Sodium Carbonate	258
6	Sodium Methoxide	128		Recovered Solvent EDC	1160
7	Solvent – EDC	1200		Solvent Loss (EDC)	40

8	4,6 - Di Chloro Pyrimidine	352		Potassium Chloride	180
9	Ortho Cyano Phenol	283		Solvent Recovered DMF	1160
10	Potassium Hydroxide	133		Solvent Loss (DMF)	40
11	Solvent – DMF	1200		Aqueous Layer to ETP	915
12	Water	880		Distillation Residue	19
	TOTAL	**6312**		**TOTAL**	**6312**

Flow Diagram of AZOXYSTROBIN :-



33. **Picoxystrobin :-**

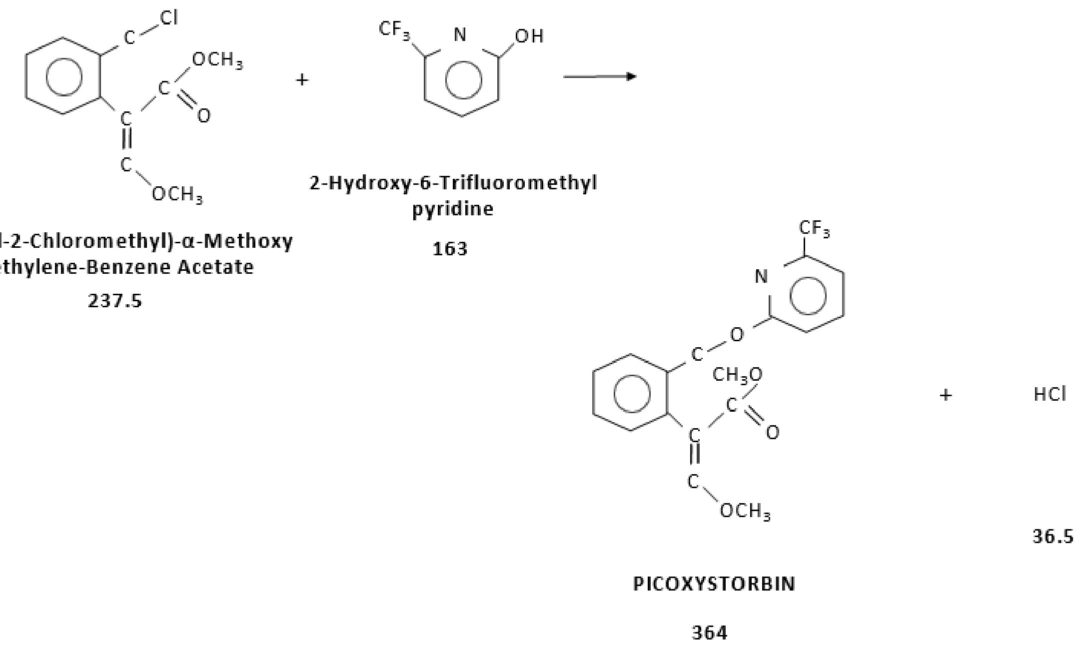
Brief Manufacturing Process :-

Step 1 :- 3-Isochromanone is reacted with Methyl Formate in presence of Di methyl Carbonate and sodium hydride to give 4-(α-Methyl Methylene)-3-Isochromanone.

Step 2 : - 4-(α-methyl Methylene)-3-Isochromanone further reacted with Hydrochloric acid in presence of Solvent – EDC to give Methyl-2-(Chloromethyl)-α-methoxy Methylene-Benzene acetate.

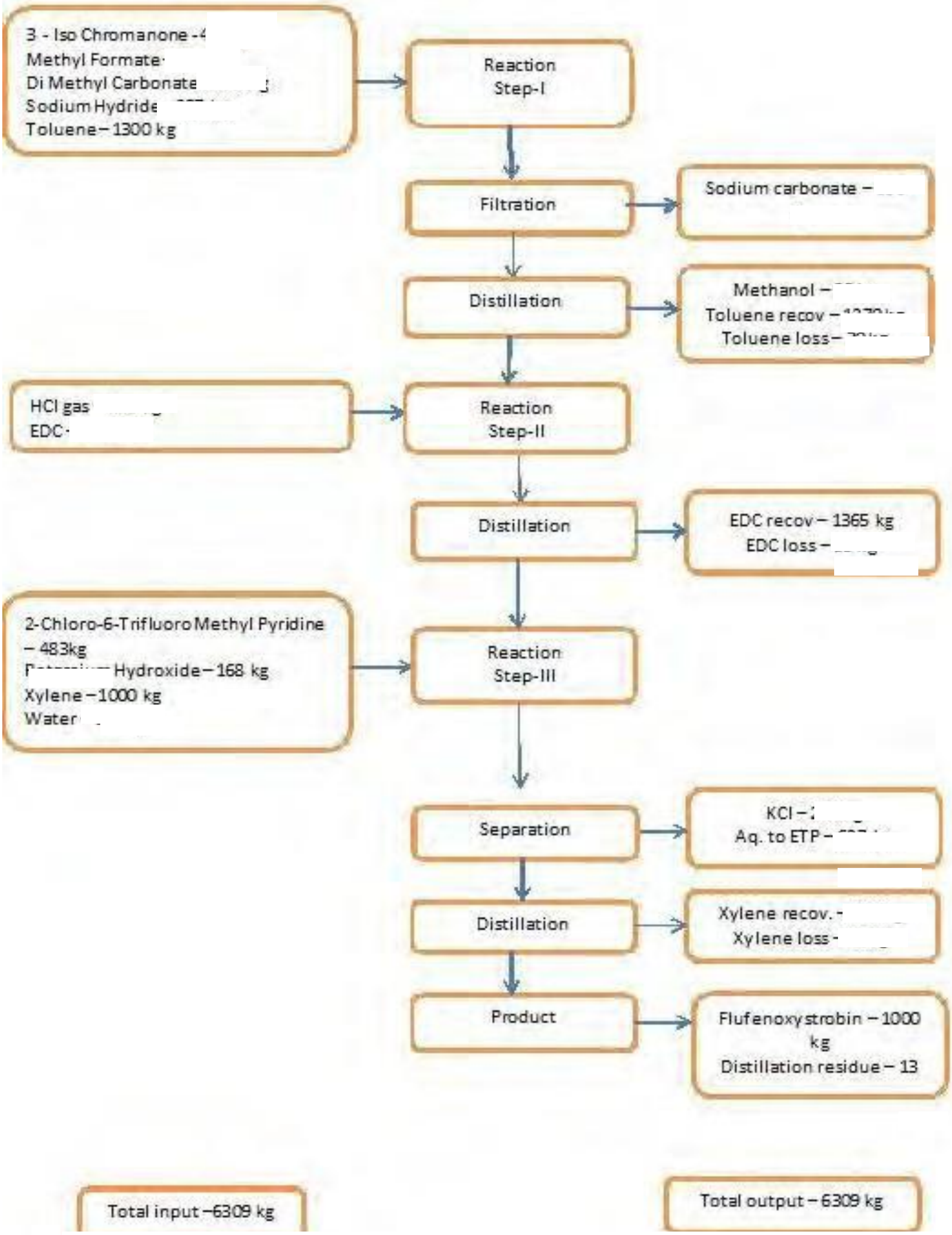
Step 3 :- Methyl-2-(Chloromethyl)-α-Methoxy Methylene-Benzene acetate reacted with 2- Hydroxy-6-Trifluoromethyl pyridine to give final product Picoxystrobin.

STEP:3



	Material / Mass Balance of PICOXYSTROBIN All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	3 – Iso Chromanone	445		Picoxystrobin	1000
2	Methyl Formate	180		Recovered Solvent – Toluene	1260
3	Di Methyl Carbonate	270		Solvent loss (Toluene)	40
4	Sodium Hydride	287		Sodium Carbonate	650
5	Solvent - Toluene	1300		Methanol	96
6	HCl Gas	110		Potassium Chloride	223
7	Solvent – EDC	1400		Recovered Solvent - EDC	1360
8	2- Chloro -6-trifluoro Methyl Pyridine	483		Solvent Loss EDC	40
9	Potassium Hydroxide	168		Solvent Recovered – Xylene	970
10	Solvent - Xylene	1000		Solvent Loss – Xylene	30
11	Water	666		Aqueous Layer to ETP	628
12				Distillation Residue	12
	TOTAL	**6309**		**TOTAL**	**6309**

Flow Diagram ofPICOXYSTROBIN :- :-



34. Pyraclostrobin:-

Process Description:

Step – 1

1, 4 Dichloro Benzene reacts with 3-Chloro Pyrazole in presence of catalyst & solvent Xylene to form Intermediate (A) as 3-Chloro 4-Chloro PhenylPyrazole.

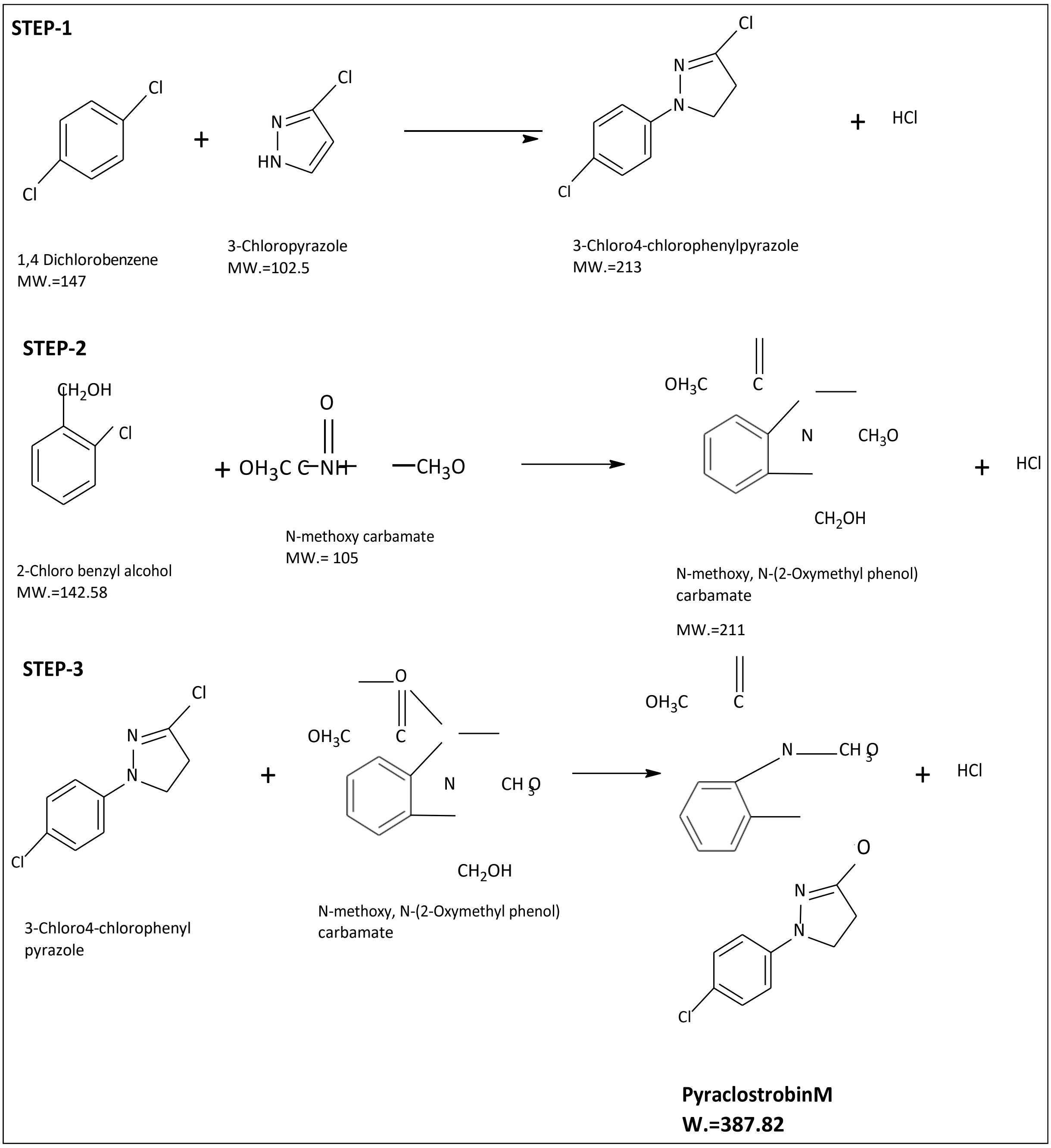
Step – 2

2-Chloro Benzyl Alcohol reacts with N-MethoxyCarbamate to form the second Intermediate (B), N-methoxy, N-(2-Oxymethyl Phenol) Carbamate.

Step – 3

Intermediates (A) & (B) then undergoes Condensation reaction in presence of Catalyst & Solvent Xylene to give the final product Pyraclostrobin Technical after Filtration, Washing & Drying. Xylene is recovered from the ML and recycled .

Process Reaction:



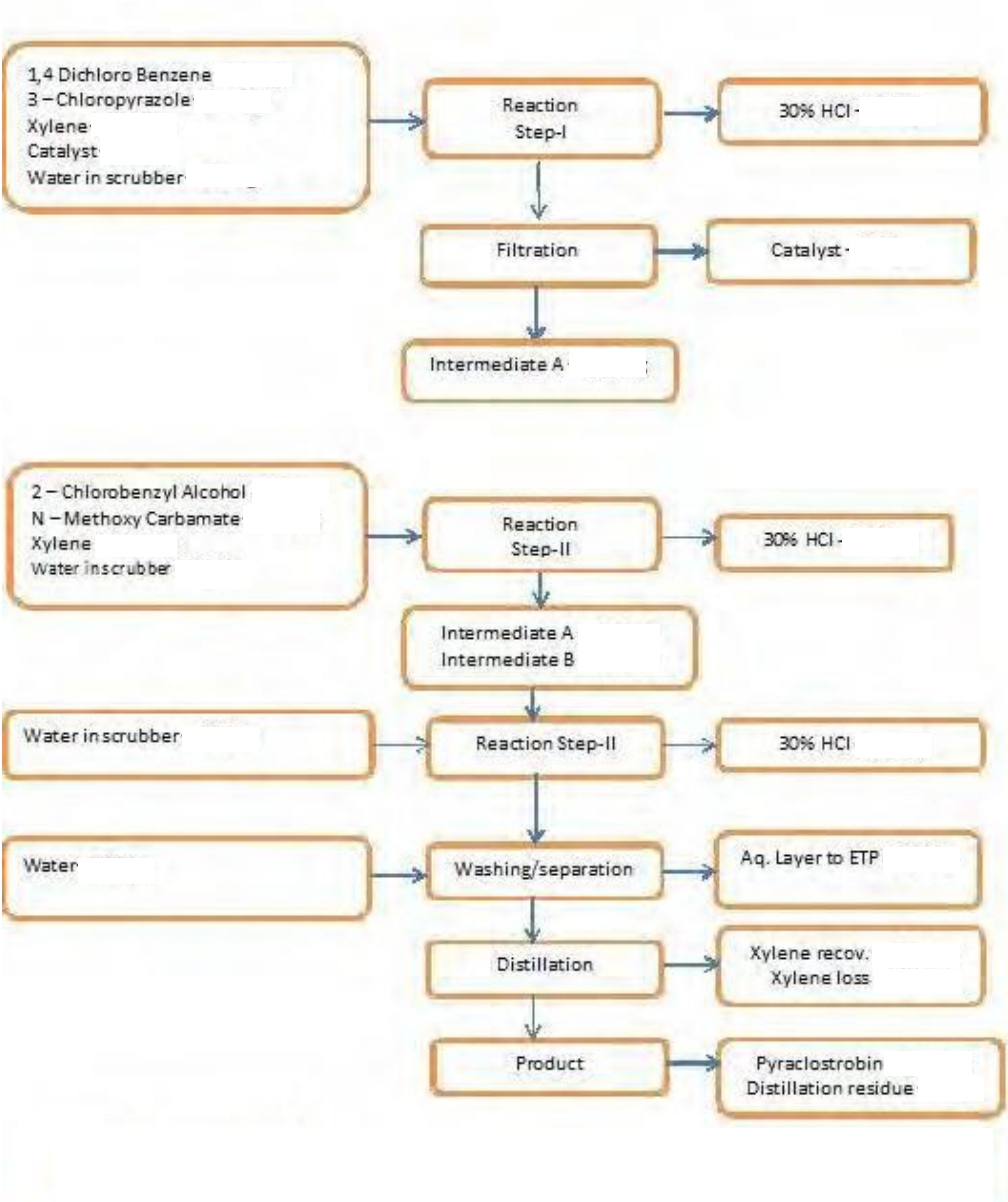
Material Balance:

Material Balance for Pyraclostrobin		
S. No.	Raw Materials	Input/MT of Product (KG)
1	1,4 DichloroBenzene	425
2	3 Chloro Pyrazole	275
3	Catalyst-5	5
4	Catalyst-6	5
5	Xylene	4000
6	2 Chloro Benzyl Alcohol	370
7	N-Methoxy Carbamate	270
8	Water Washing	1000
Total		**6350**

.

S. No.	Output/MT of Product (KG)					Remarks
	Product	Liquid Effluent	Air Emission/ loss	Recovery	Solid Waste	
1	Pyraclostrobin	-	-	1000	-	Product
2	Aqueous Layer	1055	-	-	-	To ETP
3	HCl	-	-	271	-	To Scrubber
4	Xylene	-	80	3920	-	Recycle
5	Residue	-	-	-	24	To Incineration
Total		**1055**	**80**	**5191**	**24**	
		6350				

Process Flow Diagram of Pyraclostrobin



35. Trifloxystrobin :-

Brief Manufacturing Process :-

Step 1 :- 2-Methyl Aniline is reacted with Sodium Nitrite and Hydrochloric acid to give 2-Methyl benzene Diazonium salt by diazotization.

Step 2 :- 2-Methyl Benzene Diazonium salt further reacted with Glyoxylic Acid methyl ester Oxime to give 2-Methyl phenyl glyoxalin acid methyl ester Oxime.

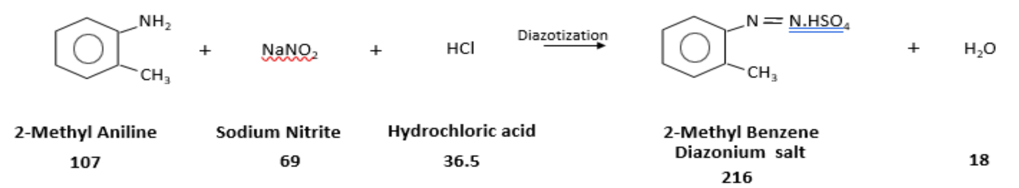
Step 3 :- 2-Methyl Phenyl Glyoxylic Acid methyl ester Oxime reacted with Dimethyl sulfate in presence of Sodium Hydroxide to give 2-Methyl Phenyl Glyoxylate-o-methyl Oxime.

Step 4 :- 2-Methyl Phenyl Glyoxylate-o-methyl Oxime further on chlorination with chlorine gas in presence of Solvent – EDC gives 2-Methyl phenyl Glyoxylate-o-methylOxime.

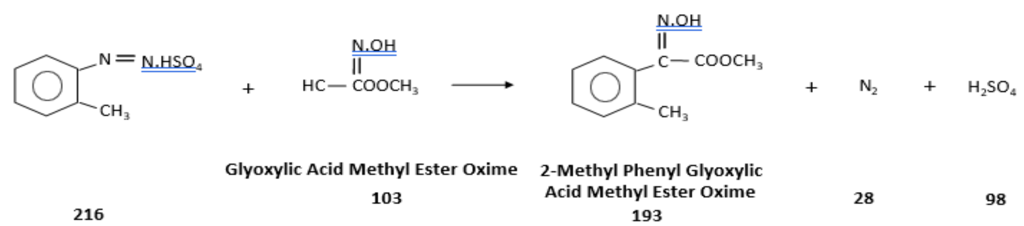
Step 5 :- 2-Methyl Phenyl Glyoxylate-o-methyl Oxime reacted with Sodium [-1- [3-(Trifluoromethyl) Phenyl] Ethylene] Amine] Oxidanide in presence of Solvent – DMF to give final product Trifloxystrobin.

Chemical Reactions: -

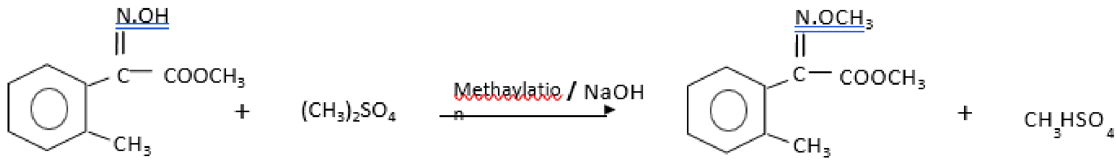
STEP:1



STEP:2

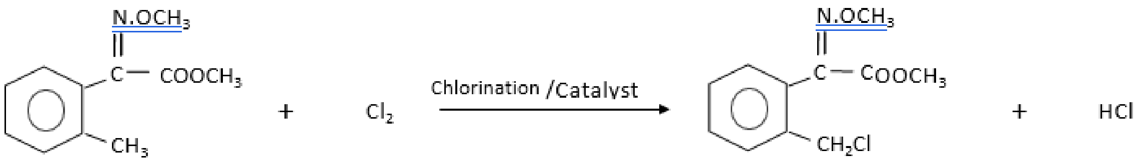


STEP:3



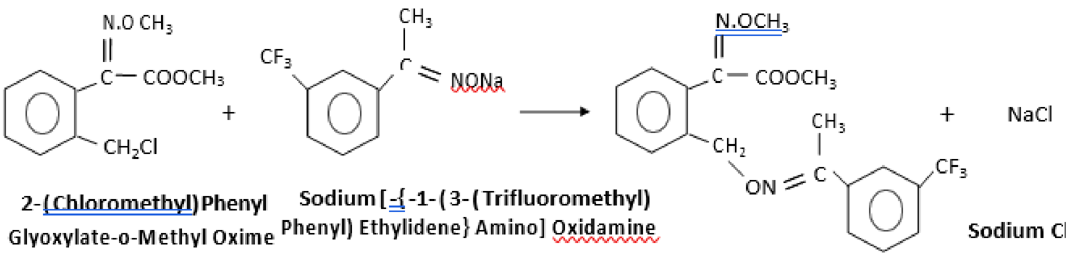
2-Methyl Phenyl Glyoxylic Acid Methyl Ester Oxime 193 + Dimethyl Sulfate 126 → 2-Methyl Phenyl Glyoxylate-O-Methyl Oxime 207 + Methyl Bisulfate 112

STEP:4



2-Methyl Phenyl Glyoxylate-O-Methyl Oxime 207 + Chlorine gas 71 → 2- (Chloromethyl) Phenyl Glyoxylate-o-Methyl Oxime 241.5 + 36.5

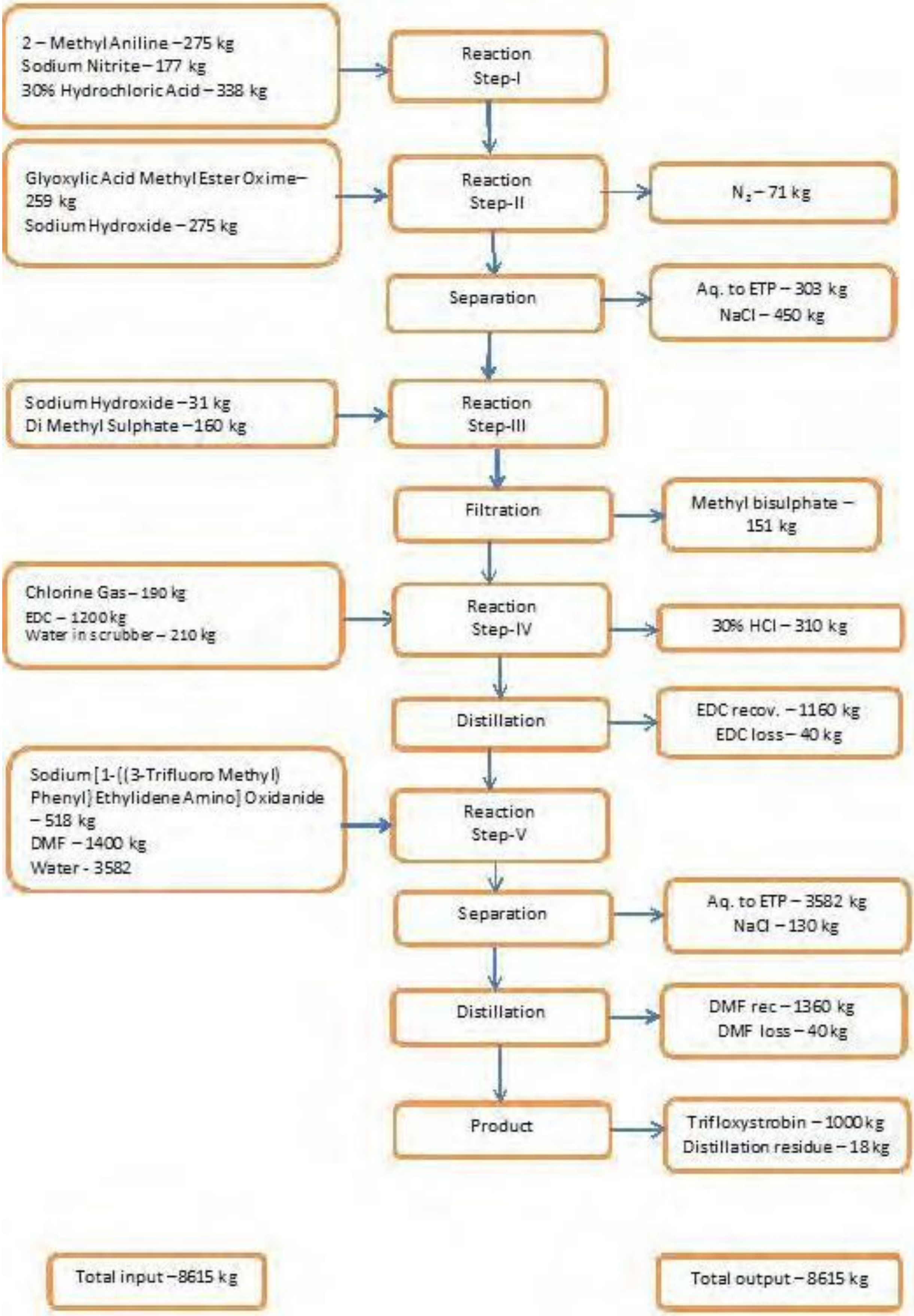
STEP:5



2-(Chloromethyl)Phenyl Glyoxylate-o-Methyl Oxime 241.5 + Sodium [-{-1-(3-(Trifluoromethyl) Phenyl) Ethylidene} Amino] Oxidamine 225 → TRIFLOXYSTORBIN 408 + Sodium Chloride 58.5

	Material / Mass Balance of TRIFLOXYSTROBIN All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	2- Methyl Aniline	275		Trifloxystrobin	1000
2	Sodium Nitrite	177		Sodium Chloride	450
3	30 % Hydrochloric Acid	338		Nitrogen Gas	71
4	Glyoxylic Acid Methyl Ester Oxime	259		Sodium Sulphate	366
5	Sodium Hydroxide	306		Recovered Solvent - EDC	1160
6	Di Methyl Sulphate	160		Solvent Loss EDC	40
7	Chlorine Gas	190		30 % Hydrochloride Solution	310
8	Solvent - EDC	1200		Solvent Recovered – DMF	1360
9	Sodium [1- {(3-Trifluoro Methyl) Phenyl} Ethylidene Amino] Oxidanide	518		Solvent Loss – DMF	40
10	Solvent - DMF	1400		Aqueous Layer to ETP	3700
11	Water	3692		Distillation Residue	18
	TOTAL	**8515**		**TOTAL**	**8515**

Process Flow:


2 – Methyl Aniline – 275 kg
Sodium Nitrite – 177 kg
30% Hydrochloric Acid – 338 kg
Reaction Step-I
Glyoxylic Acid Methyl Ester Oxime– 259 kg
Sodium Hydroxide – 275 kg
Reaction Step-II
N_2 – 71 kg
Separation
Aq. to ETP – 303 kg
NaCl – 450 kg
Sodium Hydroxide – 31 kg
Di Methyl Sulphate – 160 kg
Reaction Step-III
Filtration
Methyl bisulphate – 151 kg
Chlorine Gas – 190 kg
EDC – 1200 kg
Water in scrubber – 210 kg
Reaction Step-IV
30% HCl – 310 kg
Distillation
EDC recov. – 1160 kg
EDC loss – 40 kg
Sodium [1-{(3-Trifluoro Methyl) Phenyl} Ethylidene Amino] Oxidanide – 518 kg
DMF – 1400 kg
Water - 3582
Reaction Step-V
Separation
Aq. to ETP – 3582 kg
NaCl – 130 kg
Distillation
DMF rec – 1360 kg
DMF loss – 40 kg
Product
Trifloxystrobin – 1000 kg
Distillation residue – 18 kg
Total input – 8615 kg
Total output – 8615 kg

36. HEXACONAZOLE TECH :-

Brief Manufacturing Process:-

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

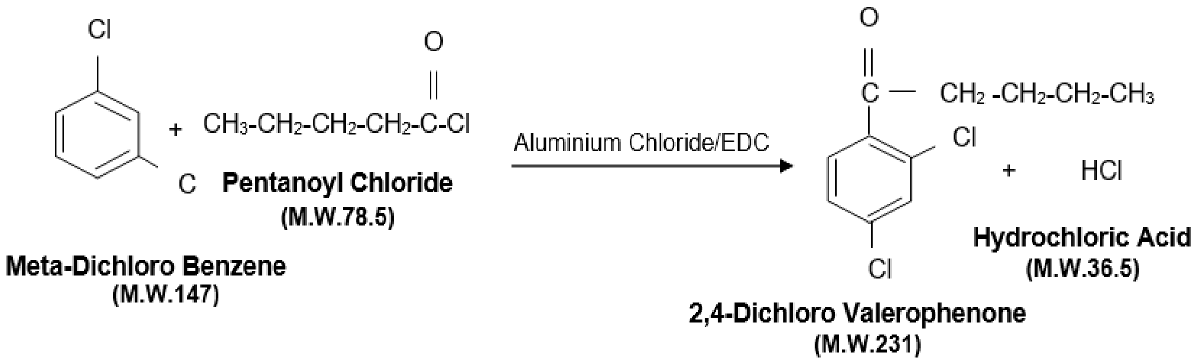
Step 2 :- 2,4-Dichloro Velerophenone reacted with Methylene-Triphenylphosphorane in presence of solvent THF to get 2-(2,4-Dichloro Phenyl)-n-hex-1-ene.

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

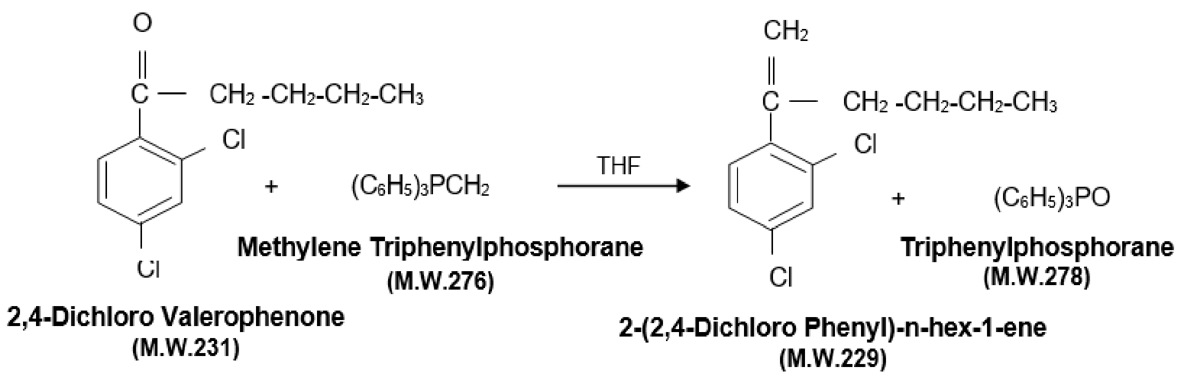
Step 4 :- 1-Bromo-2--(2,4-Dichloro Phenyl)-hexane-2-ol further reacted with 1,2,4-Triazole in presence of Potassium Hydroxide and solvent DMF to get final product Hexaconazole.

Chemical Reactions :-

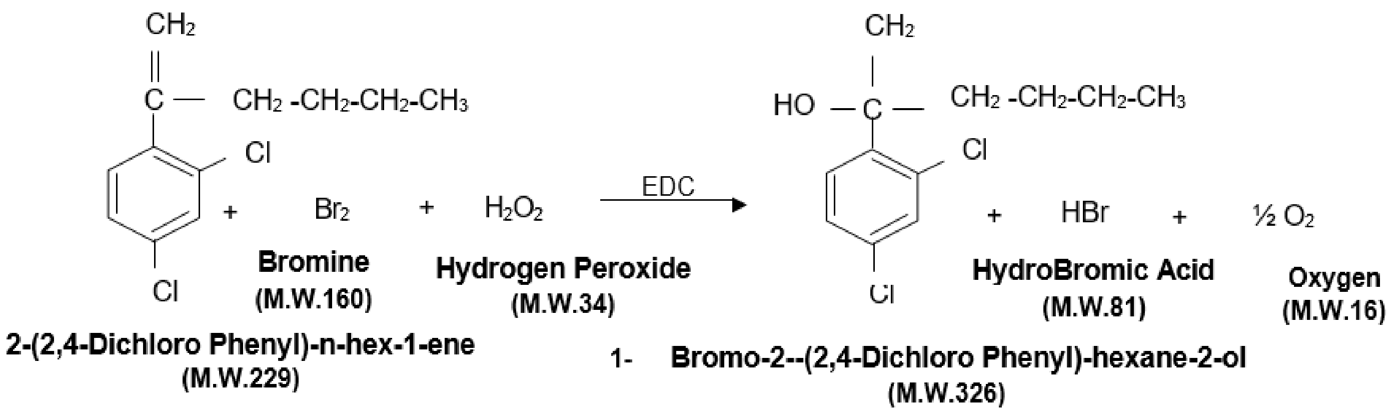
Step 1 :-



Step 2 :-

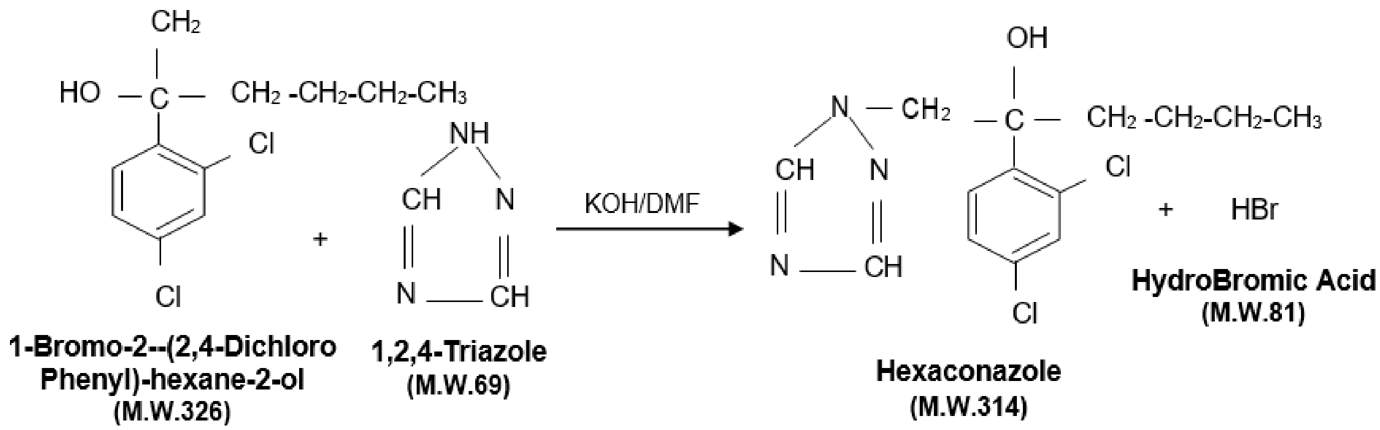


Step 3 :-



Bromine
(M.W.160)
Hydrogen Peroxide
(M.W.34)
EDC
HydroBromic Acid
(M.W.81)
Oxygen
(M.W.16)
2-(2,4-Dichloro Phenyl)-n-hex-1-ene
(M.W.229)
1- Bromo-2--(2,4-Dichloro Phenyl)-hexane-2-ol
(M.W.326)

Step 4:-

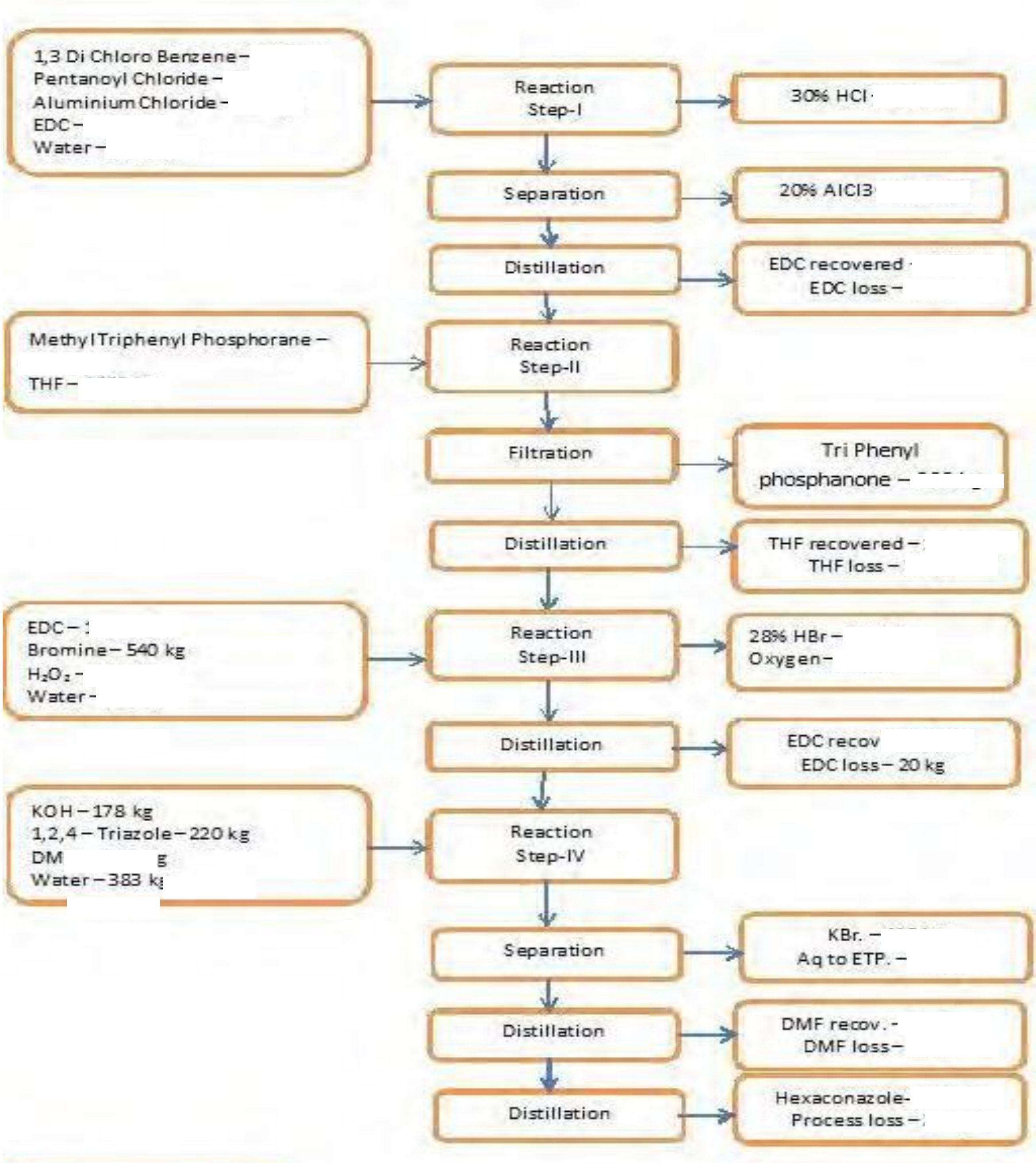


KOH/DMF
HydroBromic Acid
(M.W.81)
1-Bromo-2--(2,4-Dichloro Phenyl)-hexane-2-ol
(M.W.326)
1,2,4-Triazole
(M.W.69)
Hexaconazole
(M.W.314)

Material Balance :-

	Material / Mass Balance of HEXACONAZOLE All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Meta-Dichlorobenzene	522		Hexaconazole	**1000**
2	Pentanoyl Chloride	422		Recovered EDC	1940
3	Aluminum Trichloride	650		EDC loss	60
4	EDC	2000		20 % Aluminium Trichloride Soln	3250
5	Methyl TriPhenyl Phosphorane	956		30% Hydrochloric Acid	435
6	Tetra hydro Furan	1500		Recovered Tetra Hydro Furan	1465
7	Bromine	545		Tetra Hydro Furan loss	35
8	Hydrogen Peroxide	120		Triphenyl Phosphanone	970
9	1,2,4 Traizole	225		28% Hydrobromic Acid	1020
10	Potassium Hydroxide	190		Recovered Dimethyl Formamide	1460
11	Dimethyl Formamide	1500		Solvent Loss Dimethyl Formamide	40
12	Water	4000		Potassium Bromide	425
13				Aqueous Layer to ETP	505
14				Tarry Waste	25
	TOTAL	**12630**		**TOTAL**	**12630**

Flow Diagram of HEXACONAZOLE:-



37. Propiconazole :

Brief Manufacturing Process:-

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

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

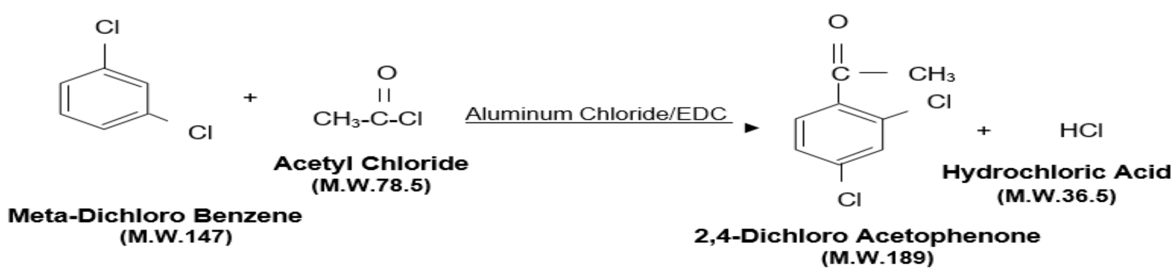
Step 3 :- 2,4-Dichloro Phenacyl Bromide reacted with 1,2-Pentanediol in presence of Toluene to get

4-(2-Bromomethyl-4-Propyl-1,3-Dioxolane-2yl)-1,3-Dichlorobenzene.

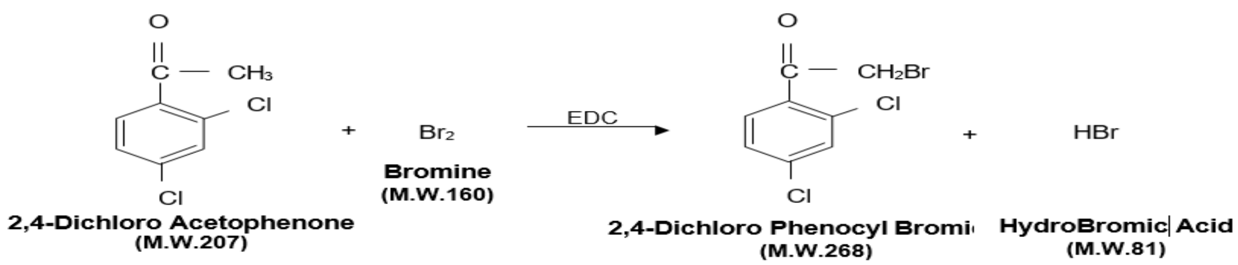
Step 4 :- 4-(2-Bromomethyl-4-Propyl-1,3-Dioxolane-2yl)-1,3-Dichlorobenzene reacted with 1,2,4-Triazole in presence solvent Toluene to give final product Penconazole.

Chemical Reactions : -

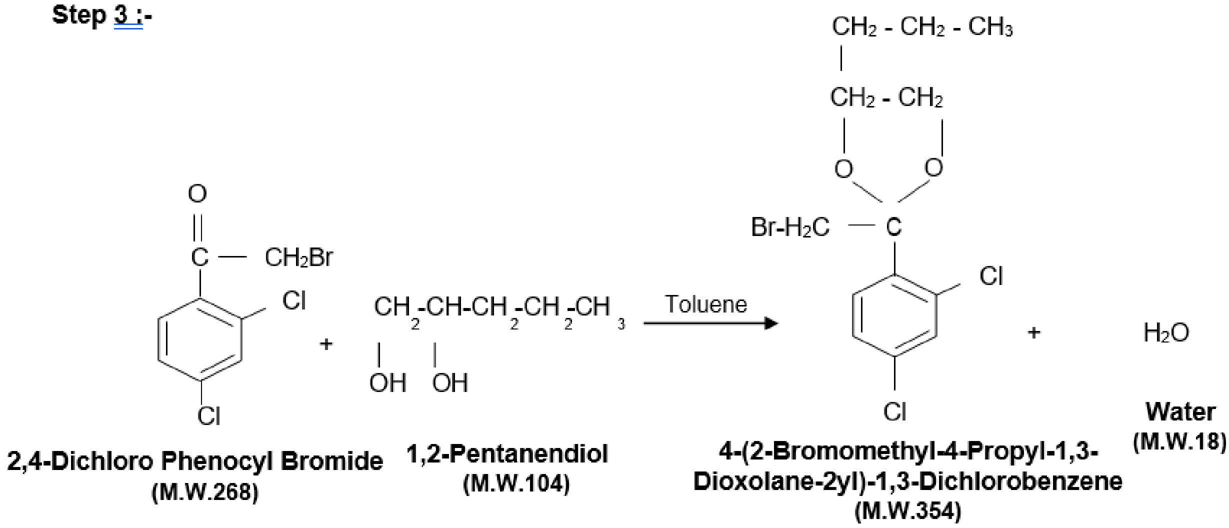
Step 1 :-



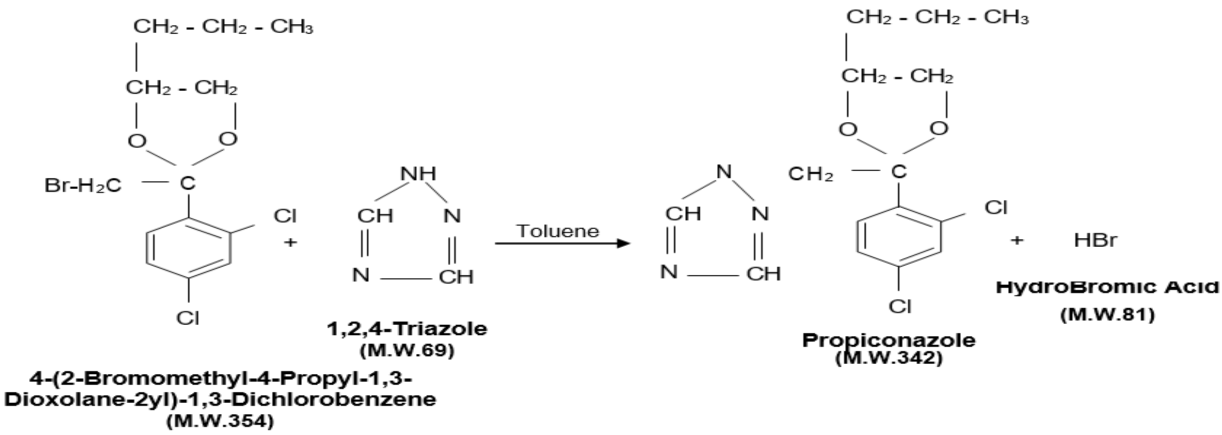
Step 2 :-



Step 3 :-



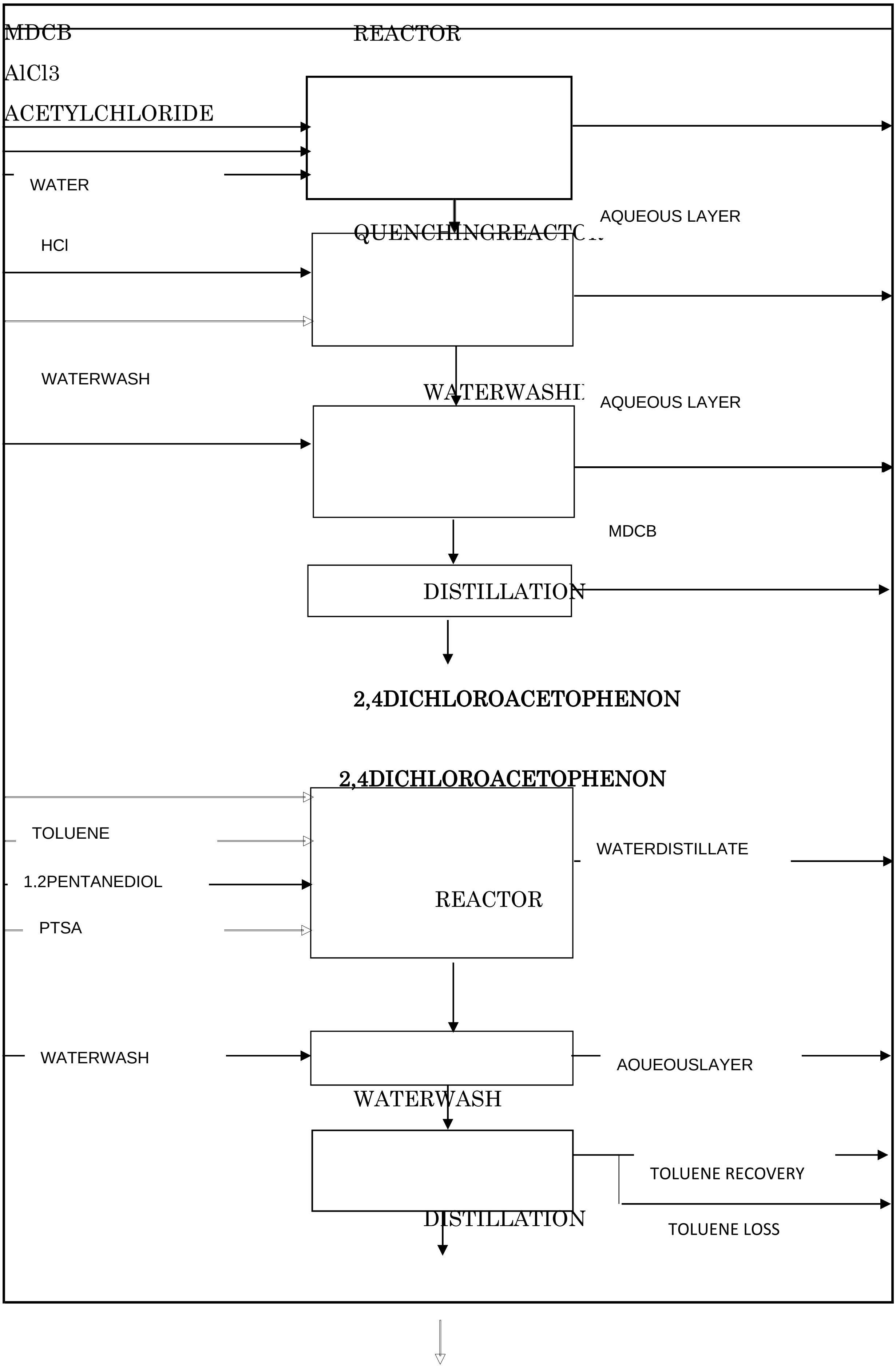
Step 4 :-

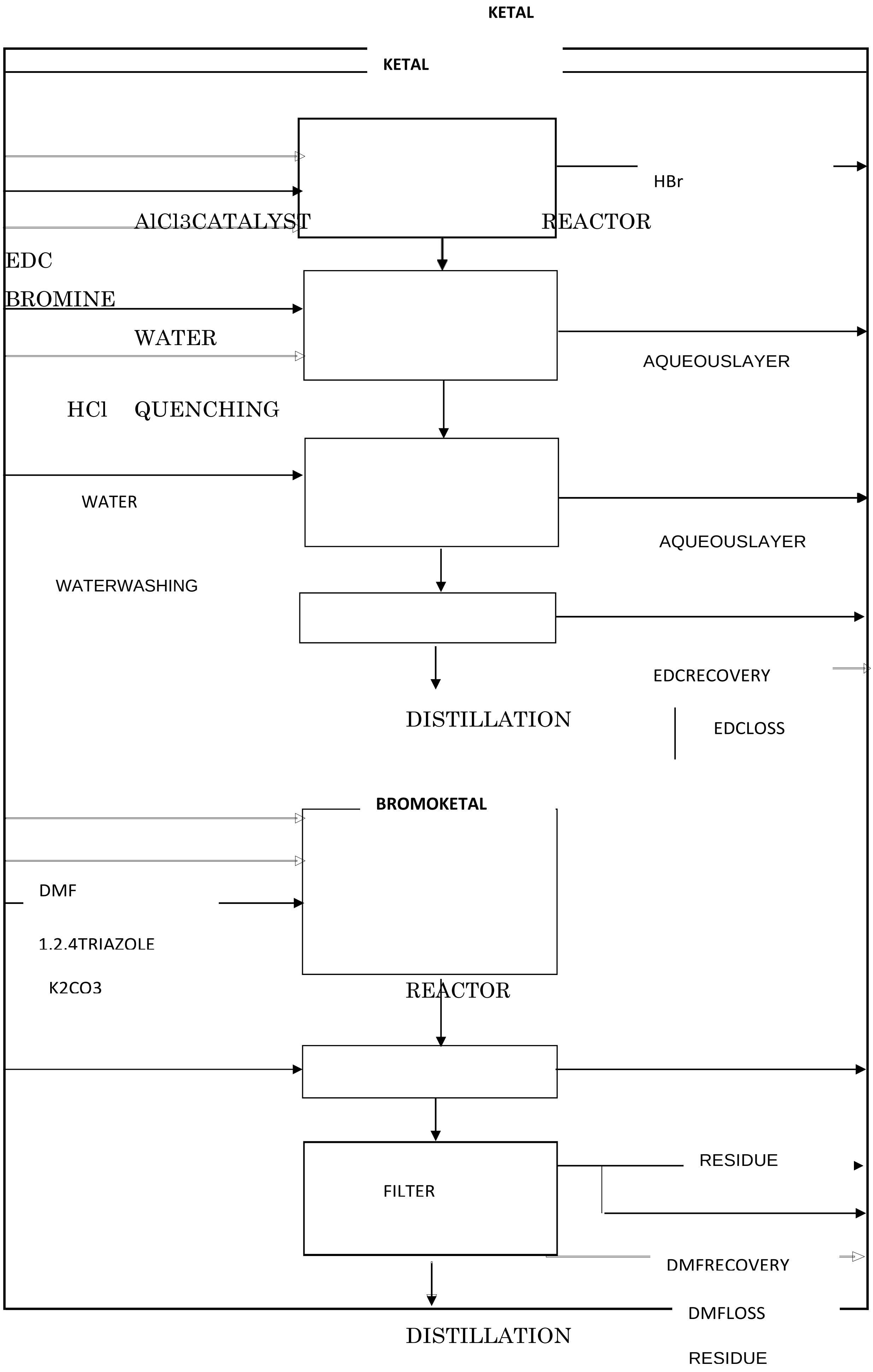


	Material / Mass Balance of PROPICONAZOLE All Quantities are in kg)			
	IN – PUT		OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch	Product / By product	Kg/Batch
1	Meta Dichloro Benzene	460	PROPICONAZOLE	**1000**
2	Acetyl Chloride	245	20 % Aluminium Trichloride Solution	2800
3	Aluminium Trichloride	560	Recovered EDC	3880
4	Ethylene Dichloride	4000	EDC LOSS	120
5	Br_2	555	30% Hydrochloric Acid	380
6	1,2 Pentane Diol	330	27% HBr Solution	900
7	Catalyst	[illegible]	[illegible] Catalyst	15
8	Water	3920	Recovered DMF	1455
9	Toluene	1200	Water t[illegible]	955
10	1,2,4 Triazole	215	DMF Loss	45
11	KOH	170	KBr	400
12	DMF	1500	Recovered Toluene	1170
13			Toluene Loss	30
14			Tarry Waste	20
	TOTAL	**13170**	**TOTAL**	**13170**

FLOW Diagram of PROPICONAZOLE

HCl


MDCB
REACTOR
AlCl3
ACETYLCHLORIDE
WATER
AQUEOUS LAYER
HCl
QUENCHINGREACTOR
WATERWASH
WATERWASHI
AQUEOUS LAYER
MDCB
DISTILLATION
2,4DICHLOROACETOPHENON
2,4DICHLOROACETOPHENON
TOLUENE
WATERDISTILLATE
1.2PENTANEDIOL
REACTOR
PTSA
WATERWASH
AOUEOUSLAYER
WATERWASH
TOLUENE RECOVERY
DISTILLATION
TOLUENE LOSS


KETAL
KETAL
AlCl3CATALYST
REACTOR
HBr
EDC
BROMINE
WATER
AQUEOUSLAYER
HCl
QUENCHING
WATER
AQUEOUSLAYER
WATERWASHING
EDCRECOVERY
DISTILLATION
EDCLOSS
BROMOKETAL
DMF
1.2.4TRIAZOLE
K2CO3
REACTOR
RESIDUE
FILTER
DMFRECOVERY
DMFLOSS
DISTILLATION
RESIDUE

38. Epoxiconazole:

Brief Manufacturing Process:-

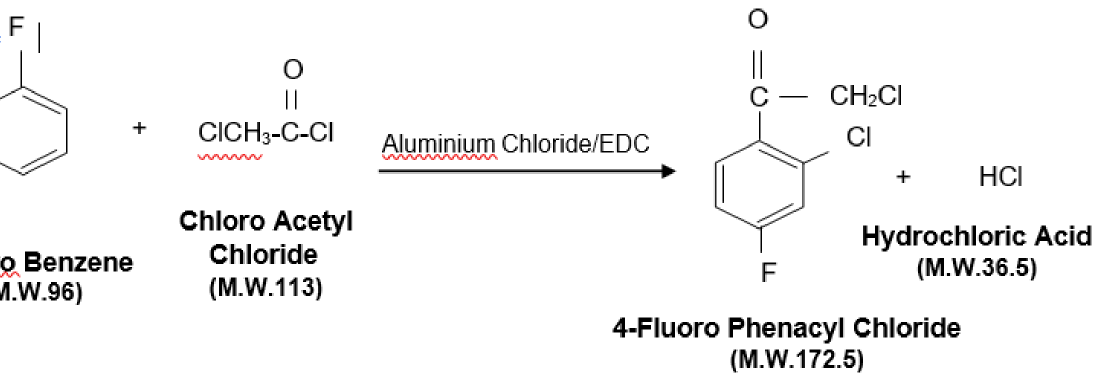
Step 1 :- Fluorobenzene is reacted with Chloro Acetyl chloride in presence of Aluminium chloride and Solvent - Ethylene Di Chloride to get 4-Fluoro Phenacyl Chloride.

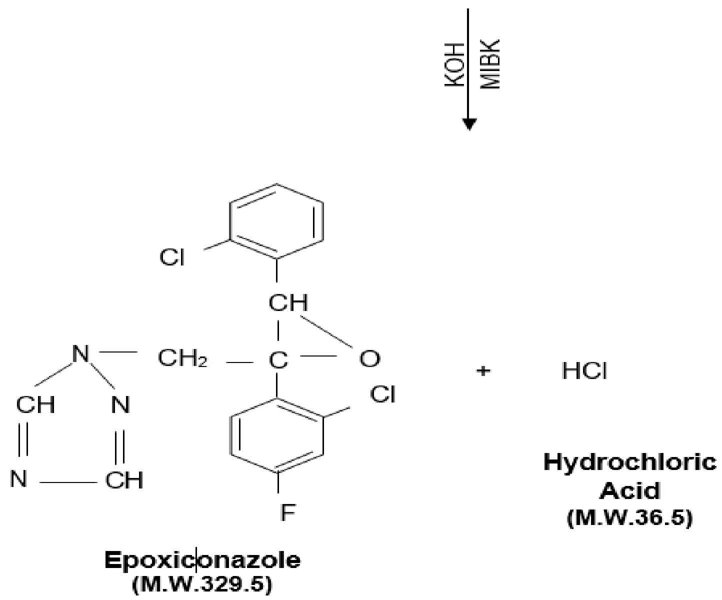
Step 2 :- 4-Fluoro Phenacyl Chloride reacted with 1,2,4-Triazole in presence of Potassium Hydroxide and Solvent DMF to give 2-(1H-1,2,4-Triazole-1-yl)-4-Fluoro Acetophenone.

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

Chemical Reactions :-

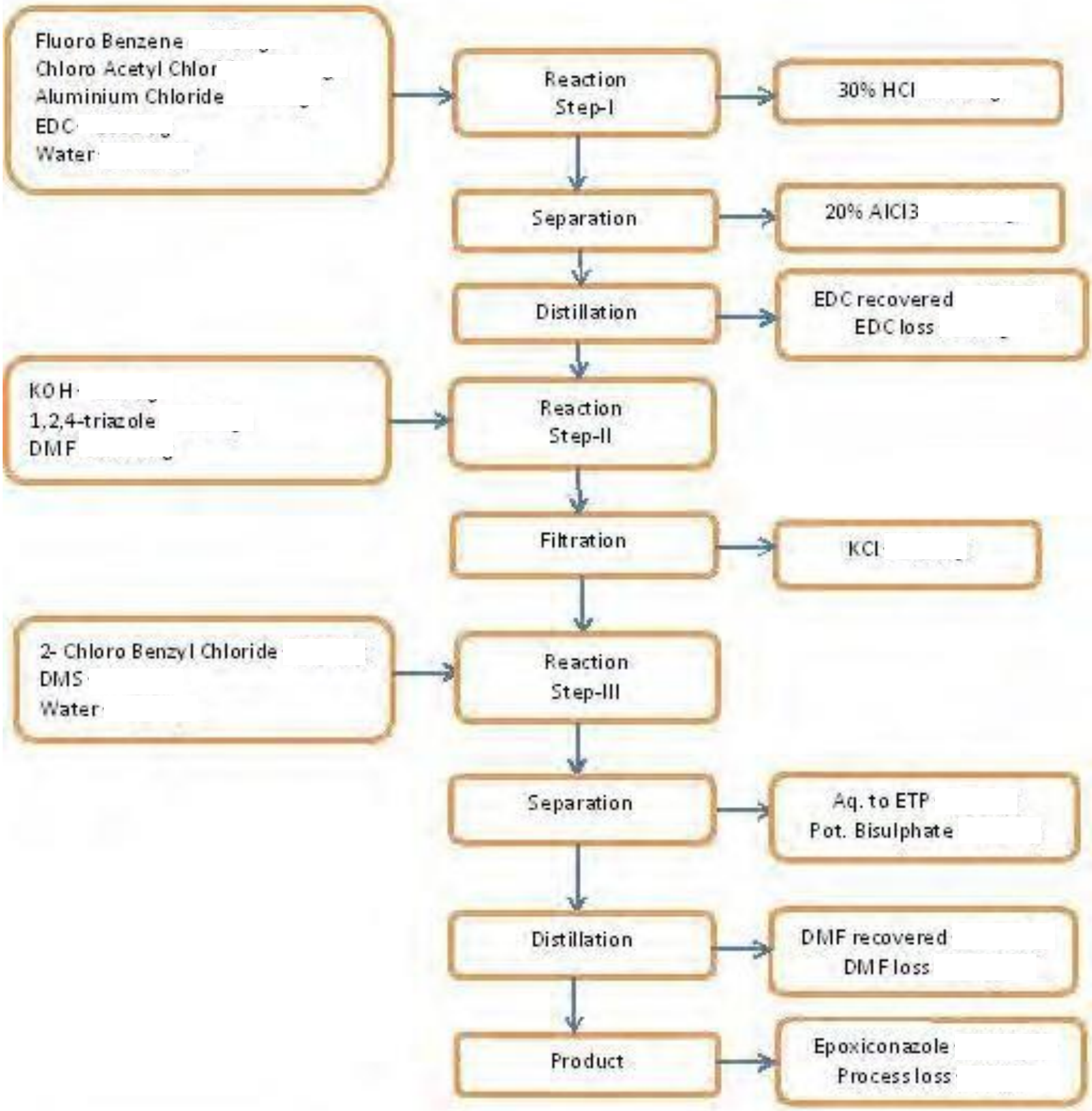
Step 1 :





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

Process Flow Diagram of EPOXICONAZOLE



39. Tebuconazole:-

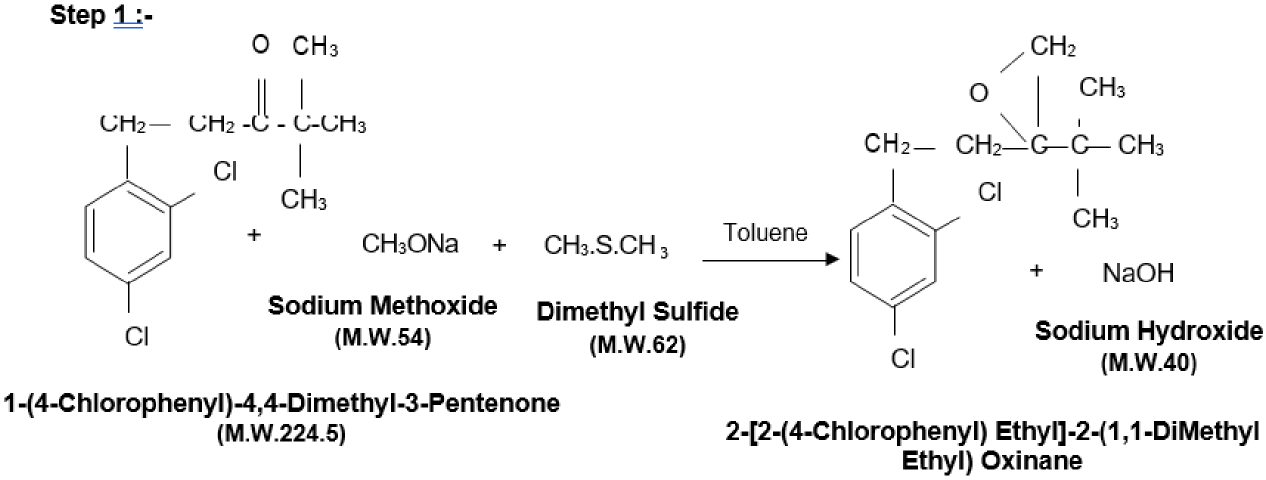
Brief Manufacturing Process :-

Step 1 :- 1-(4-Chlorophenyl)-4,4-Dimethyl-3-Pentenone reacted with Sodium Methoxide & Dimethyl Sulfide in presence of Sodium solvent Toluene to get product 2-[2-(4-Chlorophenyl)ethyl]-2-(1,1- DiMethyl ethyl) Oxinane.

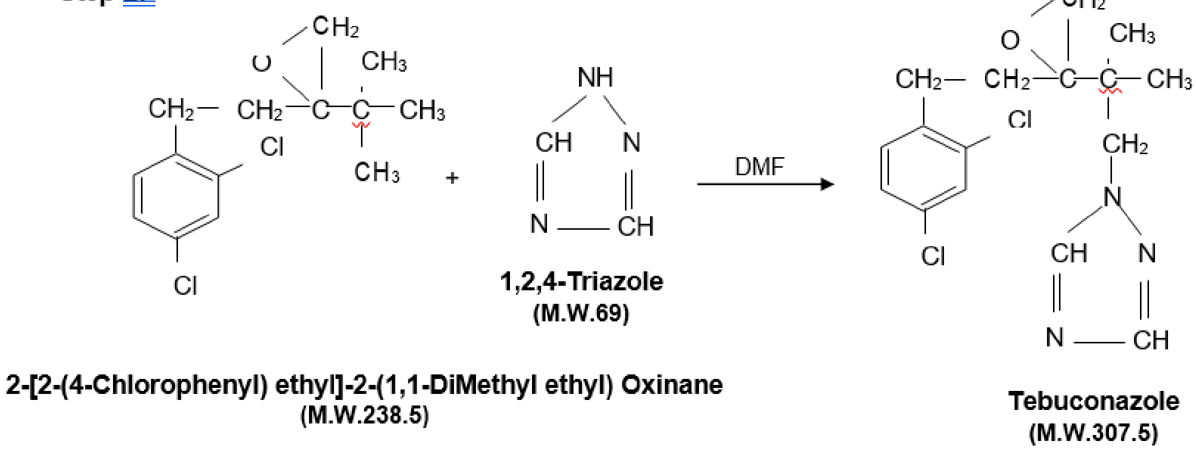
Step 2 :- 2-[2-(4-Chlorophenyl) ethyl]-2-(1,1-DiMethyl ethyl) Oxinane reacted with 1,2,4-Triazole in presence of DMF to get final product Tebuconazole.

Chemical Reactions:-

Step 1 :-

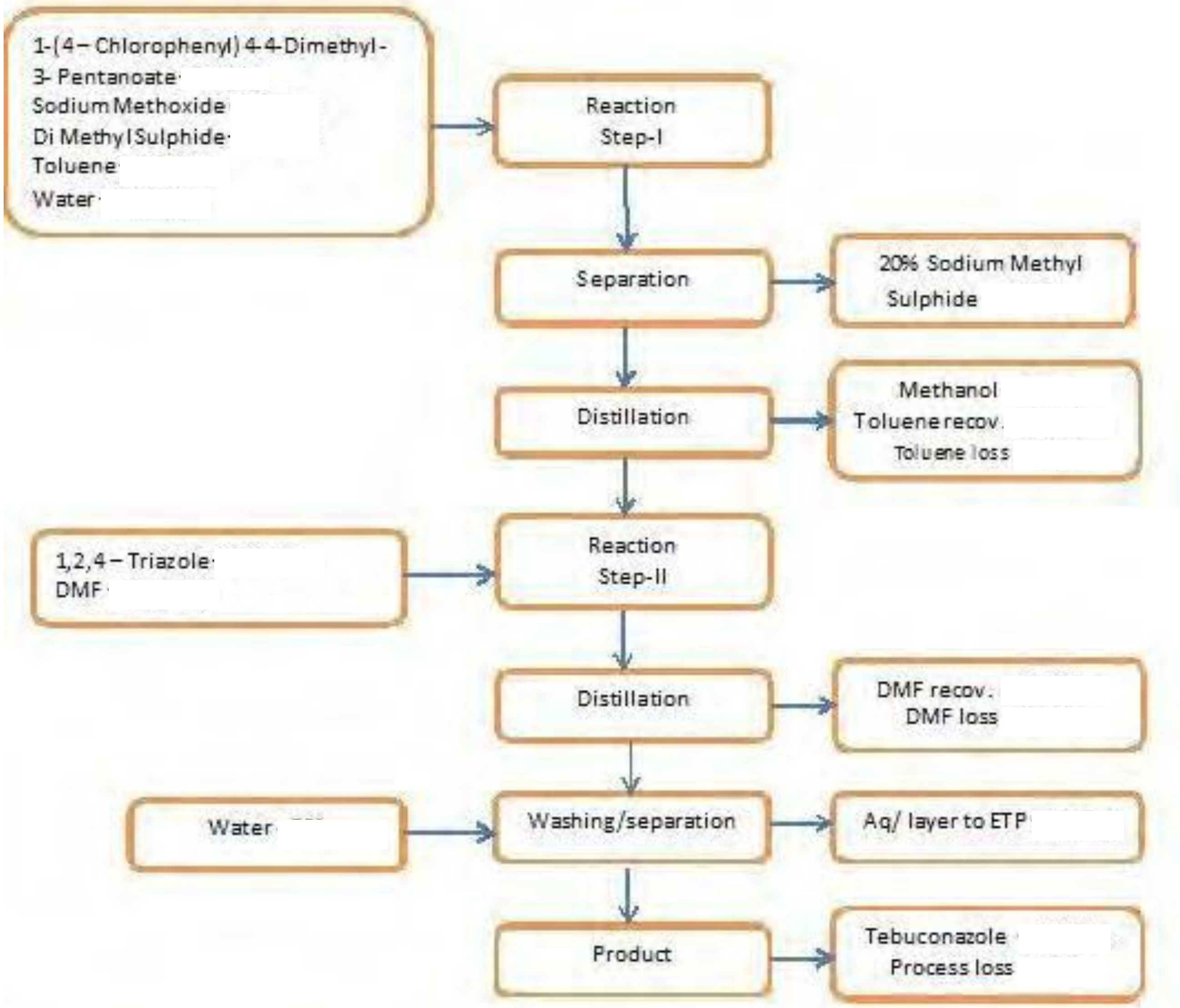


Step-2:-



	Material / Mass Balance of TEBUCONAZOLE All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	1-(4-Chlorophenyl)4-4 Dimethyl 3- Pentanoate	695		TEBUCONAZOLE	**1000**
2	Sodium Methoxide	180		Recovered Toluene	1746
3	Dimethyl Sulphide	195		Toluene Loss	54
4	Toluene	1800		20 % Sodium Methyl Sulphide	1100
5	1,2,4 Triazole	220		Recovered DMF	1455
6	Water	1800		DMF loss	38
7	DMF	1500		Effluent to ETP	967
8				Tarry Waste	30
	TOTAL	**6390**		**TOTAL**	**6390**

Flow Diagram of TEBUCONAZOLE :-



40. Tetraconazole:

Brief Manufacturing Process:-

Step 1 :- Methane-alpha-2,4-Dichloro Phenyl –beta-Hydroxy Propanoate reacts with methane ulfonyl chloride in presence of solvent as well as catalyst to give methyl-alpha-2,4-Dichloro Phenyl- 3-Methyl Sulfoxonyl Propionate (A).

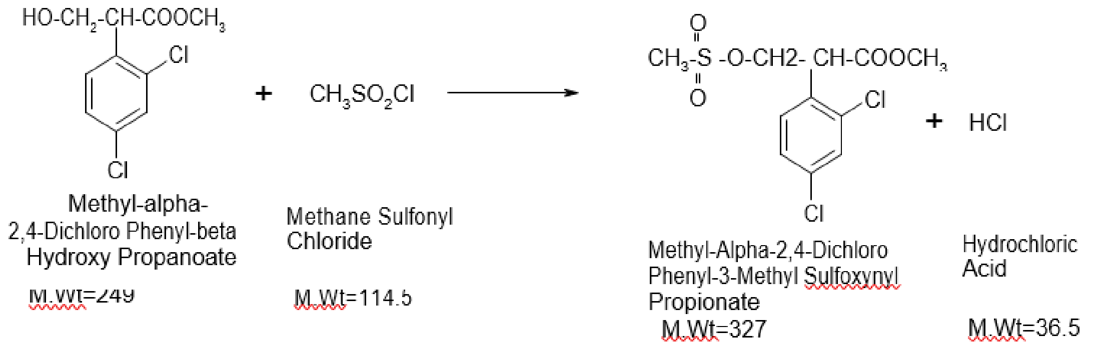
Step 2 :- A reacts with 1,2,4-Triazole to give the intermediate methyl-alpha-2,4-Dichloro Phenyl- beta propanol Propionate (B).

Step 3 :- B -further undergoes reduction by means of hydrogen as well as catalyst in presence of solvent to give the product 2,4-Dichloro Phenyl Propanol-2-Triazole (C)

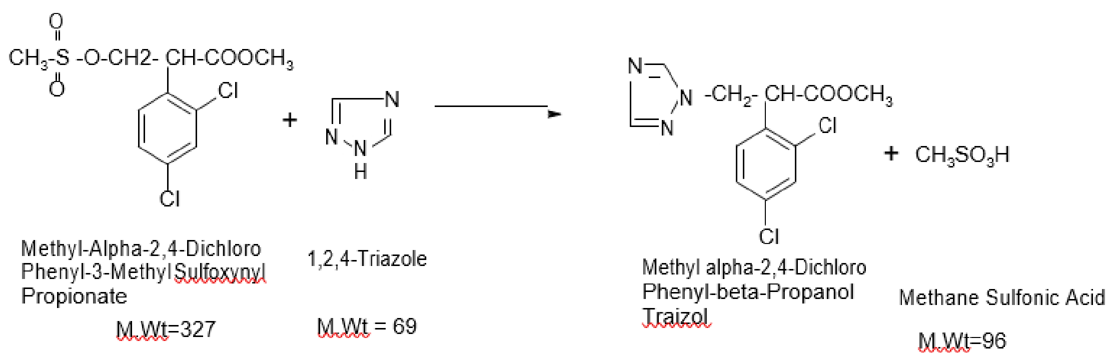
Step 4 :- C-finally reacts with Tetra Flouro Ethylene in presence of solvent and catalyst to gives the final product.

Chemical Reactions :-

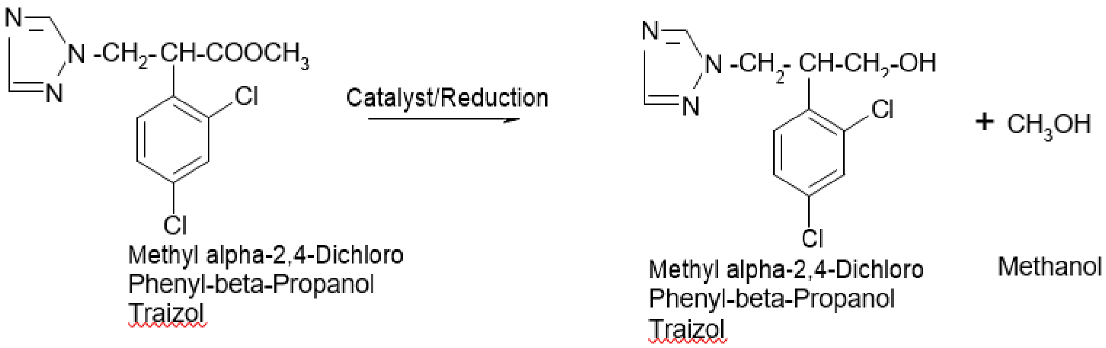
Step 1 :-



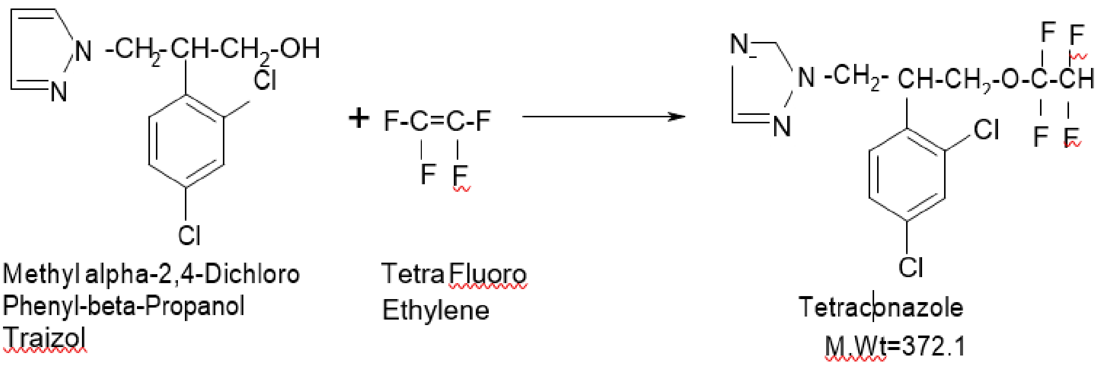
Step 2 :-



Step 3 :-



Step 4 :-



	Material / Mass Balance of TETRACONAZOLE All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Methyl alpha-2,4, Dichloro Phenyl Beta Hydroxy Propanoate	740		Tetraconazole	1040
2	Methane Sulphonyl Chloride	325		Rec. Solvent	2940
3	Solvent Toluene	3000		Solvent Loss	60
4	Catalyst	20		30% HCl Soln.	330
5	Tetrafluoro Ethane	275		Methane Soln.	260
6	Water for Reaction and washing	1750		Methane Distillate	80
				Aqueous Layer to ETP	1400
	TOTAL	**6110**		**TOTAL**	**6110**

41. Difenoconazole :

Brief Manufacturing Process :-

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

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

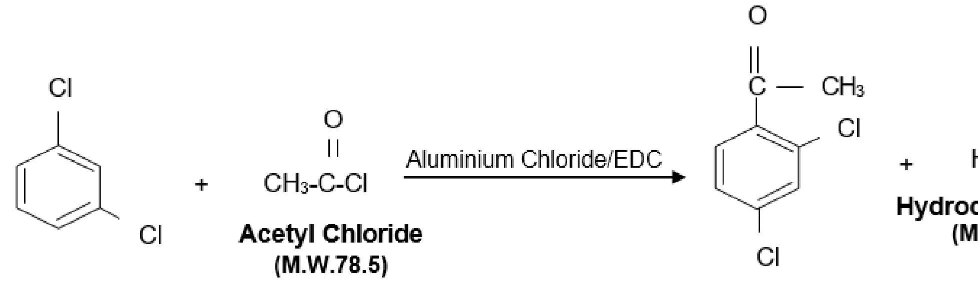
Step 3 :- 2,-Chloro-4-(4-Chlorophenoxy) Acetophenone further reacted with Bromine inpresence of catalyst and solvent Ethylene Dichloride . This process gives product 2,-Chloro-4-(4-Chlorophenoxy) Phenacyl Bromide.

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

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

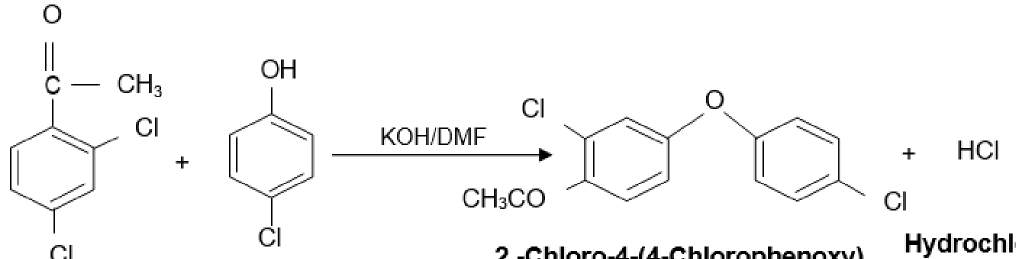
Chemical Reactions:-

Step 1 :-



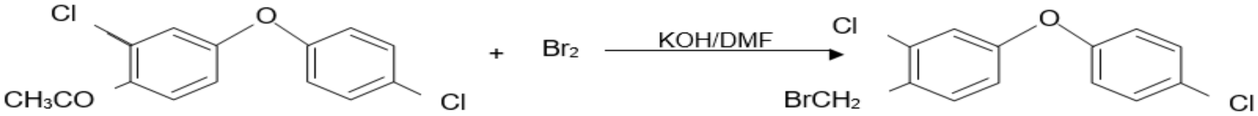
Meta-Dichloro Benzene (M.W.147) + **Acetyl Chloride** (M.W.78.5) → **2,4-Dichloro Acetophenone** (M.W.189) + **Hydrochloric Acid** (M.W.36.5)

Step 2 :-



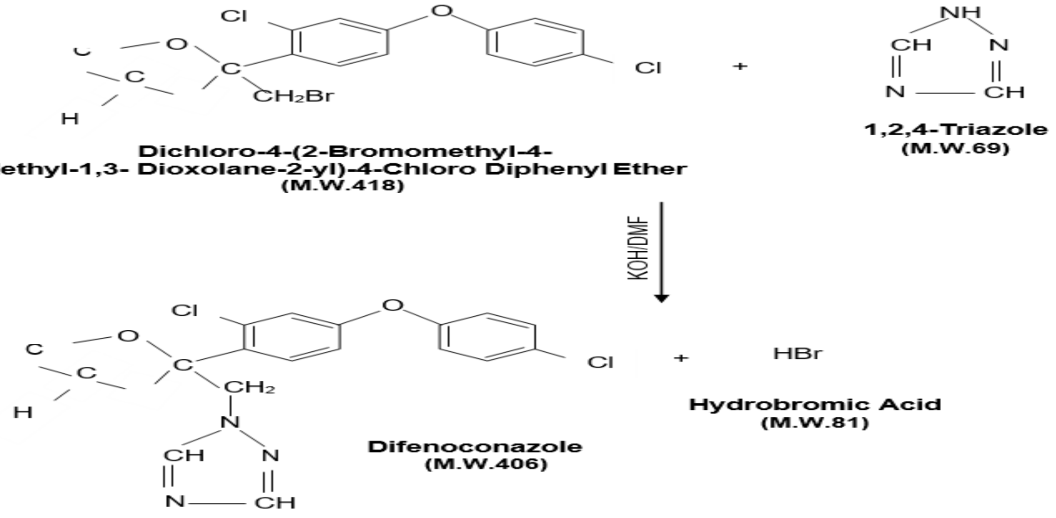
2,4-Dichloro Acetophenone (M.W.189) + **4-Chloro Phenol** (M.W.128.5) → **2 -Chloro-4-(4-Chlorophenoxy) Acetophenone** (M.W.281) + **Hydrochloric Acid** (M.W.36.5)

Step 3:-



2, -Chloro-4-(4-Chlorophenoxy) Acetophenone (M.W.281) + **Bromine** (M.W.160) → **2, -Chloro-4-(4-Chlorophenoxy) Phenacyl Bromide** (M.W.360)

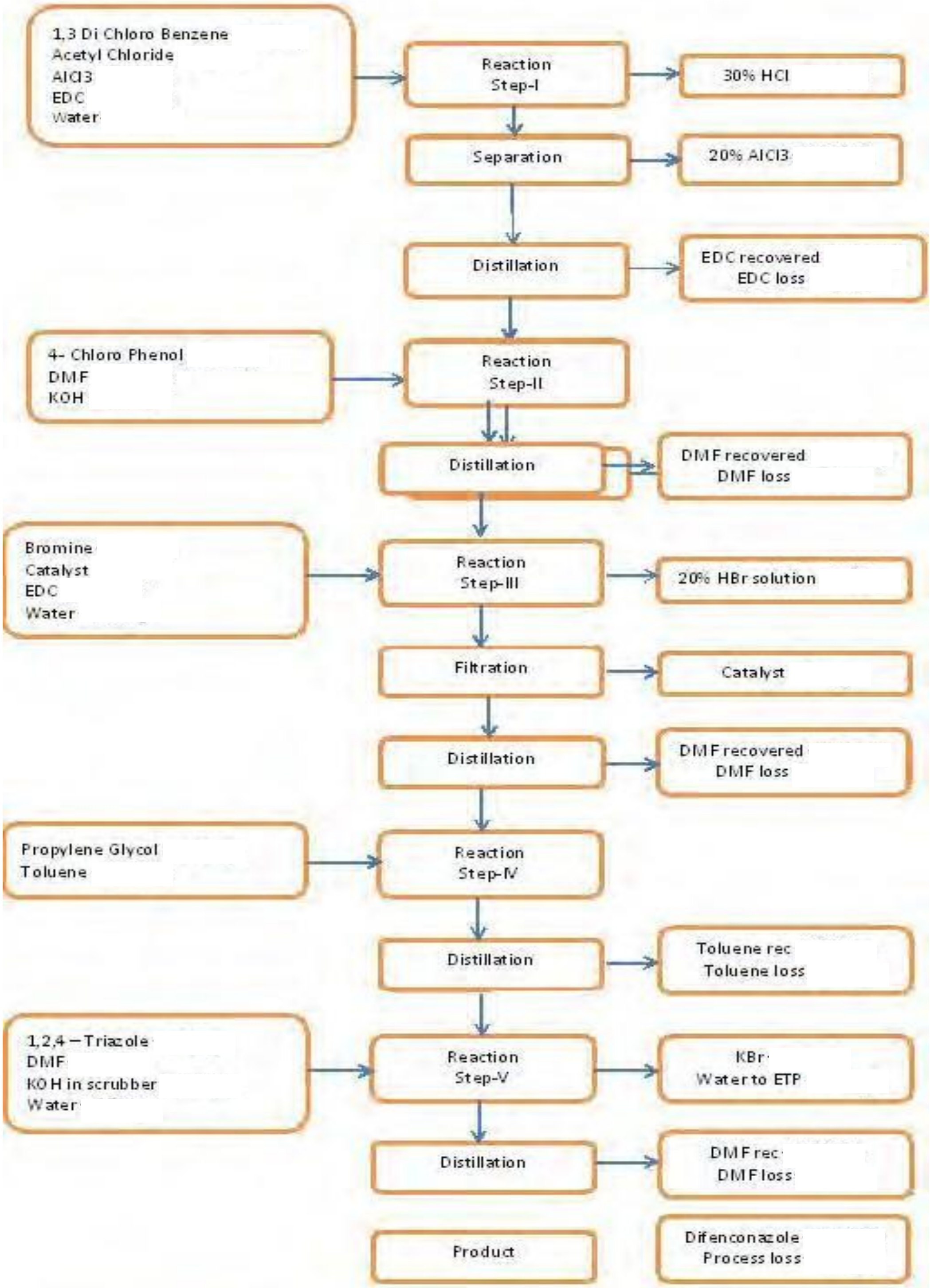
Step 5 :-



3- Dichloro-4-(2-Bromomethyl-4-Methyl-1,3- Dioxolane-2-yl)-4-Chloro Diphenyl Ether (M.W.418) + **1,2,4-Triazole** (M.W.69) → **Difenoconazole** (M.W.406) + **Hydrobromic Acid** (M.W.81)

	Material / Mass Balance of DIFENCONAZOLE All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Meta-Dichlorobenzene	402		DIFENCOCANAZOLE	**1000**
2	Acetyl Chloride	225		Recovered EDC	2910
3	Aluminium Trichloride	520		Loss EDC	90
4	EDC	3000		20 % Aluminium Trichloride Solution	2600
5	4 Chloro Phenol	345		30% Hydrochloric Acid	312
6	Dimethyl Formamide	2100		Recovered Catalyst	10
7	Potassium Hydroxide	300		28% Hydrobromic Acid	740
8	Catalyst	12		Recovered Toluene	1170
9	Bromine	410		Loss Toluene	30
10	Proplyene Glycol	205		Recovered Dimethyl Formamide	2040
11	Toluene	1200		Loss Dimethyl Formamide	60
12	Water	3300		Potassium Bromide	315
13	1,2,4 Traizole	182		Tarry Waste	15
14				Aqueous Layer to ETP	709
15				Potassium Chloride	200
	TOTAL	**12201**		**TOTAL**	**12201**

Flow Diagram

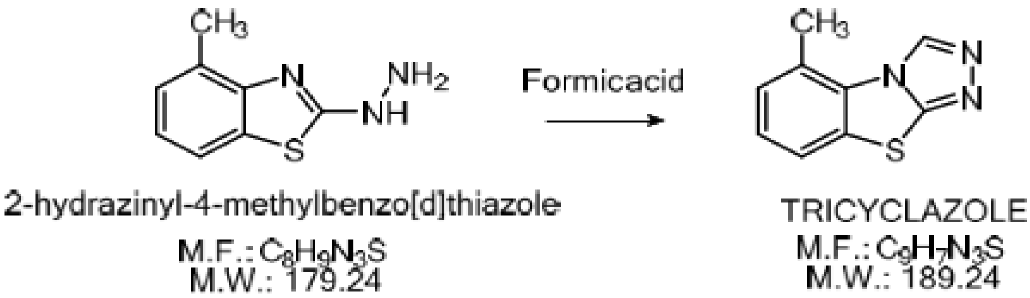

1,3 Di Chloro Benzene
Acetyl Chloride
AlCl3
EDC
Water
Reaction Step-I
30% HCl
Separation
20% AlCl3
Distillation
EDC recovered
EDC loss
4- Chloro Phenol
DMF
KOH
Reaction Step-II
Distillation
DMF recovered
DMF loss
Bromine
Catalyst
EDC
Water
Reaction Step-III
20% HBr solution
Filtration
Catalyst
Distillation
DMF recovered
DMF loss
Propylene Glycol
Toluene
Reaction Step-IV
Distillation
Toluene rec
Toluene loss
1,2,4 – Triazole
DMF
KOH in scrubber
Water
Reaction Step-V
KBr
Water to ETP
Distillation
DMF rec
DMF loss
Product
Difenconazole
Process loss

42. Tricyclazole:-

Brief Manufacturing Process :-

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

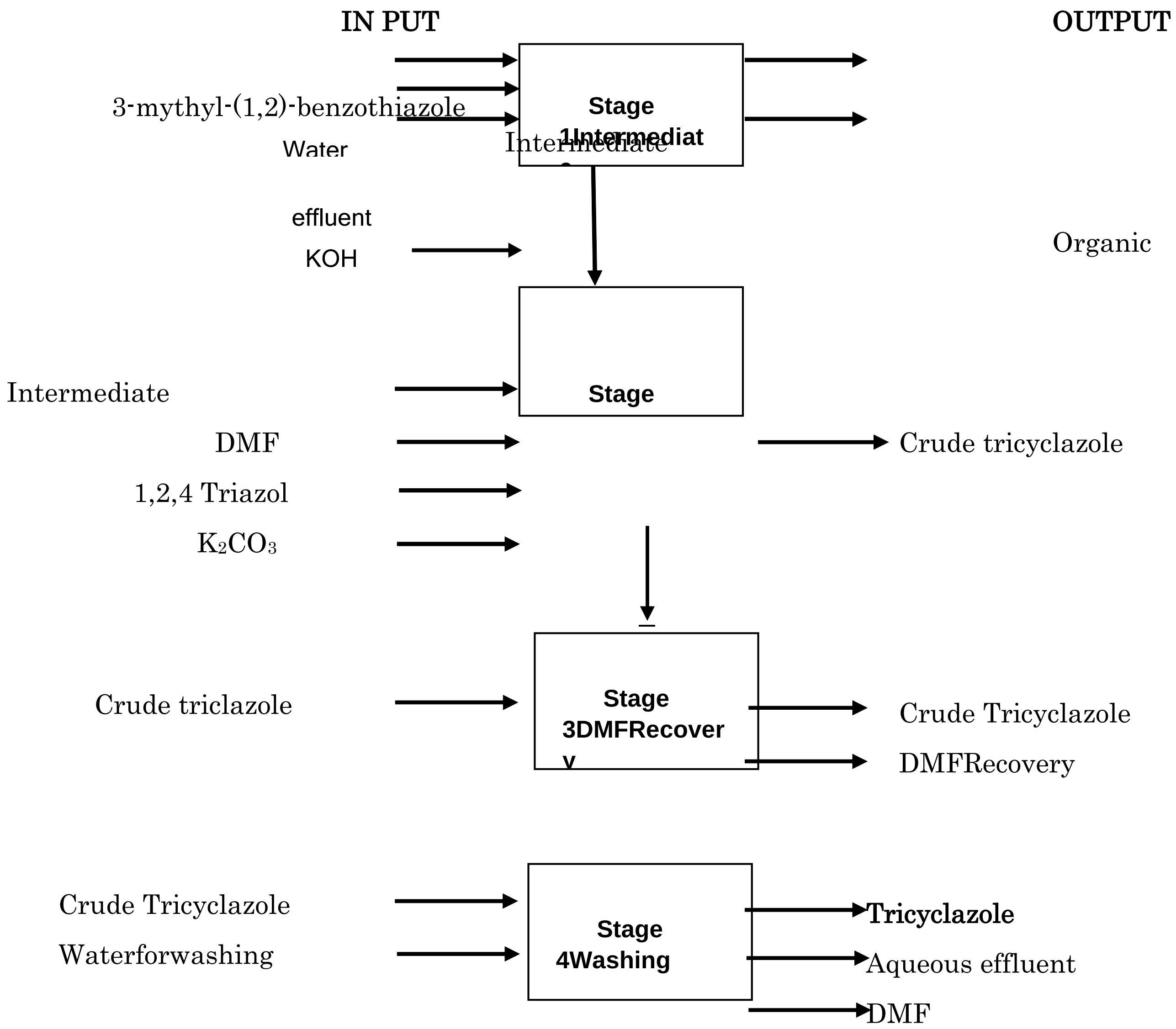
Chemical Reactions :-



	Material / Mass Balance of TRICYCLAZOLE All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2- Hydroxy -4- Methyl Benzothiazole(HMBT)	1000		Tricyclazole	**1000**
2	Formic Acid	2000		Recovered Ortho Xylene	4800
3	Solvent-1 Ortho Xylene	5000		Ortho Xylene Loss	200
4	Solvent-2 Toluene	2000		Recovered Toluene	1900
5	Water for Washing	1500		Toluene Loss	100
6				Recovered Formic Acid	2700
7				Drying Loss	800
	TOTAL	**11500**		**TOTAL**	**11500**

Flow diagram of Tricyclazole:

Tricyclazole



43. Mancozeb :-

Brief Manufacturing Process :-

Step 1 :- Carbon Di Sulphide (CS2) and Ethylene Di Amine (EDA) are reacted under controlled conditions in a reactor to produce Ethylene Bisdithio Carbamic Acid. This acid is neutralized in the same reactor with Caustic Lye (NaOH) solution to get Sodium salt of Ethylene Bisdithiocarbamate (Na-EBDC).

Step 2 :- The Na-EBDC solution is reacted with Manganese Sulphate Solution (MnSO4) to form Manganese salt of Ethylene Bisdithiocarbamate (Mn-EBDC). The Manganese salt is insoluble in aqueous medium and forms a slurry. Also by-product Sodium Sulphate (Na2SO4) is formed.

Step 3 :- To improve purity of the product the slurry is filtered and washed to remove Na2SO4. The Manganese salt is obtained as a cake.

Step 4 :- The cake is re-slurried and additives like Sodium Ligno Sulphonate (SLS) are added to make slurry processable. Also stabilizers like Hydroxy Methyl Tetra Amine (HMT) are added. Then itiscomplexed with Zinc Sulphate Solution (ZnSO4) to form coordinated complex of Manganese & Zinc of EthylenenBisdithiocarbamate(MnxZnyEBDC).

The slurry is then Spray Dried to get Mancozeb powder with moisture content less than 12%.

Chemical Reactions:-

STAGE 1

$$2CS_2 + NH_2CH_2\,NH_2CH_2 + 2NaOH + 4H_2O \longrightarrow NaSC(S)NHCH_2CH_2NH(S)CSNa\,.\,6H_2O$$

$2CS_2$	$NH_2CH_2\,NH_2CH_2$	$2NaOH$	$4H_2O$	$NaSC(S)NHCH_2CH_2NH(S)CSNa\,.\,6H_2O$
Carbon Disulphide	Ethylene Diamine	Sodium Hydroxide	Water	Disodium salt of ethylene bis dithio carbamate hexahydrate (DBH)
152	60	80	72	365

STAGE 2

$$NaSC(S)NHCH_2CH_2NH(S)CSNa\,.\,6H_2O + MnSO_4 \longrightarrow [SC(S)NHCH_2CH_2NH(S)CSMn]x + Na_2SO_4 + 6H_2O$$

$NaSC(S)NHCH_2CH_2NH(S)CSNa\,.\,6H_2O$	$MnSO_4$	$[SC(S)NHCH_2CH_2NH(S)CSMn]x$	Na_2SO_4	$6H_2O$
Disodium salt of ethylene bis dithio carbamate hexahydrate (DBH)	Manganese sulphate	Manganese salt ethylene bis dithio carbamate	Sodium sulphate	Water
332	151	265.3	142	108

STAGE 3

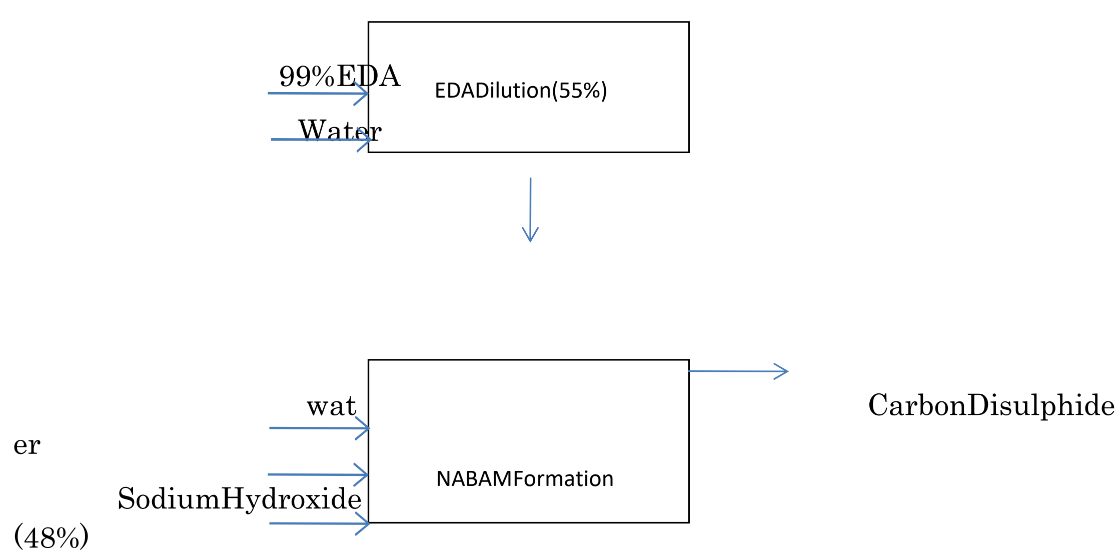
$$[SC(S)NHCH_2CH_2NH(S)CSMn]x + ZnSO_4 \longrightarrow [SC(S)NHCH_2NH(S)CSMn]x(Zn)y$$

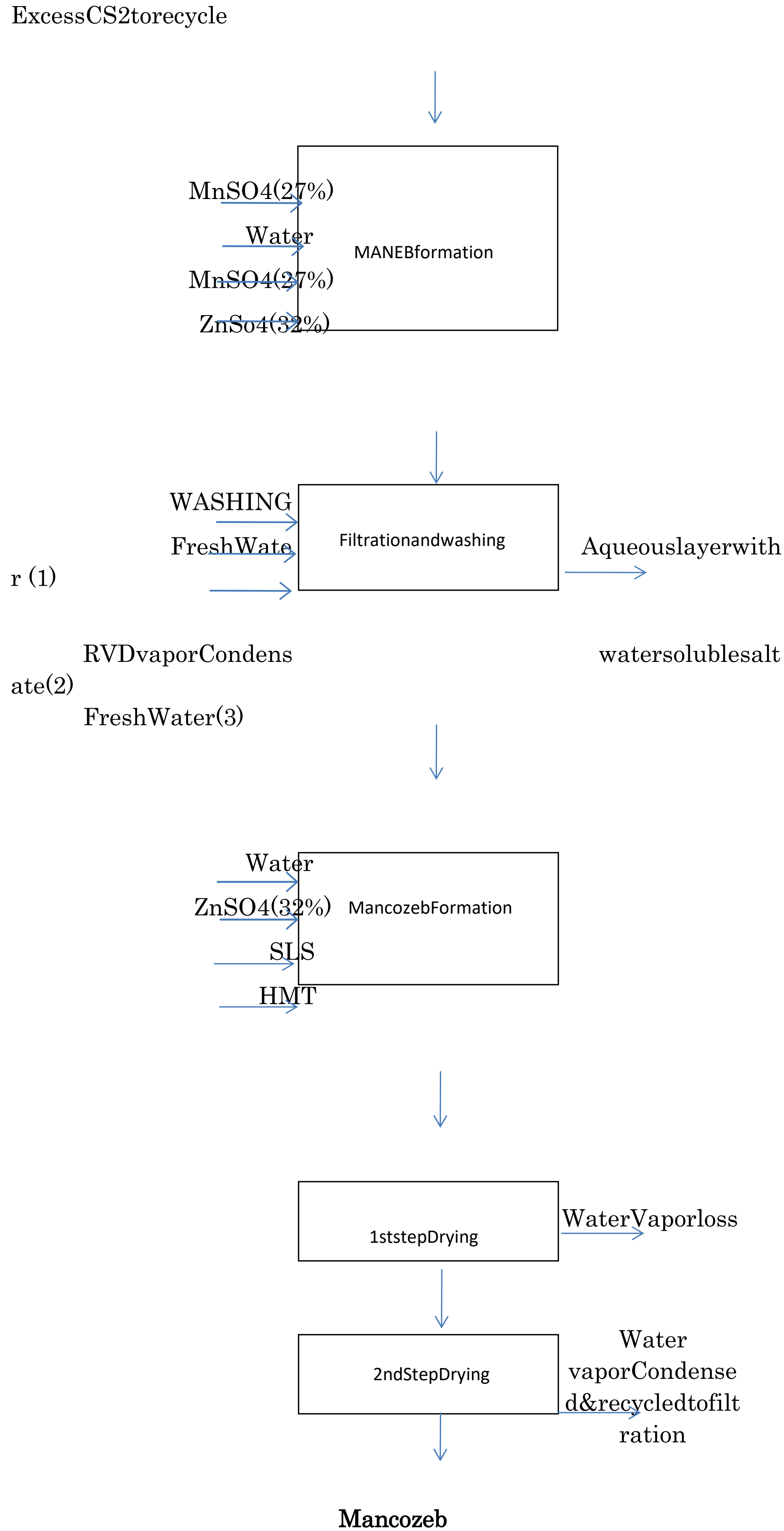
$[SC(S)NHCH_2CH_2NH(S)CSMn]x$	$ZnSO_4$	$[SC(S)NHCH_2NH(S)CSMn]x(Zn)y$
Manganese salt ethylene bis dithio carbamate	Zinc sulphate	MANCOZEB
265.3	161	271

	Material / Mass Balance of MANCOZEB All Quantities are in kg)				
	INPUT			OUT PUT	
Sr. No .	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Ethylene Di Amine	205		Mancozeb	**1000**
2	Caustic Soda Lye	620		Mother Liquor	5333
3	Carbon Disulphide	527		Water of Evaporation with Air	1481
4	$MnSO_4.H_2O$	2084			
5	$ZnSO_4.7H_2O$	208			
6	Water	4055			
7	Hexamine	34			
8	Dispersant	81			
	TOTAL	**7814**		**TOTAL**	**7814**

Flow Diagram of Mancozeb

Input **Output**




ExcessCS2torecycle
MnSO4(27%)
Water
MnSO4(27%)
ZnSo4(32%)
MANEBformation
WASHING
FreshWate
r (1)
RVDvaporCondens
ate(2)
FreshWater(3)
Filtrationandwashing
Aqueouslayerwith
watersolublesalt
Water
ZnSO4(32%)
SLS
HMT
MancozebFormation
1ststepDrying
WaterVaporloss
2ndStepDrying
Water
vaporCondense
d&recycledtofilt
ration
Mancozeb

44. **Propineb :-**

Brief Manufacturing Process :-

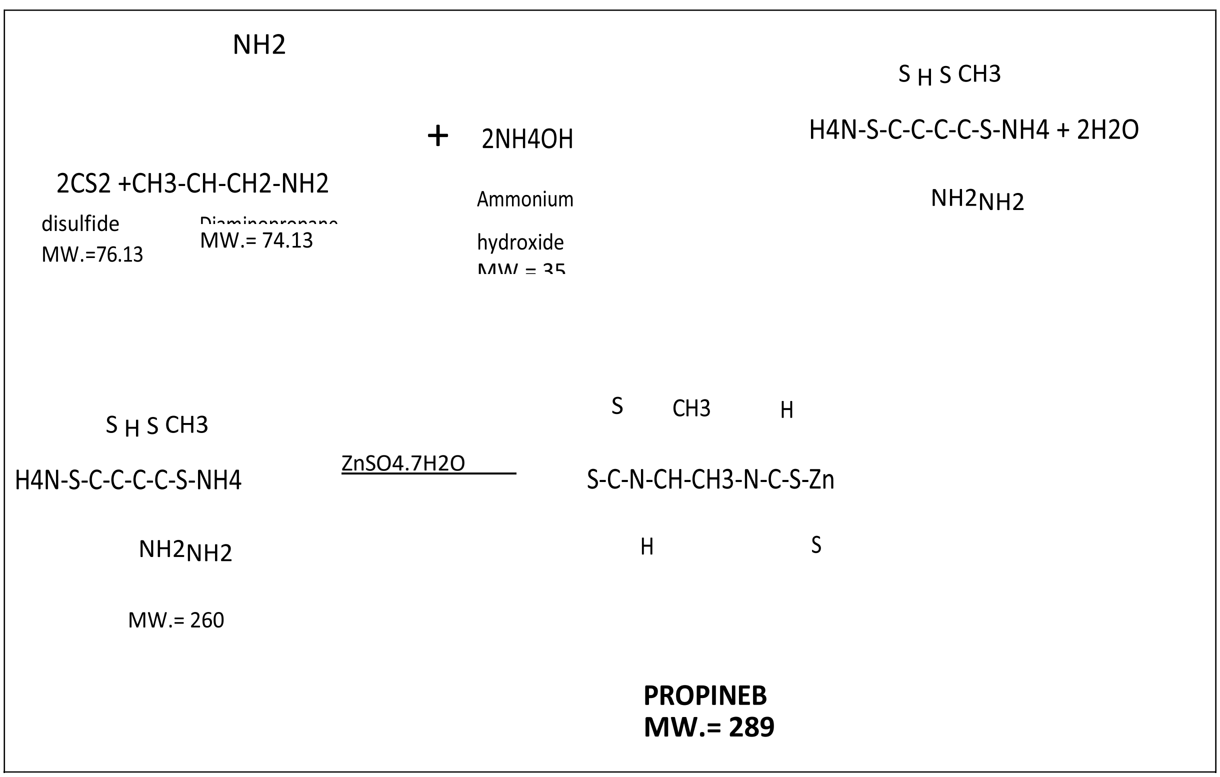
Step 1 : - Carbon Di Sulphide (CS_2) and Propylenediamine (PDA) are reacted under controlled conditions in a reactor to produce Propylene Bisdithio Carbamic Acid. This acid is neutralized in the same reactor with ammonia solution to get ammonium salt. The ammonium salt. Forms a solution in aqueous medium for production of Propineb.

Step 2 :- The ammonium salt. Solution is reacted with Zinc sulphate to form Zinc salt of Propylene Bisdithiocarbamate. The Zinc salt is insoluble in aqueous medium and forms a slurry. Also by-product Ammonium Sulfate is formed.

Step 3 :- To improve purity of the product the slurry is filtered and washed to remove Ammonium Sulfate. The Zinc salt is obtained as a cake.

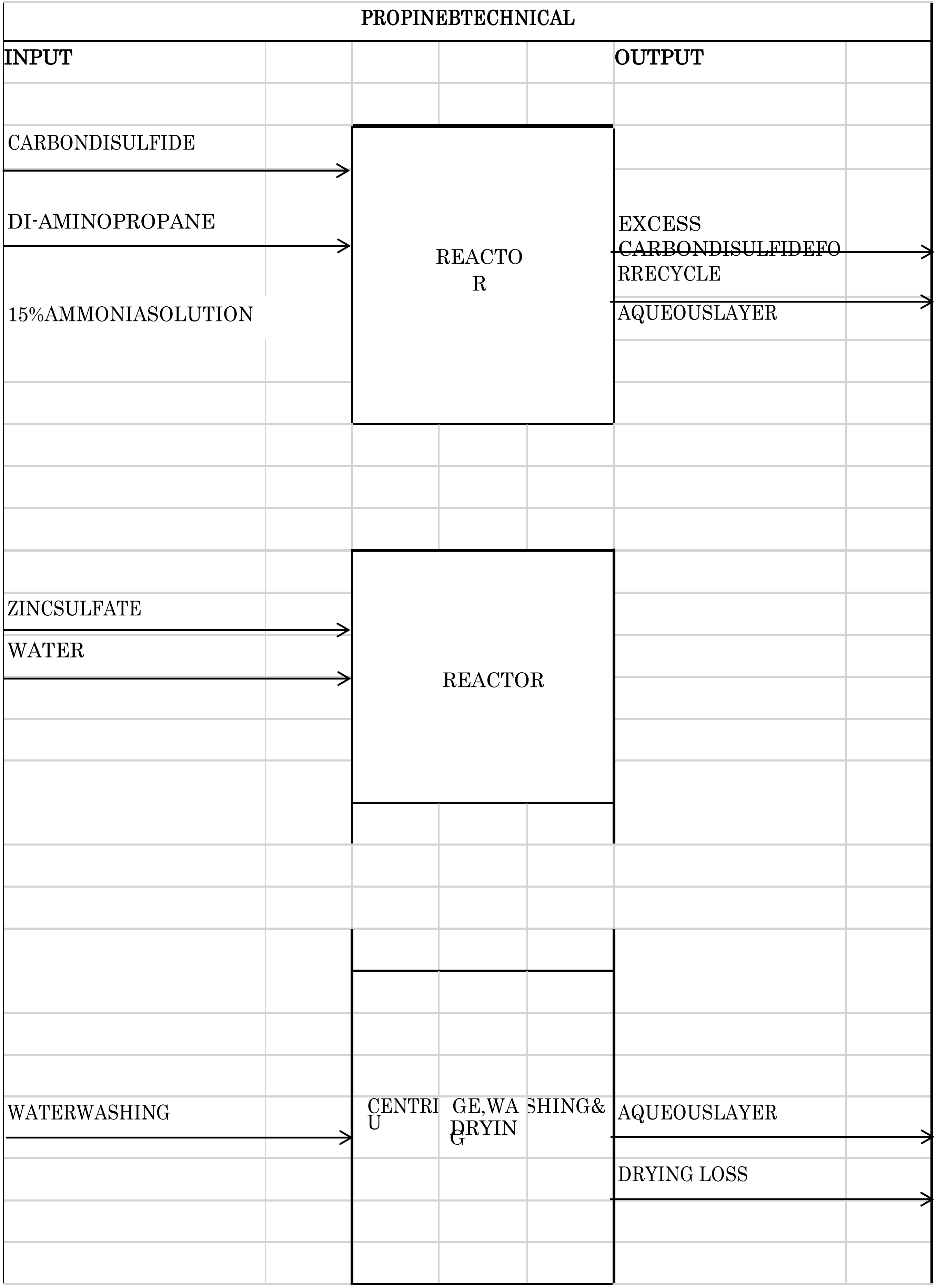
Step 4 : - The Cake is re-slurries and additives like Sodium Ligno Sulphonate (Na-SLS) are added to make slurry processable. The slurry is then Spray Dried to get Propineb powder with moisture content less than1%.

Chemical Reactions :-



	Material / Mass Balance of PROPINEB All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Ethylene Di Amine	205		Mancozeb	**1000**
2	Caustic Soda Lye	620		Mother Liquor	3333
3	Carbon Disulphide	527		Water of Evaporation with Air	481
4	$MnSO_4.H_2O$	2084			
5	$ZnSO_4.7H_2O$	208			
6	Water	1055			
7	Hexamine	34			
8	Dispersant	81			
	TOTAL	**4814**		**TOTAL**	**4814**

Flow Diagram of Propineb Technical :



			PROPINEB			

INSECTICIDE GROUPS

45. Pyridaben:

Brief Manufacturing Process:-

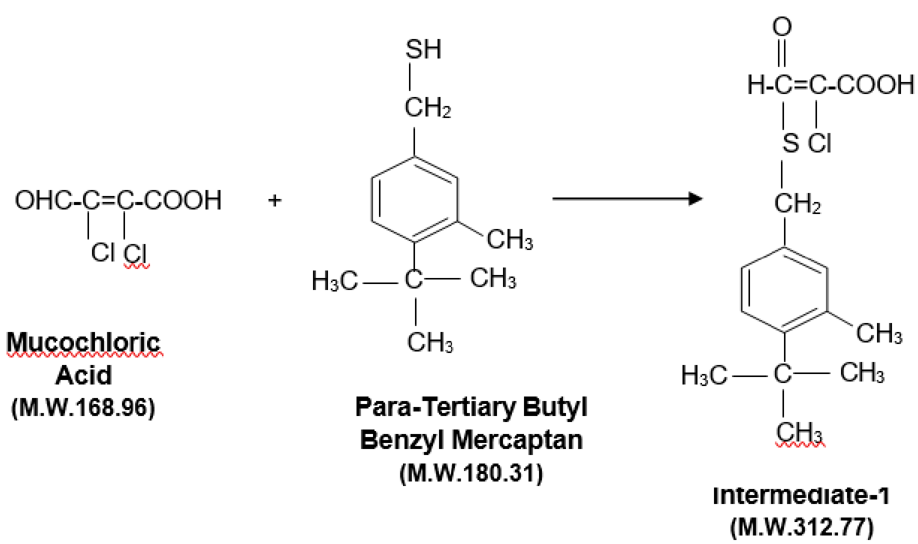
Step 1:-Mucochloric is reacted with Para-Tertiary Butyl Benzyl Mercaptan in presence of Catalyst. This reaction gives out Intermediate-1.

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

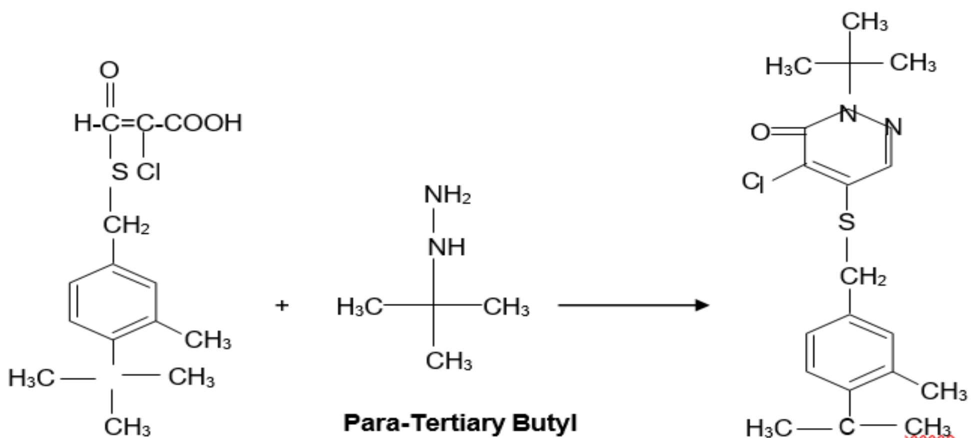
After completion of reaction crude product is distilled out to get pure product.

Chemical Reactions:-

Step 1:-



Step 2 :-



Intermediate-1 (M.W.312.77)

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

Pyridaben (M.W.364.9)

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

46. Diafenthiuron:

Brief Manufacturing Process:-

Step 1:- 2,6-Diisopropyl Aniline is undergoes Nitration reaction by concentrated Nitric Acid in Presence of Concentrated Sulphuric Acid and Solvent Toluene. This reaction gives out 2,6- Diisopropyl-4-Nitro Aniline as an Intermediate Product.

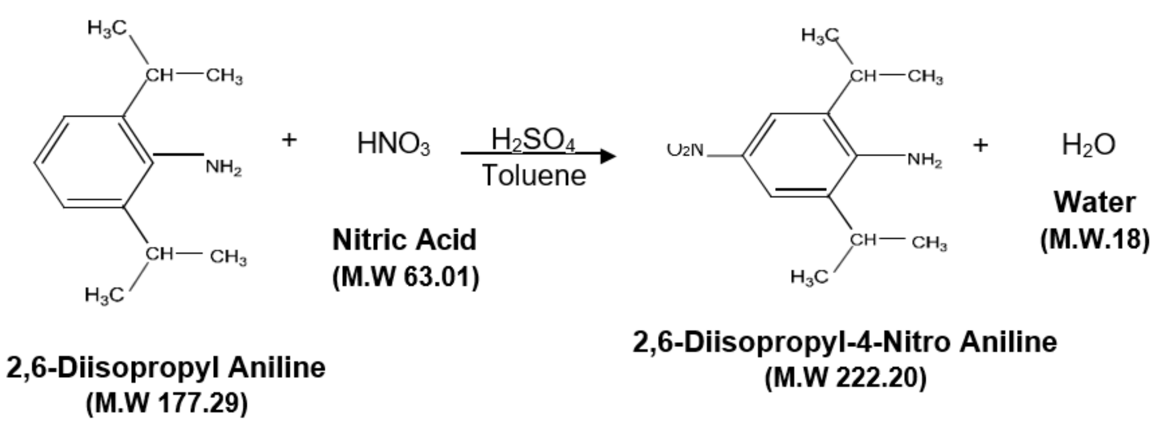
Step 2 :- 2,6-Diisopropyl-4-Nitro Aniline is further reacted with Phenol in presence of Potassium Hydroxide (30% KOH). This reaction gives out 2,6-Diisopropyl-4-Phenoxyaniline. Water gets separated after completion of reaction. Toluene Solvent is recovered under vacuum and 2,6- Diisopropyl-4-Phenoxyaniline is recrystallized from Methanol.

Step 3 :- 2,6-Diisopropyl-4-phenoxyaniline is further reacted with Thiophosgene in presence of Solvent- Ethylene Dichloride
(EDC) and Calcium Carbonate. This reaction gives out 1,3-diisopropyl- 2-Isothiocyanato-5-Phenoxybenzene. After Completion of reaction Ethylene Dichloride (EDC) is recovered by distillation.

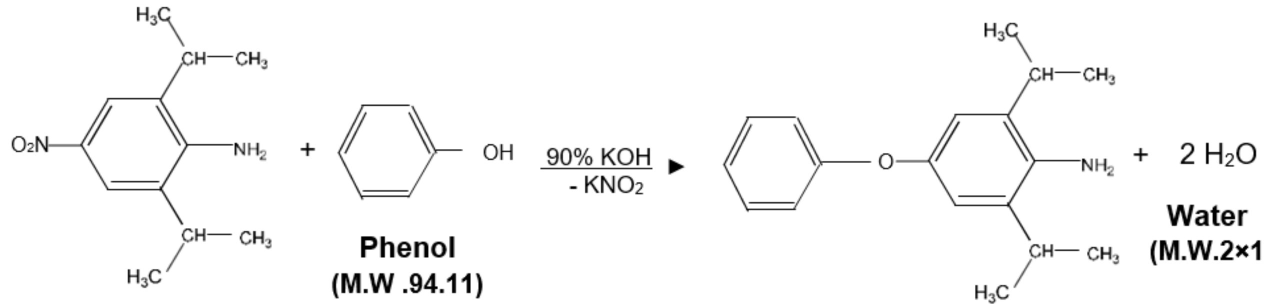
Step 4 :- Finally 1,3-Diisopropyl-2-Isothiocyanato-5-Phenoxybenzene is reacted with Tertiary Butyl Amine in presence of Solvent Toluene. This reaction gives out Diafenthiuron as a final product. After completion of reaction Toluene is distilled out from the reaction mass. Diafenthiuronisre crystallized from Methanol.

Chemical Reactions:-

Step 1 :-



Step 2 :-



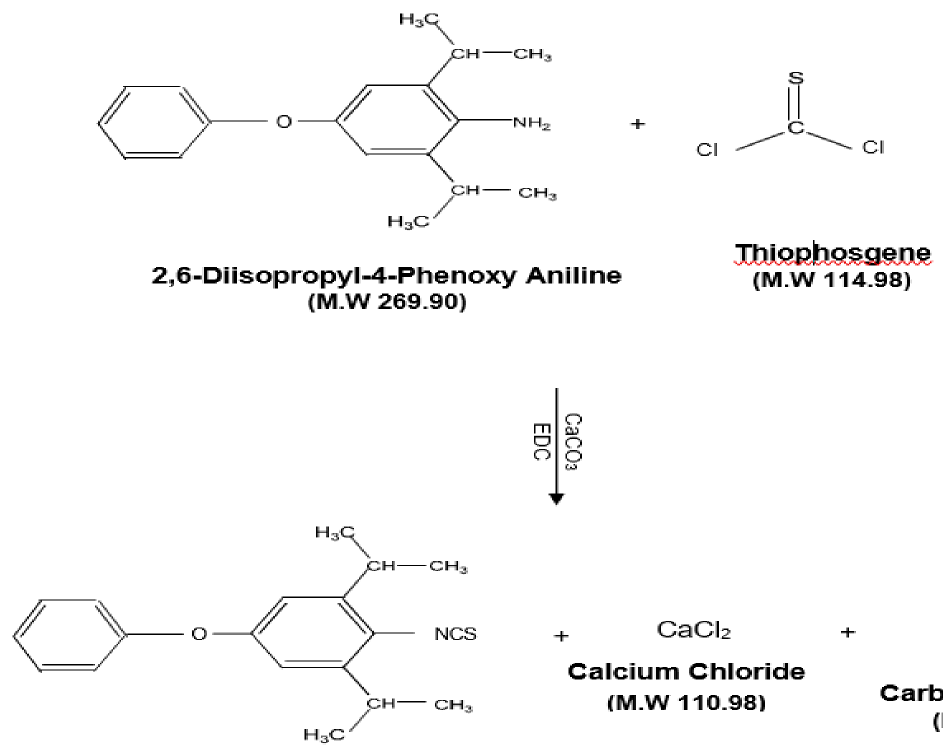
Phenol
(M.W .94.11)

Water
(M.W.2×1

2,6-Diisopropyl-4-Nitroaniline
(M W 222 20)

2,6-Diisopropyl-4-Phenoxy Aniline

Step 3 :-



2,6-Diisopropyl-4-Phenoxy Aniline
(M.W 269.90)

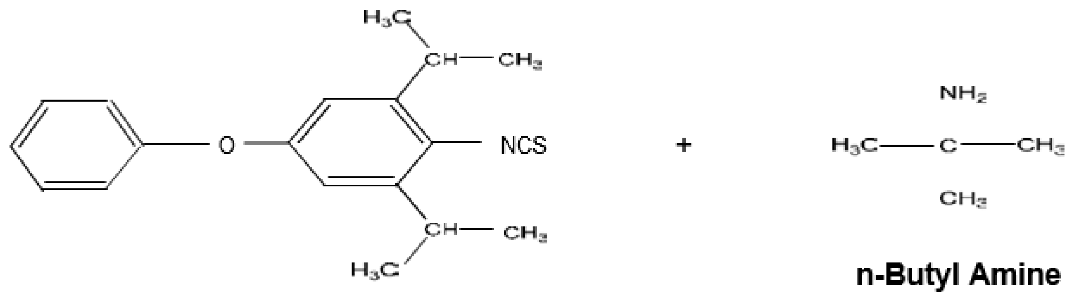
Thiophosgene
(M.W 114.98)

Calcium Chloride
(M.W 110.98)

Carbon Dioxide
(M.W.44)

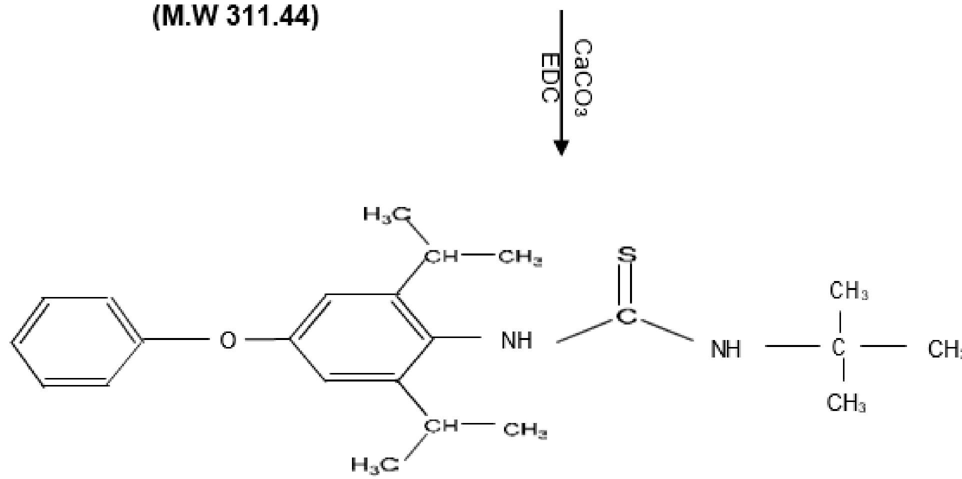
1,3-Diisopropyl-2-Isothiocyanato-5-Phenoxy Benzene
(M.W 311.44)

Step 4 :-



1,3-Diisopropyl-2-Isothiocyanato-5-Phenoxy Benzene
(M.W 311.44)

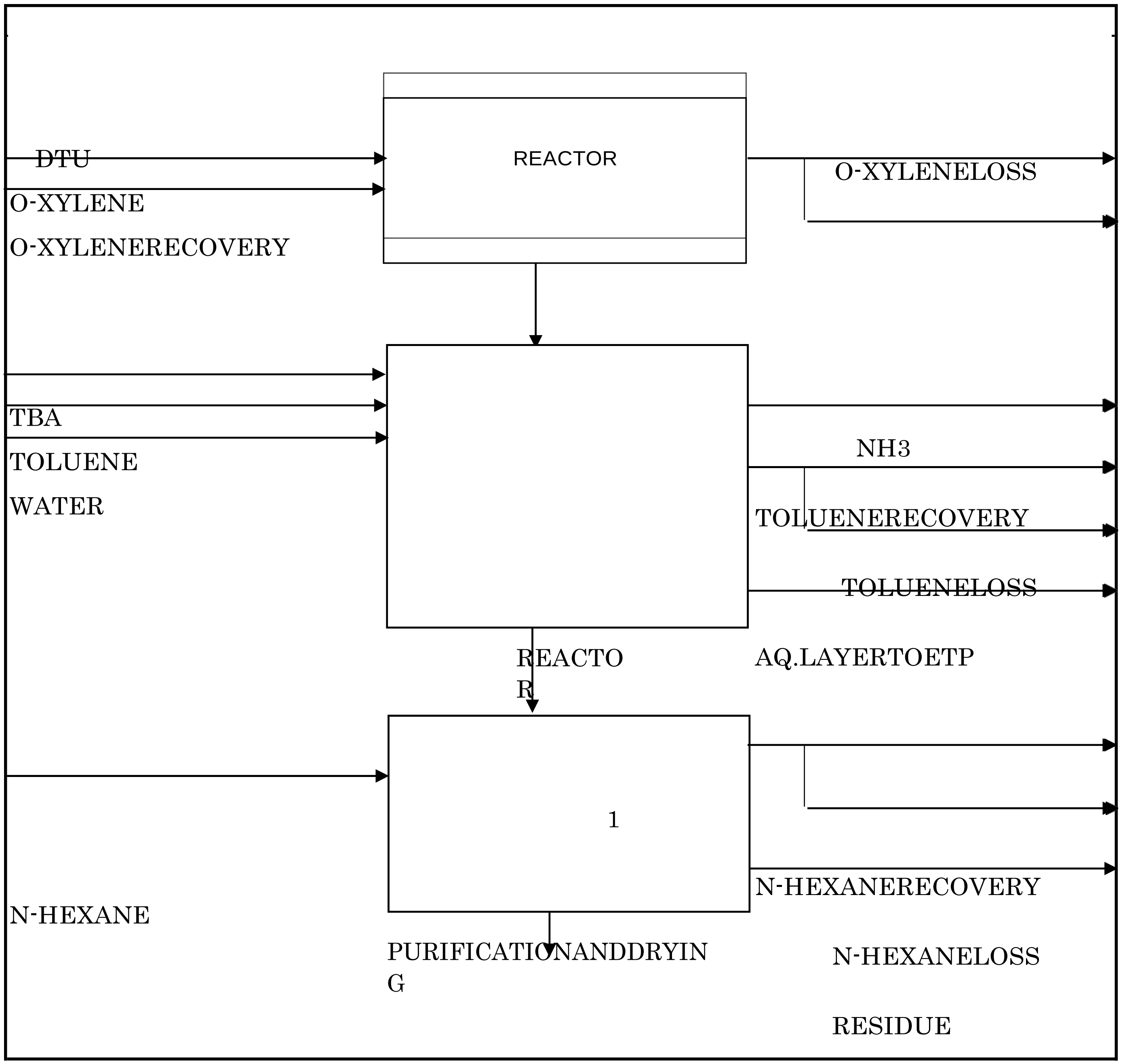
n-Butyl Amine
(M.W.73.14)



Diafenthiuron
(M.W.384.6)

	Material / Mass Balance of DIAFENTHIURON All Quantities are in kg)				
	INPUT			OUTPUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2,6-Diisopropyl Aniline	490		Diafenthiuron	**1000**
2	Nitric Acid	174		Water	140
3	Potassium Hydroxide (30%)	686		Calcium Chloride	382
4	Phenol	260		Carbon Dioxide	70
5	Thiophosgene	317		Potassium Nitrite	221
6	Calcium Carbonate	278		Toluene Recovered	6838
7	Tert-Butyl Amine	202		Toluene Loss	21
8	Ethylene Dichloride (EDC)	3900		Toluene in Residue	189
9	Toluene	7050		Methanol Recovered	3810
10	Methanol	4000		Methanol Loss	13
11	Water	1302		Methanol to Waste Water	40
12	Sulfuric Acid	31		Methanol in Residue	136
13				EDC Recovered	3822
14				EDC Loss	8
15				EDC in Residue	70
16				2,6-Diisopropyl Aniline	29
17				Thiophosgene	18
18				Phenol	15
19				Tert-Butyl Amine	14
20				Nitric Acid	12
21				Potassium Hydroxide	12
22				Calcium Carbonate	16
23				Sulphuric Acid	31
24				Waste Water	1783
	TOTAL	**18690**		**TOTAL**	**18690**

FLOW DIAGRAM OFDIAFENTHIURONTECHNICAL :-



DIAFENTHIU RON

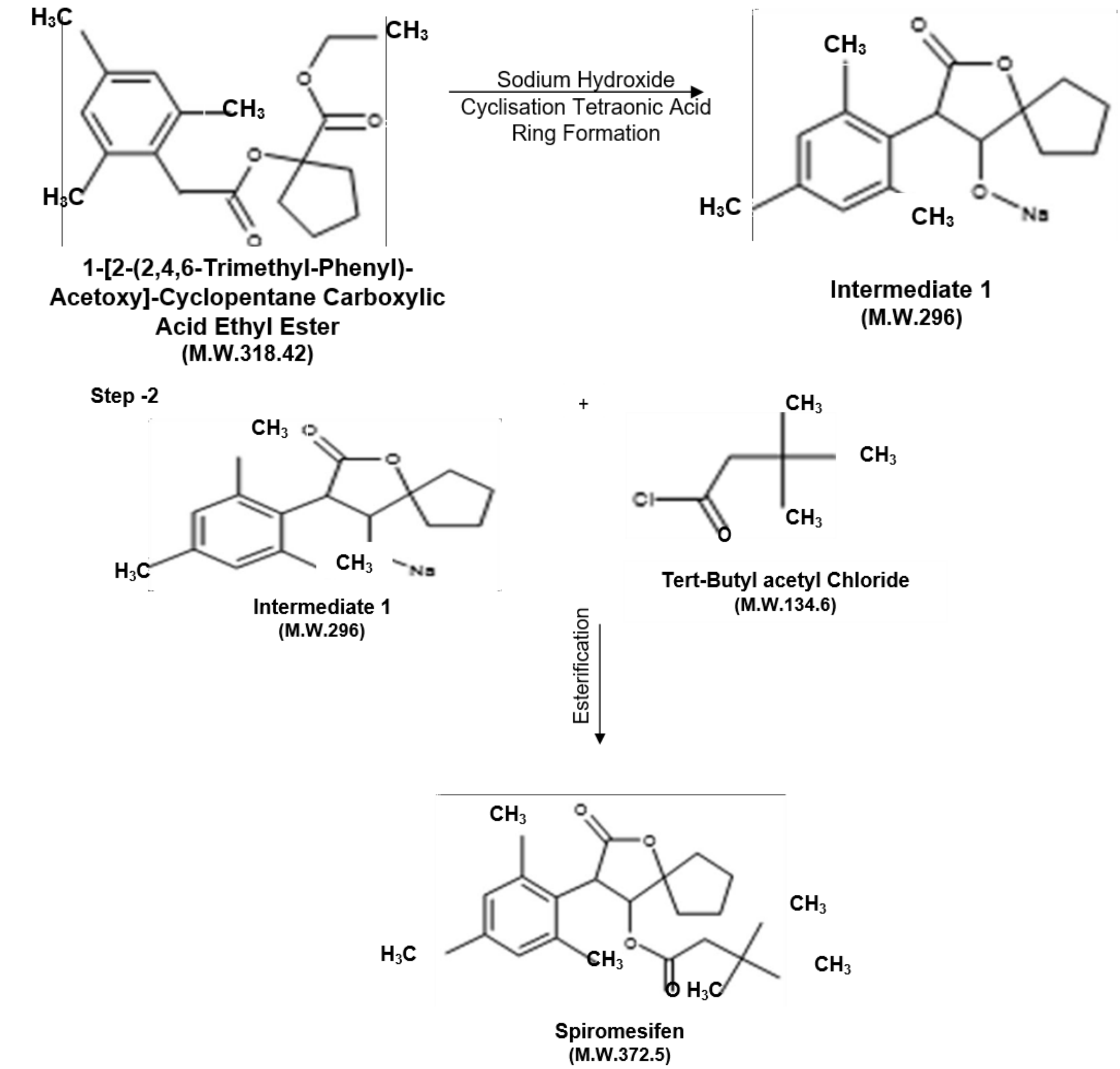
47. **Spiromesifen:**

Brief Manufacturing Process:-

In the manufacturing process, 3,3-Dimethylpentanoyl chloride (DMPC) is reacted with 3-Mesityl-2- oxo-1-oxaspiro [4,4] non-3-ene (MOONE) in presence of solvent toluene, caustic and water. The aqueous later is separated out and the toluene solvent is distilled partially and crystallized, filtered and dried to get the product.

Chemical Reactions:-

Step 1 :-



Material Mass Balance :-

	Material / Mass Balance of SPIROMESIFEN All Quantities are in kg)				
	IN PUT			OUTPUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	DMF	1947		**Spiromesifen**	**1000**
2	NaOH	124		DMF	1947
3	Ester	941		Water	53
4	Toluene	1480		Ethyl Alcohol	135
5	TBAC	438		Water	2123
6	3% Sodium Bicarbonate	1480		NaCl	224
7	Water	592		CO_2	25
8	Water wash	500		Toluene Recovered	1465
9				Organic Impurities	125
10				Aq. wash	390
11				Toluene loss	15
	TOTAL	**7502**		**TOTAL**	**7502**

48. **Lufenuron:**

Brief Manufacturing Process :-

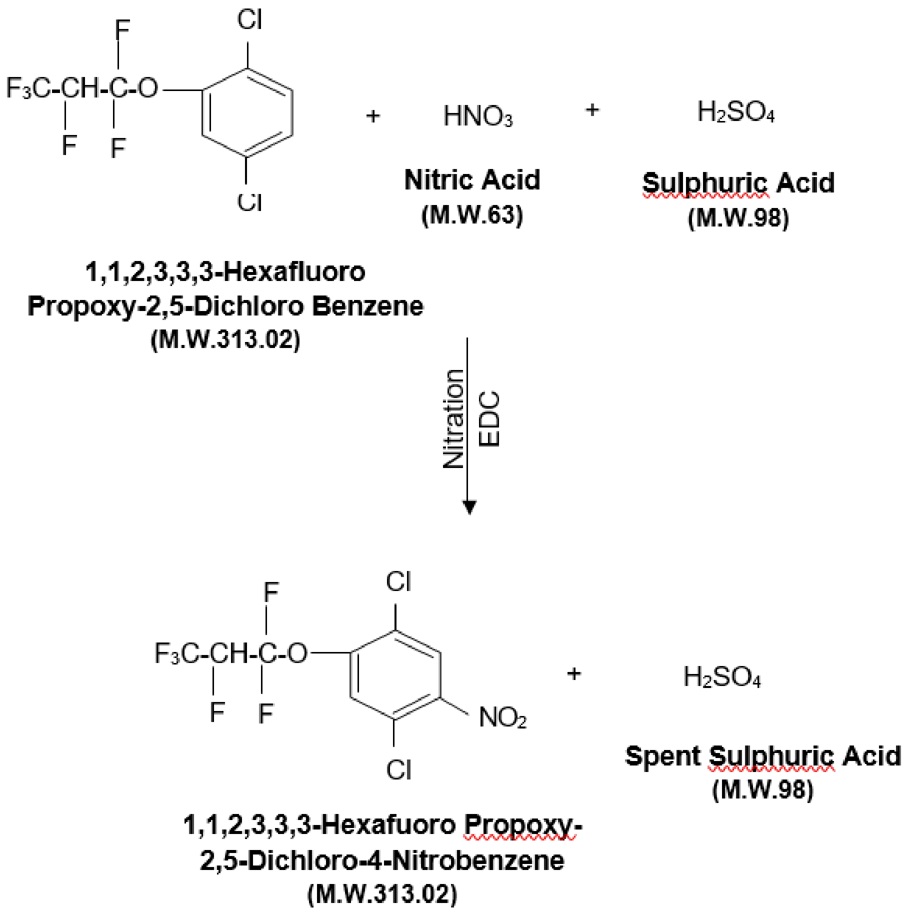
Step 1 :- 1,1,2,3,3,3-Hexafluoro Propoxy-2,5-Dichloro Benzene undergoes Nitration reaction by Nitric Acid and Concentrated Sulphuric Acid in presence of Solvent Ethylene Dichloride (EDC). This reaction gives out 1,1,2,3,3,3-Hexafluoro Propoxy-2,5-Dichloro-4-Nitrobenzene. Spent Sulphuric Acid is recovered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

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

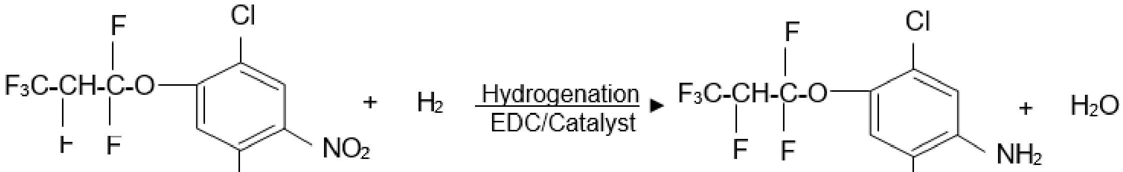
Step 3 : - 1,1,2,3,3,3-Hexafluoro Propoxy-2,5-Dichloro-4-Aminobenzene undergoes Condensation reaction by 2,6-Difluoro Benzyl Isocyanate in presence of Solvent Toluene as well as Catalyst. This reaction gives out Lufenuron as a crude product. After completion of reaction Toluene is recovered from reaction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

Chemical Reactions:-

Step 1 :-



Step 2 :-



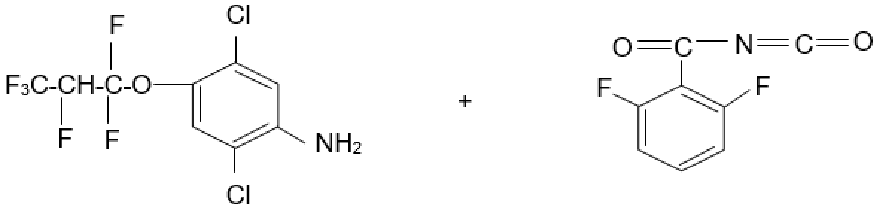
Hydrogen
(M.W.2)

Water
(M.W.18)

1,1,2,3,3,3-Hexafuoro Propoxy-2,5-Dichloro-4-Nitrobenzene
(M.W.358.02)

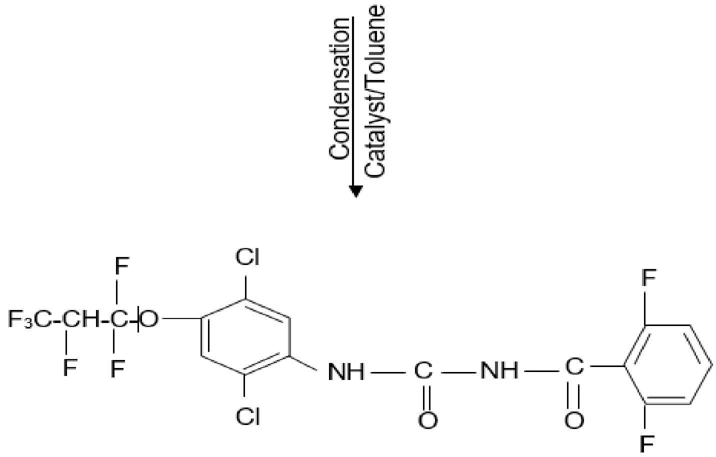
1,1,2,3,3,3-Hexafuoro Propoxy-2,5-Dichloro-4-Aminobenzene
(M.W.328.02)

Step 3 :-



1,1,2,3,3,3-Hexafuoro Propoxy-2,5-Dichloro-4-Aminobenzene
(M.W.328.02)

2,6-Difluorobenzoyl Isocyanate
(M.W.186.10)



Lufenuron
(M.W.511.15)

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

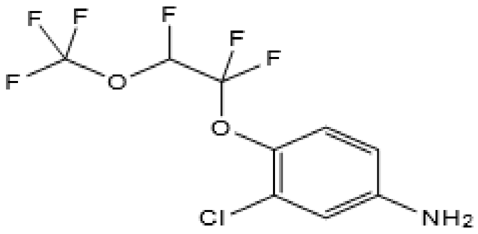
49. Novaluron:

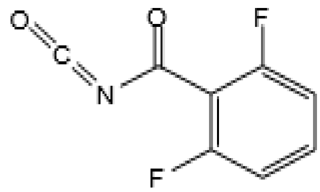
Brief Manufacturing Process:-

3-Chloro-4-(1,2,2-Trifluoromethoxy) Ethoxy Aniline reacted with 2,6-Difluorobenzoyl Isocyanate in presence of Monochloro Benzene as well as Toluene. This reaction gives out Novaluron as a final product.

After completion of the reaction, the reaction mass is cooled, filtered and washed with water. Novaluron wet cake is then recrystallized with Toluene, filtered and dried to get Novaluron technical.

Chemical Reactions:-





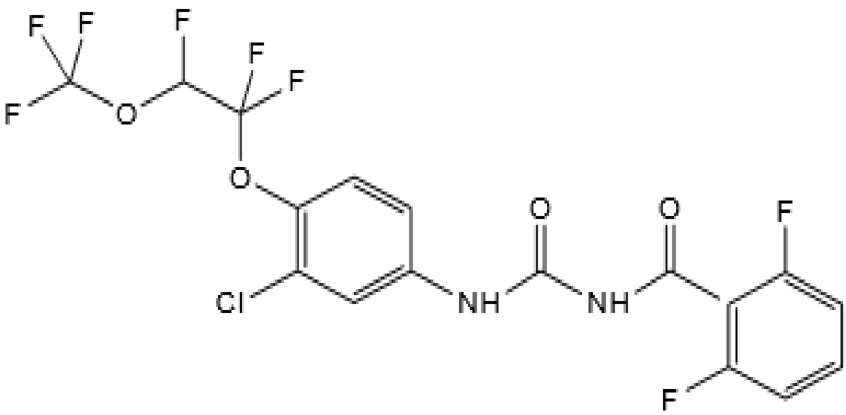
3-Chloro-4-(1,1,2-Trifluoromethoxy) Ethoxy Aniline

(M.W.309.59)

2,6-Difluorobenzoyl Isocyanate

(M.W.183.11)

MCB/Tolue



Novaluron

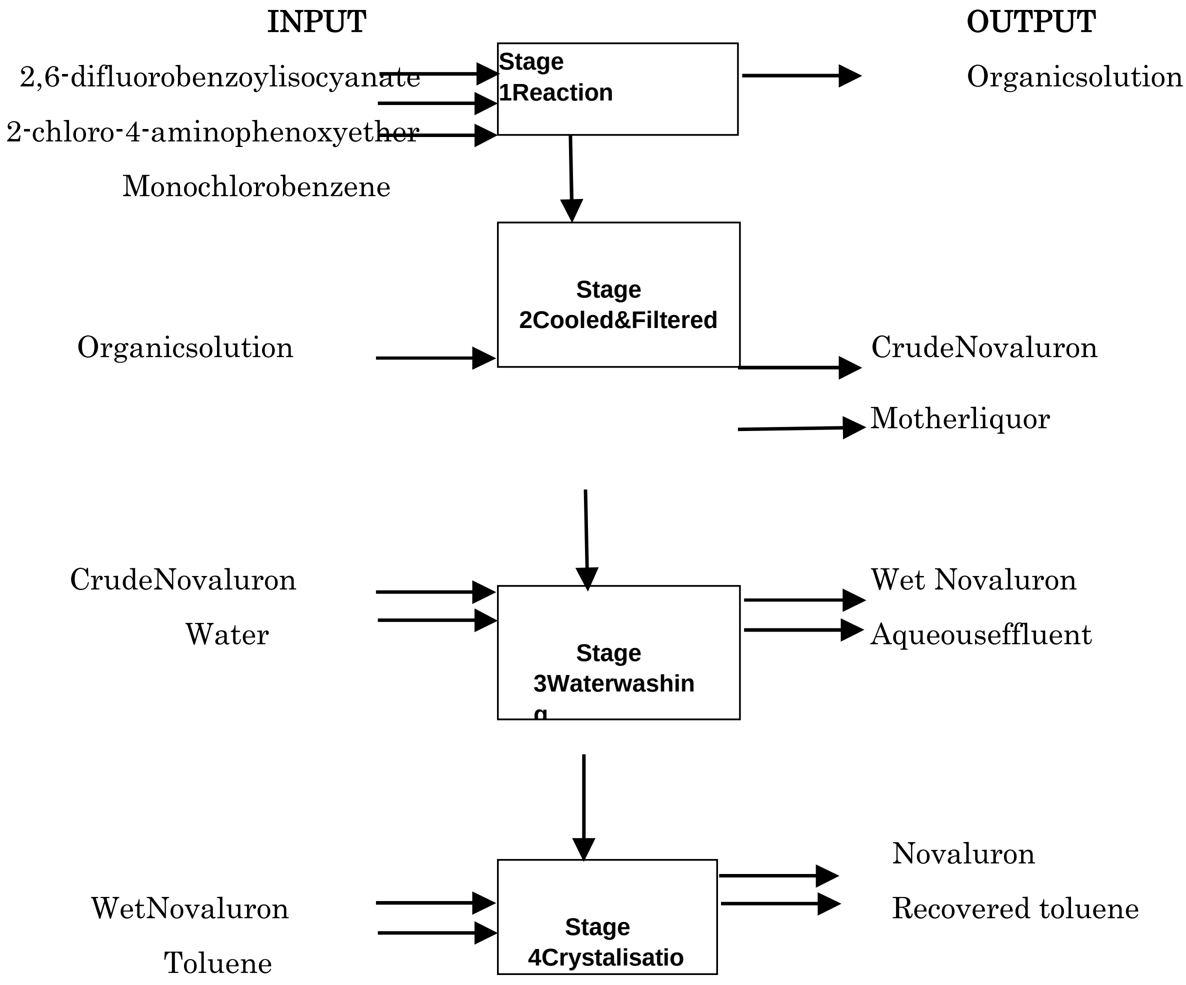
(M.W.492.7)

	Material / Mass Balance of NOVALURON All Quantities are in.kg)				
	INPUT			OUT PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2,6-Difluoro Benzoyl Isocyanate	320		Novaluron	**1000**
2	3-Chloro-4-(1,1,2-Trifluoro-2-[Trifluoro Methoxy] Ethoxy) Aniline	792		Recovered Toluene	880
3	Monochloro Benzene	546		Loss Toluene	20
4	Water	1000		Aqueous Layer to ETP	1108

5	Toluene	900		Residue	4
6				Recovered MCB	529
7				Loss MCB	17
	TOTAL	3558		TOTAL	3558

Flow diagram of Novaluron:

Novaluron



50. Buprofezin:

Brief Manufacturing Process:-

Step 1 :- Charge PNNCC,(Para-Nitro phenyl-N-Chloro Methyl Carbamate) Toluene, and lime in the reaction vessel. Stir the reaction mass for 2- 3 hours. Charge Thiourea slowly in the reaction mass in 2-3 hours and stir the reaction mass at higher temperature until raw material is totally consumed.
Step 2 :- After completion of reaction, Filter the reaction mass to isolate inorganic solid.

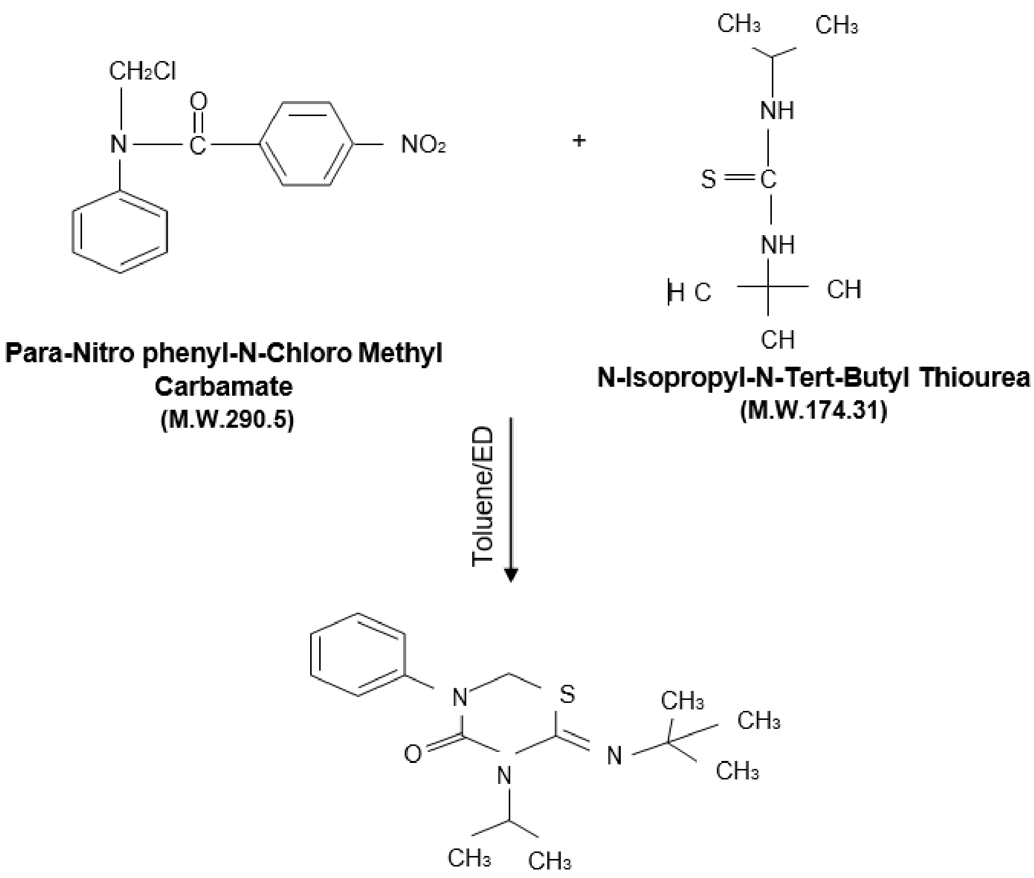
Step 3 :- Wash inorganic solid with toluene. Recover toluene under vacuum from clear organic phase.

Step 4 :- Add EDC in the crude solid. Charge TEA slowly at room temperature and stir the reaction mass for 3 hours.

Step 5 :- Reaction mass is washed with water. Separate the layers. Recover EDC under vacuum partially.

Step 6 :- Cool the conc. mass slowly and filter the crystals. Dry the wet product at 50 –65%.

Chemical Reactions:-

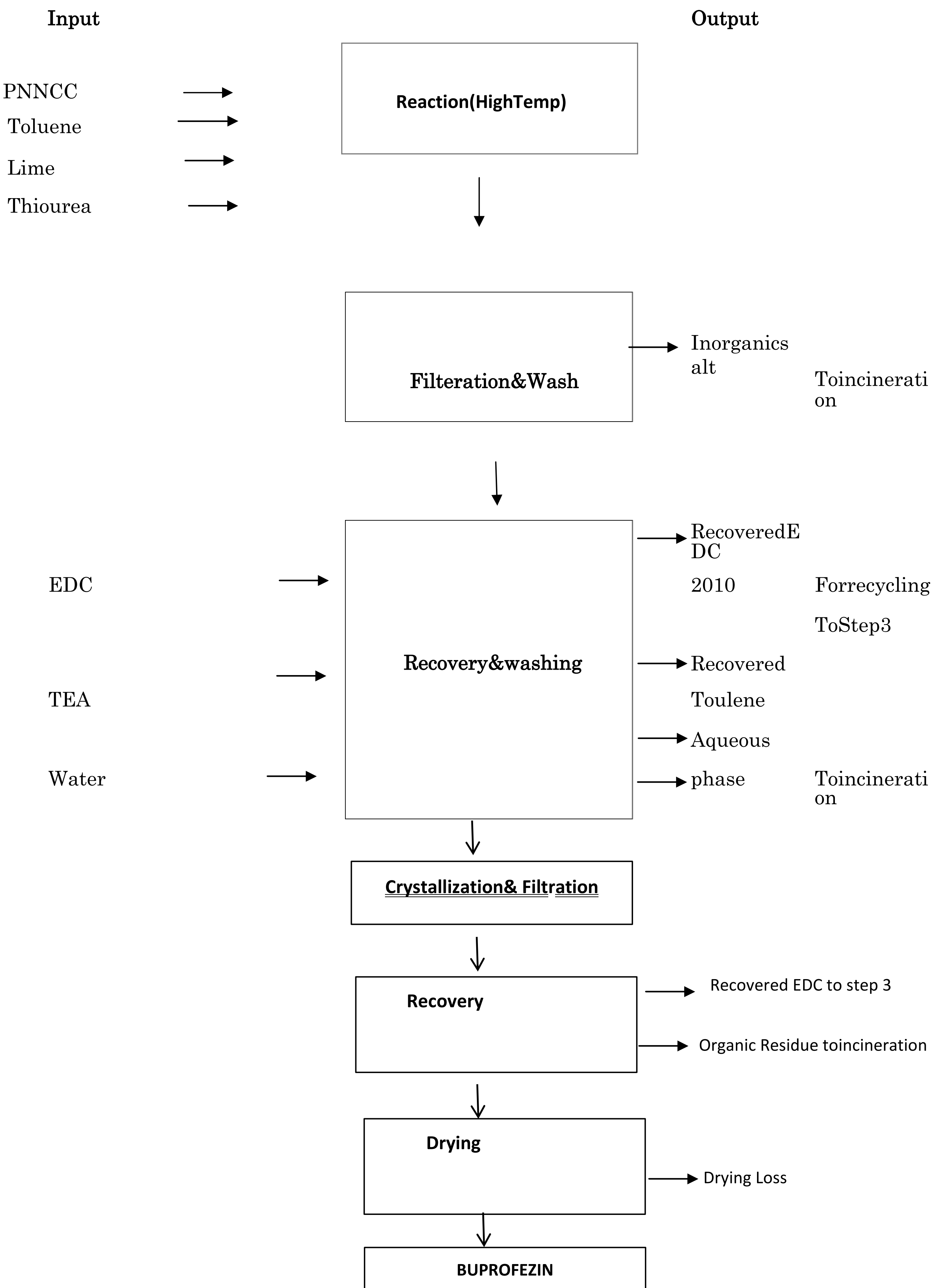


5.0 KL/Day

Buprofezin

	Material / Mass Balance of BUPROFEZIN All Quantities are in kg)			
	INPUT		OUTPUT	
Sr.No.	Raw Materials / Items	Kg/Batch	Product / By product	Kg/Batch
1	PNNCC	1427	Buprofezin	**1000**
2	Toluene	4910	Inorganic Salt	150
3	Lime	282	Recovered EDC	4440
4	Thio Urea	855	Loss EDC	470
5	Ethylene Dichloride (EDC)	4910	Recovered Toluene	4638
6	TEA	496	Loss Toluene	272
7	Water	2160	Organic Residue	394
8			Aqueous Phase	1718
9			Drying Loss	1958
	TOTAL	**15040**	**TOTAL**	**15040**

Flow diagram of BUPROFEZIN:-



51. Methoxyfenozide:

Brief Manufacturing Process:-

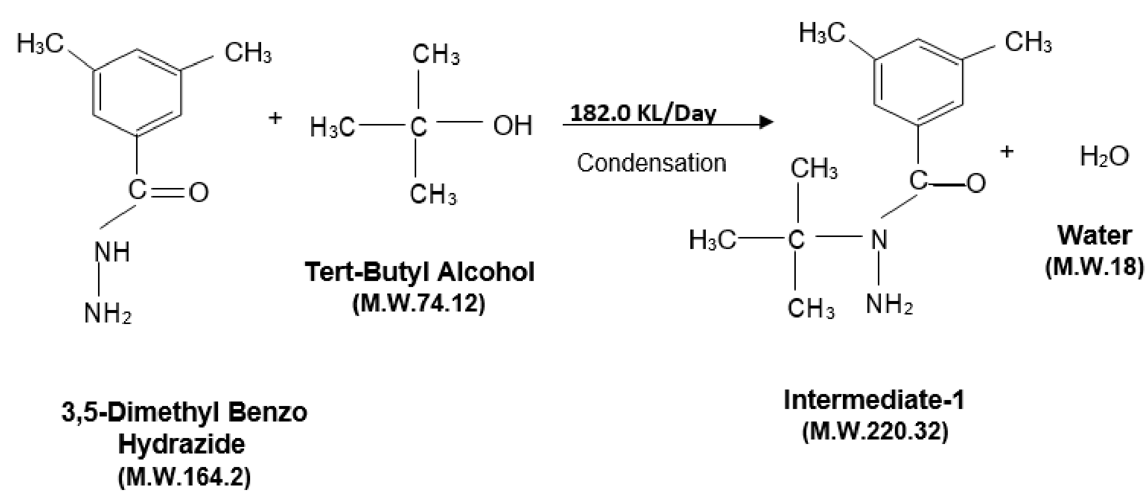
Step 1:- 3,5-Dimethyl Benzoyl Hydrazide undergoes Condensation reaction with Tert-Butyl Alcohol in presence of Catalyst PTSA as well as Solvent Toluene. This reaction gives out Intermediate-1. After completion of reaction solvent Toluene is recovered from reaction mass.

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

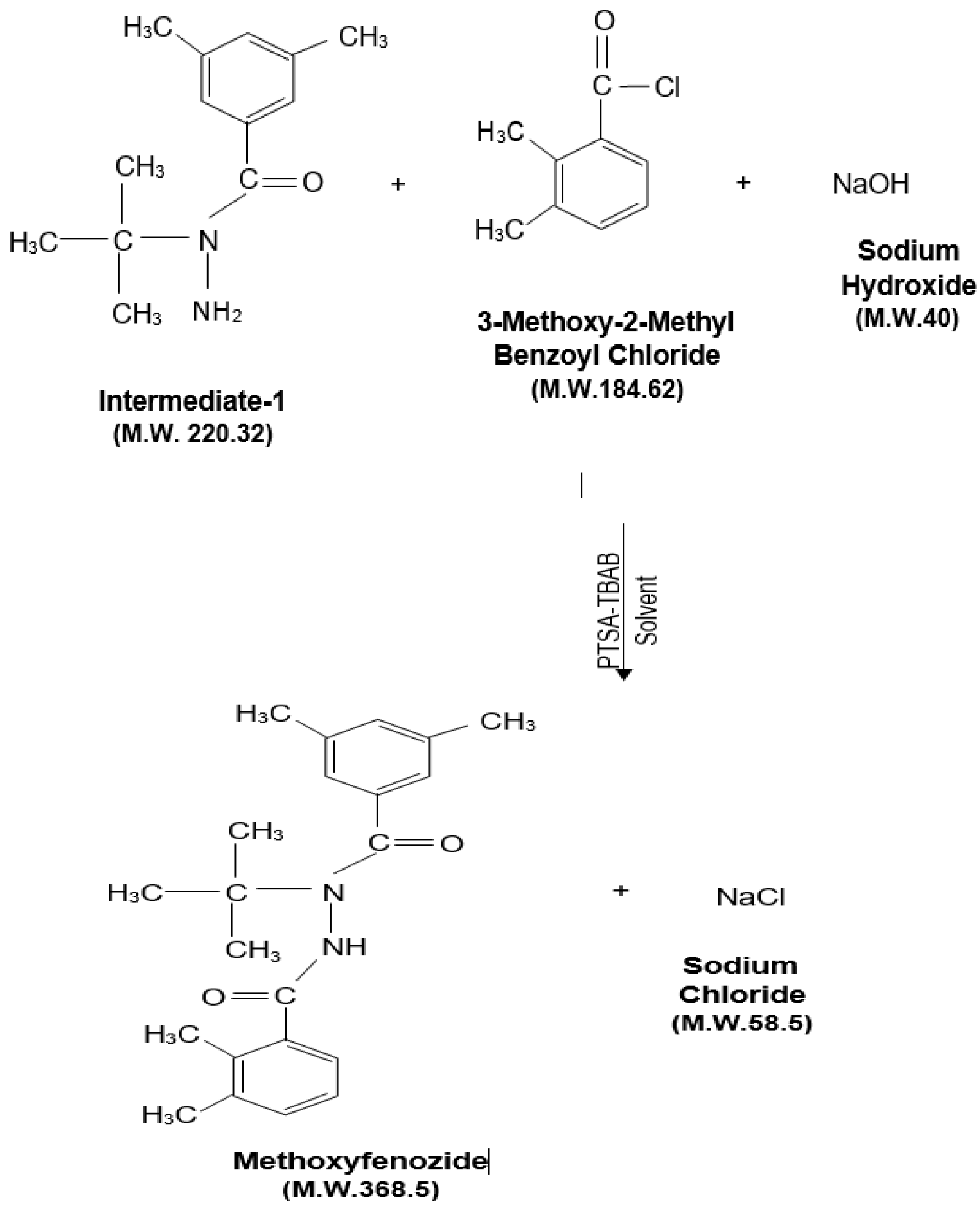
After completion of reaction Catalyst TBA is recovered from the reaction mass, Solvent is recovered at the end of reaction. Crude product is distilled out to get pure product.

Chemical Reactions:-

Step 1 :-



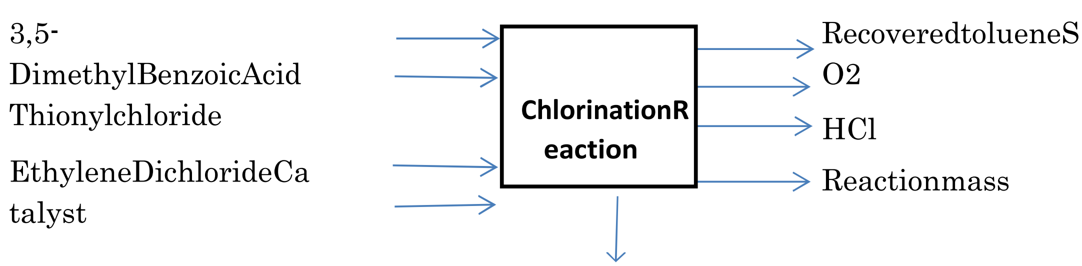
Step-2 :-

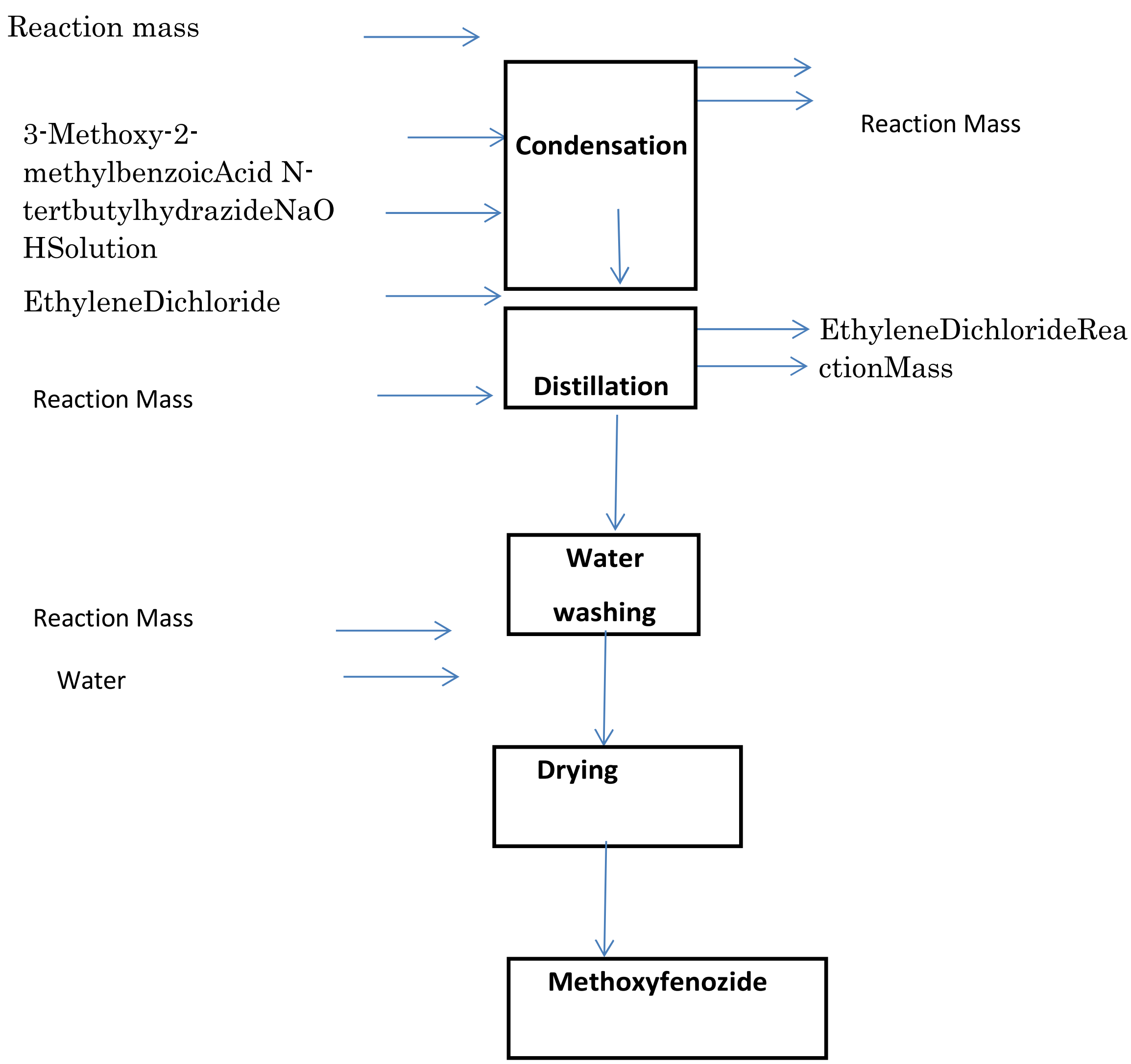

Intermediate-1
(M.W. 220.32)
3-Methoxy-2-Methyl
Benzoyl Chloride
(M.W.184.62)
NaOH
Sodium
Hydroxide
(M.W.40)
PTSA-TBAB
Solvent
NaCl
Sodium
Chloride
(M.W.58.5)
Methoxyfenozide
(M.W.368.5)

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

Flow Diagram :

INPUTS **OUTPUTS**




Reaction mass
3-Methoxy-2-methylbenzoicAcid N-tertbutylhydrazideNaOHSolution
EthyleneDichloride
Condensation
Reaction Mass
Distillation
Reaction Mass
EthyleneDichlorideReactionMass
Water washing
Reaction Mass
Water
Drying
Methoxyfenozide

52. Pyriproxyfen:

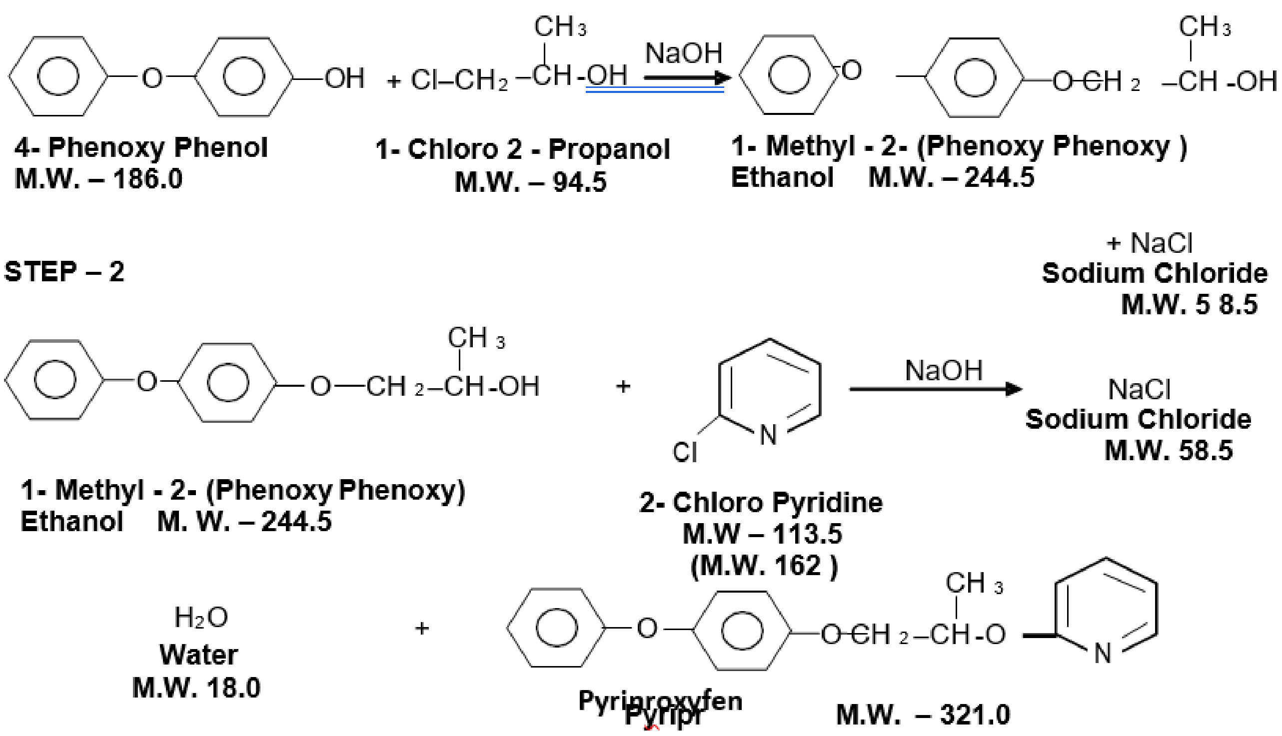
Brief Manufacturing Process:-

Step 1 :- 4-Phenoxy Phenol is reacted with 1- Chloro -2- Propanol in presence of Sodium Hydroxide to get 1- Methyl -2- (4- Phenoxy Phenoxy) Ethanol. This Intermediate is extracted by using the solvent – Toluene and then mass is filtered to isolate the Sodium Chloride salt & organic mass is taken for further stage.

Step 2 :- 1-Methyl -2- (4-Phenoxy Phenoxy) Ethanol reacts with 2- Chloro Pyridine in presence of Sodium Hydroxide to form Pyriproxyfen. This product is finally extracted by using Methanol – Solvent to isolate Sodium Chloride salt from the reaction mass. Filtrate ML is than taken for crystallization to get the pure product.

Chemical Reactions :-

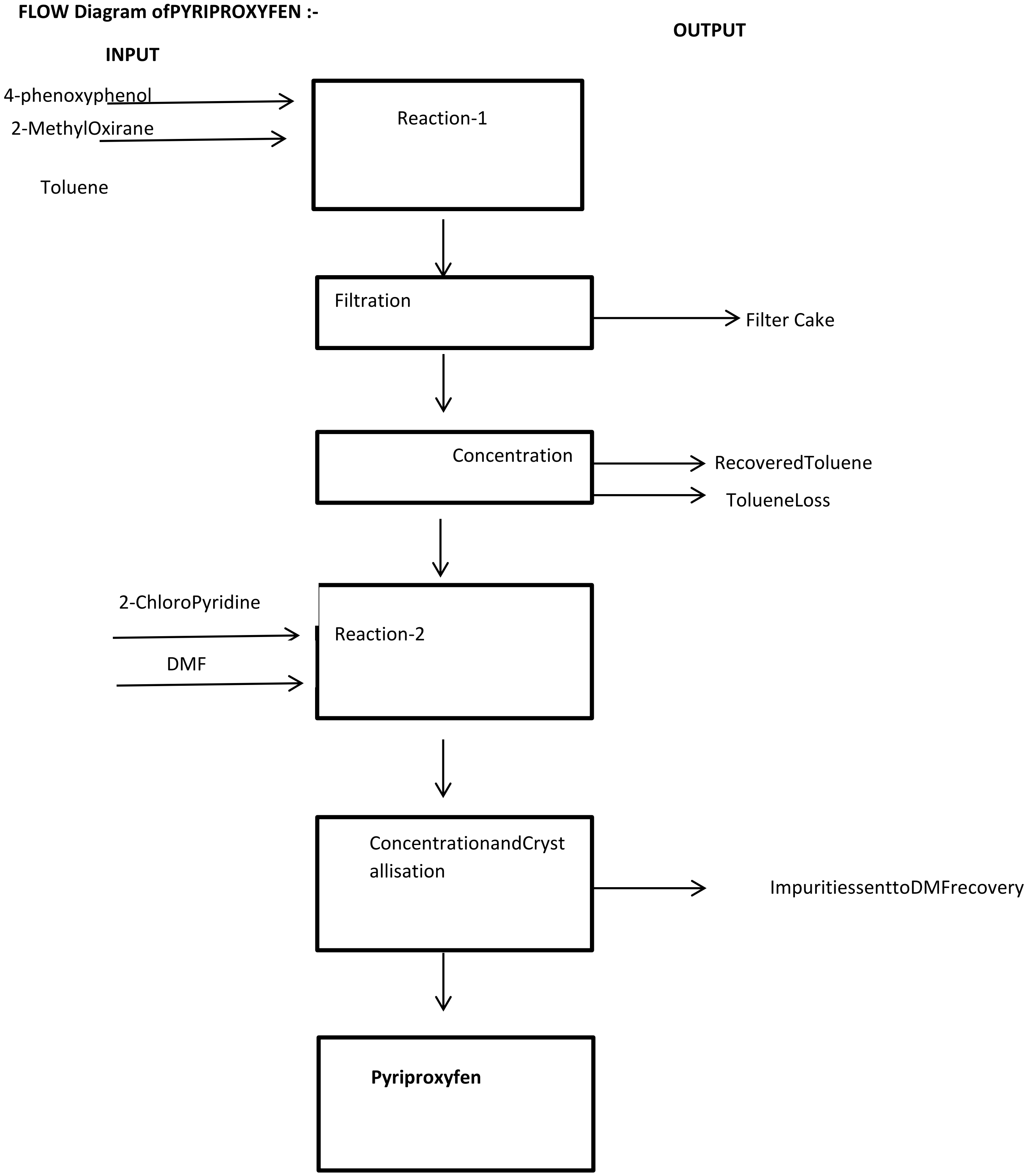
STEP – 1



Material Balance :-

	Material / Mass Balance of PYRIPROXYFEN All Quantities are in kg)				
	INPUT			OUTPUT	
SrNo.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	4-Phenoxy Phenol	595		Pyriproxyfen	1000
2	1-Chloro -2- Propanol	305		Recovered Toluene	1640
3	Sodium Hydroxide	255		Toluene Loss	60
4	2-Chloro Pyridine	362		Sodium Chloride	378
5	Solvent -Toluene	1700		Water Distillate	130
6	Solvent - Methanol	1800		Recovered Methanol	1740
7	Water	660		Methanol Loss	60
8				Aqueous Layer to ETP	645
9				Distillation Residue	24
	TOTAL	**5677**		**TOTAL**	**5677**

FLOW Diagram ofPYRIPROXYFEN :-

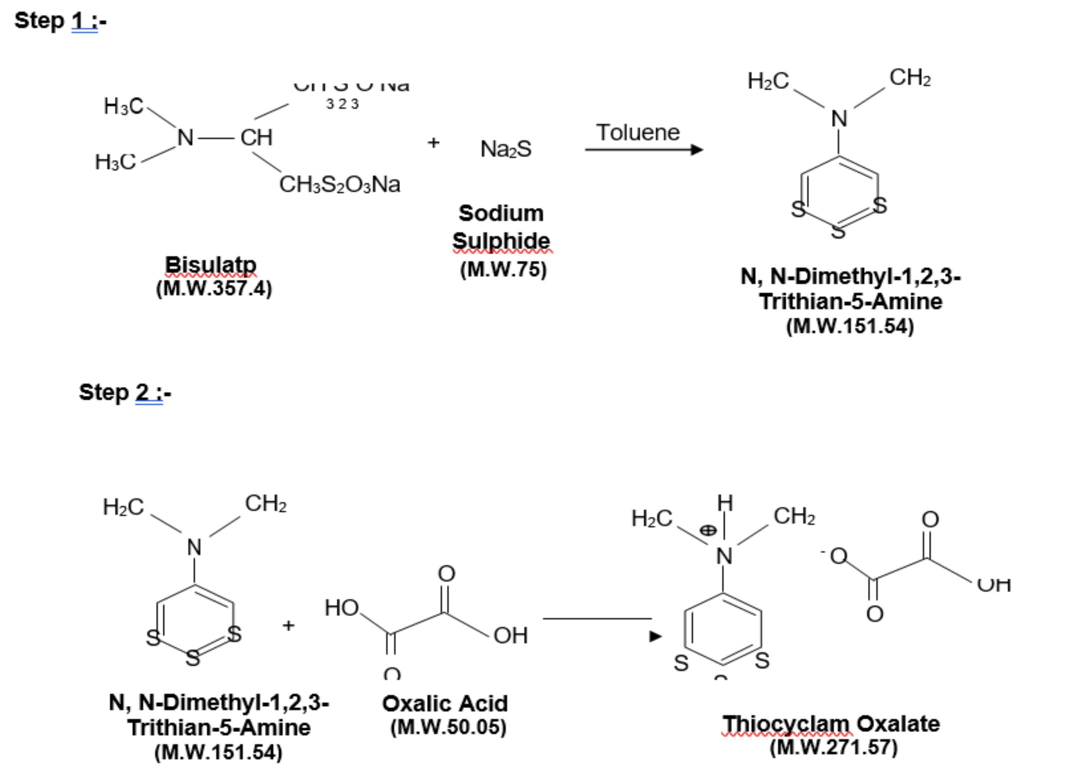


53. Thiocyclam:

Brief Manufacturing Process:-

Bisulfate is reacted with sodium Sulphideinpresence of toluene at 0°C. After the completion of the reaction solids are filtered and washed with water. The filtrate is subjected to layer separation and oily layer was heated to 20° C and slowly oxalic acid is added and stirred for 2 hours. The obtained mass is cooled and filtered to obtain pure Thiocyclamoxalatesolids.

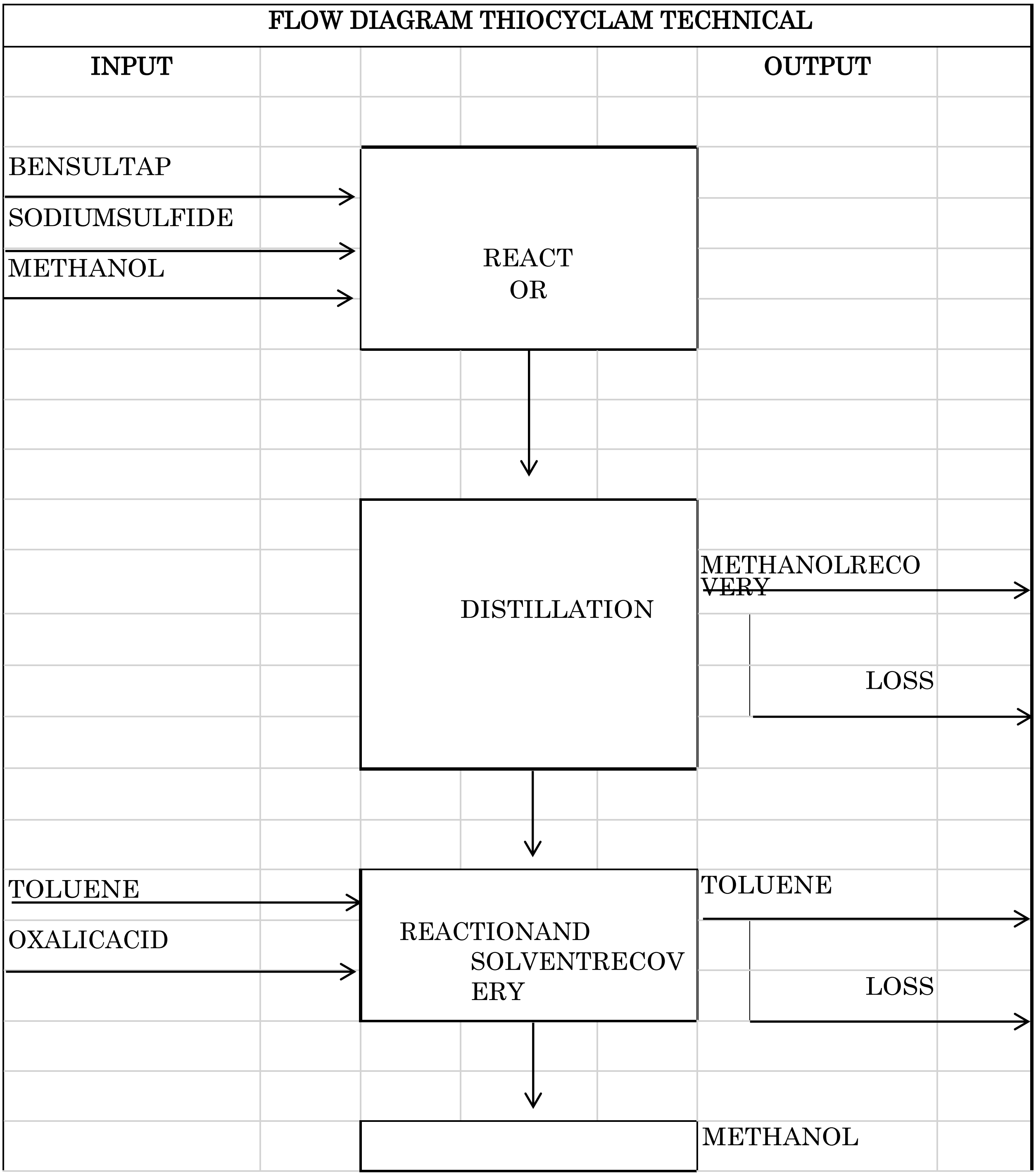
Chemical Reaction :-

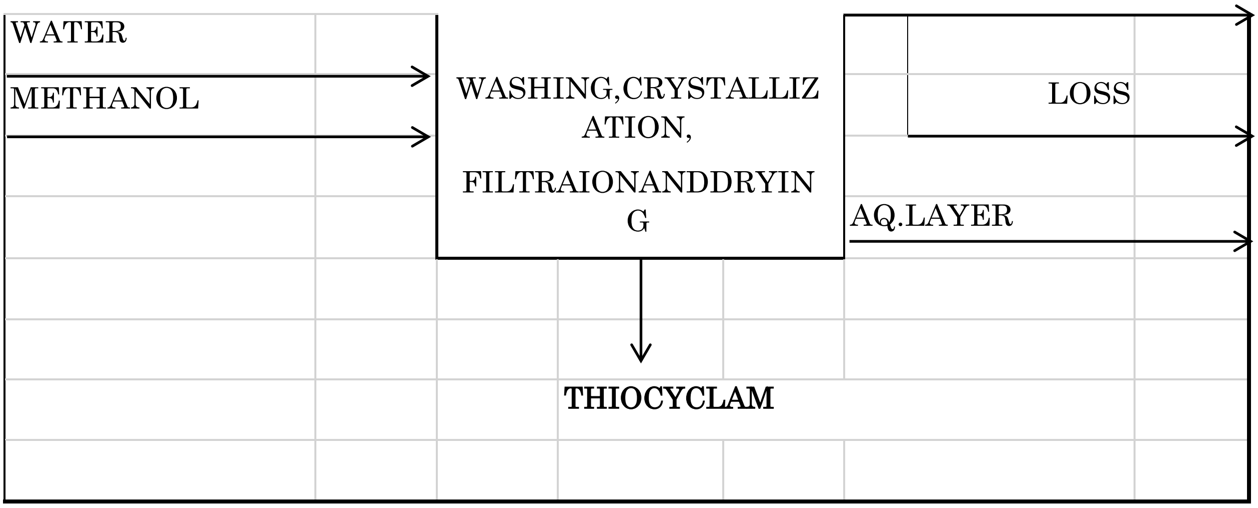


	Material / Mass Balance of THIOCYCLAM All Quantities are in kg)				
	IN PUT			OUT PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Bisultap	1333		Thiocyclam	**1000**
2	Sodium Sulphide	290		Sodium Sulphite	928
3	Oxalic Acid	337		Toluene Recovered	4775
4	Water	1000		Toluene Loss	20
5	Toluene	5000		Toluene to wastewater	20

6				Toluene in Residue	185
7				Oxalic Acid	5
8				Sodium Sulphide	5
9				Waste Water	1000
10				Bisultap	22
	TOTAL	**7960**		**TOTAL**	**7960**

FLOW DIAGRAMOFTHIOCYCLAM :



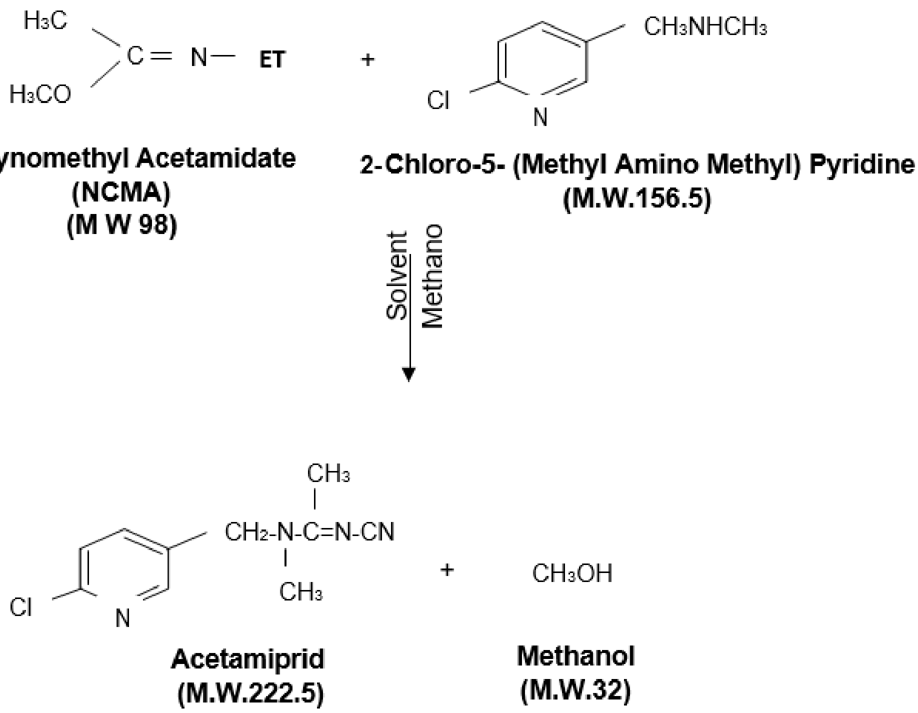


54. **Acetamiprid :**

Brief Manufacturing Process:-

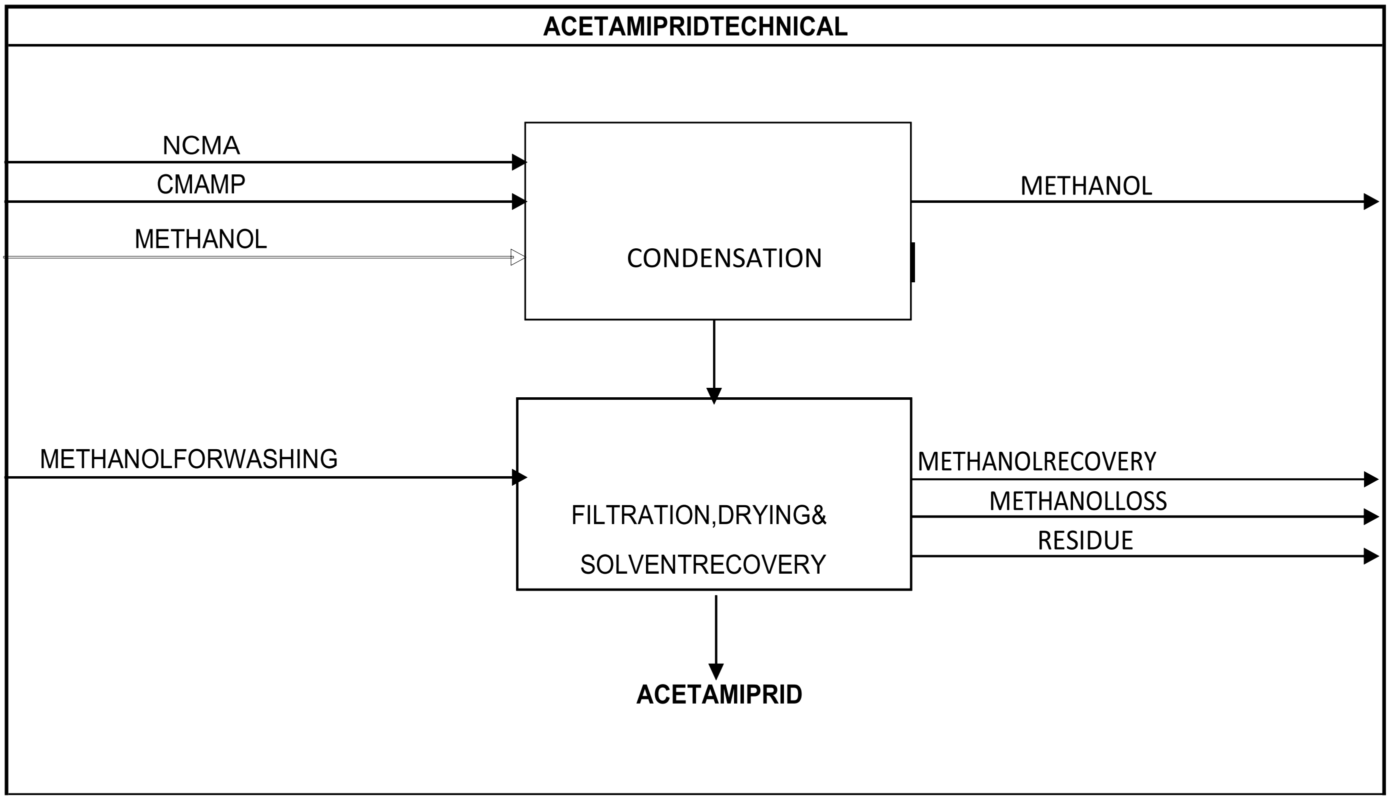
N-Cyano Methyl Acetamidate (NCMA) is reacted with 2-Chloro 5- (methyl amino methyl) Pyridine (CMAMP) in Solvent media. After the reaction is completed the product is filtered and Solvent is concentrated to yield more products as well as recover Solvent which is recycled.

Chemical Reactions:-



	Material / Mass Balance of ACETAMIPRID All Quantities are in kg)				
	INPUT			OUTPUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	N-Cynomethyl – Acetamidate (NCMA)	505		Acetamiprid	**1000**
2	CMAMP	730		Recovered Solvent	2450
3	Solvent – Methanol	2500		Solvent Loss	70
4	Water for Washing	1200		Distillation Residue	40
5				Aqueous Layer to ETP	1375
	TOTAL	**4935**		**TOTAL**	**4935**

FLOW DIAGRAMOFACETAMIPRID :



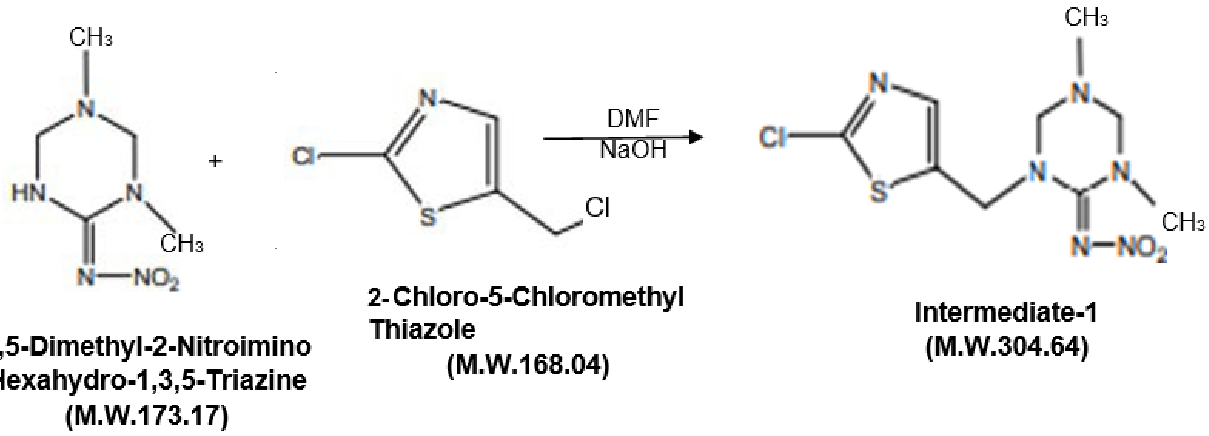
55. Clothianidin:

Brief Manufacturing Process :-

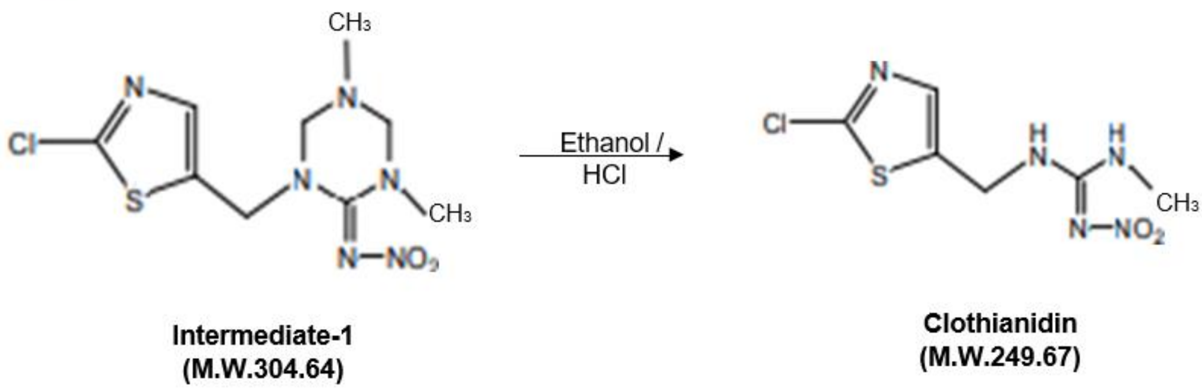
1,5-Dimethyl-2-Nitroimino Hexahydro-1,3,5-Triazine is dissolved in dried DMF. Slowly add Sodium Hydroxide solution to the mixture with cooling. The mixture is stirred for 1 h at room temperature then the mixture heated with stirring further for 1 h at 50° C. To this mixture, a solution of 2-Chloro-5-Chloromethyl Thiazole in dried DMF added dropwise at 40–50° C. After this addition, the reaction mixture heated with stirring for two hours at 70– 80° C. The mixture poured into ice-water and filtered. Take ethanol & hydrochloric acid & add the crude Clothianidin and maintain for 10-12 hours at 75-80°C, after completion of reaction, cool at 20°C and filter. Dry the material to get Clothianidin Technical.

Chemical Reactions:-

Step 1 :-



Step 2 :-



Flow diagram & Mass Balance:

Clothianidin

INPUT	KG	Stage	OUTPUT	KG
1,5-DMNIHH-1,3,5-triazine	740	Stage 1Reactio	Reactionmixture	2760
DimethylFormamide	1000			
Sodiumhydroxide	170			
Water	850			

INPUT	KG	Stage	OUTPUT	KG
Reactionmixture	2760	Stage 2Reactio n	ReactionMixture2	4475
2-chloro-5-TM chloride	715			
DimethylFormamide	100 0			

INPUT	KG	Stage	OUTPUT	KG
ReactionMixture2	4475	Stage 3Quanchingan dfiltration	CrudeClothianidin	1150
Icewater	5000		Aquouseffluents	8325

INPUT	KG	Stage	OUTPUT	KG
Crude Clothianidin	1150	Stage 4Purificationan ddistillation	Clothianidin	1000
Ethanol	3000		AquousLayer	750
Hydro chloric acid	600		Ethanolrecovered	2650
			Ethanolloss	350

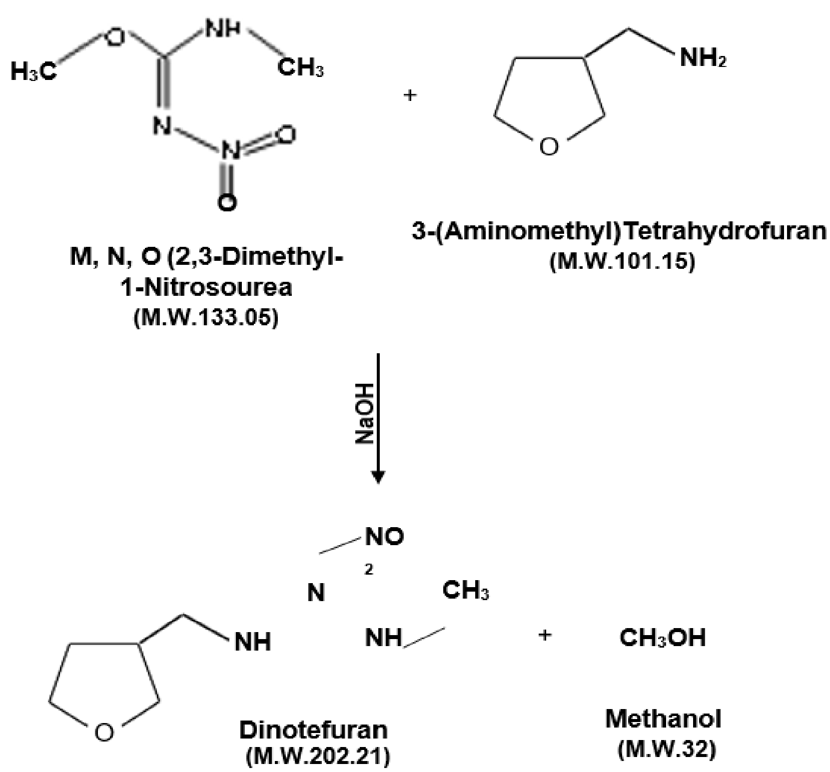
Total 21460 21460

56. Dinotefuran:

Brief Manufacturing Process:-

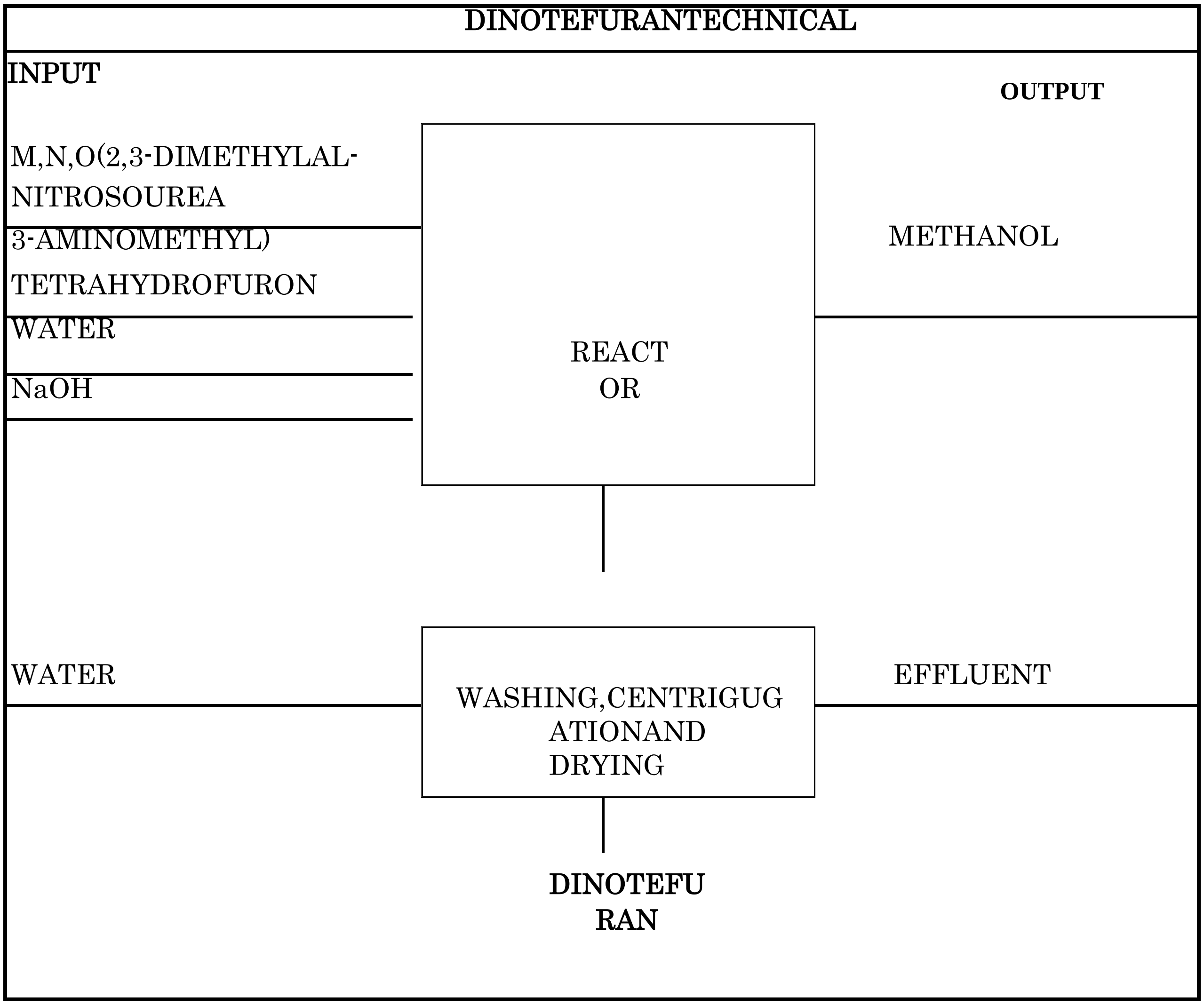
M,N,O (2,3-Dimethyl-1-Nitrosourea reacted with 3-(Amino methyl) Tetrahydrofuran in presence of Sodium Hydroxide. This Reaction gives out Dinetofuran as a Final Product. Methanol gets separated out from the reaction mass as a By-product.

Chemical Reactions:-



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

Flow Diagram of DINOTEFURANTECHNICAL:



57. **Imidacloprid :-**

Brief Manufacturing Process:-

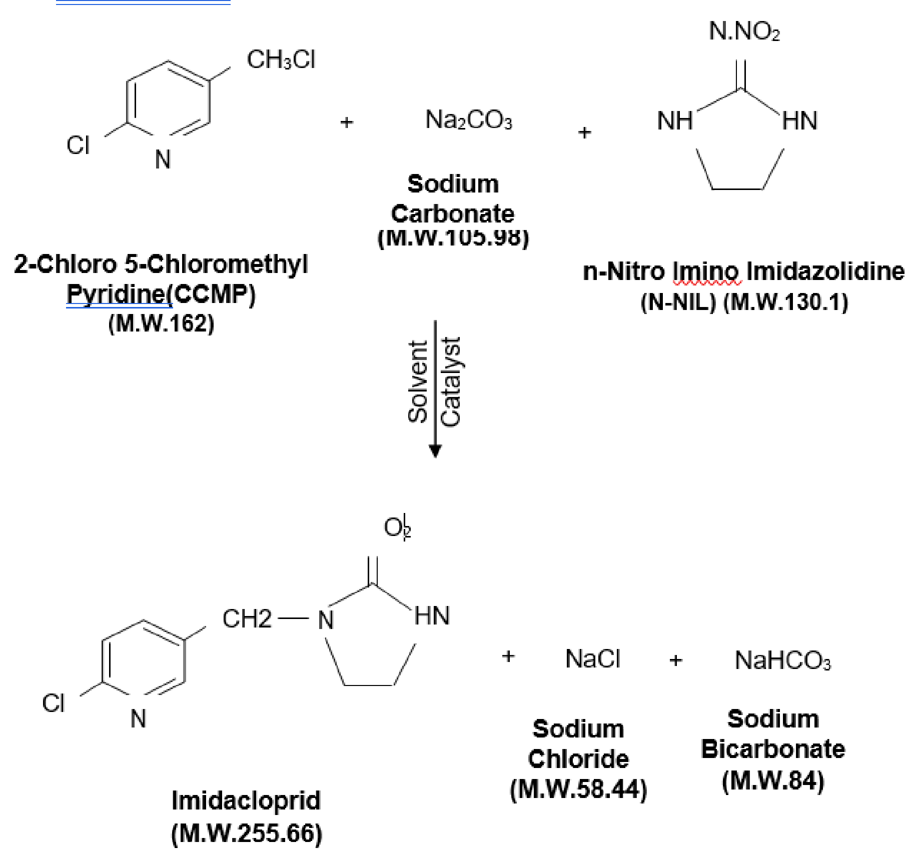
2 - Chloro, 5 - Chloromethyl Pyridine (CCMP) is reacted with N-– Nitro Imino Imidazolidine (N-NII) in present of Catalyst and Solvent to give the crude Product Imidacloprid.

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

The organic mass is then treated with water and finally solvent is removed by distillation. The concentrated mass is then crystallized to get pure product – Imidacloprid (Tech).

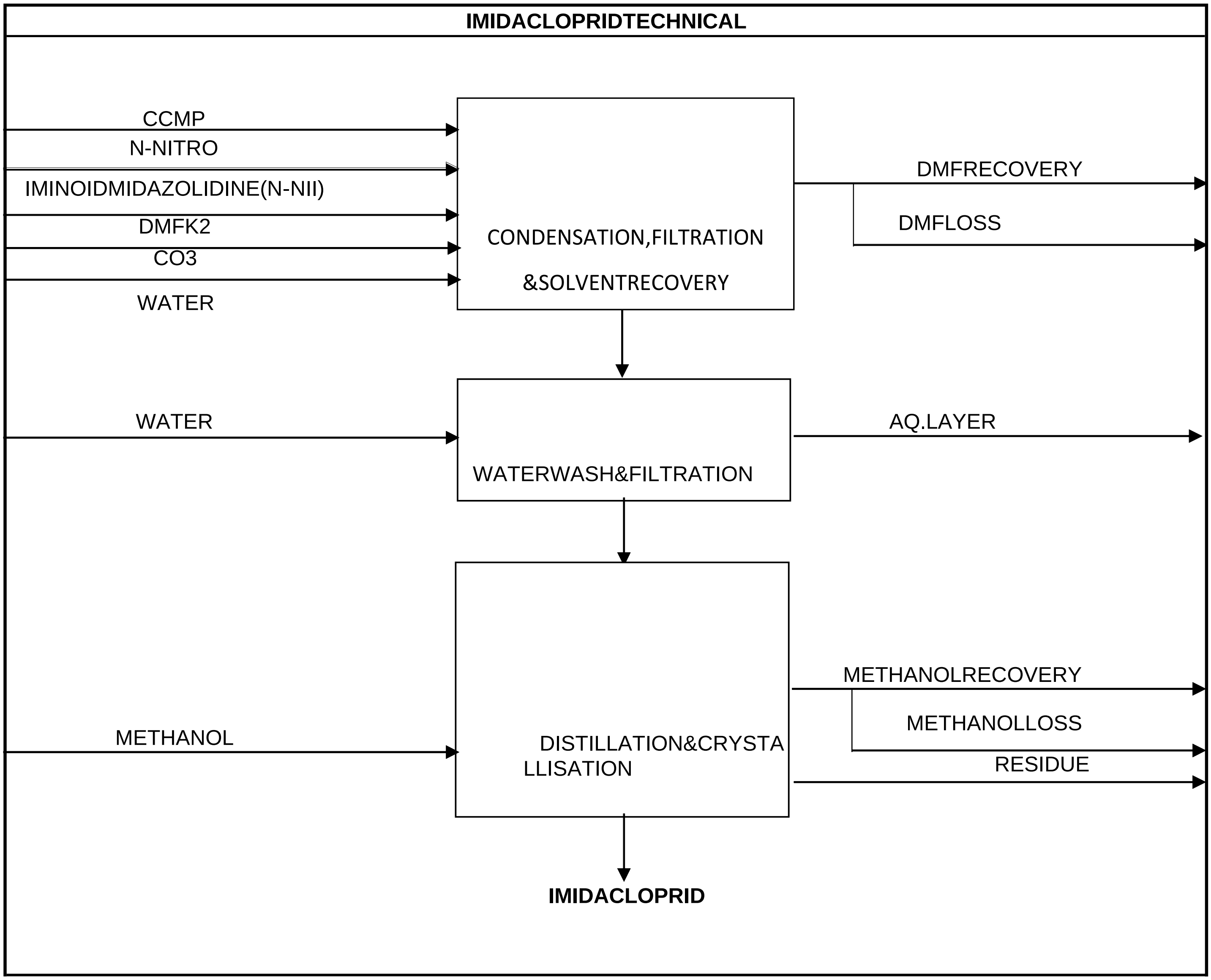
Finally, Toxic Effluent which contains traces of Pesticides is taken to Hydrolysis stage for detoxification, where aqueous mass is treated at high temperature by Alkali for the rapid hydrolysis of pesticides to simpler non-toxic compounds.

Chemical Reactions:-



	Material / Mass Balance of IMIDOCLOPRID All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2- Chloro -5- Chloromethyl Pyridine	850		Imidacloprid	**1000**
2	N- Nitro N- Methyl Imidazolidine	750		Recovered Solvent DMF	2140
3	Sodium Carbonate	680		Solvent Loss DMF	60
4	Catalyst -1	10		Recovered Solvent Methanol	370
5	Solvent - DMF	2200		Solvent Loss Methanol	30
6	Water for Washings	1000		Aqueous Layer to ETP	2317
7	Caustic Lye 47 %	50		Distillation Residue	23
8	Solvent - Methanol	400			
	TOTAL	**5940**		**TOTAL**	**5940**

Flow Diagram :



58. Nitenpyram:

Brief Manufacturing Process:-

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

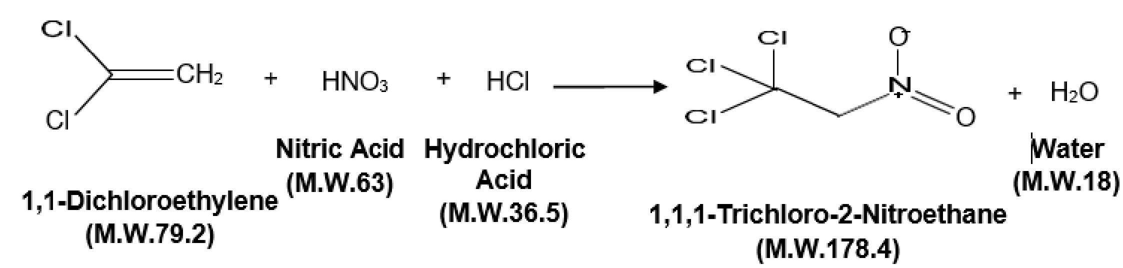
Step 2 :- 1,1-Dichloroethylene is reacted with Nitric Acid and Hydrogen Chloride in excess HCl medium to form a 1,1,1-Trichloro-2- Nitroethane. The NIT-02 formed is distilled under vacuum to obtain 99% pure material.

Step 3 :- 2-chloro-5- Chloromethyl pyridine is reacted with ethylamine in water to form a 2-Chloro 5- Ethylaminomethyl Pyridine and liberated Hydrogen Chloride is neutralised in Caustic Scrubber.

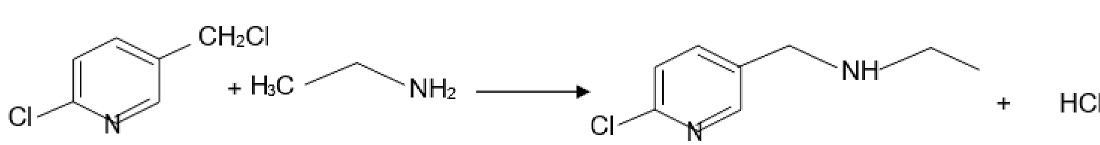
Step 4 :- 2-Chloro-5-Ethylaminomethyl Pyridine is reacted with Trichloro-2-Nitroethane to form (E)- 1-Chloro-N-(6-Chloropyridin-3-yl)Methyl)-N-Ethyl-2- Nitroetenamine (NIT-04) which is then reacted with methyl amine to form a (Z)-N-((6- Chloropyridin-3-yl)Methyl)-N-Ethyl-N-Methyl-2-Nitroethene- 1,1-Diamine. After the completion of the reaction Solvent is recovered under vacuum and Methanol is added to Crystallize the material to obtain 98% pure Nitenpyram.

Chemical Reactions:-

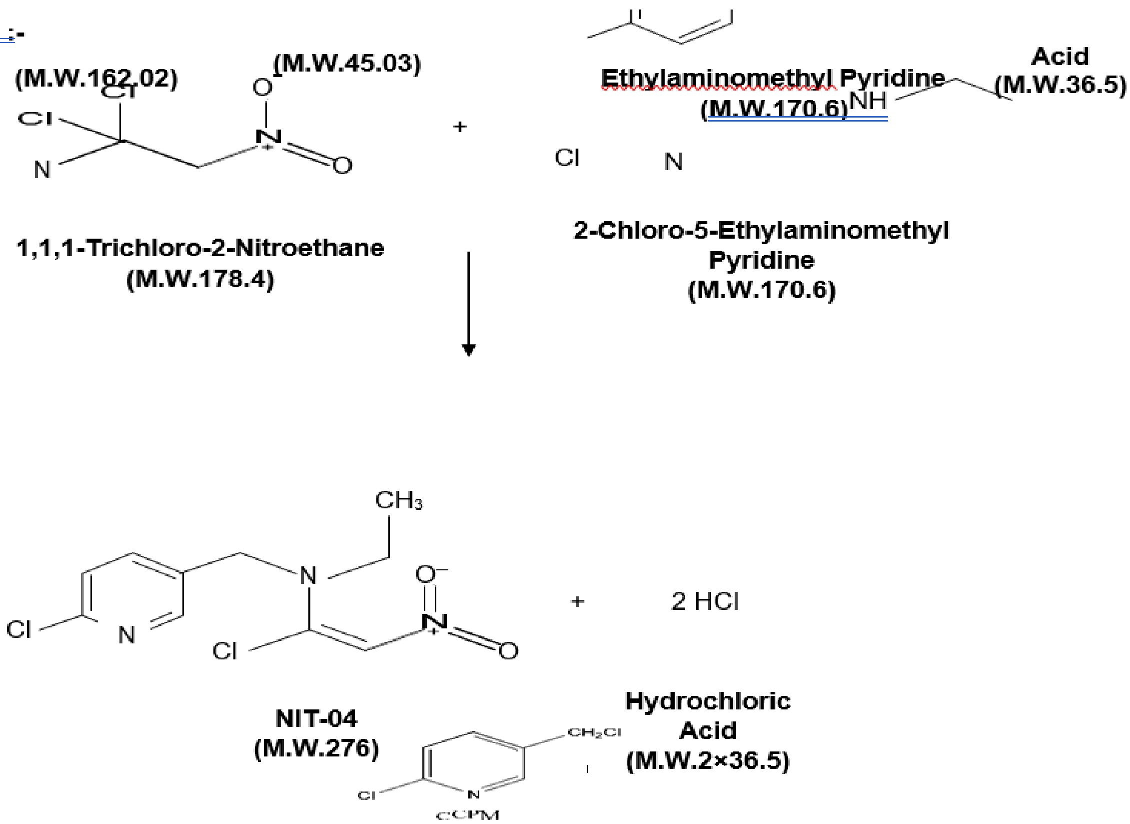
Step 1 :-



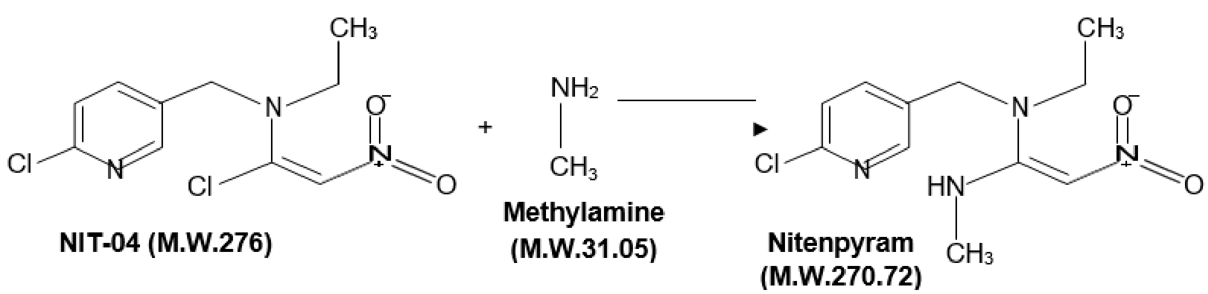
Step 2 :-



Step 3 :-

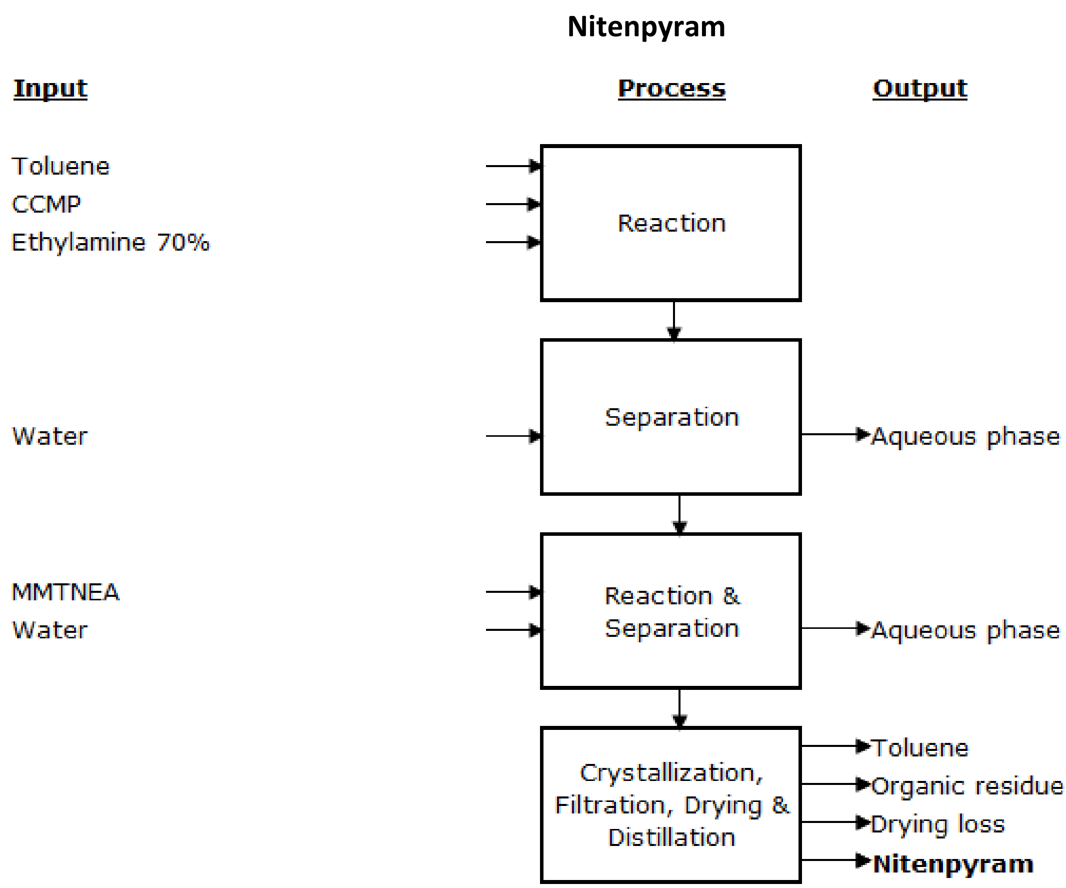

(M.W.162.02)
(M.W.45.03)
Ethylaminomethyl Pyridine
(M.W.170.6)
Acid
(M.W.36.5)
1,1,1-Trichloro-2-Nitroethane
(M.W.178.4)
2-Chloro-5-Ethylaminomethyl Pyridine
(M.W.170.6)
2 HCl
NIT-04
(M.W.276)
Hydrochloric Acid
(M.W.2×36.5)
CCPM

Step 4 :-


NIT-04 (M.W.276)
Methylamine
(M.W.31.05)
Nitenpyram
(M.W.270.72)

	Material / Mass Balance of NITENPYRAM All Quantities are in kg)				
	INPUT			OUTPUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	1,1,2-Trichloroethane	755		Nitenpyram	**1000**
2	Sodium Hydroxide (48%)	472		Sodium Chloride	366
3	Nitric Acid (85%)	419		Water formed	133
4	Hydrochloric Acid (36%)	573		Hydrochloric Acid	539
5	2-Chloro-5-Chloromethyl Pyridine	917		MDC Recovered	1786
6	Ethyl Amine (70%)	364		MDC Loss	2
7	Methyl Amine (40%)	440		MDC in Residue	34
8	Methylene Dichloride (MDC)	1822		Methanol Recovered	1995
9	Methanol	2100		Methanol Loss	114
10	Water	2350		Methanol to Wastewater	21
11				Methanol in Residue	70
12				1,1,2-Trichloroethane	262
13				2-Chloro-5-Chloromethyl Pyridine	318
14				Recovered Ethyl Amine (70%)	88
15				Methyl Amine (40%)	61
16				Nitric Acid (85%)	123
17				Waste Water	3300
	TOTAL	**10212**		**TOTAL**	**10212**

Flow Diagram of Nitenpyram :



59. **Thiacloprid:-**

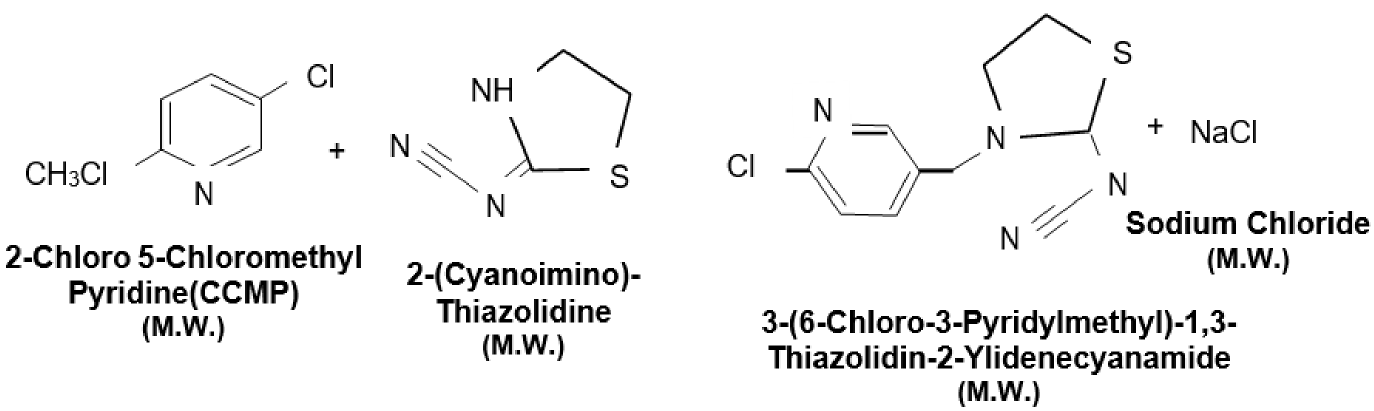
Brief Manufacturing Process:-

2-Chloro, 5-Chloro methyl Pyridine (CCMP) is reacted with Thiazolidinylidene Cyanamide in present of catalyst and solvent. The Hydrochloric acid, which is formed during the reaction, is scavenged by putting Sodium carbonate as acid scavenger. The resulting mass is diluted by water and filtered to remove the salts of Sodium Chloride (NaCl) and sodium bi carbonate.

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

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

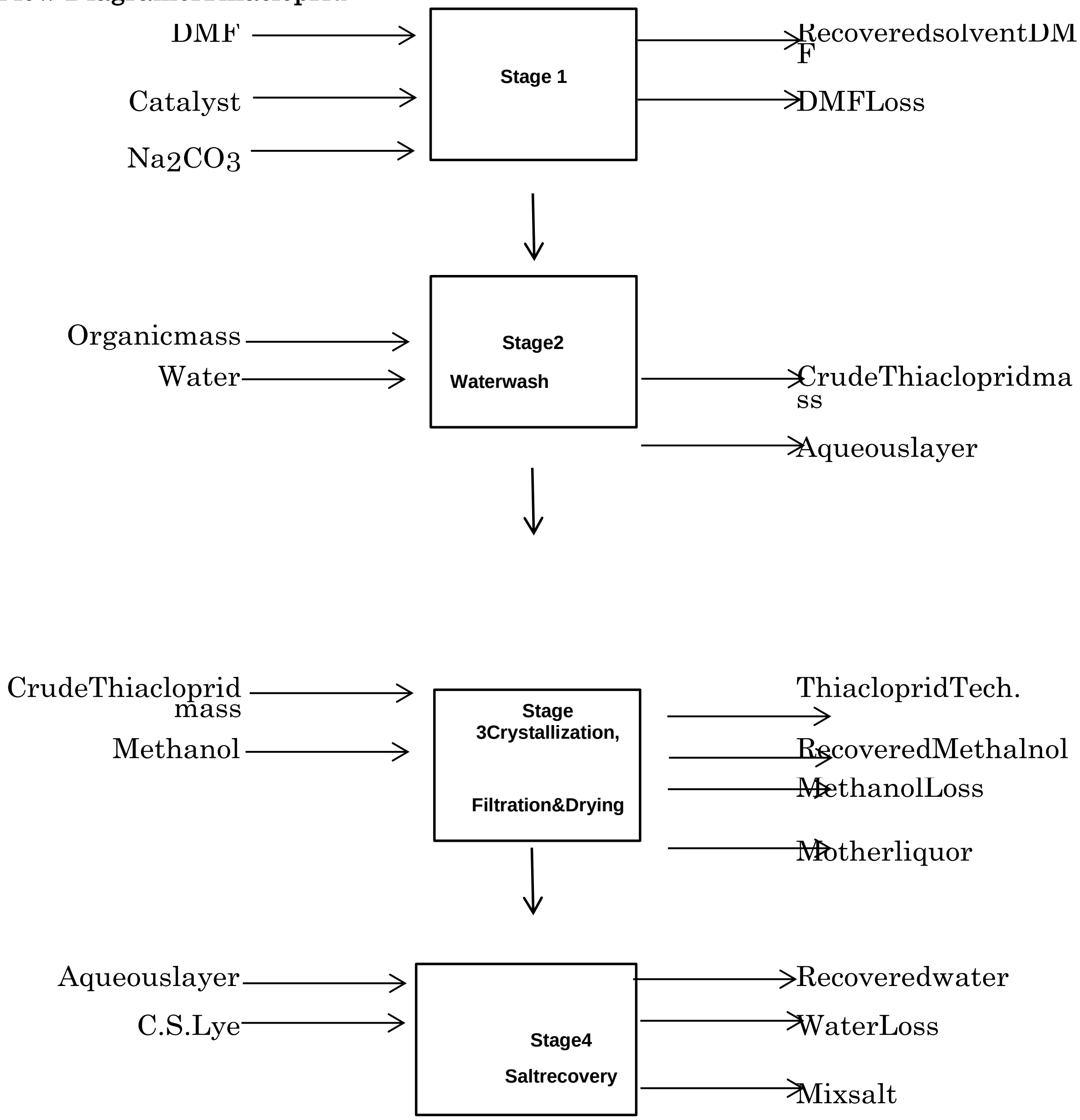
Chemical Reactions :-



	Material / Mass Balance of THIACLOPRID All Quantities are in kg)				
	INPUT			OUTPUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2-Chloro, 5-Chloro Methyl Pyridine	900		Thiacloprid	**1000**
2	Thiazolidimylidene Cyanamide	750		Recovered Sol – DMF	2050
3	DMF	2200		DMF Loss	150
4	Catalyst	10		Recovered Methanol	295
5	Na_2CO_3	706		Methanol Loss	105

6	Water	1000		Mother liquor	470
7	Methanol	400		Recovered water	940
8	Caustic Soda Lye	50		Water Loss	50
9				Mix salt	956
	TOTAL	**6016**		**TOTAL**	**6016**

Flow DiagramofThiacloprid：

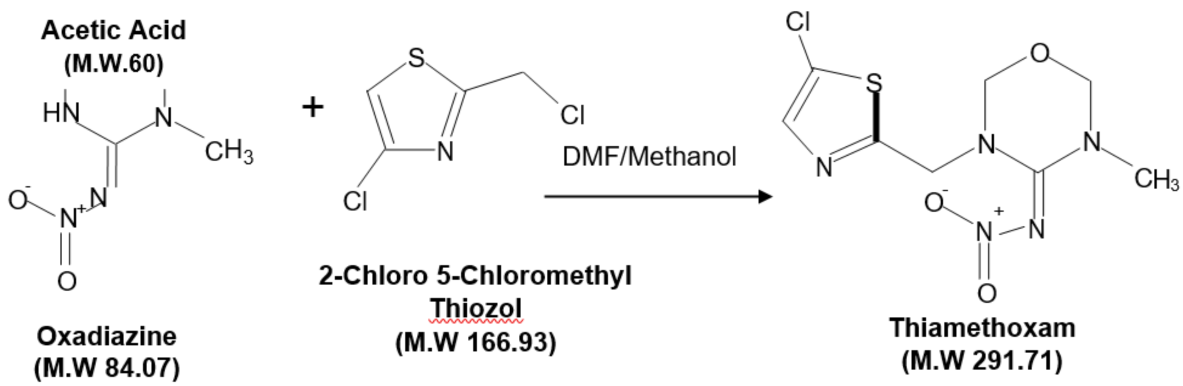


60. **Thiamethoxam :**

Brief Manufacturing Process:-

3-Methyl 4-Nitro Imino Per hydro 1,3,5 Oxidiazine is condensed with 2-Chloro 5-Chloromethyl Thiazole (CCMT) in presence of Solvent to form the final product Thiamethoxam. Organic mass contain solvent is taken for distillation. After it is diluted with water, neutralized with Hydrochloric Acid, cool it to form Crystal & filtered it to get product. Again re- slurry it in Spent Solvent.

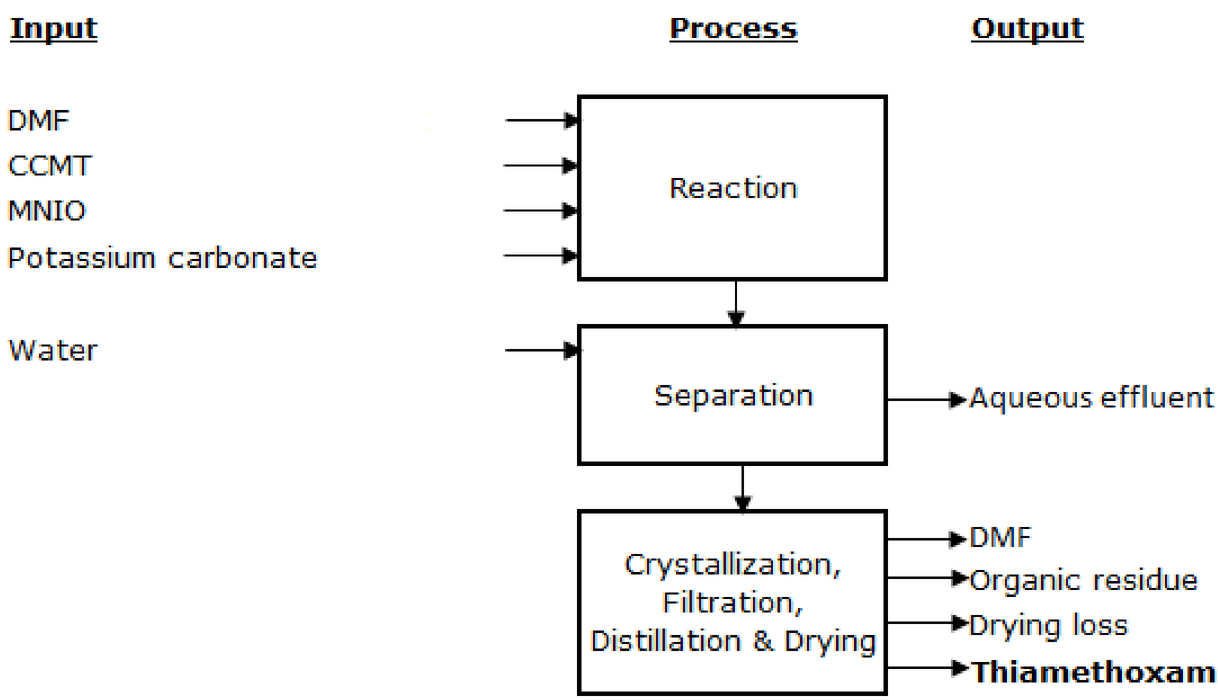
Chemical Reactions:-



	Material / Mass Balance of THIAMETHOXAM All Quantities are in kg)				
	INPUT			OUT PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2-Chloro 5-Chloromethyl Thiazole	883		Thiamethoxam	**1000**
2	3-Methyl 4-Nitroimino 1,3,5 Oxidiazine (MNIO)	962		Recovered DMF	3800
3	DMF	4000		DMF Loss	200
4	Methanol	2000		Recovered Methanol	1925
5	Caustic Soda Flakes	240		Methanol Loss	75
6	HCl (30%)	28		Aqueous Layer to ETP	2060
7	Water	1000		Distillation Residue	53
	TOTAL	**9113**		**TOTAL**	**9113**

Flow Diagram of THIAMETHOXAM Technical:

THIAMETHOXAM



61. Pymetrozine :

Brief Manufacturing Process:-

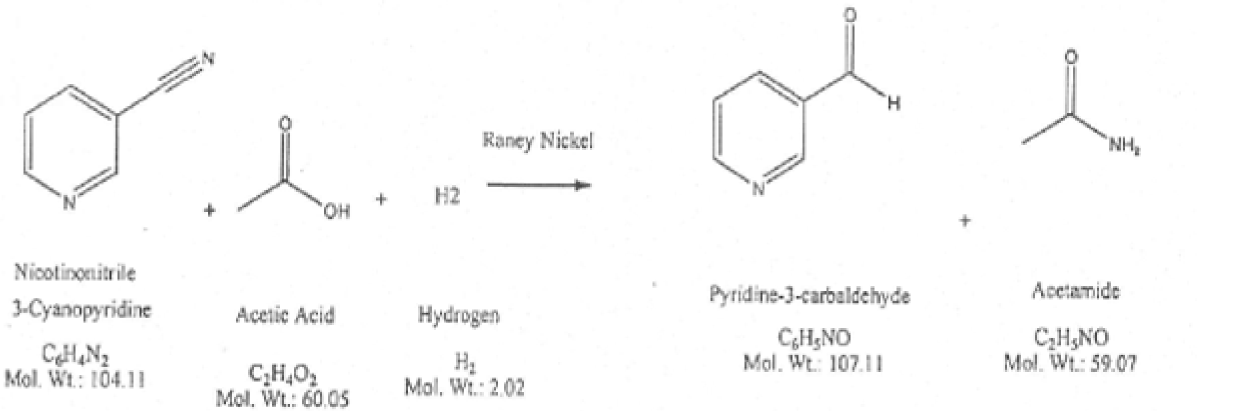
Step 1 :- 3- Cyano Pyridine undergoes hydrogenation reaction in presence of water, Acetic Acid & Catalyst (Moist Raney Nickel) under Pressure to give an intermediate as 3-Pyridine Carbaldehyde. After completion of reaction, resulted Product is isolated by filtration &Catalyst is recovered & recycled.

Step 2 :- Acetyl Amine Triazinone when reacted with Conc. Hydrochloric Acid (HCl) in presence of Solvent as water it gives second intermediate as 4-Amino-6-Methyl-3-Oxo-2,3,4,5-Tetrahydro-1,2,4-Triazin-3-(2H)-one . After completion of reaction, the reaction is treated by Caustic Lye & pH adjusted to slightly alkaline & this resulting Mass is then forwarded to next step for condensation as such.

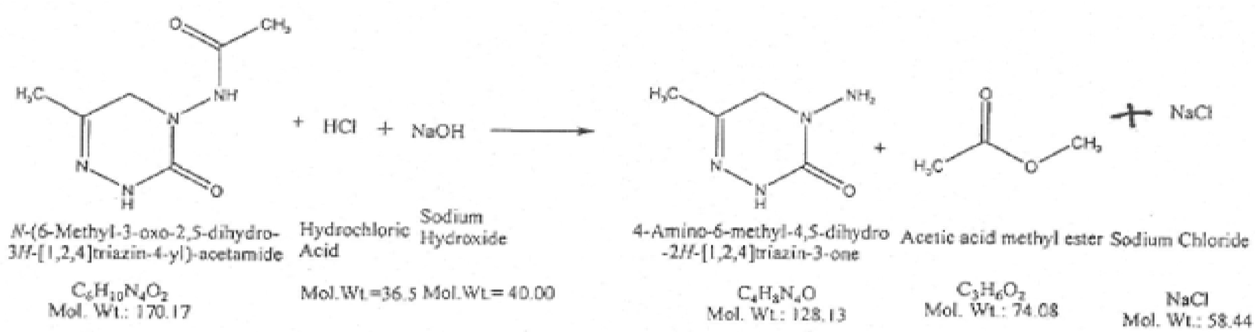
Step 3 :- 4-Amino-6-Methyl-3-Oxo-2,3,4,5-Tetrahydro-1,2,4-Triazin-3-(2H)-on undergoes condensation with 3-Pyridinaaldehyde in presence of Solvent- Methanol and maintain reaction for8.0 to 9.0 hours at 65 to 68°C. Finally, reaction mass cooled and filtered to give pure product as Pymetrozine Technical.

Chemical Reaction :-

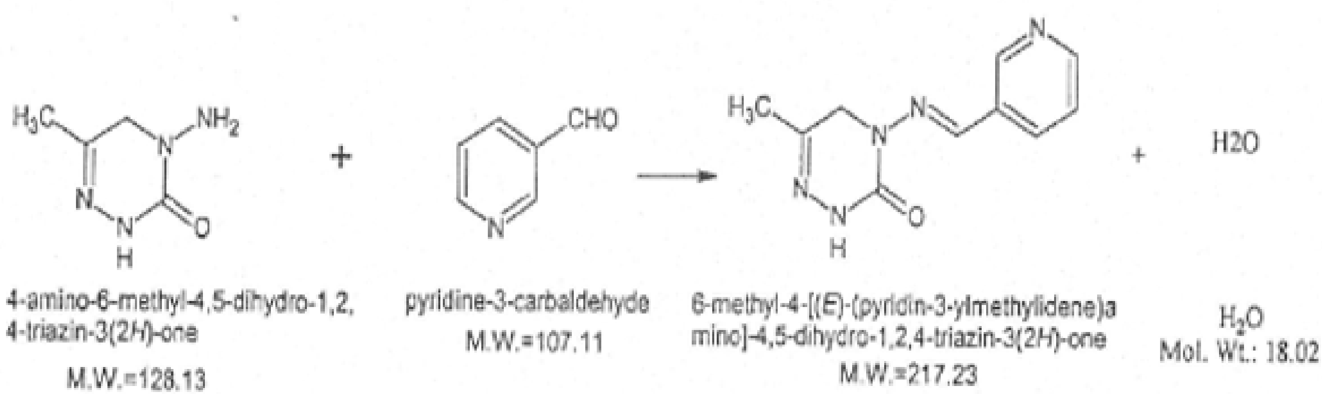
Step 1:-



Step 2:-



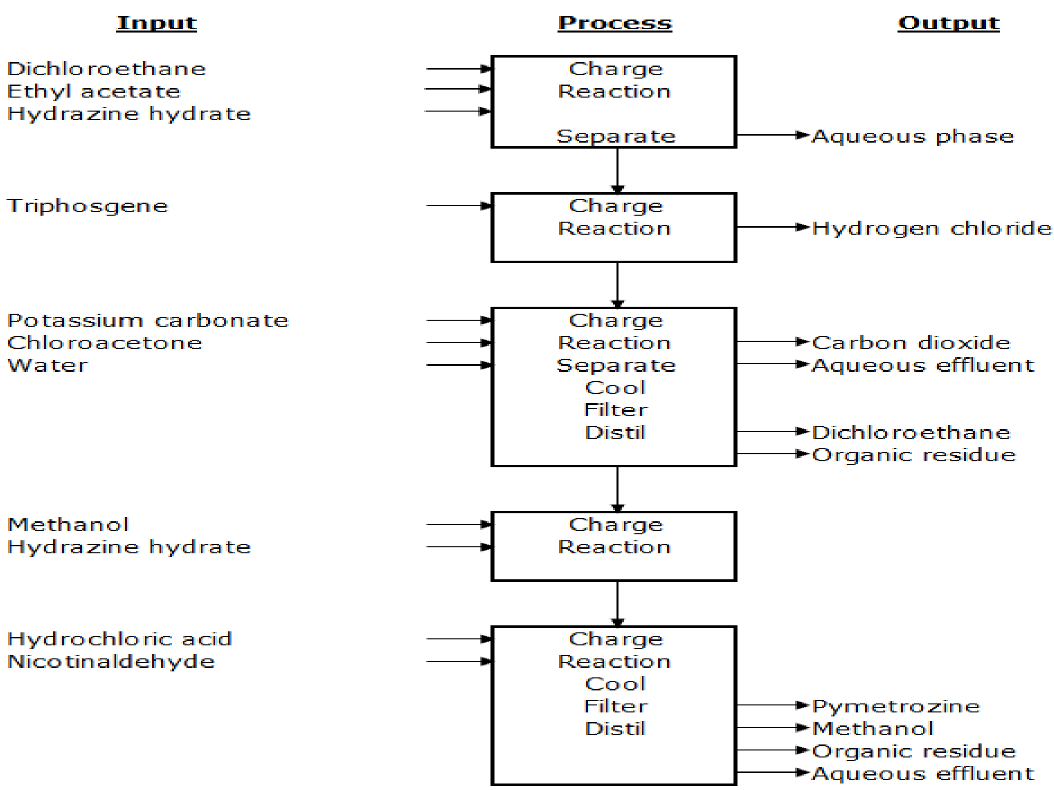
Step 3:-



Material / Mass Balance of PYMETROZINE All Quantities are in kg)					
	INPUT			OUTPUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	3- Cyano Pyridine	532		Pymetrozine	**1000**
2	Water	4000		Recovered Solvent Methanol	930
3	Catalyst- Raney Nickel	15		Methanol Loss	1070
4	Hydrogen Gas	51		Aqueous Layer to ETP	5880
5	Acetic Acid	368		Recovered Catalyst- Raney Nickel	14
6	Acetyl Amine Triazinone	870		Loss Catalyst- Raney Nickel	1
7	Concentrated HCl	623			
8	Caustic Soda Lye	436			
9	Solvent-Methanol	2000			
	TOTAL	**8895**		**TOTAL**	**8895**

Flow Diagram of PYMETROZINE Technical :

Mass balance of Pymetrozine



TOTAL:

62. LambdaCyhalothrin:

Brief Manufacturing Process:-

Meta Phenoxy Benzaldehyde is reacted with Sodium Cyanide to form Meta Phenoxy Benzaldehyde Cyanohydrin as an intermediate. This on reaction with Tri Fluoro Propenyl Acid Chloride (TFP Acid Chloride) forms the Product Cyhalothrin. In this process n - Hexane is used as solvent along with phase transfer Catalyst. The reaction mass of Cyhalothrin is washed by Soda Ash solution as well as water. Solvent- n- Hexane is stripped off to get pure Cyhalothrin oil. Finally, Cyhalothrin oil is epimerized to give Lambda Cyhalothrin of 85 % (Min.)

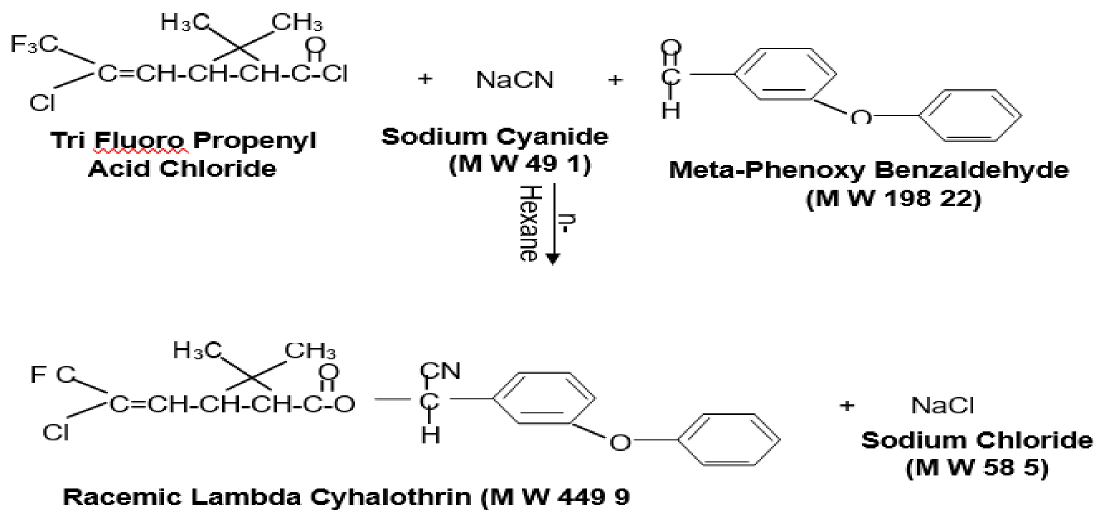
An aqueous layer which contains traces of Sodium Cyanide is detoxified by the treatment of Sodium Hypochlorite Solution (8 - 10%) up to < 0.2 ppm Level. Then it is mixed up with main ETP stream for further treatment & finally drained to gutter.

	Material / Mass Balance of LAMBDA CYHALOTHRIN All Quantities are in kg)				
	IN PUT			OUTPUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Meta Phenoxy Benzaldehyde	470		Lambda Cyhalothrin	1050
2	Lambda Acid Chloride	640		Recovered Solvent-n Hexane	2375
3	Water for Reaction	470		Solvent Loss n – Hexane	125
4	Sodium Cyanide	130		Recovered IPA + Catalyst	1154
5	Solvent –n- Hexane	2500		IPA + Catalyst Loss	56
6	5 % Soda Ash Solution	500		Detoxified Aqueous to ETP	2260
7	Water for washing	500			
8	8-10 % Sodium Hypochlorite Solution	600			

Chemical Reactions:-

Step 1 :-

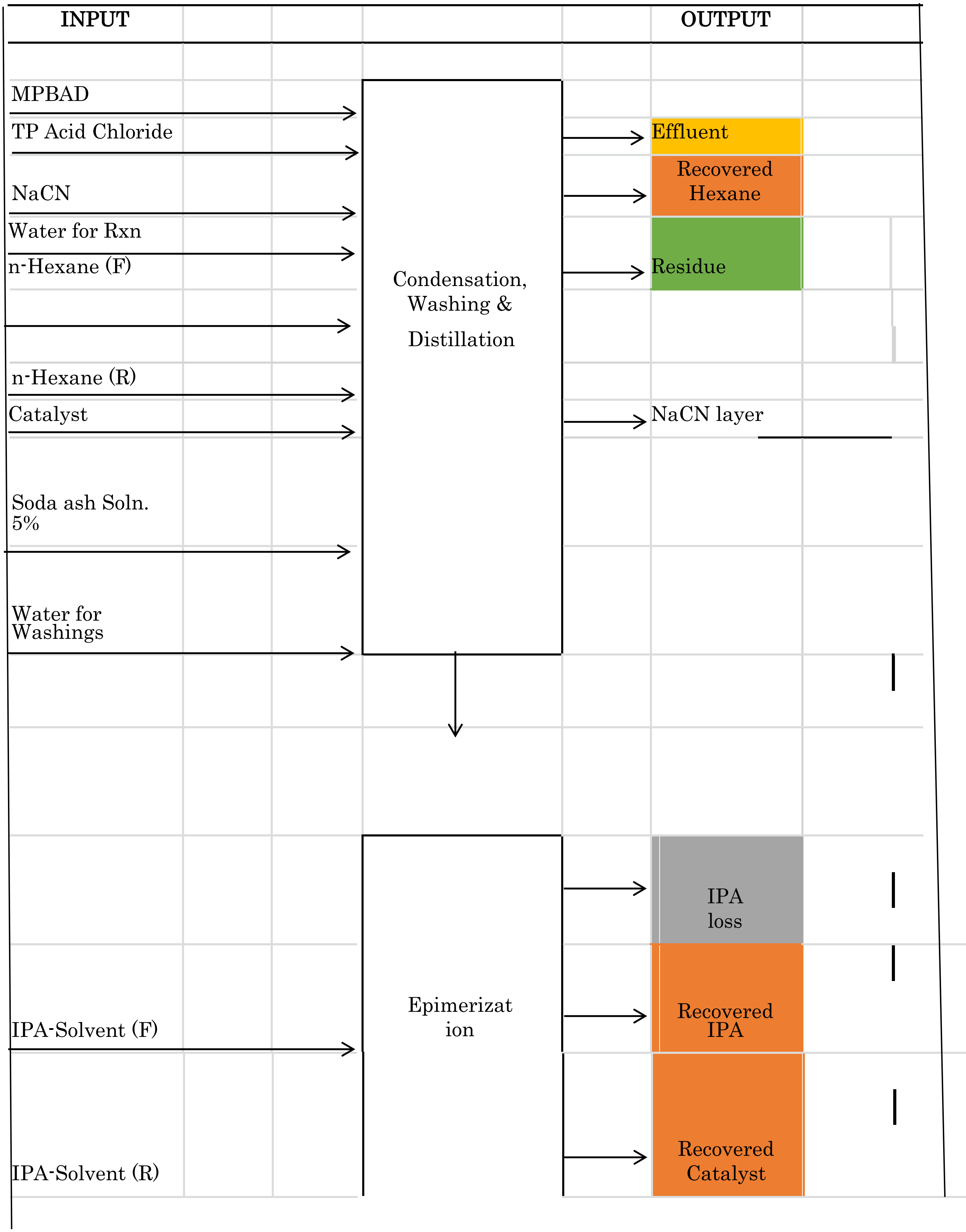
Lambda Cyhalothrin (M W 449 9

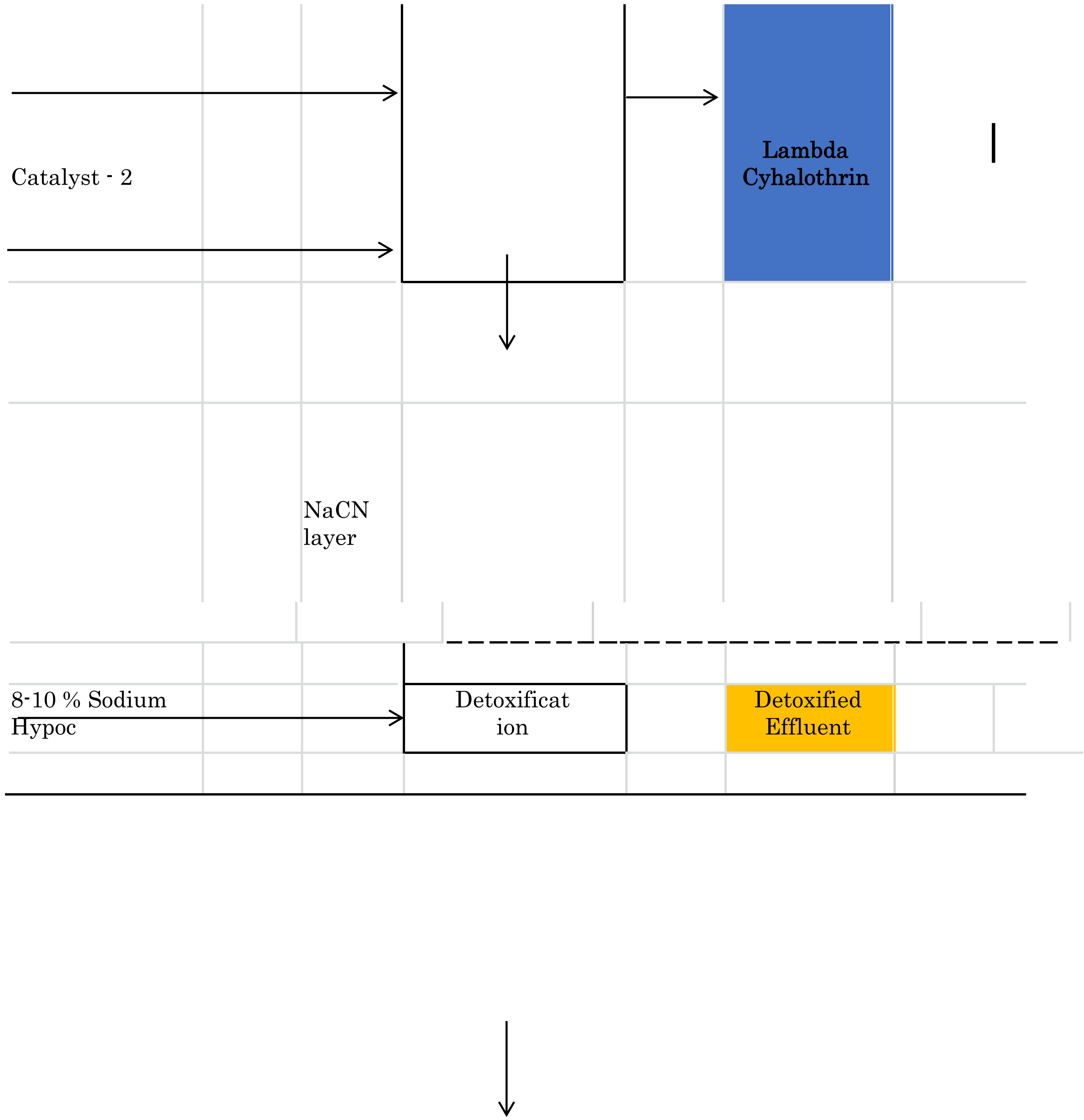


	Material / Mass Balance of LAMBDA CYHALOTHRIN All Quantities are in kg)				
	INPUT			OUTPUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Meta Phenoxy Benzaldehyde	470		Lambda Cyhalothrin	1050
2	Lambda Acid Chloride	640		Recovered Solvent-n Hexane	2375
3	Water for Reaction	470		Solvent Loss n – Hexane	125
4	Sodium Cyanide	130		Recovered IPA + Catalyst	1154
5	Solvent –n- Hexane	2500		IPA + Catalyst Loss	56
6	5 % Soda Ash Solution	500		Detoxified Aqueous to ETP	2260
7	Water for washing	500			
8	8-10 % Sodium Hypochlorite Solution	600			
9	Solvent- IPA for Epimerization	1100			
10	Catalyst for Epimerization	110			

	TOTAL	**7020**		**TOTAL**	**7020**

Flow Diagram of LAMBDA CYHALOTHRIN :-



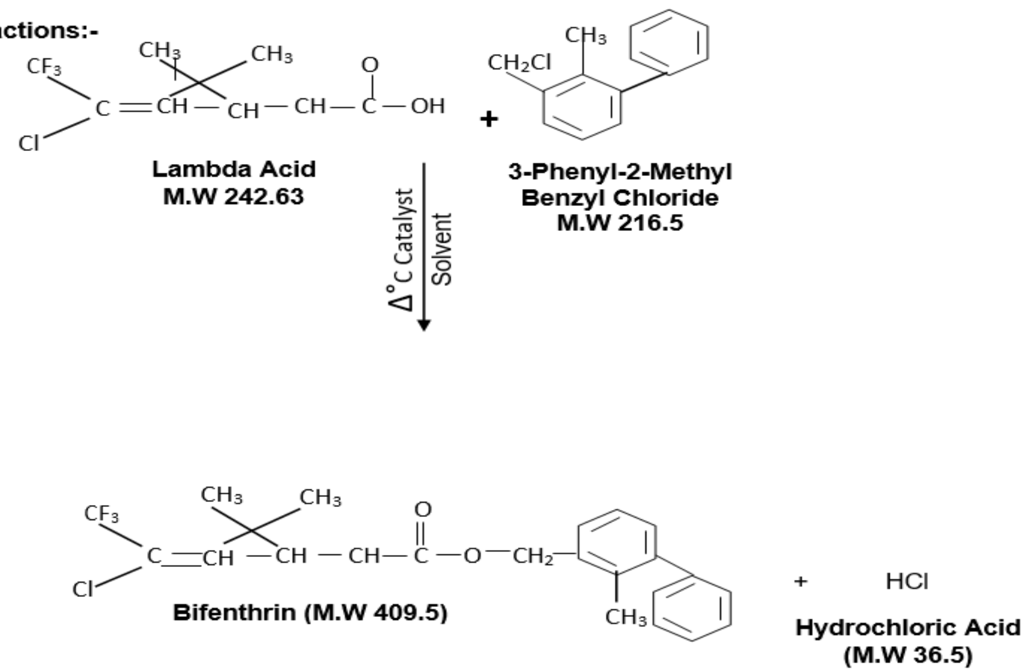

Catalyst - 2
Lambda Cyhalothrin
NaCN layer
8-10 % Sodium Hypoc
Detoxificat ion
Detoxified Effluent

63. **Bifenthrin :**

Brief Manufacturing Process:-

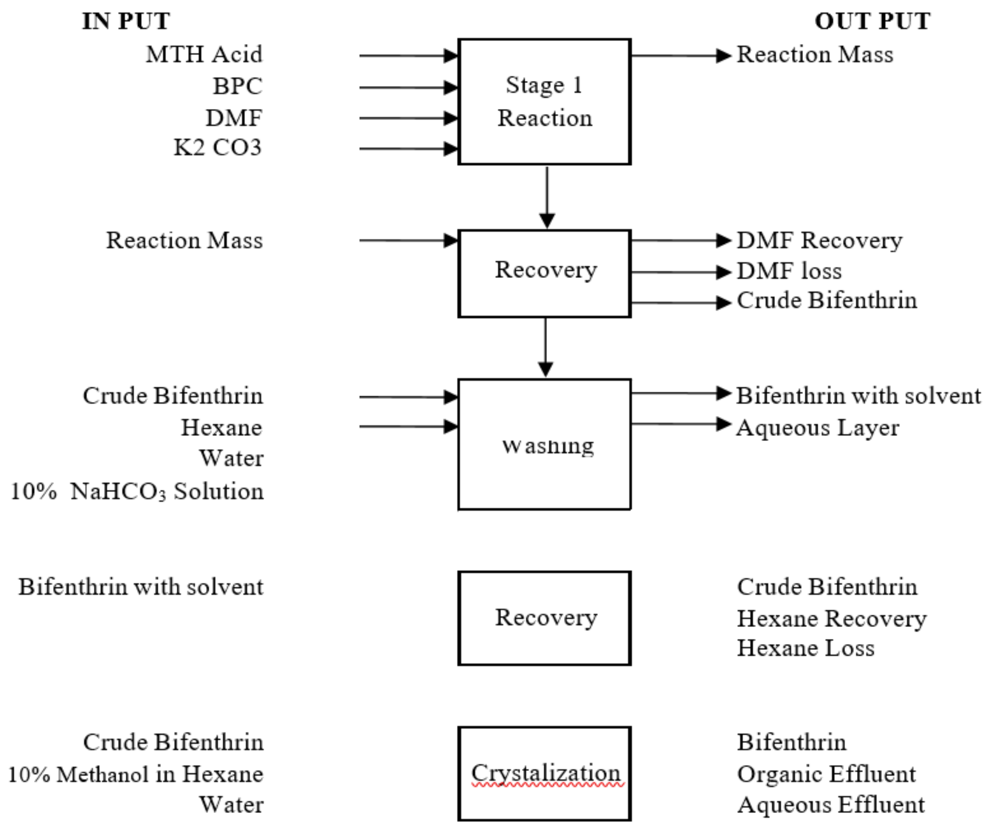
TFP Acid (Lambda Acid) is reacted with 3-Phenyl 2-Methyl Benzyl Chloride (PMBC) in presence of Solvent & catalyst to give the product Bifenthrin.

Chemical Reactions:-



	Material / Mass Balance of BIFENTHRIN All Quantities are in kg)				
	IN – PUT			OUT – PUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Lambda Acid	585		Bifenthrin	**1030**
2	3-Phenyl -2-Methyl Benzyl Chloride	558		Recovered Solvent - n Hexane	560
3	Catalyst	25		Solvent Loss n – Hexane	40
4	Solvent- Hexane	600		30 % HCl Solution	315
5	Water for HCl Solution	220		Distillation Residue	20
6	Water for Washing	500		Aqueous to ETP	523
	TOTAL	**2488**		**TOTAL**	**2488**

Flow Diagram of BIFENTHRIN :-



64. Cypermethrin Tech 92% :-

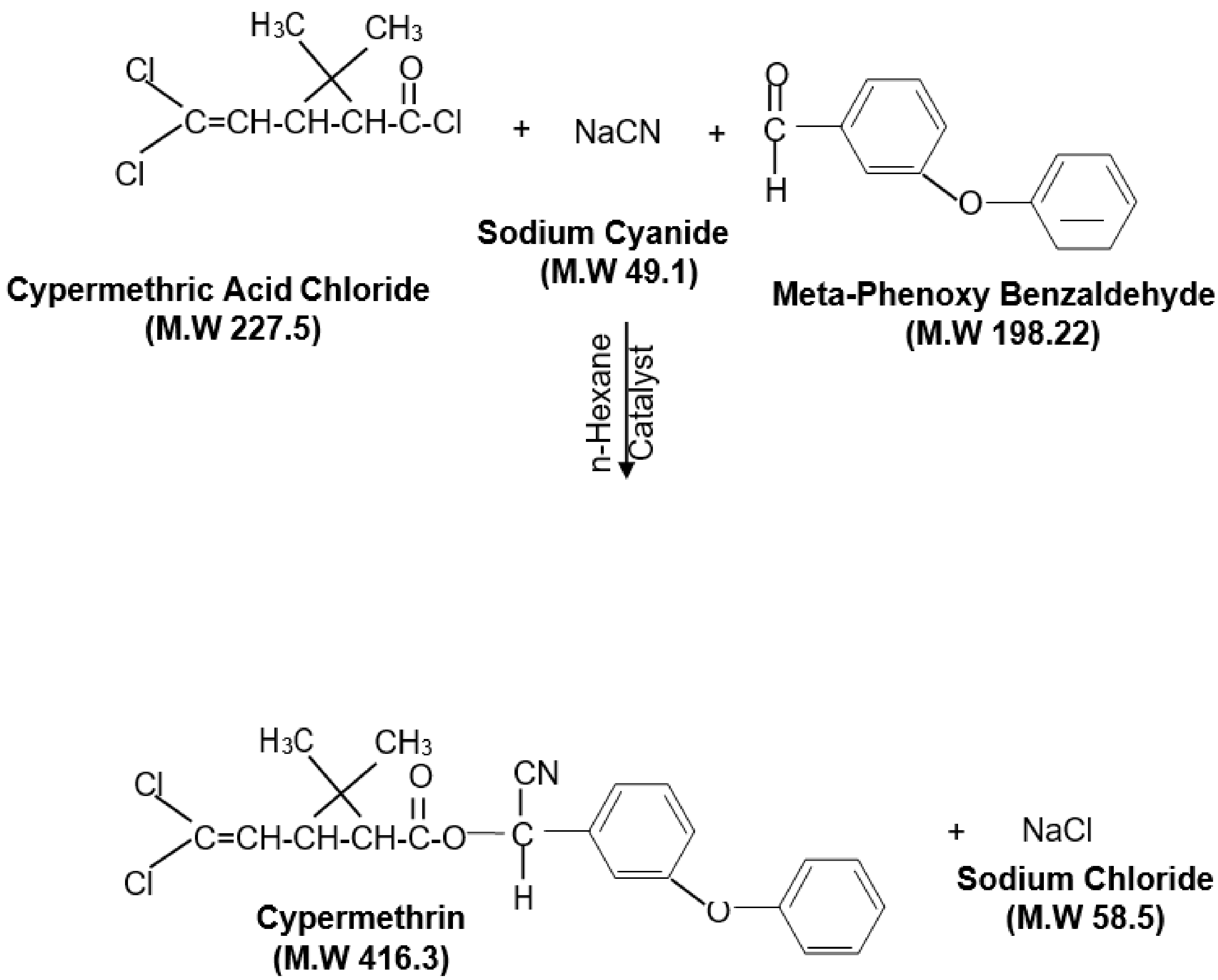
Brief Manufacturing Process:-

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

Aqueous layers which content traces of Sodium Cyanide is detoxified by the treatment

of Sodium Hypochlorite 8 - 10% Solution to < 0.2 ppm Level.

Chemical Reaction :-

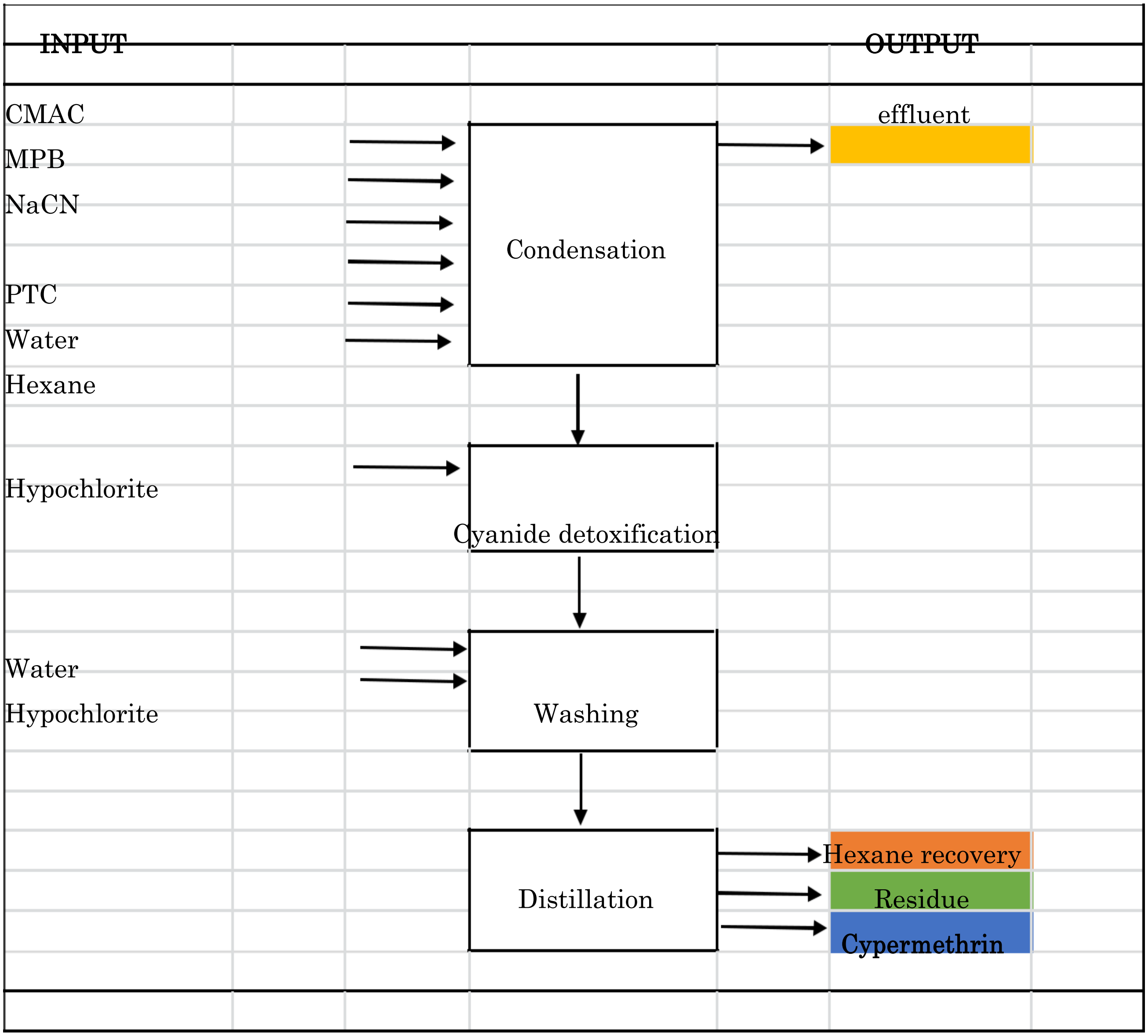


Material Balance:

	Material / Mass Balance of CYPERMETHRIN All Quantities are in kg)				
	IN PUT			OUTPUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Meta Phenoxy Benzaldehyde	500		Cypermethrin Tech	**1060**
2	Cypermethric Acid Chloride	585		Recovered Solvent n-Hexane	2900
3	Solvent n- Hexane	3000		Solvent Loss	100
4	Water for Reaction	500		Detoxified Aqueous Layer toETP	2520
5	Sodium Cyanide	135			

6	Catalyst	10			
7	4 % Soda Ash Solution	500			
8	2% Acetic Acid solution	500			
9	10 % Sodium Hypochlorite Soln	850			
	TOTAL	**6580**		**TOTAL**	**6580**

Flow Diagram of CYPERMETHRIN Technical:-



65. Deltamethrin:-

Brief Manufacturing Process:-

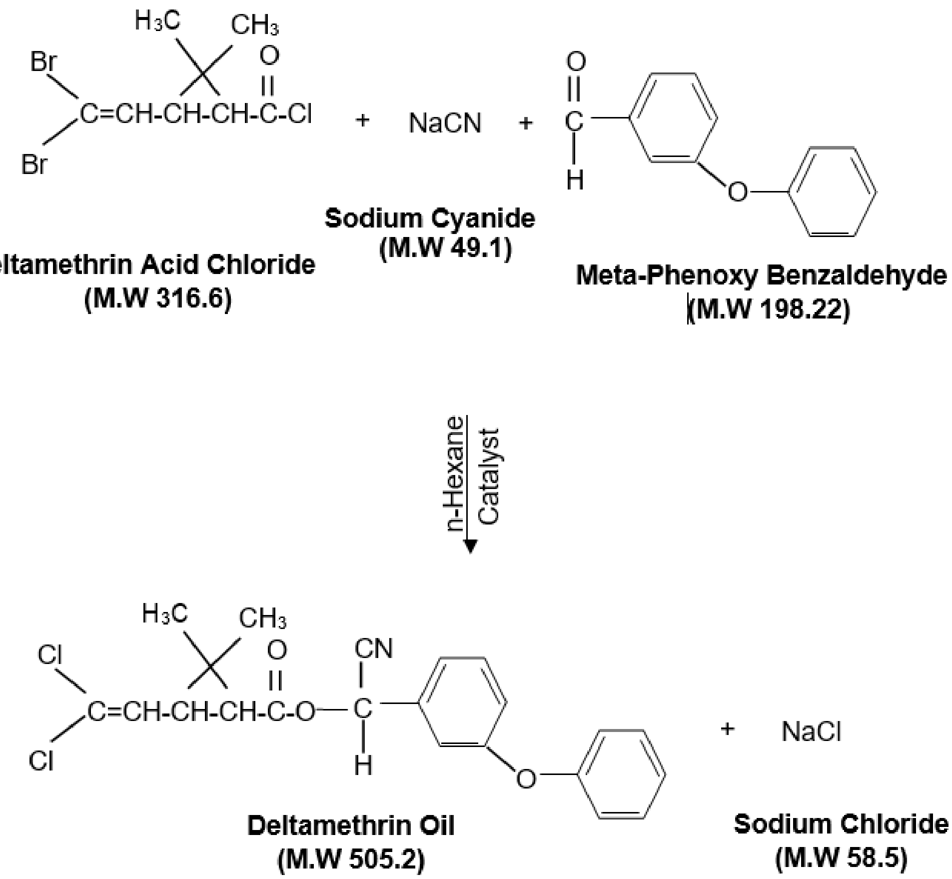
Meta Phenoxy Benzaldehyde is reacted with Sodium Cyanide to form Meta Phenoxy Benzaldehyde Cyanohydrin as intermediate. This on reaction with Di Bromo vinyl Dimethyl Cyclopropane Carboxylic Acid Chloride – Deltamethric acid chloride (DMAC) of high cis > 96% form the product Deltamethrin oil as Racemic mixture. In this process n-Hexane is used as solvent along with phase transfer catalyst.

The solvent n-Hexane is then stripped off to get Deltamethrin oil in Racemic form which is then epimerized by catalyst in presence of IPA-solvent to form the final product Deltamethrin of >95% Purity

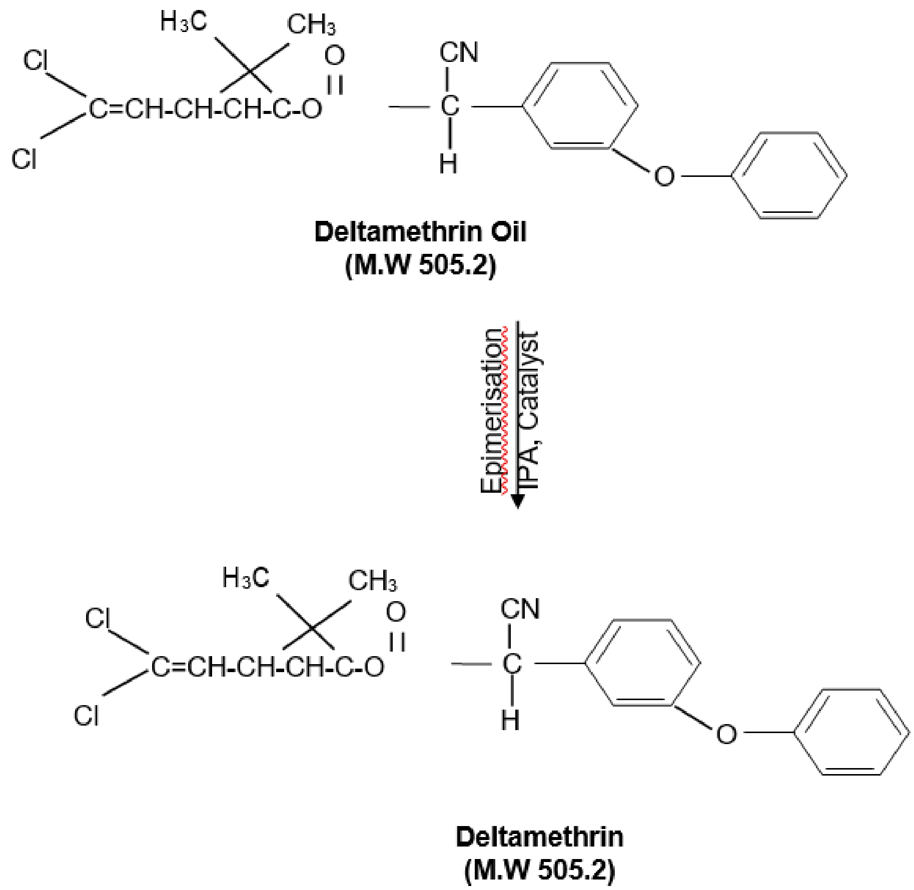
Aqueous layers of reaction stage as well as washings which contains traces of sodium cyanide is treated by sodium hypochlorite 8% solution to kill cyanide up to 0.2 ppm level, which is then mixed up with main effluent treatment plant (ETP) streams and after further treatment in effluent treatment plant drained to gutter.

Chemical Reactions:-

Step 1 :-



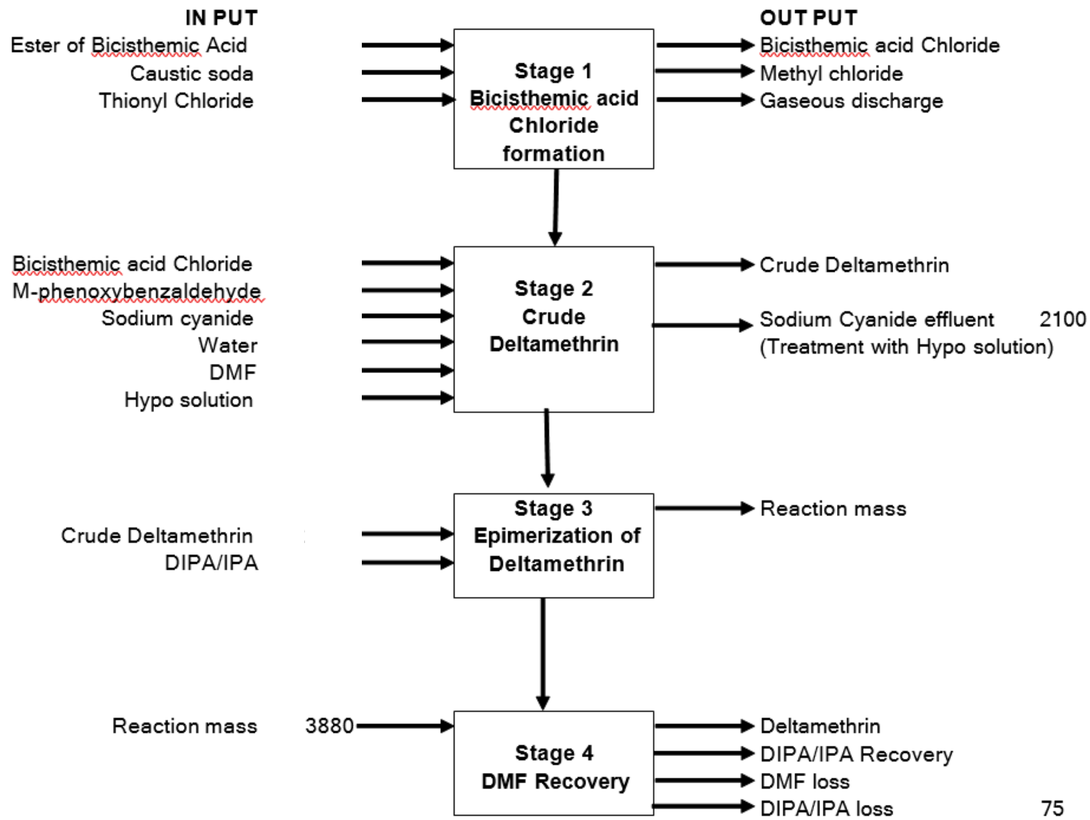
Step 2 :-



	Material / Mass Balance of DELTAMETHRIN All Quantities are in kg)				
	INPUT			OUT PUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Meta Phenoxy Benzaldehyde	545		Deltamethrin	**1010**
2	DMAC - Deltamethric Acid Chloride	890		Recovered Solvent-n. Hexane	4295
3	Water for Reaction	745		Solvent Loss n - Hexane	205
4	Sodium Cyanide	150		Detoxified Aqueous to ETP	3717

5	Solvent –n- Hexane	4500		Recovered IPA + Catalyst	2465
6	Catalyst	12		Loss IPA + Catalyst	125
7	5 % Soda Ash Solution	500			
8	5 % Acetic Acid Solution	500			
9	Water for washing	500			
10	8-10 % Sodium Hypochlorite Soln	800			
11	IPA -Iso Propyl Alcohol	1450			
12	Catalyst for Epimerization	85			
13	IPA for crystallization & Washing	1140			
	TOTAL	**11817**		**TOTAL**	**11817**

Flow Diagram of DELTAMETHRIN:-



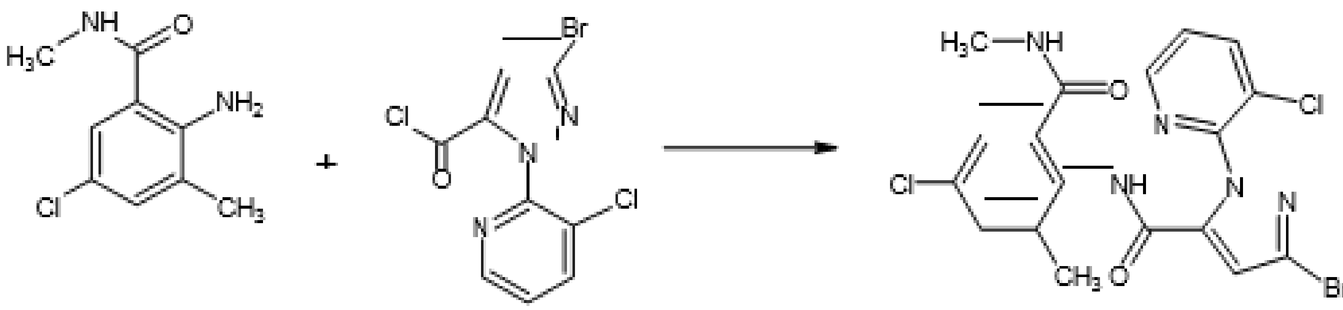
66. **Chlorantraniliprole:**

Brief Manufacturing Process:-

The desired quantities of 2-Amino-5-Chloro-N,3-Dimethylbenzamide, Toluene, 3-Bromo-1-(3- Chloropyridin-2-yl)-1H-Pyrazole-5-Carbonyl Chloride and Triethyl Amine are charged in to the reactor and stirred at desired temperature until reaction is over.

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

Chemical Reactions :-



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

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

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

MF= $C_9H_4BrCl_2N_3O$
FW= 320.95756

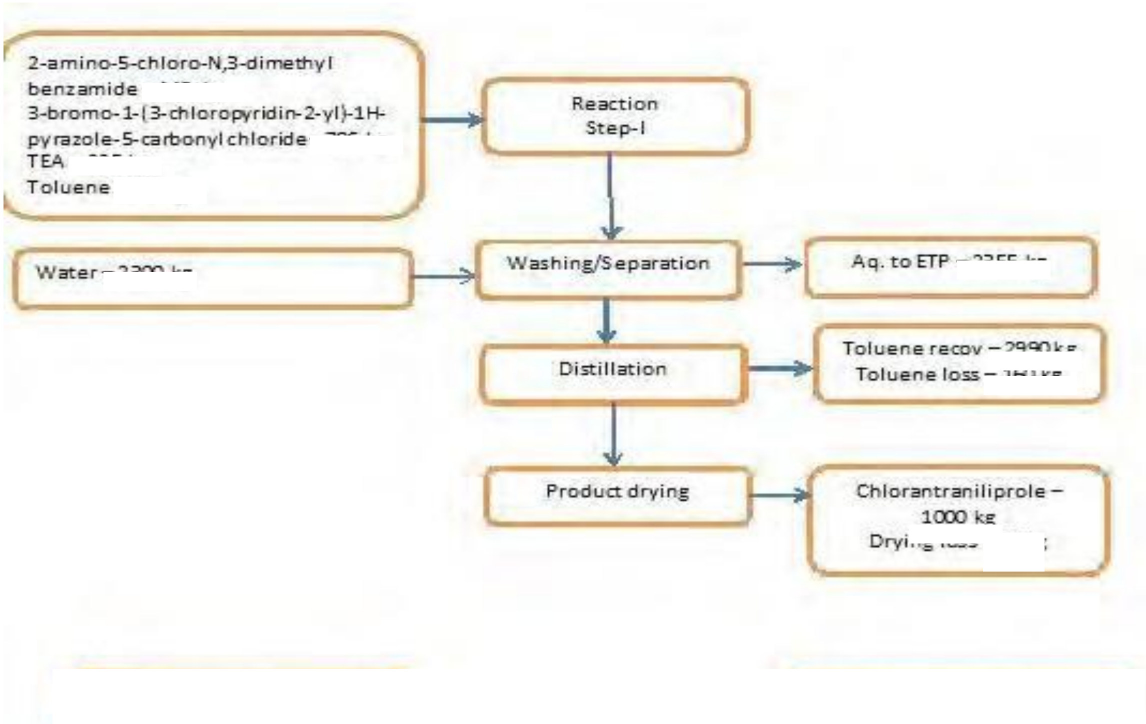
Chlorantraniliprole

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

29	Material / Mass Balance of CHLORANTRANILIPROLE All Quantities are in kg)				
	INPUT			OUTPUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2-Amino-5-Chloro-N,3-Dimethylbenzamide	440		Chlorantraniliprole	**1000**
2	3-Bromo-1-(3-Chloropyridin-2-yl)- 1H-Pyrazole-5-Carbonyl Chloride	706		Toluene	2992

3	Triethyl Amine	225		Residue	146
4	Toluene	3150		Aq. Layer	2525
5	Water	2300		Drying Loss	158
	TOTAL	**6821**		**TOTAL**	**6821**

Flow Diagram of CHLORANTRANILIPROLE:-



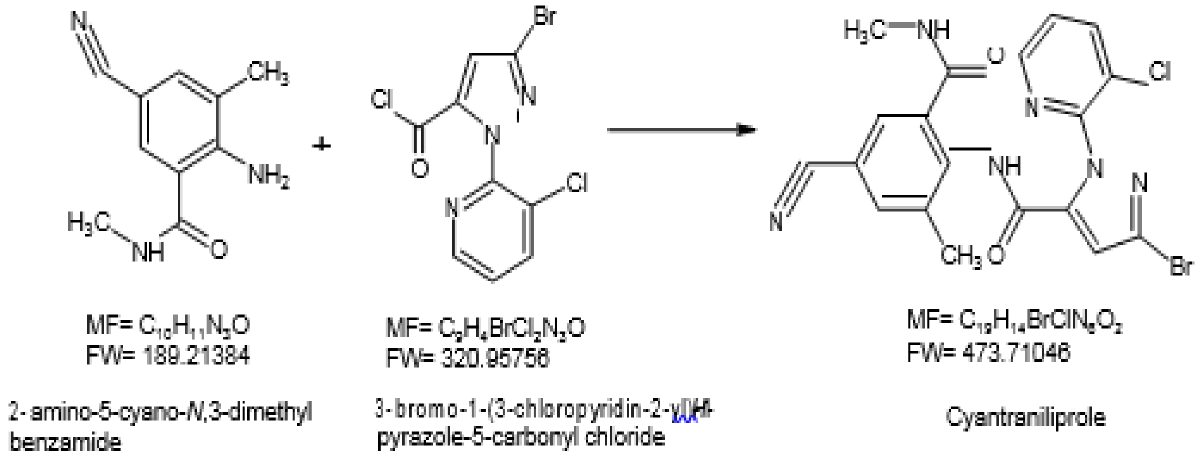
67. Tetraniliprole :-

Brief Manufacturing Process :-

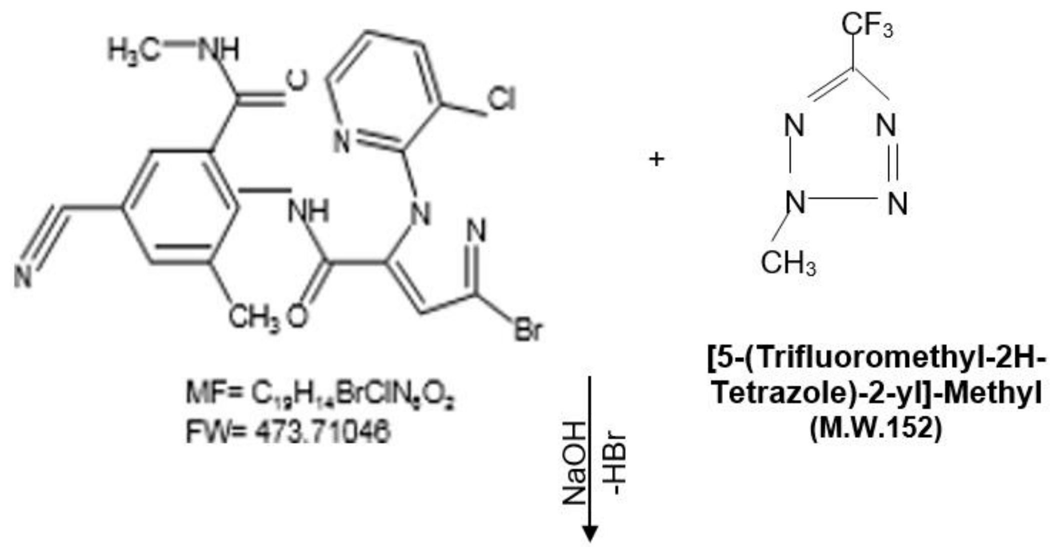
Step 1 : - 2-Amino-5-Cyano-N,3-Dimethyl Benzamide is reacted with 3-bromo-1-(3-chloropyridin-2- yl)-1H-pyrazole-5-carbonyl chloride in presence of Xylene as well as Triethyl Amine.This reaction gives out Cyantraniliprole. After completion of reaction Xylene is recovered from the reaction mass.
Step 2 : - Bromine group of Cyantraniliprole is replaced by Condensation process by [5-(Trifluoromethyl)-2H-Tetrazol-2-yl]methyl group in presence of Sodium Hydroxide. This reaction gives out Tetraniliprole as a final product.

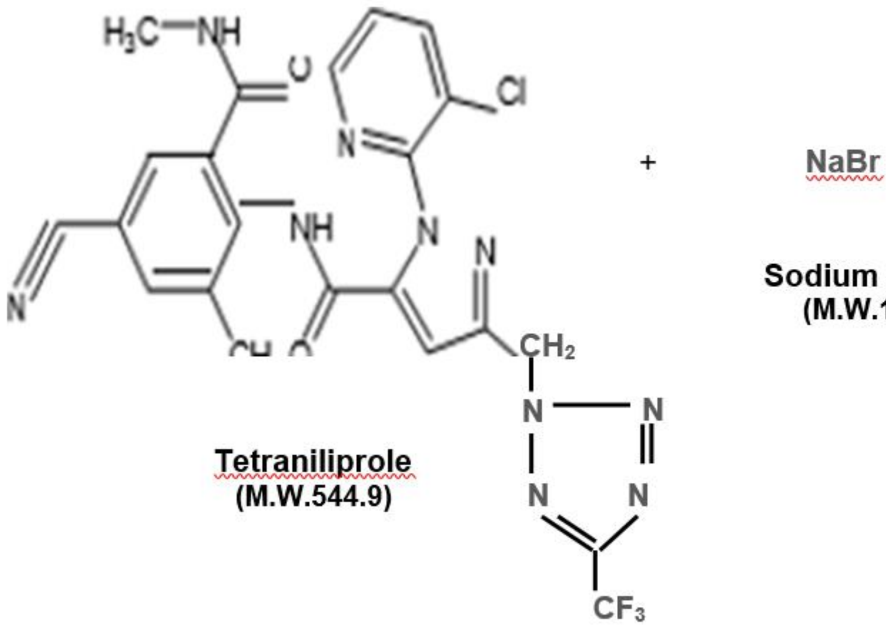
Chemical Reactions:-

Step 1:-


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

Step 2-


MF= $C_{19}H_{14}BrClN_6O_2$
FW= 473.71046
NaOH
-HBr
[5-(Trifluoromethyl-2H-Tetrazole)-2-yl]-Methyl
(M.W.152)



Tetraniliprole
(M.W.544.9)

Sodium Bromide
(M.W.102.89)

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

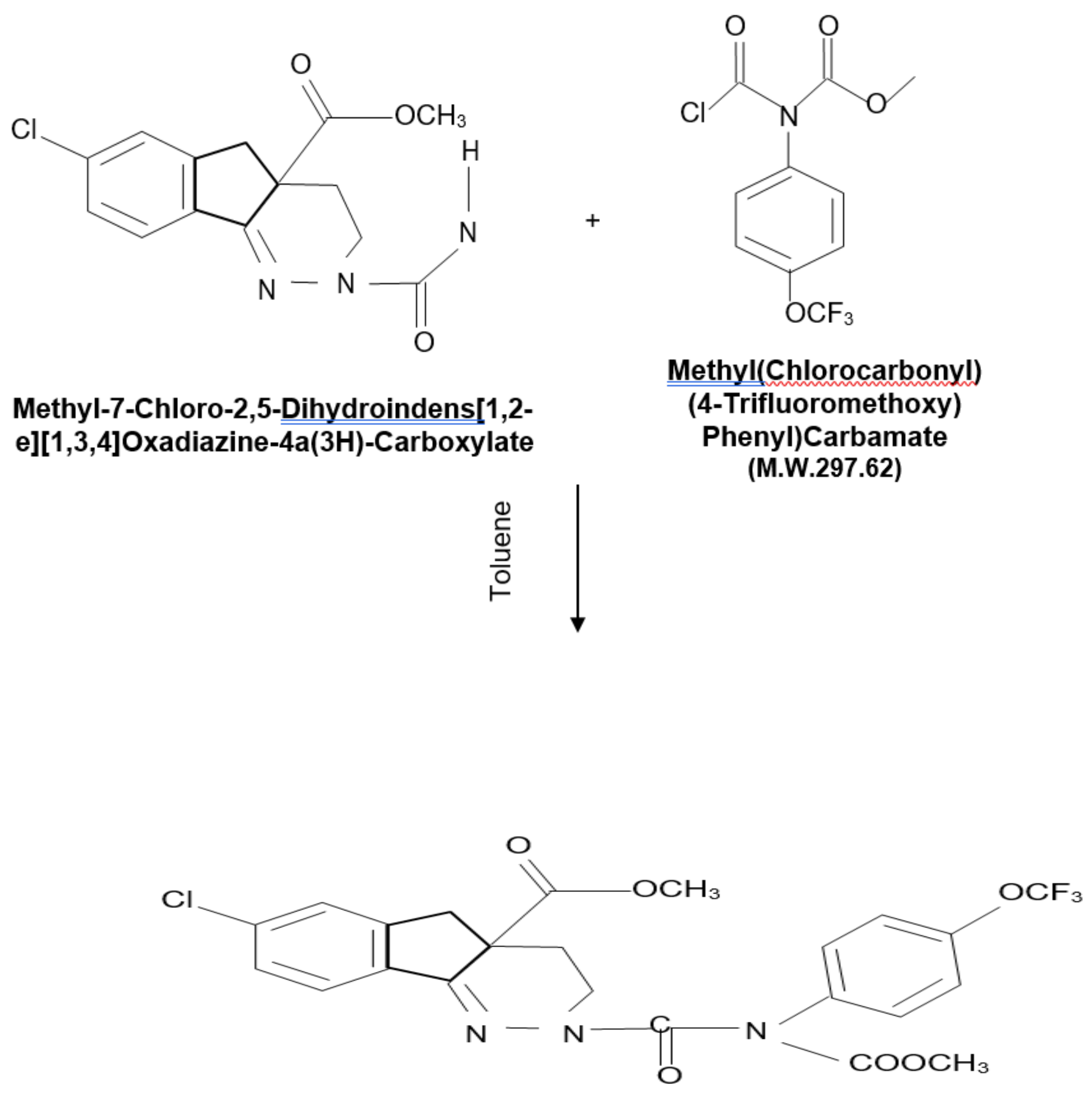
	TOTAL	10300		TOTAL	10300

68. **Indoxacarb :-**

Brief Manufacturing Process:-

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

Chemical Reactions:-



Methyl-7-Chloro-2,5-Dihydroindens[1,2-e][1,3,4]Oxadiazine-4a(3H)-Carboxylate

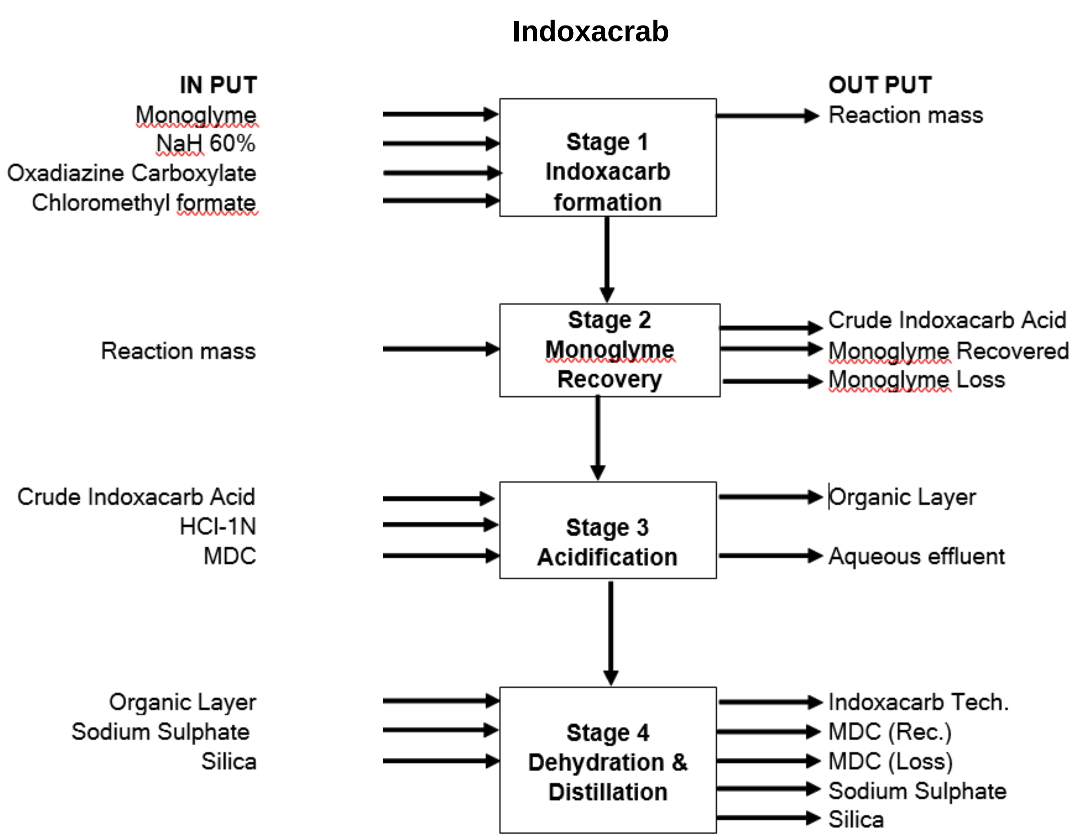
Methyl(Chlorocarbonyl) (4-Trifluoromethoxy) Phenyl)Carbamate (M.W.297.62)

Indoxacarb (M.W.527.84)

	Material / Mass Balance of INDOXACARB All Quantities are in kg)

Sr.No.	INPUT			OUTPUT	
	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Methyl-7-Chloro-2,5-Dihydroindeno [1,2-e]Oxadiazine-4a(3H-Carboxylate)	600		Indoxacarb	**1000**
2	Methyl(Chlorocarbonyl)[4- Trifluoromethoxy Phenyl]Carbamate	300		Recovered Catalyst	192
3	Catalyst	200		Aqueous Layer	1188
4	Toluene	550		Recovered Toluene	500
5	Caustic Lye	80		Toluene Loss	50
6	Water	1200			
	TOTAL	**2930**		**TOTAL**	**2930**

Flow Diagram of Indoxacrab :-



69. Flonicamid:

Brief Manufacturing Process:-

Step 1 :-

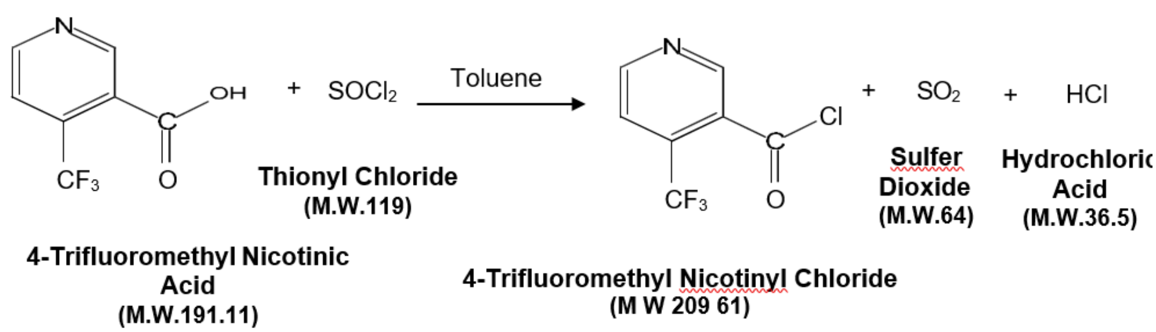
To a solution of 4- Triflouromethyl nicotinic acid in toluene, catalytic amount of dimethyl Formamide (DMF) is added and molar equivalent of Thionyl Chloride is added over a period of time and the mixture is heated at 60^{o} C until completion of reaction. Hydrogen chloride gas and sulphur dioxide formed is scrubbed in a caustic scrubber. At the end of reaction toluene is completely distilled off and the residue is taken to next reaction without further purifications.

Step 2 :-

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

Chemical Reactions:-

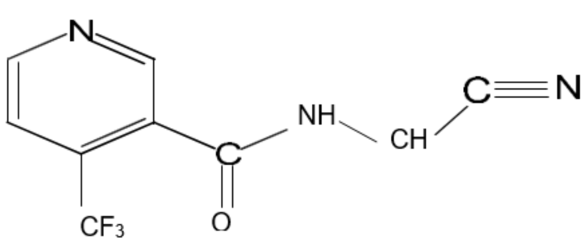
Step 1 :-



Step 2 :-

4-Trifluoromethyl Nicotinyl Chloride
(M.W.209.61)

Aminoacetonitrile
(M.W.210.21)



+ H_2SO_4 + NH_4Cl

Flonicamid
(M.W.265.33)

Sulphuric Acid
(M.W.98)

Ammonium Chloride
(M.W.53.49)

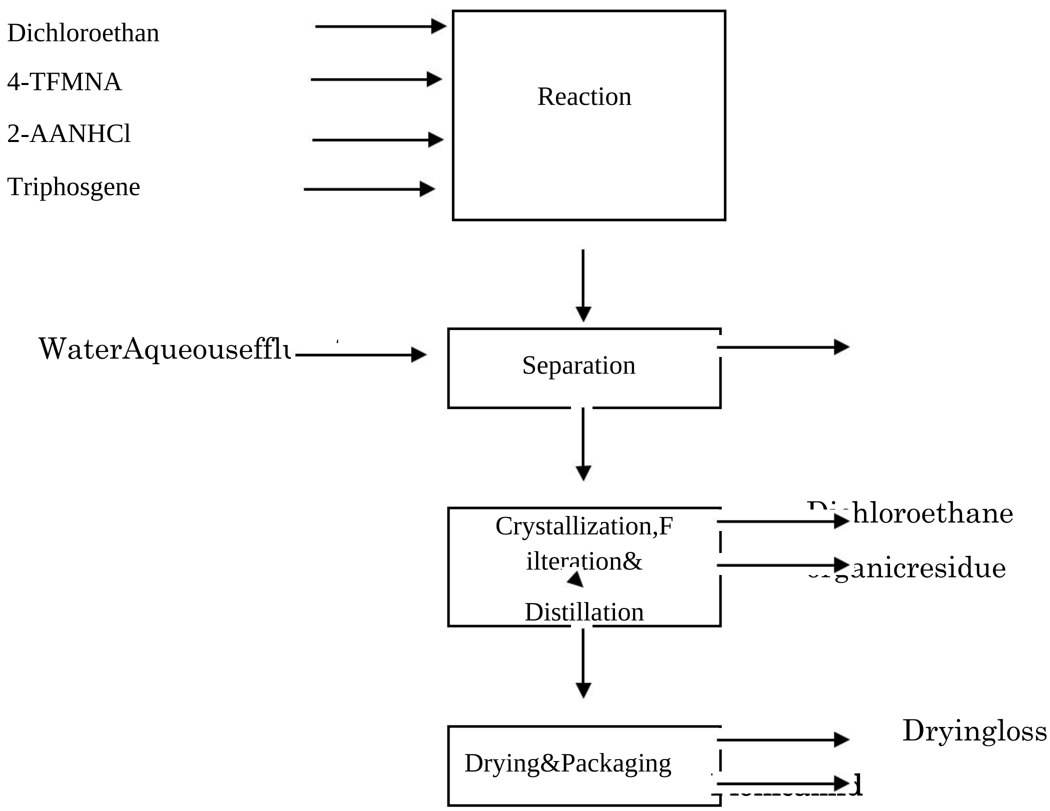
	Material / Mass Balance of FLONICAMID All Quantities are in kg)				
	INPUT			OUTPUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	4-Trifluoromethyl Nicotinic Acid	895		Flonicamid	**1000**
2	Thionyl Chloride	443		Hydrogen Chloride	136
3	Amino Acetonitrile Sulfate	984		Sulphur Dioxide	238
4	Caustic	298		Ammonium Chloride	203
5	Dimethyl Formamide (DMF)	615		Water	134
6	Toluene	4600		Sodium Sulphate	529
7	Ethylene Dichloride (EDC)	9900		DMF Recovered	597
8	Methanol	2000		DMF Loss	1
9	Water	3182		DMF to Wastewater	7
10	Triethyl Amine	200		DMF in Residue	9
11				EDC Recovered	9702
12				EDC Loss	20
13				EDC in Residue	177
14				Methanol Recovered	1900
15				Methanol Loss	12
16				Methanol to Wastewater	20
17				Methanol in Residue	68
18				Toluene Recovered	4462
19				Toluene Loss	14
20				Toluene in Residue	123
21				4-Trifluoromethyl Nicotinic Acid	182

22				Amino Acetonitrile Sulphate	201
23				Triethyl Amine	200
24				Waste Water	3182
	TOTAL	**23117**		**TOTAL**	**23117**

Flow Diagram of Flonicamid :-

Flonicamid

Input **Output**



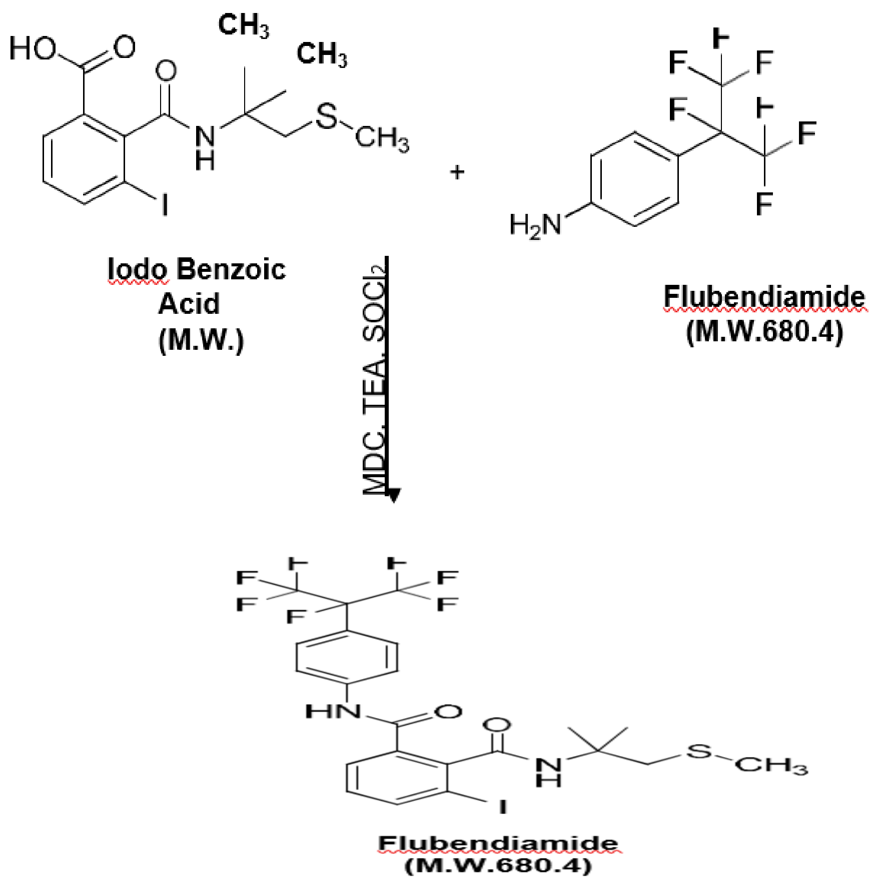
70. **Flubendiamide:**

Brief Manufacturing Process:-

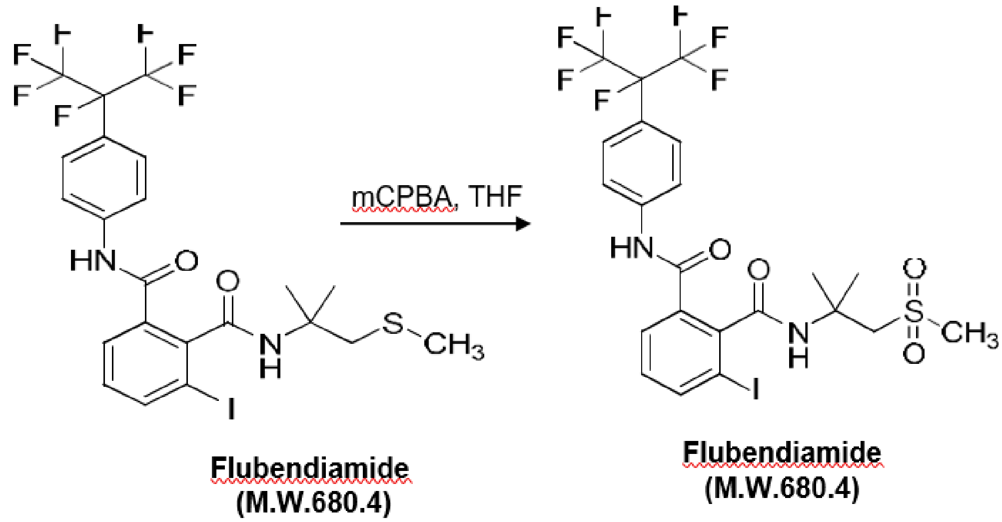
Iodo Benzoic Acid and TEA was dissolved in MDC. Into this Thionyl Chloride was added and stirred the mixture for few hours. After completion of reaction MDC and Thionyl Chloride was distilled completely. Crude mixture was again dissolved in MDC and Flubendiamide was added and stirred for 4h. After completion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

Chemical Reactions:-

Step 1 :-

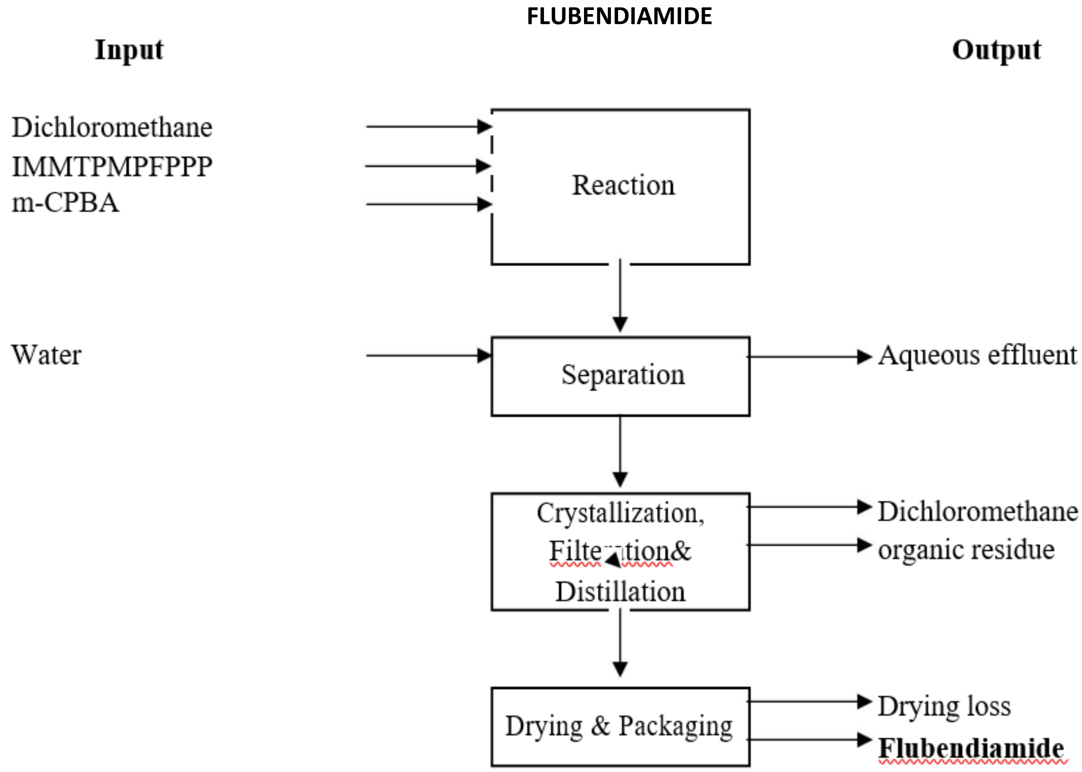


Step 2 :-



	Material / Mass Balance of FLUBENDIAMIDE All Quantities are in kg)				
	INPUT			OUTPUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Iodo benzoic Acid	618		Flubendiamide	**1000**
2	Amine	410		Recovered THF	3175
3	Thionyl chloride	187		Loss THF	165
4	TEA	159		Recovered MDC	2350
5	MDC	2472		Loss MDC	122
6	mCPBA	568		Waste Water	2800
7	THF	3340		Drying Loss	142
8	10% $NaHCO_3$	2000			
	TOTAL	**9754**		**TOTAL**	**9754**

Flow Diagram of FLUBENDIAMIDE :-



71. **2-Chloro-5-Chloromethyl Pyridine**

(CCMP) Brief Manufacturing Process:-

Part – 1 (2-Chloro 5-Methyl Pyridine (CMP)) :-

Step 1 : - Benzyl Amine undergoes condensation reaction with Propanaldehyde to give an intermediate as Imino Derivative.

Step 2 : - Imino intermediate on reaction with Acetic Anhydride gives an intermediate as Acetaldehyde.

Step 3 : - Acetaldehyde on Cyclization reaction presence of Phosphorus Oxy Chloride and Solvent gives the Products CMP along with Bi product as Benzyl Chloride.

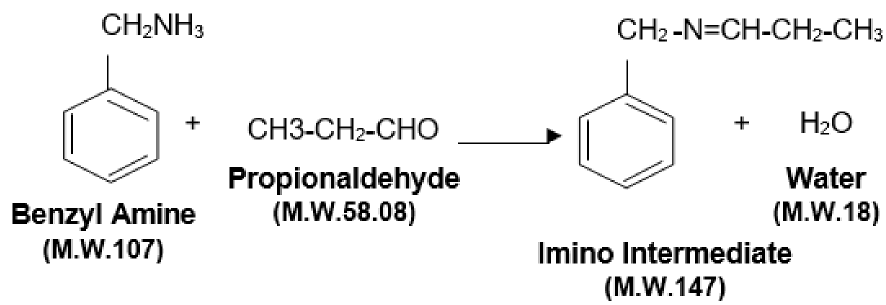
Part-II (2-Chloro 5-Chloro ethyl Pyridine (CCMP)) :-

Step 4 : - Chloro Methyl Pyridine (CMP) undergoes selective Chlorination by Chlorine gas in presence of Catalyst to give 2-Chloro 5-Chloromethyl Pyridine (CCMP).

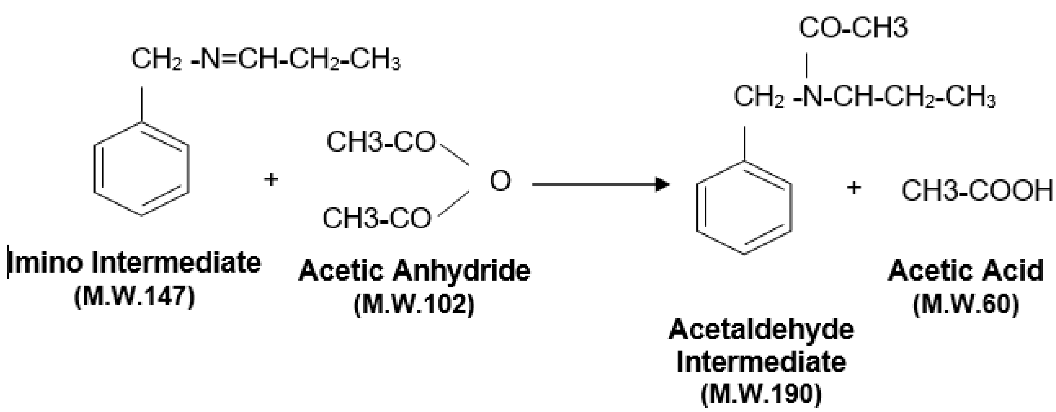
Chemical Reactions :-

Part :1

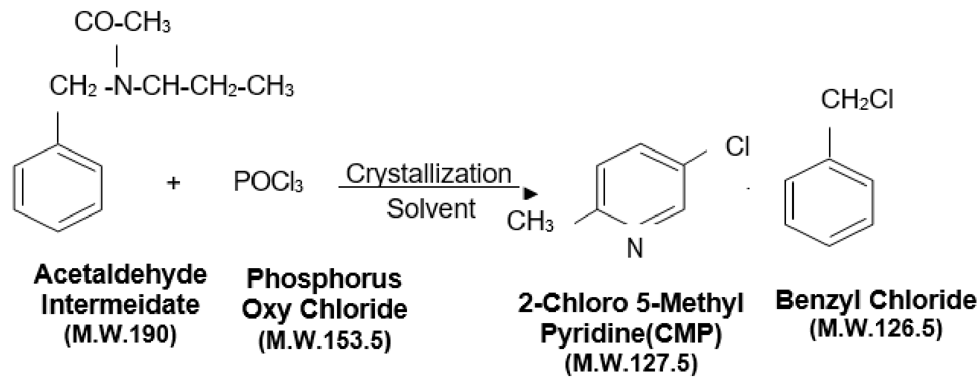
Step 1 :-


CH2NH3
+
CH3-CH2-CHO
CH2 -N=CH-CH2-CH3
+
H2O
Benzyl Amine
(M.W.107)
Propionaldehyde
(M.W.58.08)
Imino Intermediate
(M.W.147)
Water
(M.W.18)

Step 2 :-

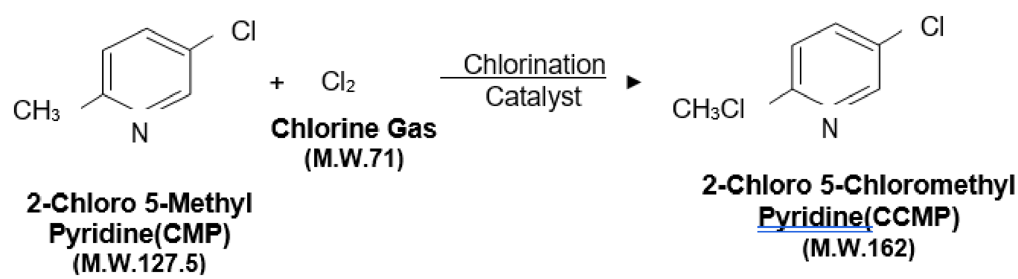

CH2 -N=CH-CH2-CH3
+
CH3-CO
O
CH3-CO
CO-CH3
CH2 -N-CH-CH2-CH3
+
CH3-COOH
Imino Intermediate
(M.W.147)
Acetic Anhydride
(M.W.102)
Acetaldehyde
Intermediate
(M.W.190)
Acetic Acid
(M.W.60)

Step 3



Part – 2

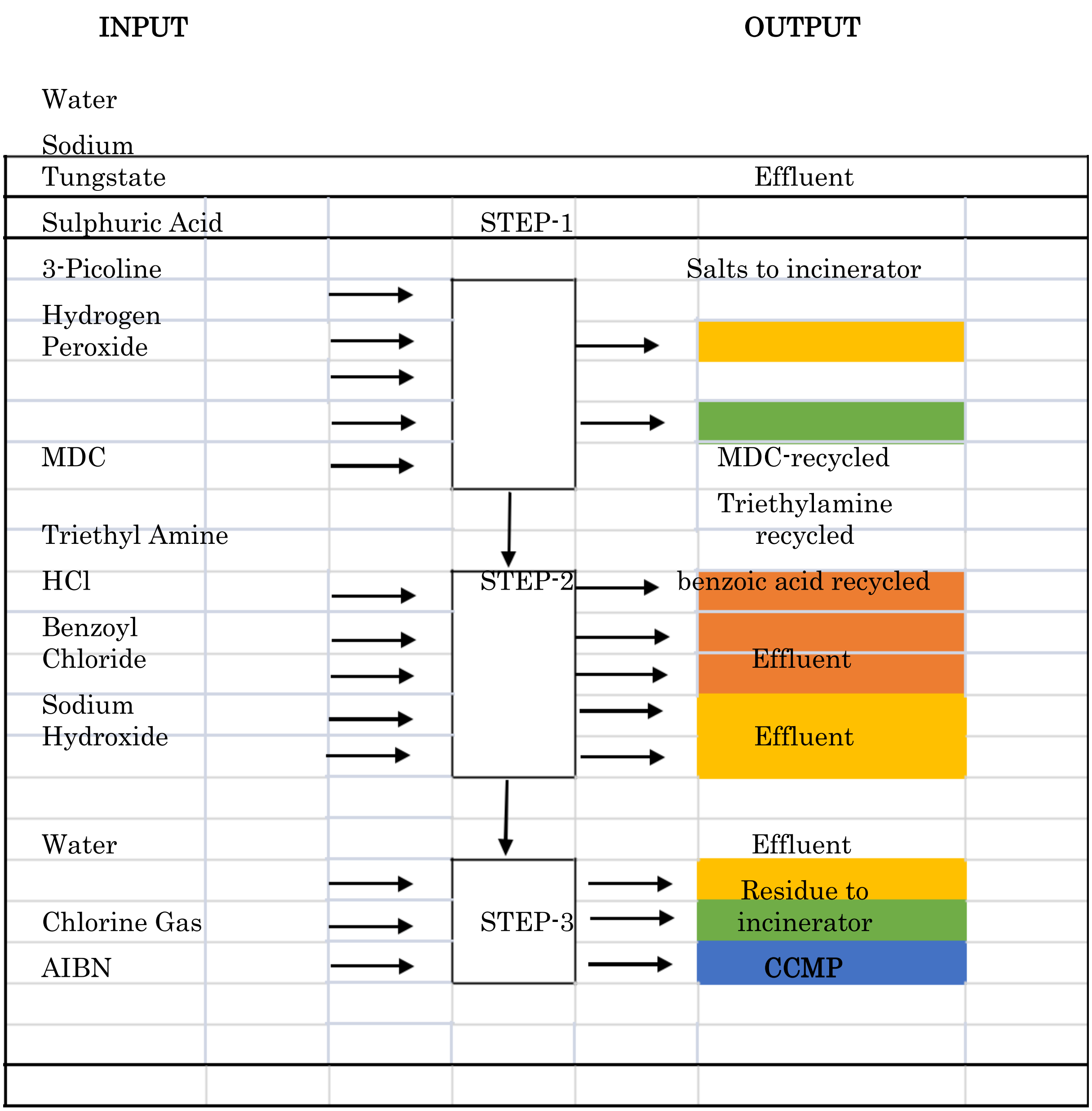
Step 4 :-



Material Mass Balance :-

	Material / Mass Balance of 2-CHLORO 5-CHLOROMETHYL PYRIDINE (CCMP) All Quantities are in kg)				
	INPUT			OUTPUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Benzyl Amine	912		CCMP	**1005**
2	Catalyst – 1	15		Recovered Solvent Toluene	1925
3	Propanaldehyde	494		Solvent Loss Toluene	75
4	Solvent - Toluene	2000		Benzyl Chloride	850
5	Acetic Anhydride	802		Recovered Solvent DMF	1450
6	Solvent – DMF	1500		Solvent Loss DMF	50
7	Tri ethyl Amine	950		Recovered TEA	902
8	Solvent – EDC	3000		TEA Loss	48
9	Solvent - Acetonitrile	2000		Recovered Solvent EDC	2870
10	Phosphorus Oxy Chloride	2125		Solvent Loss EDC	130
11	Chlorine Gas	330		Phosphoric Acid	2610
12	Catalyst – 2	10		Recovered Solvent Acetonitrile	1900
13	Caustic Lye 47%	1000		Solvent Loss Acetonitrile	100
14	Water	270		Aqueous Layer to ETP	1423
15				Distillation Residue	70
	TOTAL	**15408**		**TOTAL**	**15408**

Flow Diagram of2-CHLORO 5-CHLOROMETHYL PYRIDINE (CCMP) :-



72. 2 – Nitro IminoImidazolidine(NII)

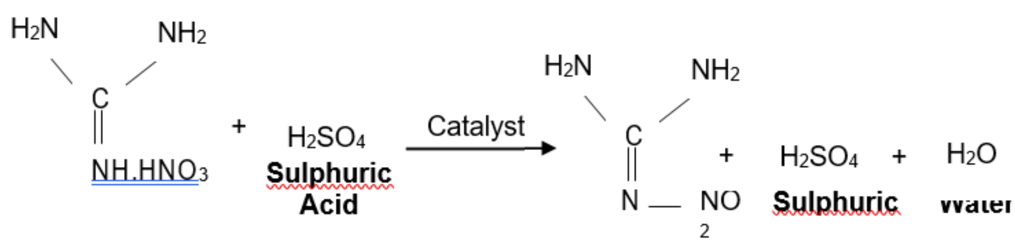
Brief Manufacturing Process:-

Step 1 :- Guanidine Nitrite is added slowly to concentrated Sulphuric Acid in presence of Catalyst and Water to yield Nitro Guanidine.

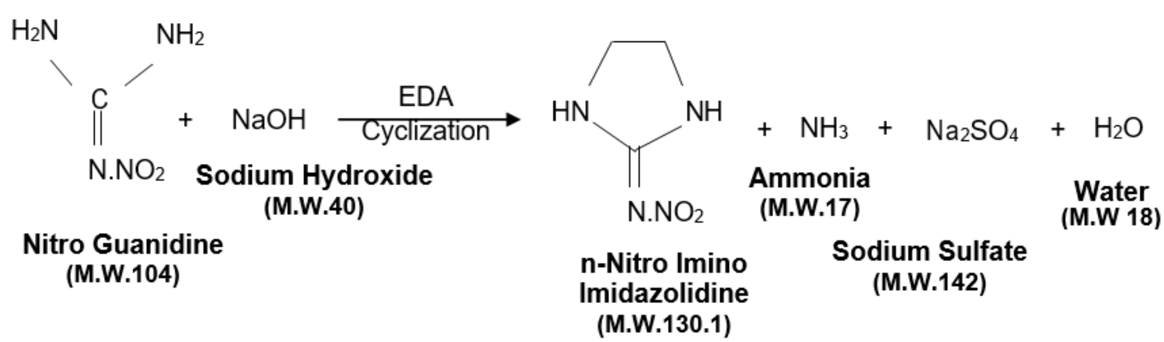
Step 2 : - Nitro Guanidine is further hydrolysed with Caustic in presence of Ethylene Diamine & finally undergoes cyclization reaction

Chemical Reactions :-

Step 1 :-



Step 2 :-



73. 2-Chloro 5-Chloromethyl Thiazole (CCMT)

Process:-

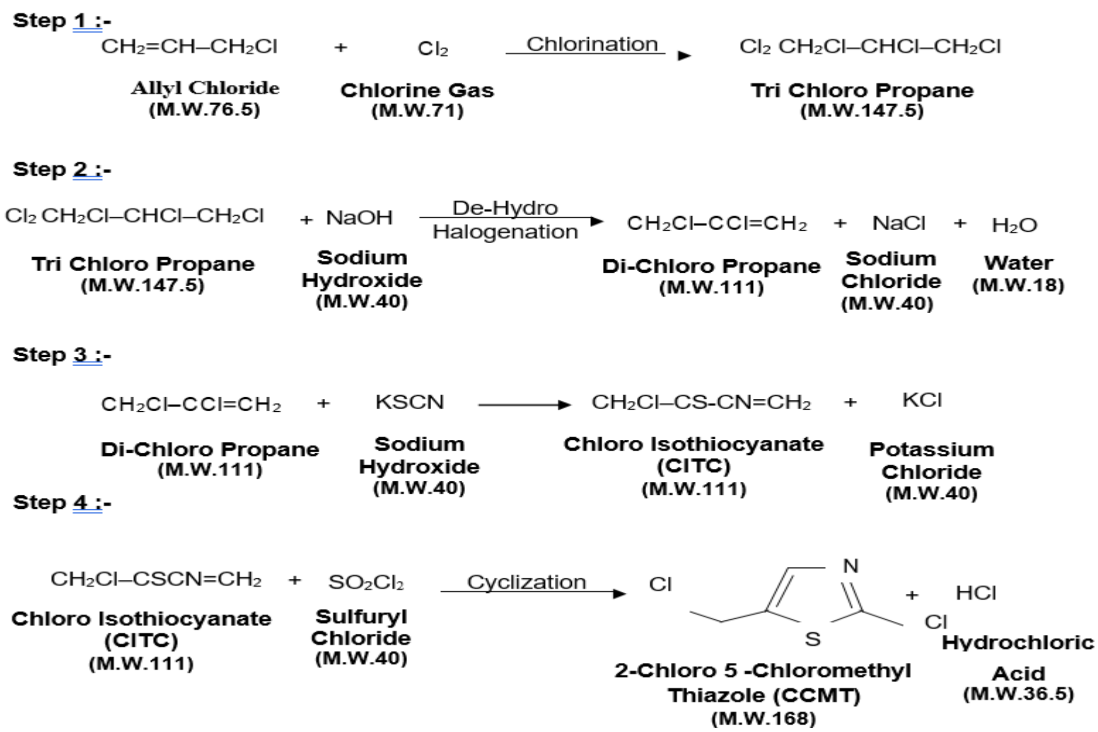
Step 1 :- Allyl Chloride undergoes chlorination reaction with Chlorine in presence of 30% Hydrochloric Acid Solution which is used as solvent media to give Tri Chloro Propane.

Step 2 :- Tri Chloro Propane further undergoes De-Hydro Halogenation reaction by the reaction with Caustic Soda Lye Solution gives Dichloro Propane.

Step 3 :- Dichloro Propane further reacts with Potassium Thiocyanate to give Chloro Isothiocyanate (CITC) intermediate.

Step : 4 :- CITC finally undergoes cyclization reaction by the action of Cyclization Agent as Sulfuryl Chloride to give the final product as 2-Chloro 5-Chloromethyl Thiazole (CCMT).

Chemical Reaction :-

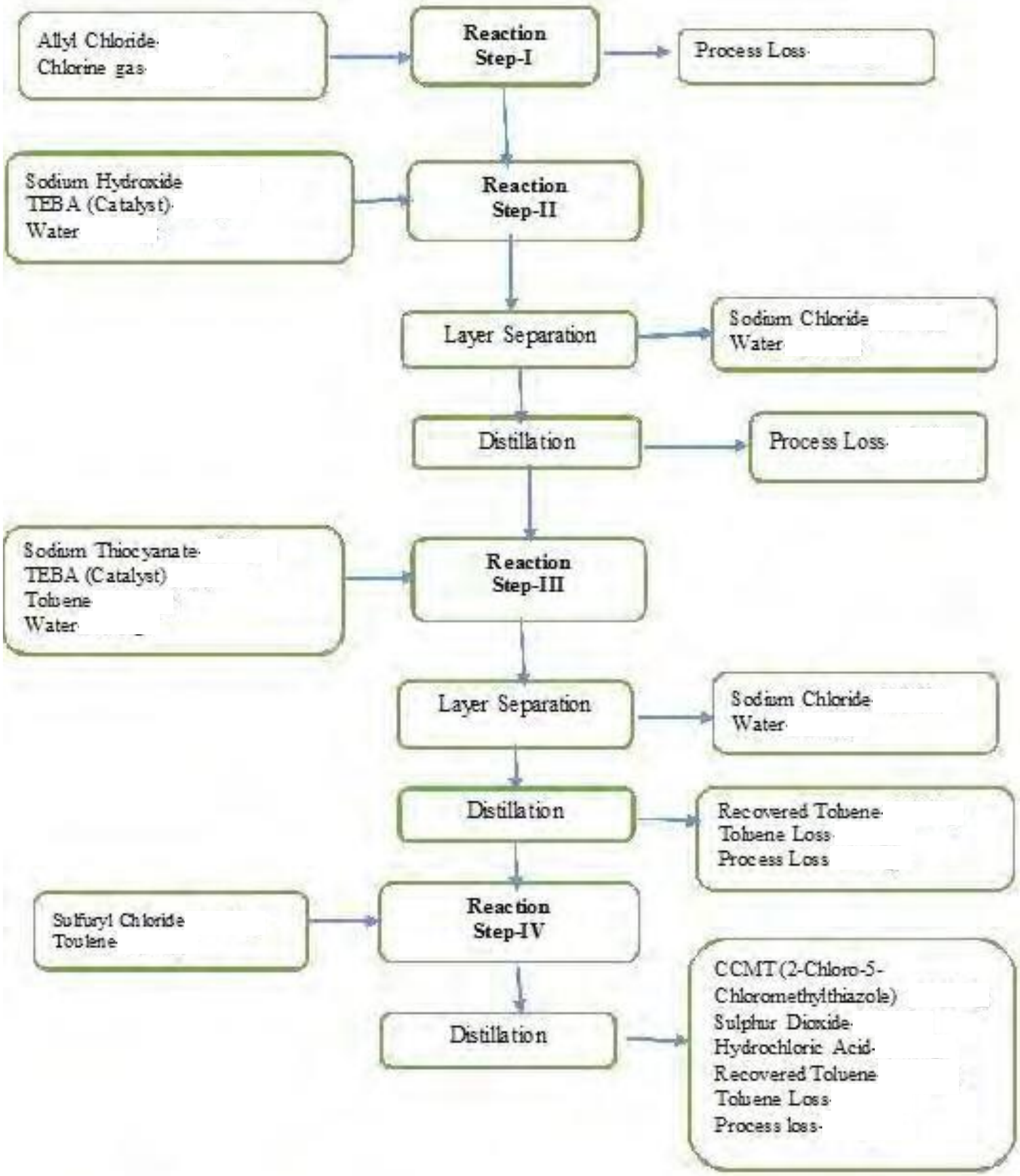


Material Mass Balance :-

	Material / Mass Balance of 2-CHLORO 5-CHLOROMETHYL THIAZOLE (CCMT) All Quantities are in kg)				
	INPUT			OUTPUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Allyl Chloride	1250		CCMT	1000
2	30% HCl Solution	1470		30% HCl Solution	2787
3	Catalyst -1 (FeCl3)	16		Recovered Solvent MDC	3800
4	Catalyst -2 (AIBN)	16		Solvent – MDC Loss	150
5	Chlorine Gas	1140		20 % Sodium SulphiteSoln	1465
6	Caustic Flakes	650		Aqueous Layer for ETP -1	2243
7	Potassium Thiocyanate Salt	1260		KCl Liquor for Recovery	4320

8	Sulfuryl Chloride	1370		Stripping Loss	85
9	Sodium Carbonate	1650		Organic Process for Recycle	3480
10	Solvent – MDC	3950		Process Waste	410
11	Caustic Soda Lye	1440			
12	Soda Ash Wash	1000			
13	Water for Reaction	848			
14	Water for 30 % HCl formation	1130			
15	Water for Dilution & Washings	2550			
	TOTAL	**19740**		**TOTAL**	**19740**

Flow Diagram of 2-CHLORO 5-CHLOROMETHYL THIAZOLE (CCMT) :-



74. 3 – Methyl 4 – Nitroimino 1,3,5 Oxidiazine **(MNIO) :-**

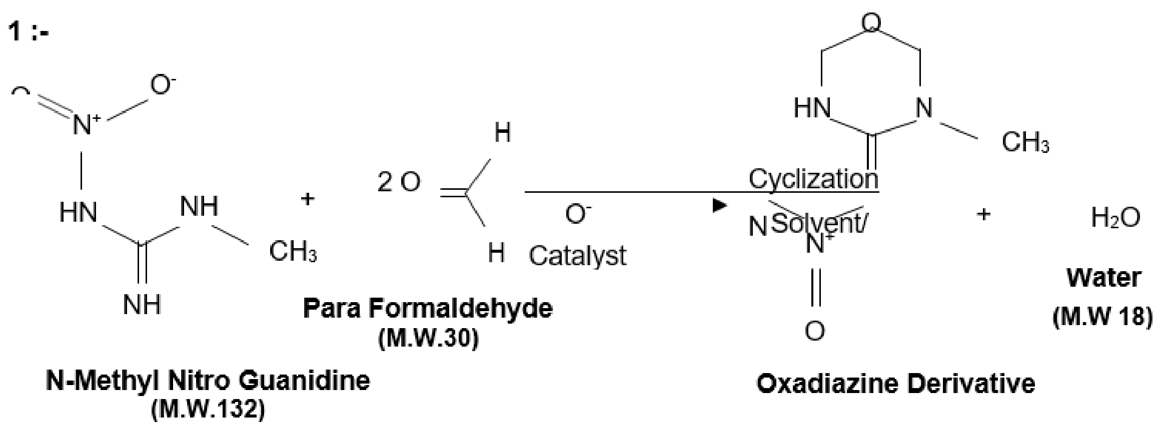
Brief Manufacturing Process:-

N-Methyl N-Nitro Guanidine (NMG) undergoes Cyclization by the reaction of Para Formaldehyde (PFA) in presence of Solvent and Catalyst to form Oxidiazine derivatives as an intermediate.

Further organic mass containing Formic Acid is taken for distillation to recover formic Acid. After it is diluted with water, neutralized with caustic Soda Lye, cool it to form crystal & filtered it to get Oxidiazine Compound.

Chemical Reaction :

Step 1 :-

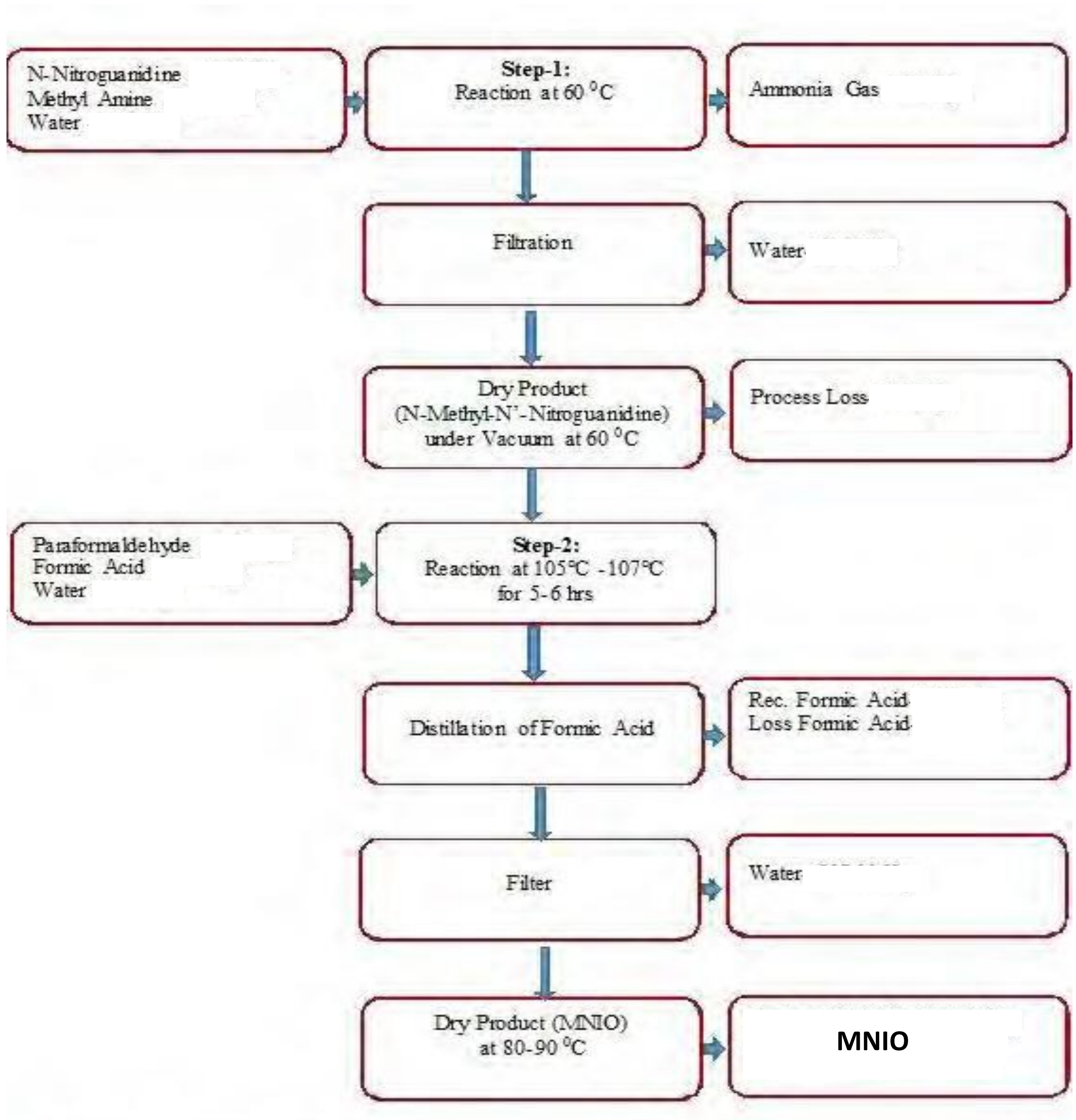


Material Mass Balance :-

	Material / Mass Balance of 3-METHYL 4-NITROIMIONO 1,3,5 OXIDIAZINE (MNIO) All Quantities are in kg)				
	INPUT			OUTPUT	
Sr. No.	**Raw Materials / Items**	**Kg/Batch**		**Product / By product**	**Kg/Batch**
1	Formic Acid	2880		MNIO	1000
2	N -Methyl Nitro Guanidine (NMG)	778		Recovered Formic Acid (HCOOH)	2795
3	Solvent-DMF	3000		Formic Acid (HCOOH) Loss	155
4	Methane Sulphonic Acid	44		Recovered Solvent - DMF	2910
5	Caustic Soda Lye 48 %	390		DMF Loss	90

6	Catalyst	12		Mother Liquor	654
7	Water for Crystallization	1000		Aqueous Layer for ETP	500
	TOTAL	**8104**		**TOTAL**	**8104**

Flow Diagram of 3-METHYL 4-NITROIMIONO 1,3,5 OXIDIAZINE (MNIO) :-

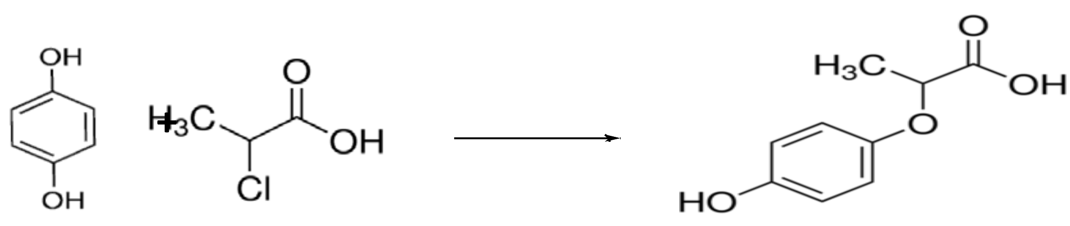


75. (4- Hydroxy Phenoxy) Propionic Acid (4HPPA):

Brief Manufacturing Process :-

Step 1 :- Para Hydro Quinone when reacted with 2-Chloro Propionic Acid it gives one intermediate product as 2(4-Hydoxy Phenoxy) Propionic Acid.

Chemical Reactions :-



Para Hydro Quinone 2-Chloro Propionic Acid 2(4-Hydroxy Phenoxy) Propionic Acid (M.W.182)

	Material / Mass Balance of 2-(HYDROXYPHENOXY) PROPIONIC ACID (4HPPA) All Quantities are in kg)				
	INPUT			OUTPUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Hydroquinone	930		**4HPPA**	**1000**
2	Caustic Soda Lye	2370		Recovered Solvent-MIBK.	2400
3	Solvent – MIBK	2500		Solvent Loss	100
4	R – Chloro Propionic Acid	862		Salt Solution for ETP	5594
5	30% HCl Solution	1438		Mother Liquor for Recycle	444
6	Water for Reaction	312			
7	Water for Washing	1126			
	TOTAL	**9538**		**TOTAL**	**9538**

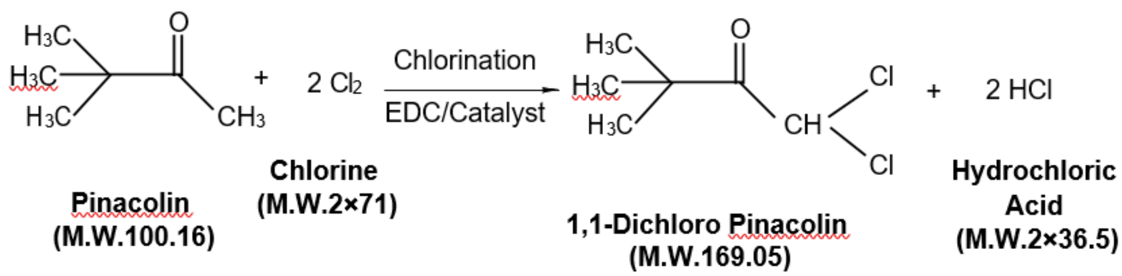
76. 1,1-Dichloro Pinacholane:

Brief Manufacturing Process:-

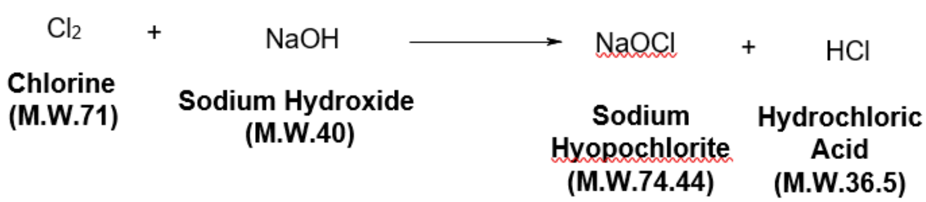
Pinacolin undergoes Chlorination reaction by Chlorine in presence of Solvent Ethylene Dichloride. This reaction gives out 1,1-DichloroPinacolin.

Chemical Reactions:-

Step 1 :-



Step 2 :-



	Material / Mass Balance of 1,1-DICHLORO PINACOLIN All Quantities are in kg)				
	INPUT			OUTPUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Pincolin	620		1,1-Dichloro Pinacolin	**1000**
2	Solvent EDC	2000		Recovered Solvent	1960
3	Chlorine	880		Loss Solvent	40
4	Catalyst	10		10% NaOCl Solution	156
5	15% NaOH Solution	100		30% HCl Solution	1510
6	Water for 30% HCl Solution	1056			
	TOTAL	**4666**		**TOTAL**	**4666**

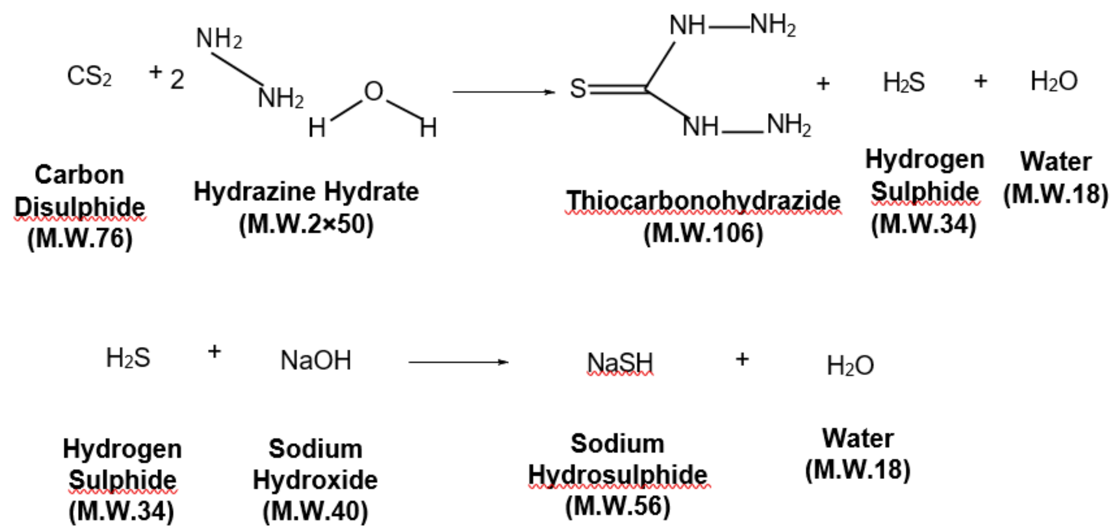
77. Thicarbono Hydrazide:

Brief Manufacturing Process :-

Carbon Disulphide reacted with Hydrazine Hydrate in presence of Catalyst and Caustic Lye. During this reaction Hydrogen Sulphide is liberated which is reacted with Caustic Lye to produce NaSH Solution as a By-Product. This reaction gives out Thiocarbonohydrazide as a final product.

Chemical Reactions:-

Step 1 :-



	Material / Mass Balance of THIOCARBO HYDRAZINE All Quantities are in kg)				
	INPUT			OUTPUT	
Sr.No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Carbon Disulfide	752		Thiocarbo Hydrazine	**1000**
2	Solvent Ethyl Acetate	2000		Recovered Ethyl Acetate	2140
3	Hydrazine Mono Hydrate	990		Loss Ethyl Acetate	60
4	Catalyst	10		Aqueous layer to ETP	552
	TOTAL	**3752**		**TOTAL**	**3752**

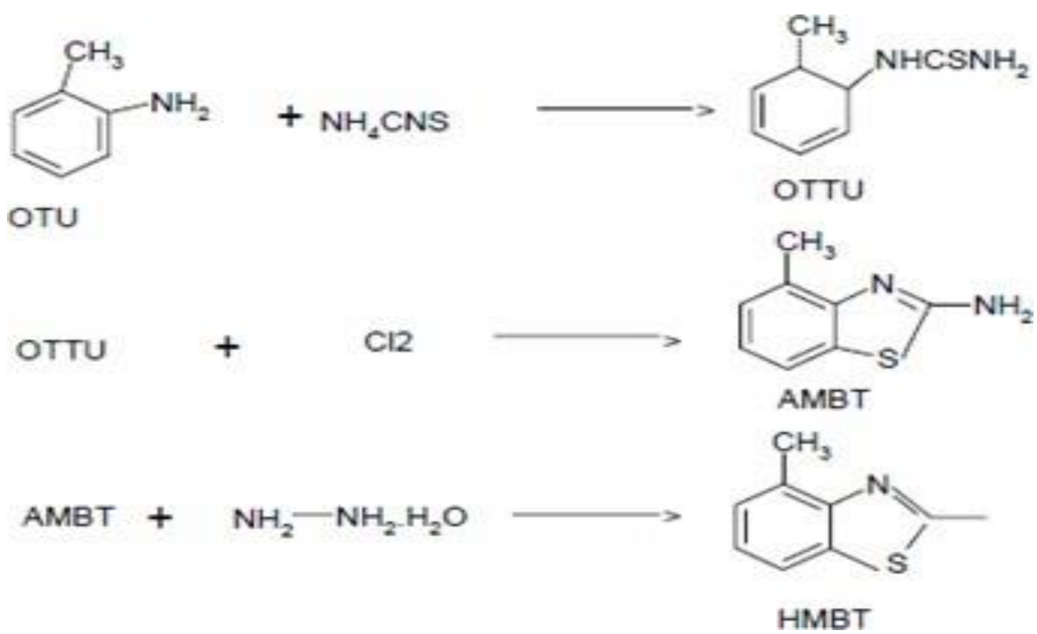
78. 2-Hydroxy-4-Methyl Benzothioate: (HMBT)

Brief Manufacturing Process :-

Step 1 :- Ortho Toluidine is reacted with Ammonium Thicynamate in presence of solvent and acid. After work up the product Ortho Tolyl Thiourea is isolated and dried.

Step 2 :- Ortho Tolyl Thiourea is cyclised to 2-amino-4-methylbenzo catalyst at room temperature. The product is then reacted with 2-hydrazo-4-methyl-henzothiazole (HMBT).

Chemical Reaction :-



STEP-1				
	Material / Mass Balance of 2-HYDROXY-4-METHYL BENZOTIOATE (HMBT) All Quantities are in kg)			
	INPUT		OUTPUT	
Sr. No.	Raw Materials / Items	Kg/Batch	Product / By product	Kg/Batch
1	Ortho Toluidine	953	Ortho Thiourea	**1317**
2	Solvent - MCB	2200	MCB Recovered	2150
3	Water	2000	MCB Loss	50
4	Ammonium Thiocyanate	790	Water	2342
5	Sulphuric Acid	460	Ammonium Sulphate	544
	TOTAL	**6403**	**TOTAL**	**6403**

STEP-2					
	Material / Mass Balance of 2-HYDROXY-4-METHYL BENZOTIOATE (HMBT) All Quantities are in kg)				
	INPUT			OUTPUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	Ortho Thiourea	1317		AMBT	**1224**
2	Chlorine	662		MCB Recovered	1170
3	Solvent - MCB	1200		MCB Loss	30
4	Water for 30% HCl Solution	757		30% HCl Solution	1082
5	Water for Reaction	1200		Aqueous Layer to ETP	1630
	TOTAL	**5136**		**TOTAL**	**5136**

STEP-3					
	Material / Mass Balance of 2-HYDROXY-4-METHYL BENZOTIOATE (HMBT) All Quantities are in kg)				
	INPUT			OUTPUT	
Sr. No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	AMBT	1224		HMBT	**1000**
2	Hydrazine Mono Hydrate	410		Xylene Recovered	1450
3	30% HCl Solution	910		Xylene Loss	50
4	Xyelene	1500		Aqueous Layer to ETP	1526
5				Distillation Residue	18
	TOTAL	**4044**		**TOTAL**	**4044**

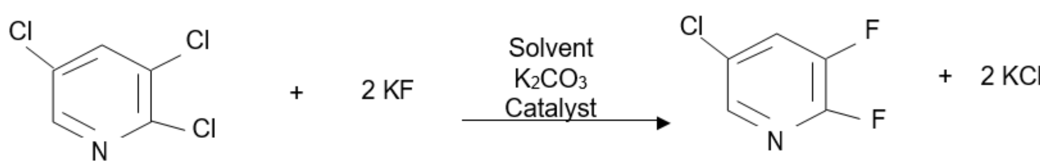
79. 2,3-Difluoro-5-Chloro **Pyridine:-**

Brief Manufacturing Process :-

2,3,5 Tri Chloro Pyridine undergoes fluorination reaction by Potassium Fluoride in presence of Solvent –THFDP & Toluene as well as Catalysts & also in presence of Acid scavenger as Potassium Carbonate at elevated temperature to get the final product as 5 - Chloro 3.5 Di FluoroPyridine(CDFP).

During the reaction Hydrochloric acid is generated which is taken care by Potassium Carbonate to get the Bye product as Potassium Chloride.

Chemical Reactions:-



2,3,5 Tri Chloro Pyridine (M.W.182.5)

Potassium Fluoride (M.W.116.18)

2,3 Difluoro 5-Chloro Pyridine (M.W.182)

Potassium Chloride (M.W.149.1)

Material / Mass Balance of 2,3-DIFLUORO 5-CHLORO PYRIDINE All Quantities are in kg)					
	INPUT			OUT PUT	
Sr No.	Raw Materials / Items	Kg/Batch		Product / By product	Kg/Batch
1	2,3,5 Trichloro Pyridine	1570		2,3 Difluoro 5-Chloro Pyridine	**1000**
2	Potassium Carbonate	130		Recovered Solvent THFDP	1460
3	Potassium Fluoride	1220		Solvent Loss	70
4	Solvent - Toluene	172		Toluene Recovered	160
5	Catalyst -1 & 2	138		Toluene Loss	12
6	Solvent- THF DP	1530		Water Distillate	21
7	Water for Washing	670		KCl + K_2CO_3 Salt Solution	1700

8				Aqueous Layer for ETP	1007
	TOTAL	**5430**		**TOTAL**	**5430**

80. Triazinone/ (4-Amino-6-Tert Butyl-3-Mercapto-1,2,4-Triazin-5(4H)-One) :-

Brief Manufacturing Process :-

Step - 1: Charge Pinacolin and start apply chilling up to 5 °C. Purge Chlorine slowly by maintaining temperature between 5-10 °C. The reaction is exothermic and controlled by external cooling. Temperature of reaction mass is raised to 40 °C and evolved HCl gas to be scrubbed in water and recover 30 % HCl as a by- product. Vent of water scrubber is connected to common Caustic scrubber. Purge remaining chlorine by maintaining temperature between 65 °C.

Step - 2:- Charge Hydrazine Hydrate and Catalyst. Apply chilling and cool up to 5 ^{O}C then charge gradually CS_2 at 5 ^{O}C. Make 25% Caustic Lye solution for H_2S gas to common caustic scrubber. After charging of CS2 start addition of 48% CS Lye by maintaining temperature up to 10 ^{O}C. During cooking hydrogen Sulphide is liberated which is scrubbed in aqueous alkali. Charge remaining CS_2 at 25 ^{O}C and cooking at 60 ^{O}C. Cool to 30 ^{O}C and filter the solid. Generated H_2S gas is then reacted with caustic lye to produce 30% NaSH solution as a by- product and water. ML obtained during the filtration is filled in drums & sent to TSDF for incineration.

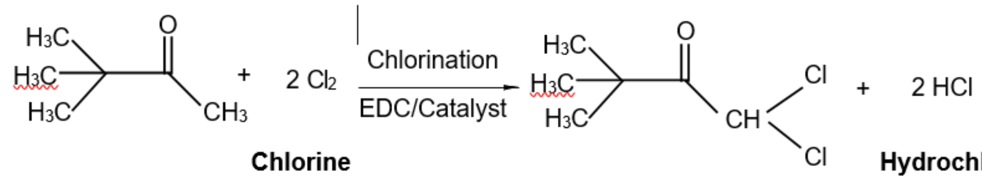
Step - 3:-

(A) Charge water and 48% Caustic Soda Lye under stirring and heat it to 40°C. Add Dichloropinacolin slowly by maintaining temperature between 30 °C. Cool reaction mixture. Add Sodium Hypochlorite solution slowly by maintaining temperature50°C.

(B) Charge water, conc. H_2SO_4 and TCH solid under stirring. Heat the reaction mass to 80°C. Start addition of Keto acid solution at temperature 80°C. After completion of Keto Acid addition add conc. H_2SO_4. Maintain the reaction mass at temperature 70-75°. Cool the reaction mass to 10°C and filter, Wash with water and dryit.

Chemical Reactions :-

Step 1 :-



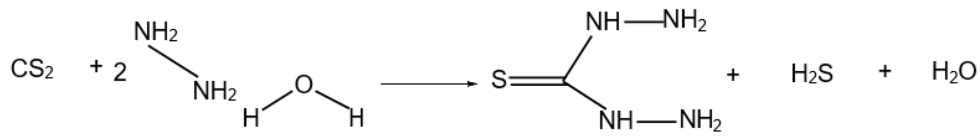
Chlorine **(M.W.2×71)**

Pinacolin (M.W.100.16)

1,1-Dichloro Pinacolin (M.W.169.05)

Hydrochloric Acid (M.W.2×36.5)

Step 2 :-



Carbon Disulphide (M.W.76)

Hydrazine Hydrate (M.W.2×50)

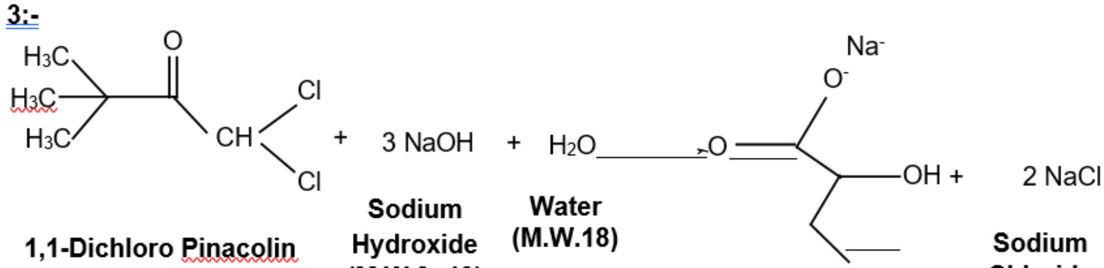
Thiocarbonohydrazide (M.W.106)

Hydrogen Sulphide (M.W.34)

Water (M.W.18)

(M .W.18)

Step 3:-



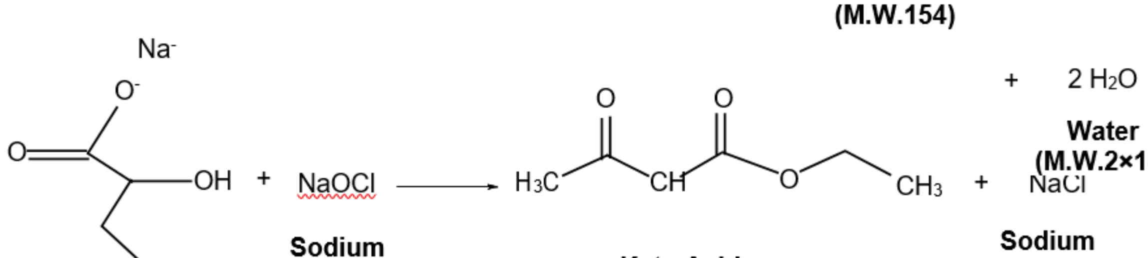
1,1-Dichloro Pinacolin (M.W.169.05)

Sodium Hydroxide (M.W.3×40)

Water (M.W.18)

Hydroxy Mix (M.W.154)

Sodium Chloride (M.W.2×58.5)



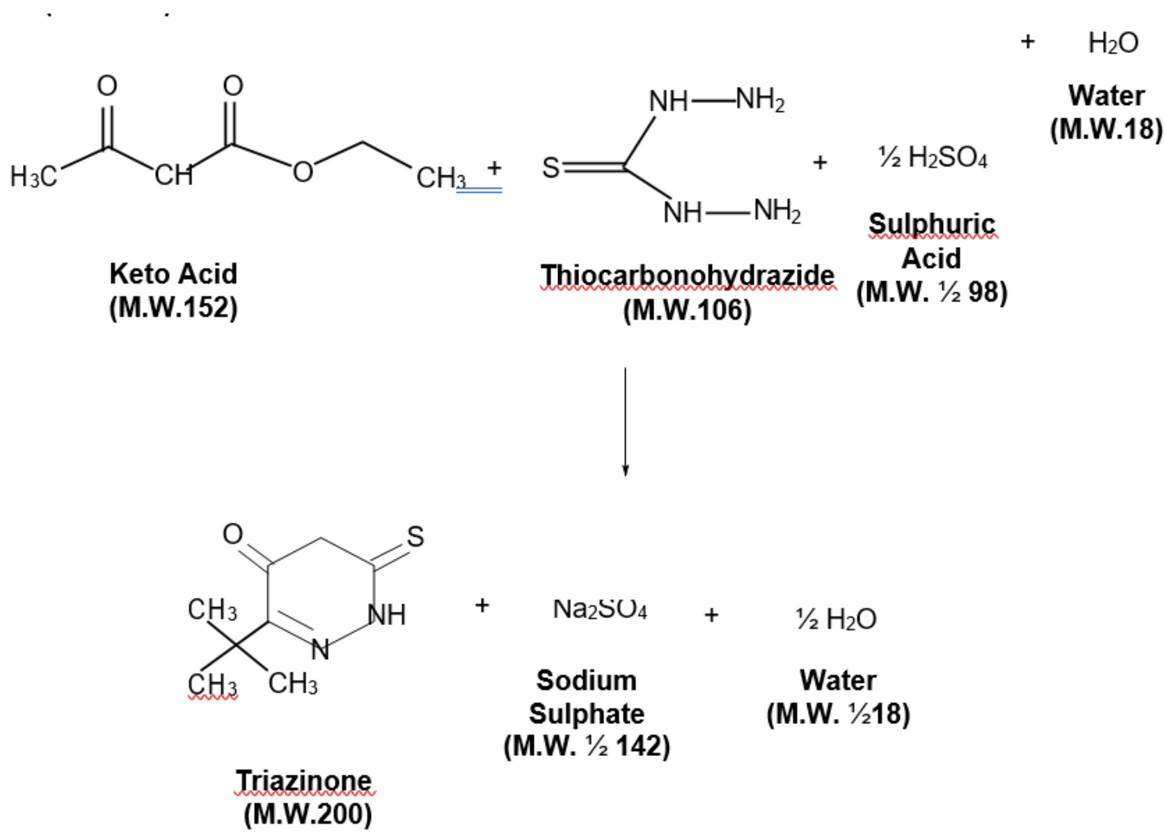
Hydroxy Mix (M.W.154)

Sodium Hypochloride (M.W.74.5)

Keto Acid (M.W.152)

Water (M.W.2×18)

Sodium Chloride (M.W.58.5)



H3C
CH
O
CH3
S
NH—NH2
NH—NH2
+
½ H2SO4
+
H2O
Keto Acid
(M.W.152)
Thiocarbonohydrazide
(M.W.106)
Sulphuric
Acid
(M.W. ½ 98)
Water
(M.W.18)
CH3
CH3
CH3
NH
N
Na2SO4
½ H2O
Sodium
Sulphate
(M.W. ½ 142)
Water
(M.W. ½18)
Triazinone
(M.W.200)

2

Annexure V
RAW MATERIALS LIST

Raw Materials List

S.No	Raw Materials Name
1	[5-(Trifluoromethyl)-2H-Tetrazole-2-yl] Methyl
2	1- Chloro 3-Allyl Oxy Amine
3	1-(2-Chloro Ethoxy) Propane
4	1-(4-ChloroPhenyl) Ethyl Amine
5	1-(4-Chlorophenyl)4-4 Dimethyl 3- Pentanoate
6	1,1,2,3,3,3-Hexafluoro Propoxy- 2,5-Dichloro Benzene
7	1,1,2-Trichloroethane
8	1,2 Pentane Diol
9	1,2,4 - Triazole
10	1,4 DichloroBenzene
11	1,5-DMNIHH-1,3,5-triazine
12	1-Chloro -2- Propanol
13	2- (4 – Hydroxy Phenoxy) Propionic Acid
14	2- Amino -4,6-Dimethoxy Pyrimidine
15	2- Chloro -5- Chloromethyl Pyridine
16	2- Chloro -6-trifluoro Methyl Pyridine
17	2 Chloro Benzyl Alcohol
18	2- Methyl Aniline
19	2- Hydroxy -4- Methyl Benzothiazole(HMBT)
20	2,2-Dichloro 1-Ethyl 3- Methylcyclopropane Carboxylic Acid
21	2,3-Di Fluoro -5-Chloro Pyridine
22	2,6 Dibromo 4- (Trifluoromethyl) Aniline
23	2,6 Diethyl Aniline (2,6-DEA)
24	2,6 DihydroxyBenzoic Acid
25	2,6-Difluoro Benzoyl Isocyanate
26	2,6-Diisopropyl Aniline
27	20 % Ammonia Solution
28	20% Sodium Chloride solution (NaCl solution)
29	2-Amino-4,6-Dimethoxy Pyrimdine
30	2-Amino-4'-Chlrobiphenyl

31	2-Amino-4-Methoxy-6-Methyl-1,3,5-Triazine
32	2-Amino-5-Chloro-N,3- Dimethylbenzamide
33	2-Amino-5-Cyano-N,3-Dimethyl Benzamide
34	2-Chloro 5-Chloromethyl Thiazole
35	2-Chloro Pyridine
36	2-Chloro, 5-Chloro Methyl Pyridine
37	2-chloro-5-TM chloride
38	2-Chloronicotinoyl Chloride
39	2-Ethylsulfonylimidazo[1,2-A]PyridineSulfonamide
40	2-FTFMA
41	2-Methyl 4-Trifluoro Methyl 5- Thiazole Carboxylic Acid Ethyl Ester + Solvent
42	3 – Iso Chromanone
43	3- Aminomethyl) Tetrahydrofuran
44	3 Chloro Pyrazole
45	3- Cyano Pyridine
46	3% Sodium Bicarbonate
47	3-(Difluoromethyl)-1-Methyl-1-H- Pyrazol-4-Carboxylic Acid
48	3,4 - Dichloro Aniline (3,4-DCA)
49	3,4,5-Trifluoro-2-Aminobiphenyl
50	3,4-Dichloro Benzotrifluoride
51	3,5 Dimethyl Benzohydrazide
52	3,6 - Di Chloro Benzoxazole
53	30 % Hydrochloric Acid
54	30% Sulfuric Acid
55	37 % Formaldehyde Solution
56	3-Bromo-1-(3-Chloropyridin-2-yl)- 1H-Pyrazole-5 Carbonyl Chloride
57	3-Chloro–2,2–Dimethylpropanoyl Chloride
58	3-Chloro-4-(1,1,2-Trifluoro-2- [Trifluoro Methoxy] Ethoxy) Aniline
59	3-Methoxy 2-Methyl Benzoyl Chloride
60	3-Methyl 4-Nitroimino 1,3,5 Oxidiazine (MNIO)
61	3-Phenyl -2-Methyl Benzyl Chloride

62	4 Chloro Phenol
63	4- Nitro Ortho Xylene
64	4, 6- Dimethoxy Pyrimidine -2- Amine
65	4,6 - Di Chloro Pyrimidine
66	4,6 Dimethoxy 2-Methyl Sulfonyl Pyrimidine
67	48% Caustic Soda Lye
68	4-Amino-6-Tert-Butyl-3-Mercapto- 1,2,4-Triazin-5(4H)-one (ATMT)
69	4-Chloro-2-Cyano-5-p-Tolylimidazole (CCDTI
70	4-Dimethylaminopyridine (4- DMAP)
71	4-Phenoxy Phenol
72	4-Trifluoromethyl Nicotinic Acid
73	5- Propyl 2- Thio Ethyl Cyclohexane 1,3 Dione
74	8-10 % Sodium Hypochlorite Solution
75	Acetic Acid
76	Acetone
77	Acetonitrile
78	Acetyl Amine Triazinone
79	Acetyl Chloride
80	Acid Chloride
81	ACMP
82	Acrolein
83	Activated Charcoal
84	Aluminium Chloride
85	Aluminium Trichloride
86	Amine
87	Amino Acetonitrile Sulfate
88	Amino Benzoic Acid
89	Ammonium Carbonate
90	Barium Hydroxide
91	Bis (2-Chloroethyl) 2 Chloro Ethyl Phosphonate
92	Bisultap
93	Br2
94	Bromine
95	Calcium Carbonate
96	Calcium Chloride
97	Carbon Disulphide

98	Carbon Disulphide
99	Catalyst - PTSA
100	Catalyst - TBAB
101	Catalyst for Epimerization
102	Catalyst Pd/C
103	Catalyst- Raney Nickel
104	Caustic
105	Caustic
106	Caustic Flakes
107	Caustic Lye 15% for 20% Na2SO3
108	Caustic Soda Flakes
109	Chlorine
110	Chloro Acetyl Chloride
111	Chlorosulphonic Acid
112	CMAMP
113	Concentrated HCl
114	Crude Clothianidin
115	Cyanuric Chloride
116	Cypermethric Acid Chloride
117	Di Isopropyl Malonate
118	Di Methyl Carbonate
119	Dichloroethane
120	Diethyl Ketone
121	Diethyl Methyl Phosphonate
122	Dimethyl Formamide
123	Dimethyl Formamide
124	Dimethyl Sulphide
125	Dimethylsulfamoyl Chloride
126	Dispersant
127	DMF
128	DMF Catalyst
129	DMMI
130	EDC
131	EPCA
132	Ester
133	Ethanol
134	Ethyl 4,4,4 Trifluoro 2-Chloro Acetoacetate
135	Ethyl Amine (70%)
136	Ethyl Bromide

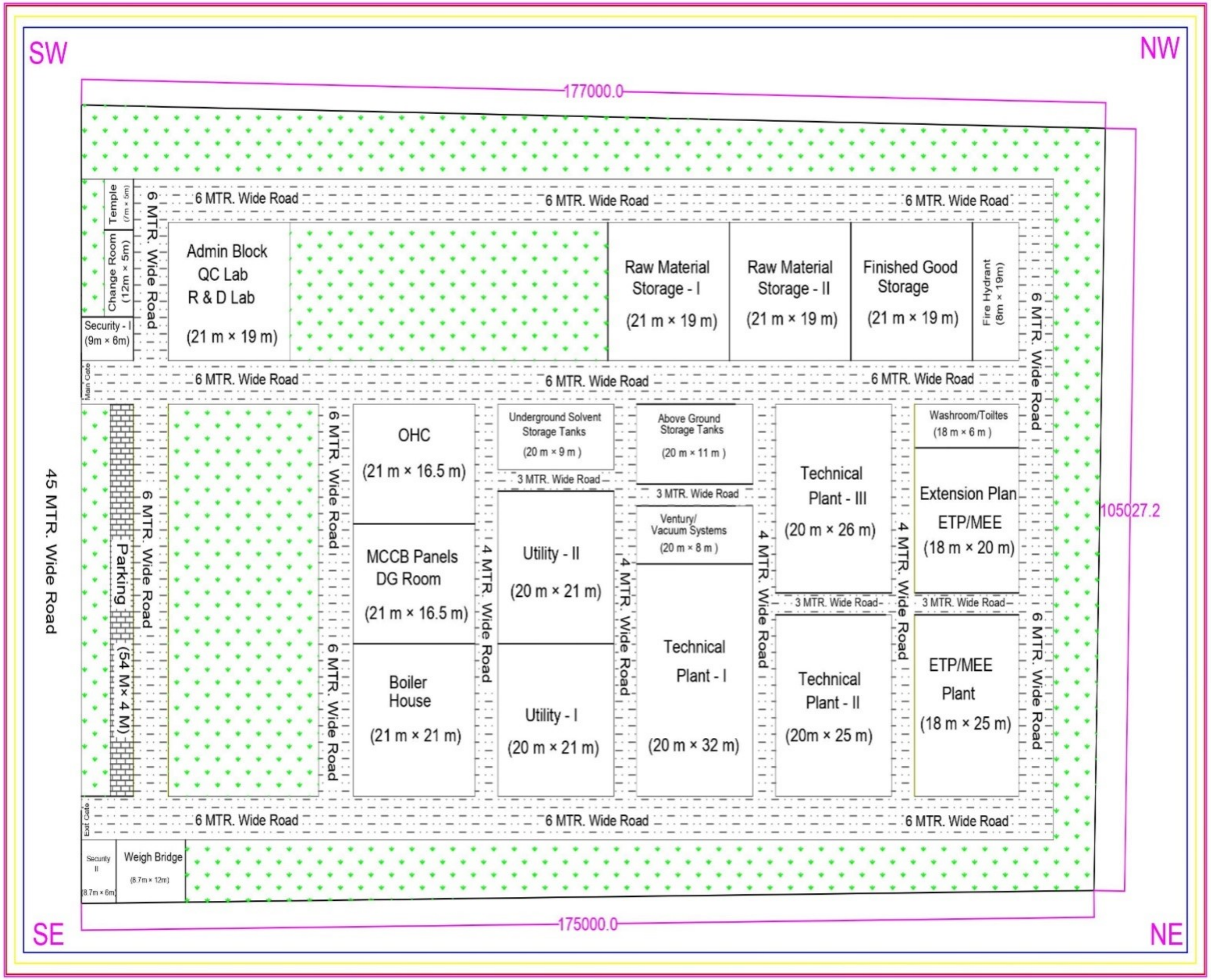
137	Ethyl-1-Methyl -5- Sulphanamide Isocyanide- 1- H Pyrazole-4- Carboxylate
138	Ethylene Di Amine
139	Ethylene Dichloride
140	Ethylene Dichloride (EDC)
141	Fluoro Benzene
142	Formic Acid
143	Glyoxylic Acid Methyl Ester Oxime
144	HCl
145	Hexamine
146	Hydrochloric Acid (36%)
147	Hydrogen Chloride
148	Hydrogen gas
149	Hydrogen Peroxide
150	Hydroxylamine Hydrochloride
151	Iodo benzoic Acid
152	Iso Propyl Alcohol
153	Isocyanate in Xylene (50%)
154	Isopropyl Amine
155	K2CO3
156	KOH
157	Lambda Acid
158	Lambda Acid Chloride
159	Lime
160	M, N, O (2,3-Dimethylal- Nitrosourea
161	mCPBA
162	MDC
163	Meta Dichloro Benzene
164	Meta Phenoxy Benzaldehyde
165	Meta-Dichlorobenzene
166	Meta-Dichlorobenzene
167	Methane Sulphonyl Chloride
168	Methanol
169	Methanol
170	Methyl alpha-2,4, Dichloro Phenyl Beta Hydroxy Propanoate
171	Methyl Amine (40%)
172	Methyl Formate
173	Methyl TriPhenyl Phosphorane
174	Methyl(Chlorocarbonyl)[4- Trifluoromethoxy Phenyl]Carbamate

175	Methyl-2- {[Isocyanate sulfamoyl] Methyl} Benzoate
176	Methyl-7-Chloro-2,5-Dihydroindeno [1,2-e]Oxadiazine- 4a(3H-Carboxylate)
177	Methylene Dichloride (MDC)
178	MnSO4.H2O
179	Mono Chloro Acetic Acid
180	Mono Ethyl Amine
181	Monochloro Benzene
182	Mucochloric Acid
183	N- Nitro N- Methyl Imidazolidine
184	N,N-Dimethylaniline(DMA)
185	Na2CO3
186	NaOH Flakes
187	N-Cynomethyl – Acetamidate (NCMA)
188	Nitric Acid (85%)
189	N-Methoxy Carbamate
190	O−Cgloro Benzyl chloride
191	Organic Mass of 2-Methyl 4- Trifluoro Methyl 5-Thiazole Carboxylic Acid
192	Ortho Cyano Phenol
193	Ortho Phosphoric Acid
194	Ortho-Carboxy Methyl Phenyl Isocyanate
195	Ortho-Xylene
196	Oxadiazepine Compound
197	Oxalic Acid
198	Oxygen Gas
199	Para-Tertiary Butyl Benzyl Mercaptan
200	Para-Tertiary Butyl Hydrazine
201	Pentanoyl Chloride
202	Phenol
203	PhenylChloroformate
204	Phthalate
205	PNNCC
206	Potassium Carbonate
207	Potassium Hydroxide
208	Propargyl Chloride
209	Propionic acid
210	Propionyl Chloride
211	Proplyene Glycol
212	PTC catalyst

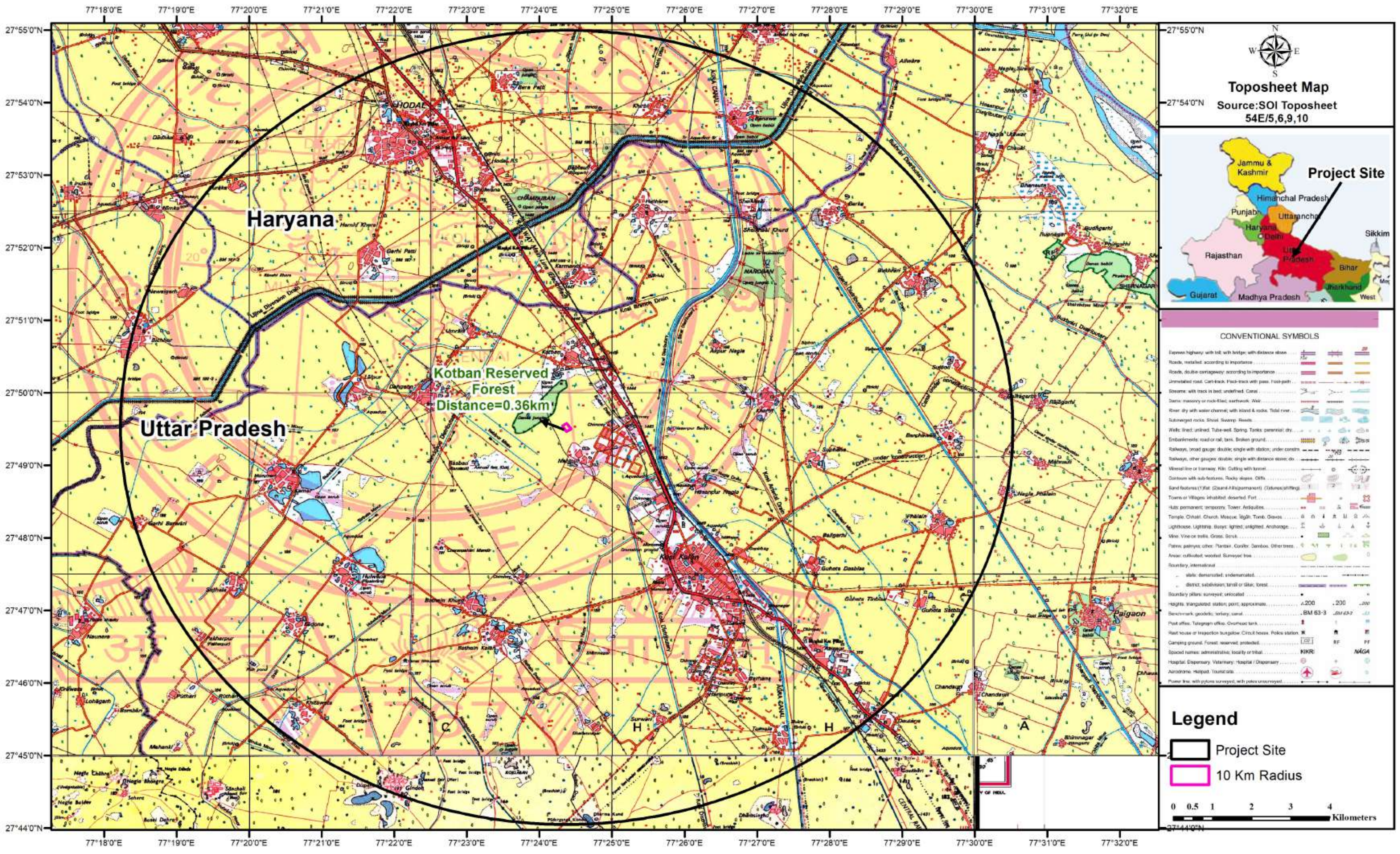
213	Resorcinol
214	Sodium [1- {(3- Trifluoro Methyl) Phenyl} Ethylidene Amino] Oxidanide
215	Sodium Carbonate
216	Sodium Cyanide
217	Sodium Cyanide
218	Sodium Ethoxide
219	Sodium Hydride
220	Sodium Hydroxide
221	Sodium Methoxide
222	Sodium Nitrite
223	Sodium Sulphide
224	Sodiummethoxide
225	Sodiumnitrite
226	Solvent – Di Methyl Sulfoxide
227	Solvent – Dimethyl Formamide
228	Solvent – DMF
229	Solvent – EDC
230	Solvent – n-Heptane
231	Solvent – Toluene
232	Solvent – Xylene
233	Solvent Acetonitrile
234	Solvent -Di Methyl Formamide (DMF)
235	Solvent – Di Methyl Sulfoxide
236	Solvent-1 Ortho Xylene
237	Solvent-2 Toluene
238	Sulphuric Acid
239	Sulphuric Acid
240	TBAC
241	TEA
242	Tert-Butyl Alcohol
243	Tert-Butyl Amine
244	Tert-Butyl Methyl Ether (MTBE)
245	Tetra hydro Furan
246	Tetrafluoro Ethane
247	Tetrahydrofuran (THF)
248	Thiazolidimylidene Cyanamide
249	Thio Acetamide
250	Thio Urea
251	Thionyl Chloride
252	Thiophosgene

253	Toluene
254	Triethyl Amine
255	Trifluoro Acetoacetate
256	Water
257	Xylene
258	$ZnSO_4.7H_2O$

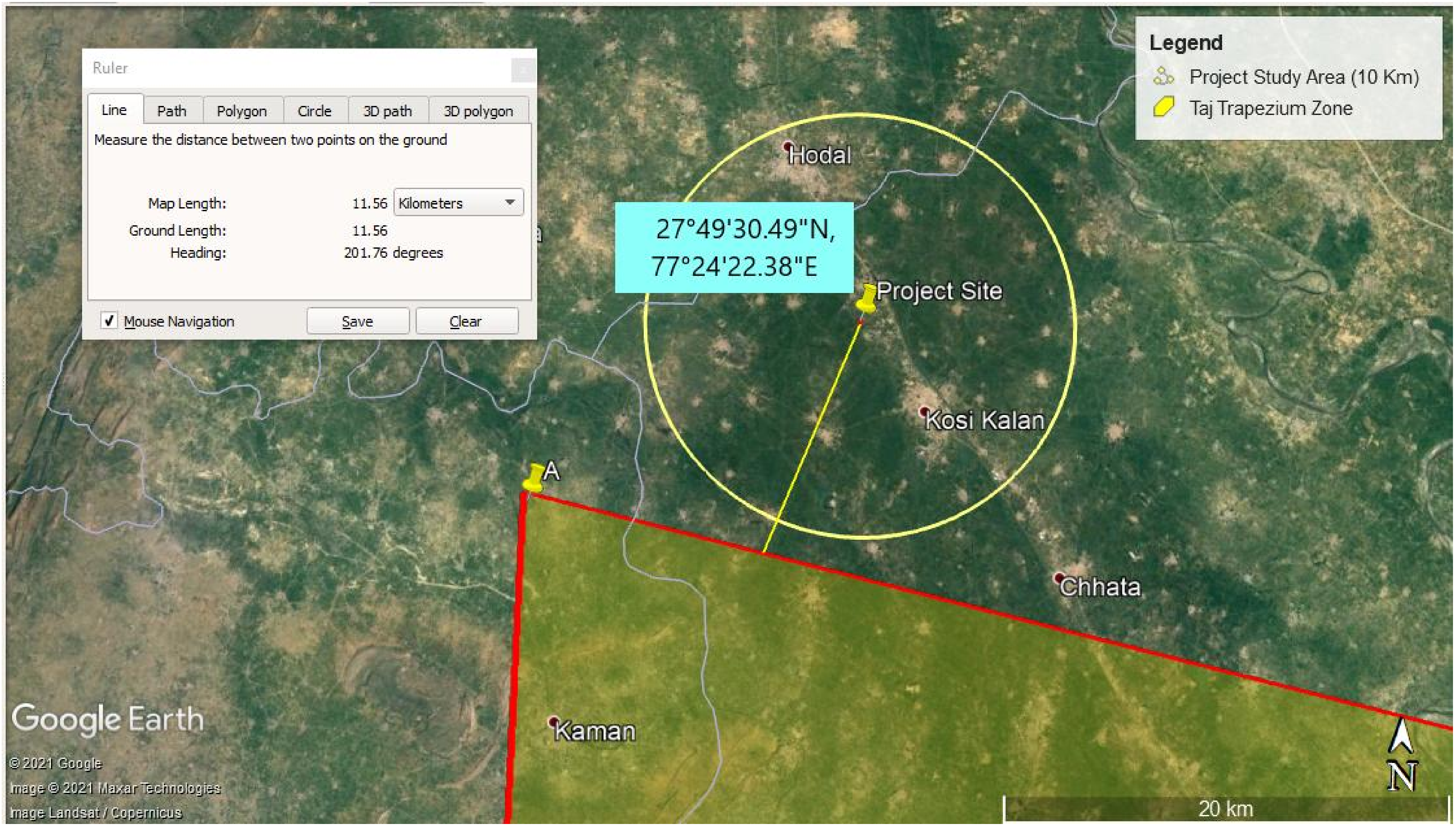
Annexure VI
LAYOUT PLAN

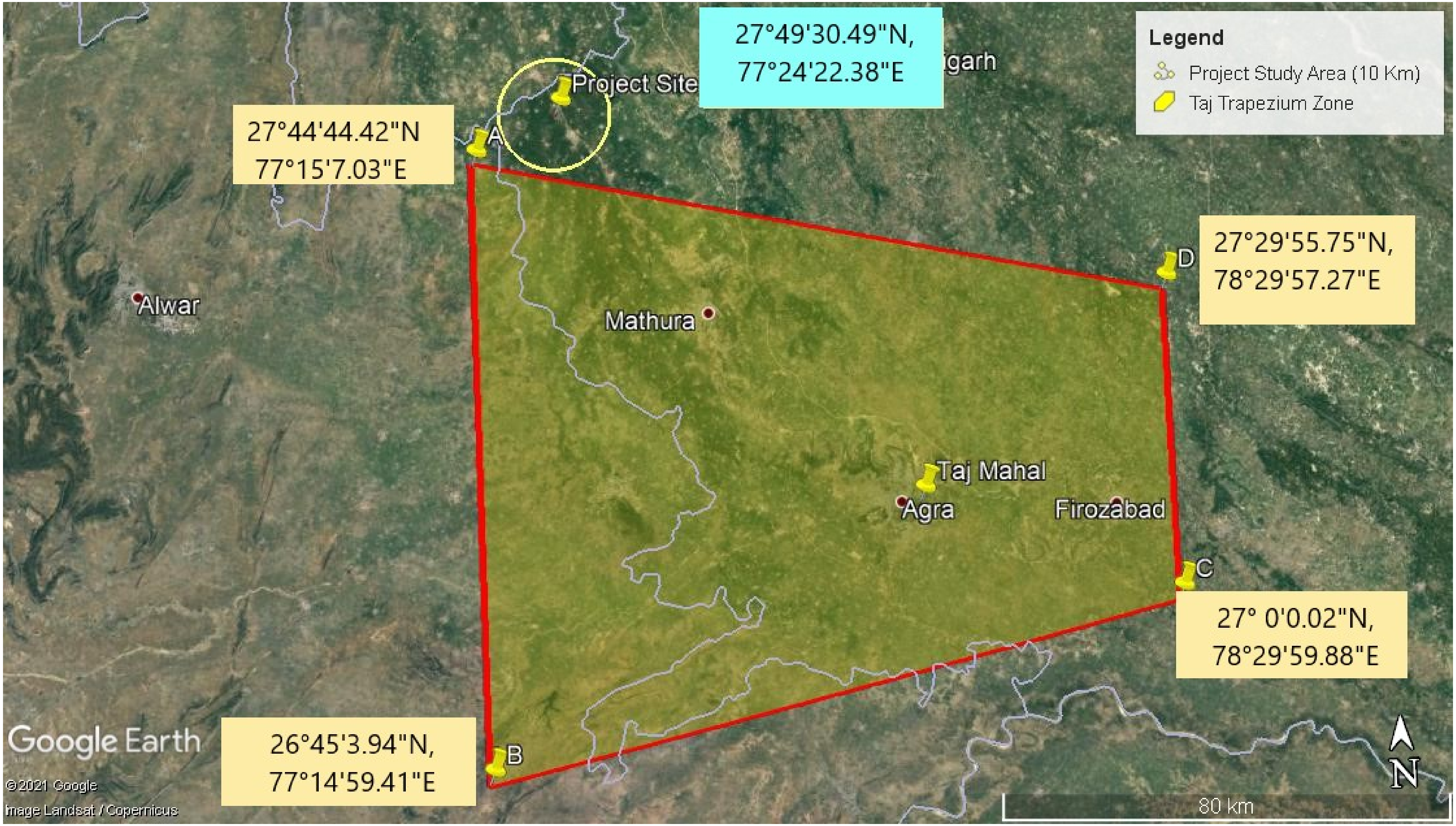

SW
NW
SE
NE
177000.0
175000.0
105027.2
45 MTR. Wide Road
6 MTR. Wide Road
4 MTR. Wide Road
3 MTR. Wide Road
Temple (7m × 5m)
Change Room (12m × 5m)
Security - I (9m × 6m)
Main Gate
Exit Gate
Admin Block
QC Lab
R & D Lab
(21 m × 19 m)
Raw Material Storage - I
(21 m × 19 m)
Raw Material Storage - II
(21 m × 19 m)
Finished Good Storage
(21 m × 19 m)
Fire Hydrant (8m × 19m)
Parking (54 M× 4 M)
OHC
(21 m × 16.5 m)
MCCB Panels
DG Room
(21 m × 16.5 m)
Boiler House
(21 m × 21 m)
Underground Solvent Storage Tanks
(20 m × 9 m)
Utility - II
(20 m × 21 m)
Utility - I
(20 m × 21 m)
Above Ground Storage Tanks
(20 m × 11 m)
Ventury/ Vacuum Systems
(20 m × 8 m)
Technical Plant - I
(20 m × 32 m)
Technical Plant - III
(20 m × 26 m)
Technical Plant - II
(20m × 25 m)
Washroom/Toiltes
(18 m × 6 m)
Extension Plan
ETP/MEE
(18 m × 20 m)
ETP/MEE Plant
(18 m × 25 m)
Security II
(8.7m × 6m)
Weigh Bridge
(8.7m × 12m)

Annexure VII
TOPOGRAPHICAL MAP


Toposheet Map
Source:SOI Toposheet
54E/5,6,9,10
Project Site
Jammu & Kashmir
Himanchal Pradesh
Punjab
Uttaranchal
Haryana
Delhi
Uttar Pradesh
Sikkim
Rajasthan
Bihar
Jharkhand
Gujarat
Madhya Pradesh
CONVENTIONAL SYMBOLS
Legend
Project Site
10 Km Radius
Kilometers
Haryana
Uttar Pradesh
Kotban Reserved Forest
Distance=0.36km
HODAL
Kosi Kalan
Paigaon
77°18'0"E
77°19'0"E
77°20'0"E
77°21'0"E
77°22'0"E
77°23'0"E
77°24'0"E
77°25'0"E
77°26'0"E
77°27'0"E
77°28'0"E
77°29'0"E
77°30'0"E
77°31'0"E
77°32'0"E
27°55'0"N
27°54'0"N
27°53'0"N
27°52'0"N
27°51'0"N
27°50'0"N
27°49'0"N
27°48'0"N
27°47'0"N
27°46'0"N
27°45'0"N
27°44'0"N

Annexure VIII
DISTANCE FROM TAJ TRAPEZIUM ZONE (11.56 Km)


Ruler
Line
Path
Polygon
Circle
3D path
3D polygon
Measure the distance between two points on the ground
Map Length: 11.56 Kilometers
Ground Length: 11.56
Heading: 201.76 degrees
Mouse Navigation
Save
Clear
27°49'30.49"N,
77°24'22.38"E
Legend
Project Study Area (10 Km)
Taj Trapezium Zone
Hodal
Project Site
Kosi Kalan
A
Chhata
Kaman
Google Earth
© 2021 Google
Image © 2021 Maxar Technologies
Image Landsat / Copernicus
N
20 km


27°49'30.49"N, 77°24'22.38"E
Legend
Project Study Area (10 Km)
Taj Trapezium Zone
Project Site
27°44'44.42"N 77°15'7.03"E
A
27°29'55.75"N, 78°29'57.27"E
D
Alwar
Mathura
Taj Mahal
Agra
Firozabad
C
27° 0'0.02"N, 78°29'59.88"E
Google Earth
26°45'3.94"N, 77°14'59.41"E
B
© 2021 Google
Image Landsat / Copernicus
80 km
N