PRE - FEASIBILITY REPORT

For

Proposed Pesticides and Organic Chemicals Manufacturing Unit (2350 MTPA)

Located at

D-2/CH-51, GIDC Dahej – II, Village - Vagra, Tehsil - Dahej,

Dist. - Bharuch, Gujarat

By

JEEVAN CHEMICALS PVT. LTD.

Project Category

- 5(b) intermediates and Pesticides industries and pesticide specific intermediates (excluding formulation) – category "A"
- 5(f) Synthetic Organic Chemicals – category "B"

August, 2019

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1 EXECUTIVE SUMMARY

The project proponent has been working since long in this field, they have working units of Synthetic chemicals, intermediates and pesticides in Maharastra. The proponents of this company Mr. Sonir Mahendrakumar Shah and Mrs. Ashita Sonir Shah both have extensive experience in this field. The managing director Mr. Sonir Mahendrakumar Shah has experience of 24 years and Director Mrs. Ashita Sonir Shah has experience of 13 years.

The proposed products fall under category 5(f) and 5(b) – "A" Synthetic Organic Chemicals, intermediates and Pesticides, as stated in Environment Impact Assessment Notification Published on 14th September, 2006 and amended thereafter. Hence the project proponent has to obtain the EC from the MoEFCC, New Delhi.

Table 1-1: Project Summary

Sr. No.	Particulars	Details
1	Name and address of project	**JEEVAN CHEMICALS PVT. LTD.** D-2/CH-51, GIDC Dahej – II, village - Vagra, Tehsil - Dahej, Dist. - Bharuch, Gujarat
2	Registered Office	B 11, Manglesh Kastur Park. Shimpoli Road, Boriwali (East), 400092
3	Type of project	Greenfield
4	Category of project	Category 5(f) and 5(b) – "A"
5	Project Coordinates	Latitude : 21°42'58.76"N Longitude : 72°37'18.28"E
6	Project Capacity	2350 MTPA
7	Project cost	Rs.1875 Lacs
	EMS cost (Capital)	Rs. 100 Lacs
	CER Cost	Rs. 37.5 Lacs (2% of project cost for Greenfield project)
8	Total Plot area	20,000 sq. m (Land is acquired by project proponent)
	Green belt Area	6700 sq.mt. (33.5% of plot area)
9	Resource Requirement (Operation phase)	
	Water	Source : GIDC, Dahej • Domestic : 2.75 KLD • Industrial : 34.85 KLD • Greenbelt : 10 KLD • **TOTAL : 47.60 KLD**
	Electricity	**Source : DGVCL** Requirement : 525 KVA Backup power : D.G. set - 500 KVA (standby)
	Fuel	Source : Local Supplier Natural Gas : 330 kg/hr HSD: 65 L/Hr.
	Manpower	55 nos.
	Solvent to be used	Toluene, Acetone, Ethanol, Methanol, hexane

Sr. No.	Particulars	Details
10	Pollution Potential and its treatment	
a)	Wastewater Generation	• Domestic : 2.2 KLD • Industrial : 33.33KLD • **Total : 35.53 KLD**
	Treatment of wastewater	• Sewage from domestic activities will be treated in septic tank/soak pit. • Industrial Effluent will be treated in ETP having primary treatment and MEE to achieving CETP norms. • Treated effluent will be discharge to CETP, Dahej for further treatment and disposal.
	Mode of Disposal	Treated effluent will be discharge to CETP, Dahej for further treatment and disposal.
b)	Source of Flue gas emission	• Boiler • Thermo Pack • DG Set
	Pollutant (Flue Gas)	SPM, SO_2, NO_X
	APCM	Adequate stack height will be provided for dispersion of pollutant. APCM with flue gas stacks will not provided as natural gas will be used as a fuel.
	Pollutant (Process Gas)	HCl, HBr, NH_3, NO_2
	APCM	Caustic Scrubber; Water scrubber
c)	Solid/hazardous waste	Solid/hazardous waste generated from proposed project will be collected, stored and managed as per solid/hazardous waste rule – 2016

En-vision Enviro Technologies Private Limited is QCI approved consultant having accreditation certificate no. NABET/EIA//1821/RA 0102 valid till 6th December 2020. They have been appointed to carry out EIA/EMP studies to obtain Environmental Clearance of proposed project.

2 INTDOUCTION OF THE PROJECT

2.1 Identification of Project

JEEVAN CHEMICALS is planning to set up of Synthetic Organic Chemicals and Pesticides products Manufacturing Units at Dahej, Gujarat. Project proponent is dealing with such projects since long; they have such units in Maharastra. The directors of this company Mr. Sonir Mahendrakumar Shah and Mrs. Ashita Sonir Shah both have extensive experience in industry.

2.2 Nature of the Project

Proposed Greenfield project to be established for manufacturing of pesticide, synthetic organic chemicals and intermediates used for manufacturing of both pesticide and organic chemicals respectively. Proposed project capacity is 2350 MTPA and to be developed at D-2/CH-51, Village - Vagra, Dahej GIDC – II, Bharuch, Gujarat.

2.3 Need for the Project

India pesticides market stood at $ 2.6 billion in the year 2016 and is projected to exhibit a Compound annual growth rate (CAGR) of 7.04% in value terms to reach $ 5.17 billion by 2026, on account of increasing awareness among farmers due to growing crop loss caused by rising number of pest attacks. Study on pesticide consumption say that approx. 35 – 45 % crop production is lost due to insects, weeds and diseases. Moreover, increasing adoption of bio pesticides, rising preference towards environmental friendly pesticides and better agricultural practices are further anticipated to drive growth in India pesticides market through 2026. Crystal Crop Protection, PI Industries, Bayer Crop Science, Syngenta India, Rallis India Ltd, BASF India, UPL Limited, Cheminova, Adama India and Dhanuka Agritech, etc. are the major pesticide manufacturer of Indian market. (*Source: Paper published by P. Indra Devi from Kerala Agricultural university*).

According to the Indian Insecticides Act 1968, all pesticide products are to be registered before they are manufactured, sold, exported or imported. There are 256 registered pesticide products (Technical grade and Formulated) in India. Cotton and Paddy are the major crops where pesticides consumption is 50% and 18%, respectively. Rice, which is grown over 24% of the cropped area, consumes 18 per cent of the pesticides. Sugarcane uses 2% of the pesticides and other crops grown over 6 per cent of the cropped area account for 1% pesticides only (*Source: agropages.com*).

The demand for organic chemicals in India has increased at nearly 7.8% during 2009 – 13 to reach 3.6 million tons in 2013. Domestic production has increased at ~ 2.4% per annum and imports grew at a rate of 8.7% during 2009 – 13.

Looking to above market scenario, project proponent proposes a plant to manufacture technical grade pesticides and synthetic organic chemicals at GIDC – Dahej II of Bharuch district in Gujarat State.

2.4 Demand-Supply Gap

According to the estimates of Research on India (a leading provider of market intelligence reports of industries), the pesticide market in India is expected to grow at a rate of 2.38 % CAGR per annum. The worldwide consumption of pesticides is about 2 million tonnes per year, out of which India's share is 3.75%. (*Source: Paper published by P. Indra Devi from Kerala Agricultural university*).

Import, Export and Domestic market:

Project proponent is already having domestic and export market for existing range of products. Project proponent shall also have captive consumption of some products which are utilized as raw material for other products. The Indian pesticide scenario seems to be more export-oriented and major export destinations for India are USA, UK, France, Netherlands, South Africa, Bangladesh, Malaysia and Singapore. Pesticide application state wise are J&K (2.34 kg/Ha.); Punjab (1.38 kg/Ha.); Haryana (1.15 kg/Ha.); Gujarat (0.6 kg/Ha.) shows that pesticide used in India are 9% of total cultivated land i.e. approx. 16.7 million hectares.

JEEVAN CHEMICALS had conduct informal market survey with various customers including current clients to understand potential for the range of products (both pesticide and organic chemicals) required now a day. There is huge gap between demand and supply of proposed products.

2.5 Employment Generation

It is assume that approx. 100 – 150 nos. of local skilled/unskilled construction labor will require for construction activities. During operation phase around 45 nos. technical staff will be employed directly, while 10-15 nos. indirect employment. The manpower requirement is as under

Table 2-1: Manpower Requirement

Sr. No.	Particular	Manpower (Nos.)		
		Permanent	Contract base	Total
1	Male	45	10	55

3 PROJECT DESCRIPTION

3.1 Type of Project

Proposed Greenfield project to be established for manufacturing of pesticide, synthetic organic chemicals and intermediates used for manufacturing of both pesticide and organic chemicals respectively.

3.2 Project Location

JEEVAN CHEMICALS is planning to set up of pesticide and synthetic organic chemicals manufacturing unit at GIDC – Dahej, Gujarat. Project site is situated at 21°42'58.76"N Latitude and & 72°37'18.28"E Longitude. Google image of project site with surrounding is depicted as ***Figure 3-1***. Location map showing project site is given in ***Figure 3-2*** and plant layout of the proposed project is shown in ***Figure 3-3*** and attached as **Annexure – 1**.

Identification	Latitude & Longitude
	21°42'58.76"N & 72°37'18.28"E
A	21°43'1.82"N & 72°37'20.32"E
B	21°42'59.46"N & 72°37'21.47"E
C	21°42'56.36"N & 72°37'21.28"E
D	21°42'55.23"N & 72°37'18.45"E
E	21°42'59.84"N & 72°37'16.26"E

Figure 3-1 Google Image of Project Site

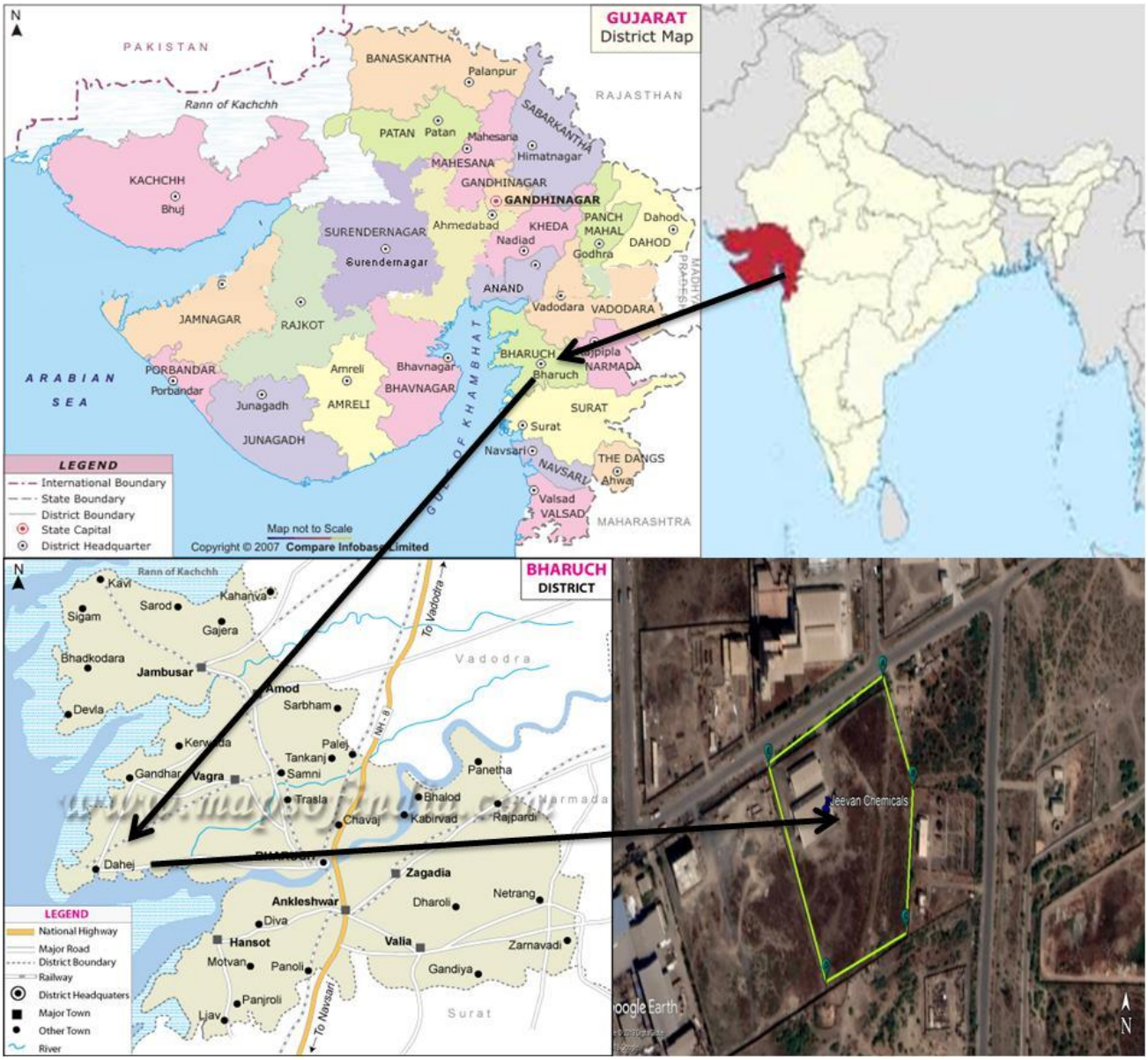


Figure 3-2: Location map of the Project Site

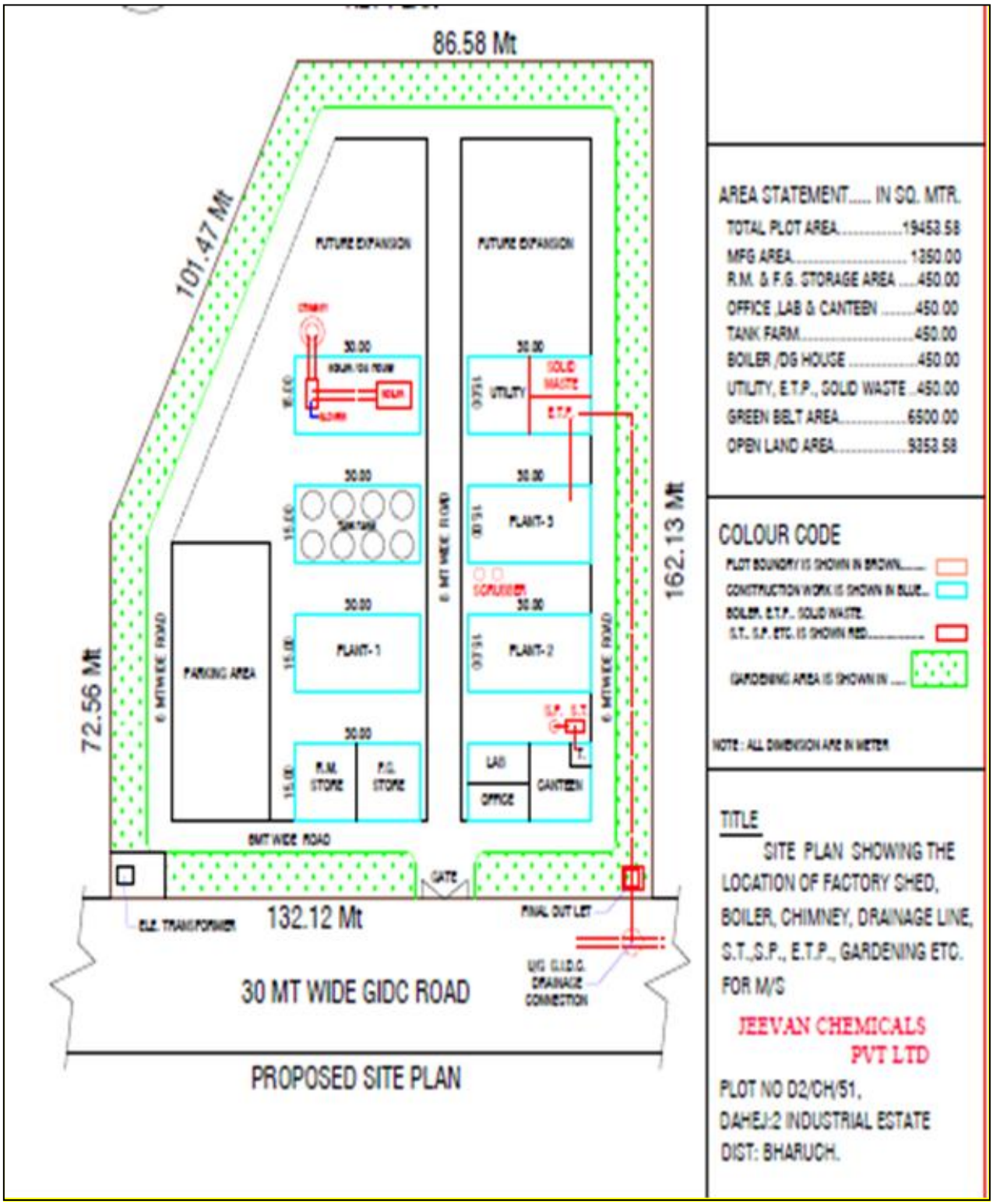


Figure 3-3 Plant Layout

3.2.1 Environmental Setting

Proposed project site is situated at notified industrial area. Environmental setting in the surroundings area of the site within 10 Km Radius is as under,

Table 3-1 Salient Features

Sr. No.	Feature	Description		
1.	Nearest Village	Dahej around 4.02 km in West direction		
2.	Nearest City/ Town	Bharuch City is around 38.21 km in East direction		
3.	Nearest River/Canal	Narmada River around 3.97km in South direction		
4.	Nearest Sea	Gulf of Khambhat 13.18 km in West direction		
5.	Seismic Zone	Zone III		
6.	Nearest Reserve forests	None within study area of 10 km radius from project site.		
7.	State, National boundaries	None within study area of 10 km radius from project site.		
8.	Areas which are important or sensitive for ecological reasons - Wetlands, biospheres, mountains	Proposed project is located at GIDC ,Dahej		
9.	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	None within study area of 10 km radius from project site.		
10.	Critically Polluted Area	None within study area of 10 km radius from project site.		
11.	Any Heritage site within project area	None within study area of 10 km radius from project site.		
12.	Site falls in Critically & Moderate pollution area	None within study area of 10 km radius from project site.		
13.	Nearest Densely populated or built-up area	Dahej (13495 nos) village is located at 4.02 km in West direction		
14.	History of Natural Calamities (Earthquake, Flood & land slide, cyclone, etc.	None within study area of 10 km radius from project site.		
15.	National Park and / Sanctuary	None within study area of 10 km radius from project site.		
16.	List industries within 10 km area	Industry	Distance	Direction
		Sunshine Industries	0.38	NNW
		Indofill Industries Limited	0.87	SSW
		Birla Copper Dahej	7.48	WSW
		Reliance Industries Limited	7.43	WSW
		Adama India Pvt. Ltd	0.24	West

3.3 Alternative Site

Proposed project site is situated in GIDC, Dahej. All basic infrastructure and facilities required for industrial development are available in GIDC. Thus alternative site analyses have been not conducted and finalize the project site.

3.4 Magnitude of Operation

Proposed project to be established for manufacturing of pesticide, synthetic organic chemicals and intermediates used for manufacturing of both pesticide and organic chemicals respectively. Proposed project capacity is 2350 MTPA. Detailed manufacturing process; process flow diagram with material balance is described as under in respective sections.

Table 3-2: Proposed Products

Sr. No.	Name of Products	Manufacturing Quantity		CAS. No.	End Use
		MTPA	MTPD		
1	Metribuzin	50	0.139	21087-64-9	Herbicides
2	Tebuconazole	50	0.139	107534-96-3	Fungicides
3	Paclobutrazole	50	0.139	76738-62-0	Plant Growth Regulator
4	Hexaconazole	50	0.139	79983-71-4	Fungicides
5	Pendimethalin	50	0.139	40487-42-1	Herbicides
6	Propiconazole	50	0.139	60207-90-1	Fungicides
7	Sodium-N-Methyl-N-Oleyl-Taurate	50	0.139	137-20-2	Surfactant
8	Diafenoconazole	50	0.139	119446-68-3	Fungicides
9	Diafenthiuron	50	0.139	80060-09-9	Insecticide
10	4-Hydroxyacetophenone & 2-Hydroxyacetophenone	50	0.139	99-93-4 582-24-1	Pesticide
11	4- Amino-6-Tert-Butyl-3-Mercapto-1, 2, 4-Triazin-5(4H)-One Triazinone	50	0.139	33509-43-2	Pesticide
12	2-Ethyl Hexyl Glyceryl Ether	150	0.417	70445-33-9	Cosmetic
13	1,2-Hexanediol	400	1.111	6920-22-5	Cosmetic
14	1,2-Octanediol	150	0.417	1117-86-8	Cosmetic
15	1,2-Dodecanediol	50	0.139	1119-87-5	Cosmetic
16	1,2-Decanediol	50	0.139	1119-86-4	Cosmetic
17	2-Cyanophenol	50	0.139	611-2-1	Intermediate for pesticide and synthetic organic chemicals
18	4-Cyanophenol	50	0.139	767-00-0	
19	Phenyl Glycidyl Ether	50	0.139	122-60-1	
20	O-Cresyl Glycidyl Ether	50	0.139	2210-79-9	
21	Butyl Glycidyl Ether	50	0.139	2426-08-6	
22	Poly Glycerol Glycidyl Ether	50	0.139	118549-88-5	
23	Poly Glycol Ethylene (PGE) Di Glycidyl Ether	50	0.139	72207-8-8	
24	Iso Propyl Alcohol (IPA) Glycidyl Glycidyl Ether	50	0.139	4016-14-2	
25	TMBPF	50	0.139	5384-21-4	
26	TMBPA	50	0.139	4073-98-7	
27	TMBP	50	0.139		
28	2,4- Dihydroxybenzophenone	50	0.139	131-56-6	
29	Benzophenone-3	50	0.139	131-57-7	
30	Benzophenone-4	50	0.139	4065-45-6	
31	Allyl Glycidyl Ether	50	0.139	203-442-4	
32	Bisphenol-F	50	0.139	620-92-8	
33	Bisphenol-S	50	0.139	80-09-1	
34	1,2-Pentanediol & 1,5-Pentanediol	50	0.139	5343-92-0 111-29-5	

Sr. No.	Name of Products	Manufacturing Quantity		CAS. No.	End Use
		MTPA	MTPD		
35	Propiophenone	50	0.139	93-55-0 96-22-0	
36	Pinacolone	50	0.139	75-97-8	
	TOTAL	**2350**	**6.528**		

3.4.1 Formulation of Pesticides

Formulation of pesticide or synthetic organic chemical does not require EC as per EIA notification. List of formulated products at proposed project is mentioned in following table.

Table 3-3 Formulation

Sr. No.	Description	Production Capacity (MTPA)
1	Surface Active Agents (Jeemol Brand)	1915
2	Various Agrochemicals formulation by mixing and blending process	7550
	A. WP (Wettable Powder)	
	B. EC (Emulsifialble Concentrate)	
	C. WDG (Water Dispersible Granule)	
	D. SC (Suspension Concentrate)	

3.5 Manufacturing Process

Manufacturing process of proposed project with process flow diagram, mass balance and chemical reactions are described as under,

3.5.1 METRIBUZIN

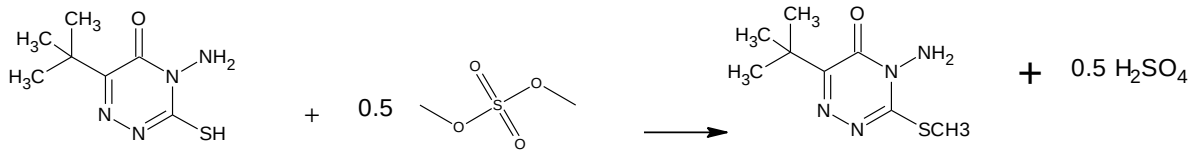
A. Manufacturing process for the preparation of Metribuzin

Metribuzin is manufactured by the reaction of 4- amino-6-tert butyl-3-mercapto-1,2,4-triazin-5 (4H)-one(Triazinone) with dimethyl sulfate (DMSO4) in presence of H2SO4 to give crude metribuzin. Finally neutralized reaction mass by using sodium carbonate followed by treating with 47% Caustic lye to give Metribuzin Technical = > 94%.

B. Material Balance for the preparation of Metribuzin/MT

Sr. No.	Input	Qty.(MT/MT)	Output	Qty.(MT/MT)	Remark
1	Triazinone	0.994	Metribuzin	1.000	Product
2	DMSO4	0.648	CO2	0.660	Gas (Scrubber)
3	H2SO4(catalyst)	1.267	Aqueous Effluent	13.875	ETP
4	Water	9.730	Ejector Water	0.800	Recycle
5	Na2CO3	1.600			
6	NaOH lye	1.296			
7	Ejector Water	0.800			
	Total	16.335	Total	16.335	

C. Chemical Reaction of Metribuzin Technical



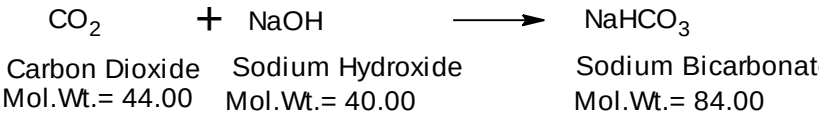
4-amino-6-tert-butyl-3-mercapto-1,2,4-triazin-5(4H)-one
Mol.wt.=200

Dimethyl sulfate
Mol.wt.=63

Metribuzin
Mol.wt.=214

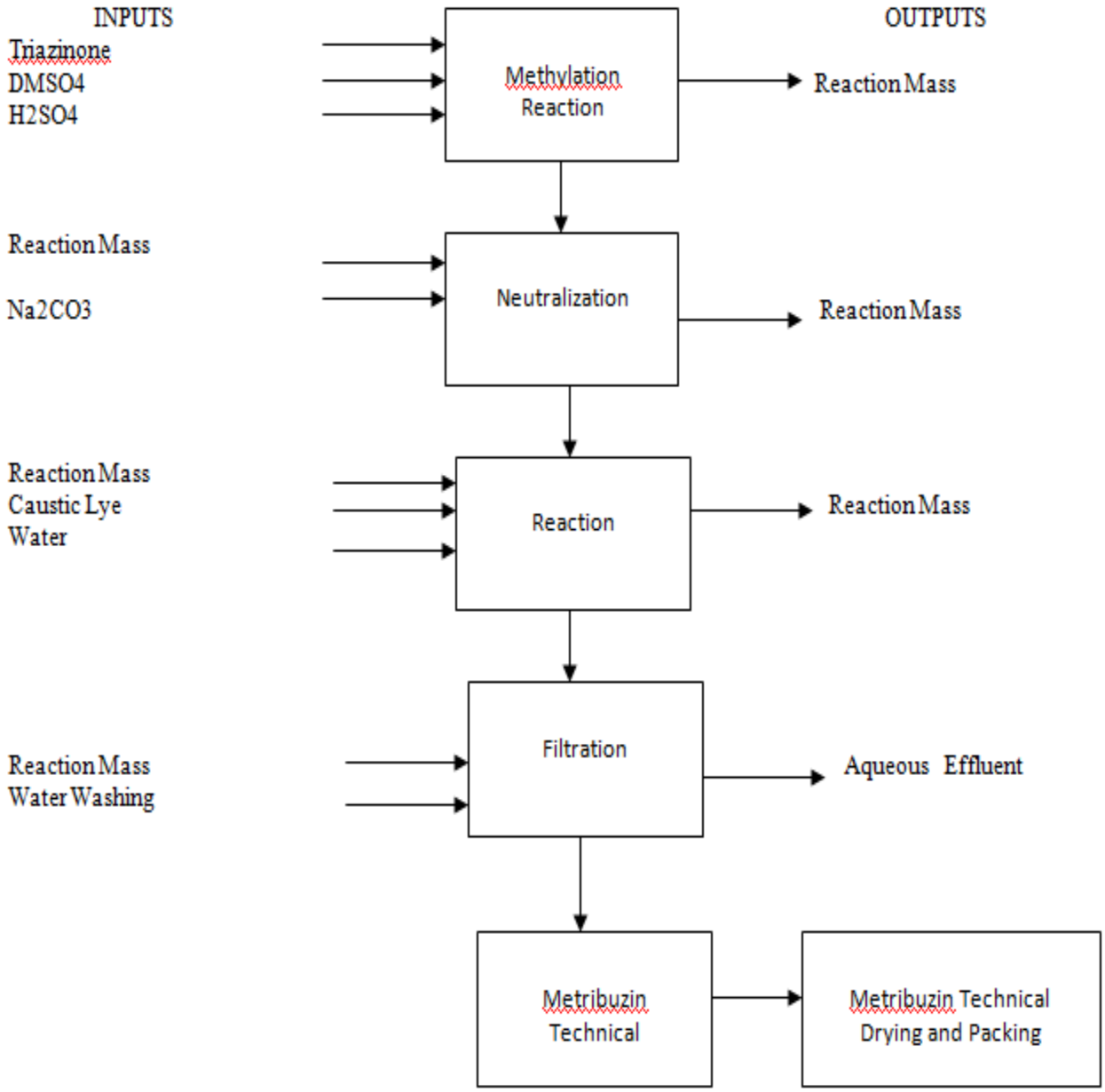
Sulphuric Acid
Mol.wt.=49

Scrubber



Sr.No.	Scrubber	Quantity(MT/MT)	Output Material	Quantity(MT/MT)	Remark
1	Carbon Dioxide	0.660	Sodium Bicarbonate (Aqueous Effluent)	12.577	ETP
2	Sodium Hydroxide	0.598			
3	Water for scrubber	11.319			
Total		12.577	Total	12.577	

D. Process Flow Diagram of Metribuzin Technical



3.5.2 TEBUCONAZOLE

A. Manufacturing process for the preparation of Tebuconazole

Step-I:

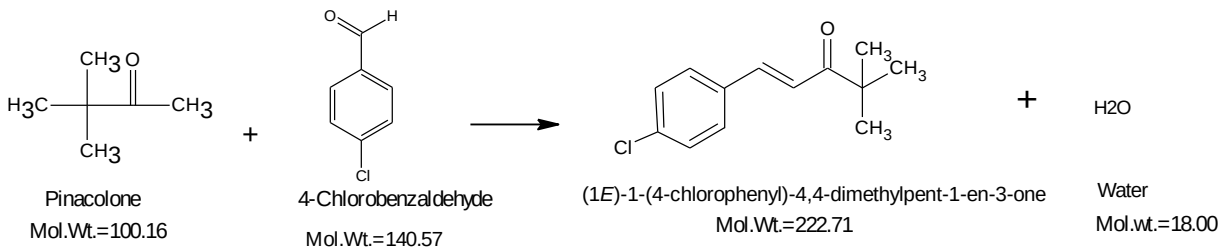
Process

Reaction of Pinacolone with 4-chlorobenzaldehyde in presence of sodium hydroxide and methanol solvent to give 1-(4-chlorophenyl)-4, 4-dimethyl-pent-1-en-3-one.

B. Material Balance :-

Sr. No.	INPUT	Quantity MT/ MT	OUTPUT	Quantity MT/MT	Remark
1	Pinacolone	0.451	Reaction Mass	1.683	Take as such for Next Reaction
2	4-Chlorobenzaldehyde	0.630			
3	Sodium Hydroxide	0.202			
4	Methanol	0.400			
Total Input		1.683	Total Outputs	1.683	

C. Reaction Scheme:-



Step-II

Process:-

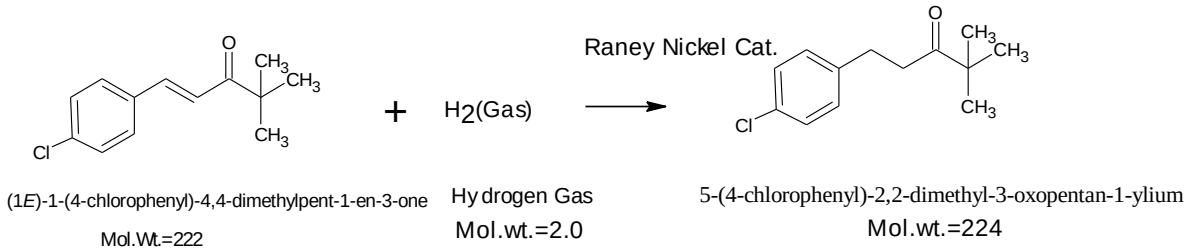
Reaction of 1-(4-chlorophenyl)-4, 4-dimethyl-pent-1-en-3-one with 5 to 10 Kg Hydrogen pressure under autoclave in presence of Raney Nickel Catalyst to give 5-(4-chlorophenyl)2,2-dimethyl-3-oxopentan-1-ylium(Pentanone)

Material Balance :-

Sr. No.	INPUT	Quantity MT/ MT	OUTPUT	Quantity MT/MT	Remark
1	1-(4-chlorophenyl) -4,4-dimethylpent-1-en-3-one (RM)	1.683	Reaction of 5-(4-chlorophenyl)2,2-dimethyl-3-oxopentan-1-ylium	0.860	Take as such in next reaction
2	Catalyst	0.010	Aqueous Effluent	1.433	ETP
3	Hydrogen Gas	0.010	Recovered Catalyst	0.010	Recycle

Sr. No.	INPUT	Quantity MT/ MT	OUTPUT	Quantity MT/MT	Remark
4	Water	1.000	Recovered Methanol	0.390	Recycle
5	Ejector Water	0.400	Ejector Water	0.410	Recycle
Total Input		3.103	Total Outputs	3.103	

Reaction Scheme:-



Step-III Process:

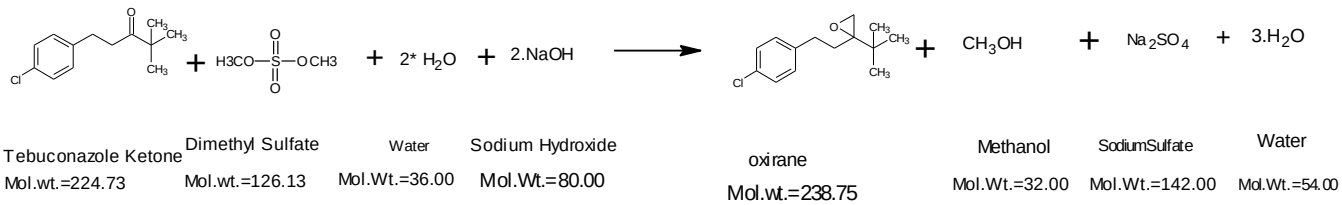
Preparation of 2-(tert-butyl)-2-(4-chlorophenylethyl) oxirane from Pentanone

Reaction of 5-(4-chlorophenyl) 2, 2-dimethyl-3-oxopentan-1-ylium with dimethyl sulfide and dimethyl sulfate in presence of potassium hydroxide to form oxirane.

Material Balance :

Sr.No.	INPUT	Quantity MT/ MT	OUTPUT	Quantity MT/MT	Remark
1	Reaction of 5-(4-chlorophenyl)2,2-dimethyl-3-oxopentan-1-ylium	0.860	2-(tert-butyl)-2-(4-chlorophenylethyl) oxirane	0.910	Take as such for next reaction
2	Dimethyl sulfide	1.420	Aq.Effluent	3.319	ETP
3	Dimethyl sulfate	0.715	Recovered Dimethyl Sulfide	1.390	Recycle
4	Water	2.200	Ejector Water	0.830	Recycle
5	SodiumHydroxide	0.454			
6	Ejector Water	0.800			
Total Input		6.449	Total Outputs	6.449	

Reaction Scheme



Step-IV Preparation of Tebuconazole from oxirane

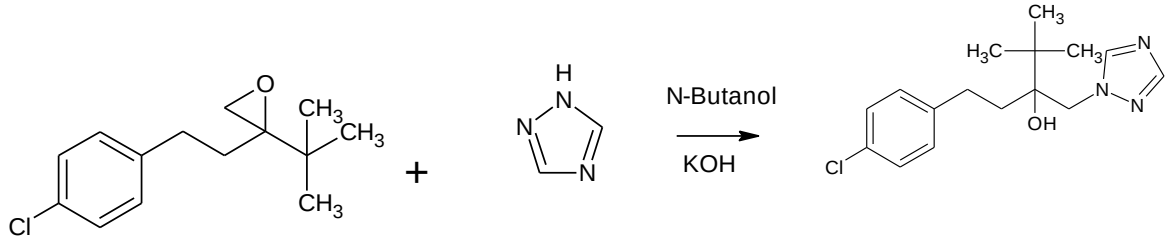
Process:-

Reaction of Oxirane intermidate with 1,2,4-triazole in presence of base by using a solvent like n-Butanol, to give Tebuconazole .Purification Carried out in presence of 2-Methylcyclohexane.

Material Balance:-

Sr. No.	INPUT	Quantity MT/ MT	OUTPUT	Quantity MT/MT	Remark
1	2-(tert-butyl)-2-(4-chlorophenylethyl) oxirane	0.910	Tebuconazole	1.000	Product
2	KOH	0.900	Recovered n-butanol	1.480	Recycle
3	n-Butanol	1.500	Recovered 2-Methyl Cyclohexane	1.570	Recycle
4	1,2,4-Triazole	0.278	Ejector Water	2.050	Recycle
5	Water	0.970	Aqueous Effluent	1.758	ETP
6	Ejector water	2.000	Organic Residue	0.300	Incineration
7	2-Methyl Cyclohexane	1.600			
Total Input		8.158	Total Outputs	8.158	

Reaction Scheme:-

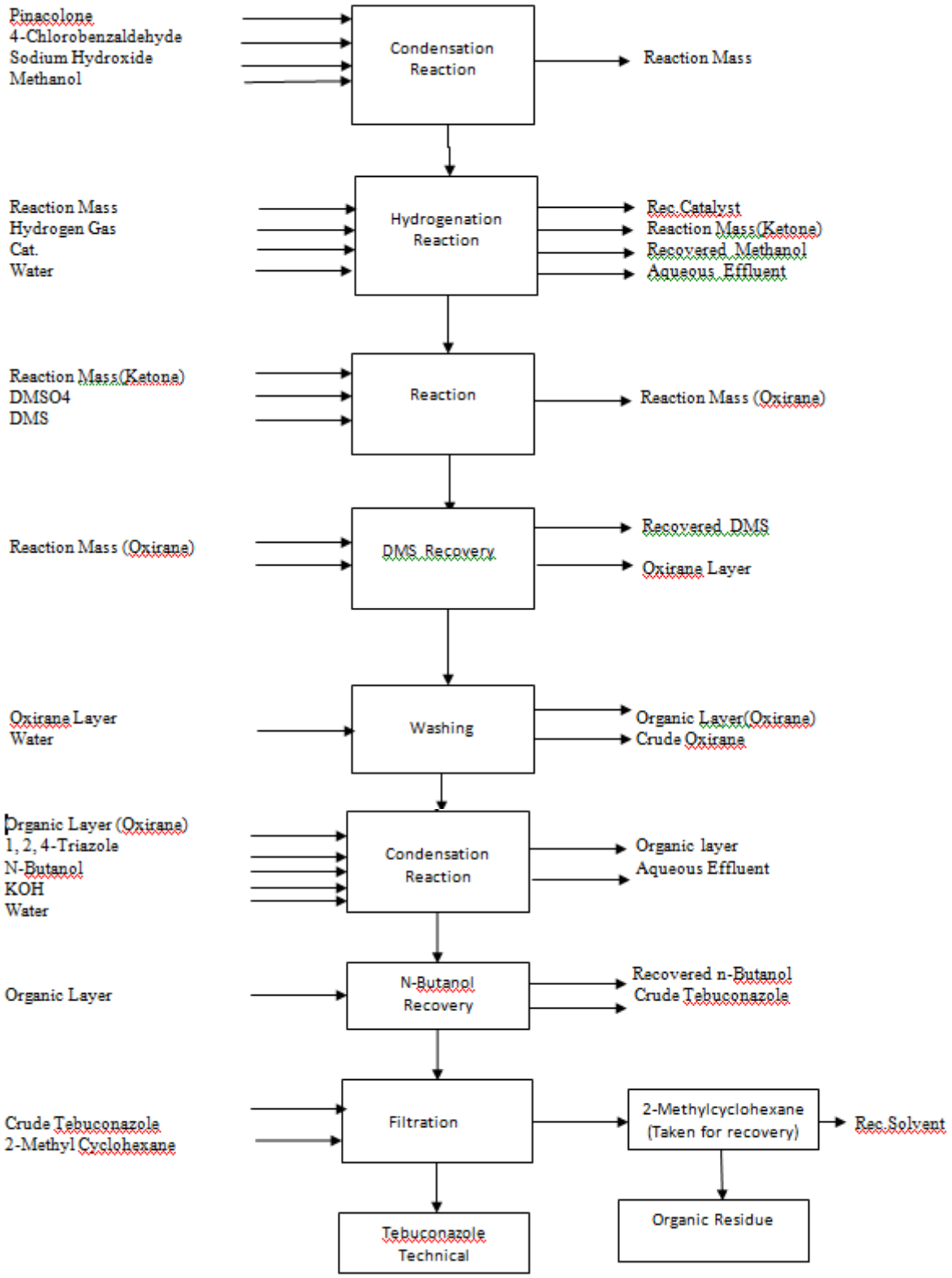


2-(tert-butyl)- 2 -(4 -chlorophenylethyl)oxirane
Molecular Weight :238.75

1H - 1,2,4 -Triazole
Molecular Weight :69.07

Tebuconazole
Molecular Weight :-307.82

D. Process Flow Diagram of Tebuconazole



3.5.3 Paclobutrazole

A. Manufacturing process for the preparation of Paclobutrazol

Step-I: -

Process:-Preparationof2-bromo-1-(4-chlorophenyl)-4, 4-dimethyl-pentan-3-one Reaction of 1-(4-chlorophenyl)-4, 4-dimethylpentan-3-one (Ketone) with bromine in presence of Dichloromethane used as a solvent at 12 to 40°c. After recovery of the solvent obtained a product 2-Bromo-1-(4-chlorophenyl)-4, 4-dimethyl pentane-3-one directly taken for next step.

B. Material Balance for the preparation of Bromo-Ketone

Sr.No.	INPUT	Quantity(MT/MT)	OUTPUT	Quantity(MT/MT)	Remark
1	Ketone	0.960	Hydrobromic Acid (48%)	0.670	Sale
2	Br2	0.675	Recovered MDC	5.750	Recycle
3	MDC	6.000	BromoKetone	1.293	Taken for next raction.
4	Ejector Water	1.000	Ejector Water	1.250	Recycle
5	Water for HBr Scrubbing	0.328			
Total		8.963	Total	8.963	

C. Reaction Mass:-

Step-II:-

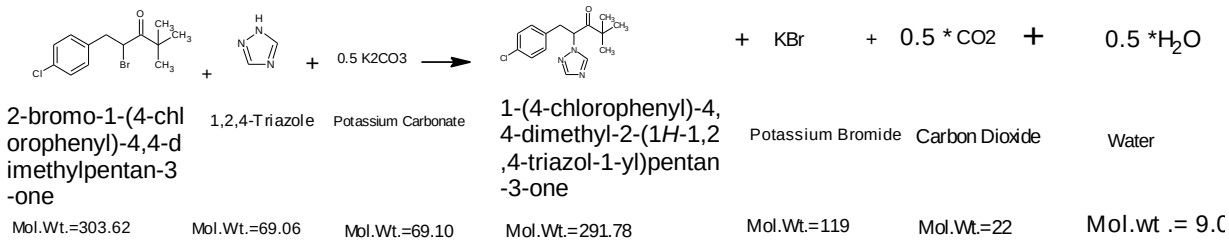
Process: Preparation of 1-(4-chlorophenyl)-4, 4-dimethyl-2-[1, 2, 4-triazol-1-yl-pentan-3-one

Reaction of 2-bromo-1-(4-chlorophenyl)-4, 4-dimethylpentan-3-one (Bromo Ketone) with 1, 2, 4-Triazol in presence of Methanol and as solvent at 25 to 30 °c. After completion of reaction reaction mass taken as such for next reaction without any workup.

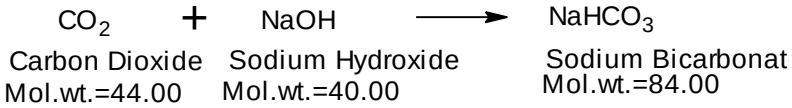
Material Balance:-

Sr.No.	INPUT	Quantity(MT/MT)	OUTPUT	Quantity(MT/MT)	Remark
1	Bromo Ketone	1.293	Paclo Ketone (Reaction Mass)	3.176	Take as such for next reaction
2	1,2,4-Triazol	0.285	CO2	0.139	Gas (Scrubber)
3	Potassium Carbonate	0.437			
4	Methanol	1.300			
Total		3.315	Total	3.315	

Reaction Scheme:-



Scrubber



Sr.No.	Raw Material	Quantity(MT/MT)	Output Material	Quantity(MT/MT)	Remark
1	Carbon Dioxide	0.139	Sodium Bicarbonate (Aqueous Effluent)	2.653	ETP
2	Sodium Hydroxide	0.126			
3	Water for scrubber	2.388			
Total		2.653	Total	2.653	

Step-III:-Preparation of Paclobutrazol

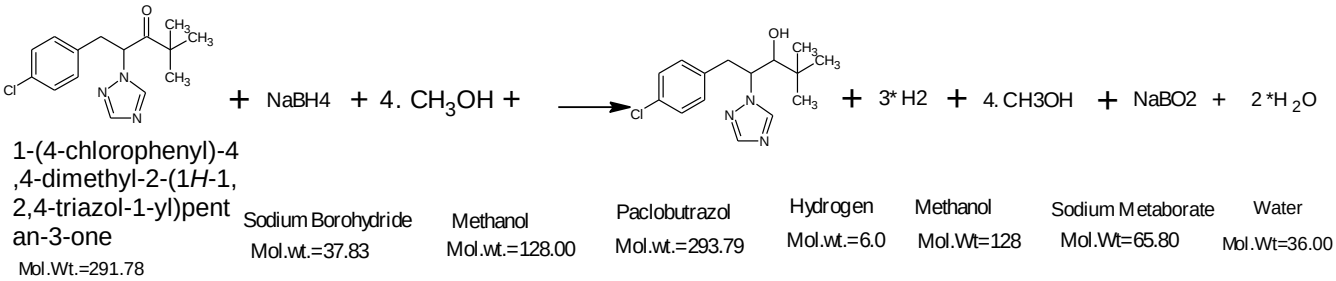
Process:-

Step-II Reaction mass treated with sodium borohydride at 10 to 30°c.After completion of reaction mass filter and washed with methanol and water simultaneously .After drying to get title compound Paclobutrazol.

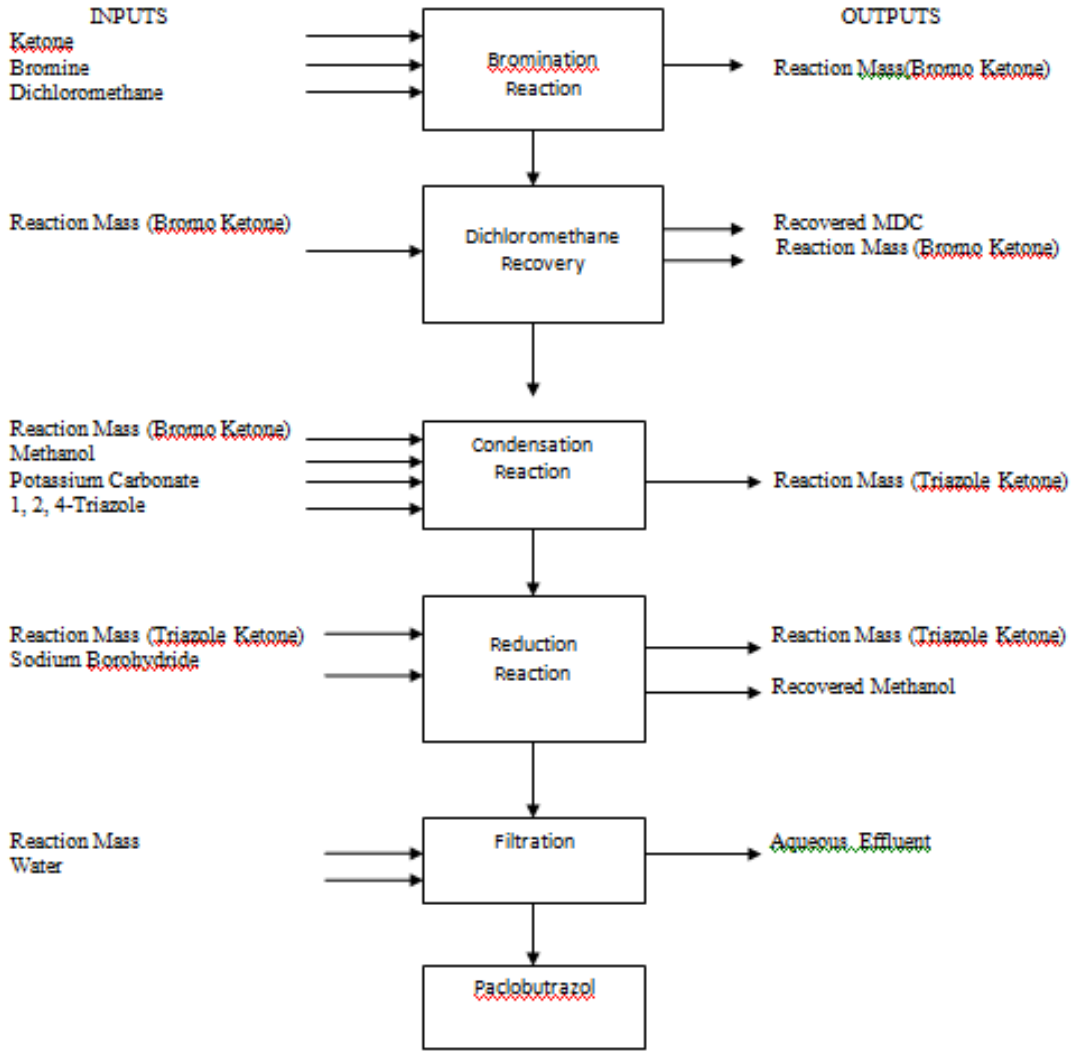
Material Balance:-

Sr.No.	INPUT	Quantity(MT/MT)	OUTPUT	Quantity(MT/MT)	Remark
1	Triazole Ketone (Rea.Mass)	3.176	Paclobutrazole	1.000	Product
2	Sodium Borohydride	0.155	Recovered Methanol	1.235	Recycle
3	Water	1.200	Aqueous Effluent	2.196	ETP
4	Ejector Water	1.000	Ejector Water	1.100	Recycle
Total		5.531		5.531	

Reaction Scheme:-



D. Process Flow Diagram of Paclobutrazol



3.5.4 Hexaconazole

A. Manufacturing process for the preparation of Hexaconazole

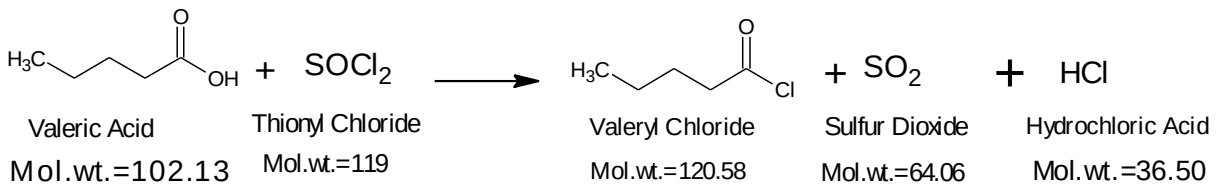
Step-I

Process:- Valeric acid reacted with thionyl chloride to give valeryl chloride.

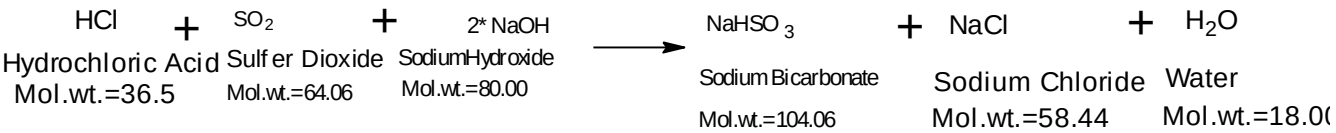
B. Material Balance:-

Sr. No.	INPUT	Qty MT/MT	OUTPUT	Qty MT/MT	Remark
1	Valeric acid	0.435	HClgas	0.155	Sale(Scrubber)
2	Thionyl chloride	0.538	Valeryl Chloride	0.544	Taken for next reaction
			SO2	0.274	Gas (Scrubber)
	Total Inputs	0.973	Total Outputs	0.973	

C. Reaction Scheme:-



Scrubber



Material Balance :-

Sr.No.	INPUT	Qty MT/MT	OUTPUT	Qty MT/MT	Remark
1	SO2	0.274	Sodium Bicarbonate and sodium chloride solution (Aqueous Effluent)	4.901	ETP
2	HCl	0.155			
3	SodiumHydroxide	0.172			
4	Scrubber Water	4.300			
	Total Inputs	4.901	Total Outputs	4.901	

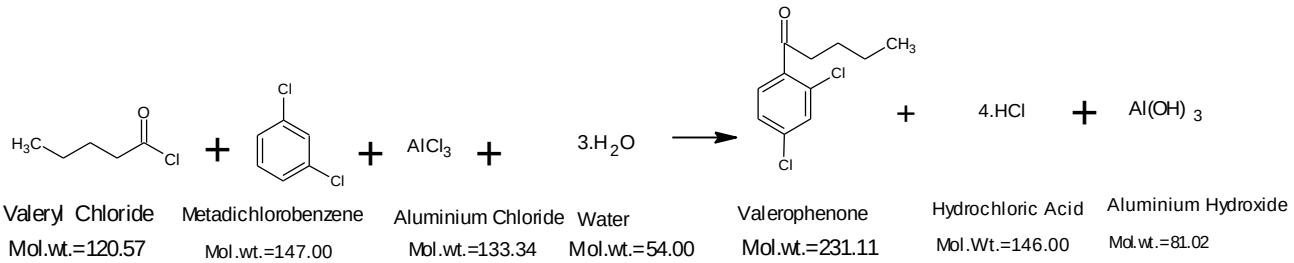
Step-II

Process:- Valeryl chloride reacted with metadichlorobenzene in the presence of aluminum chloride to give valerophenone.

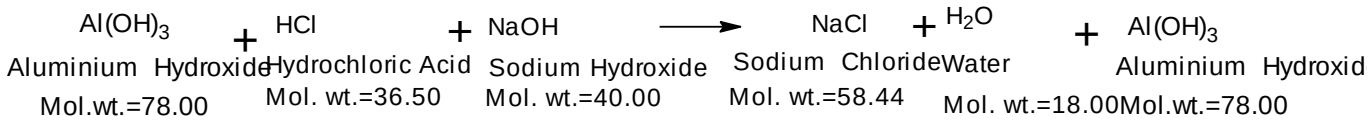
Material Balance:-

Sr. No.	INPUT	Qty MT/MT	OUTPUT	Qty MT/MT	Remark
1	Valeryl Chloride	0.544	Valerophenone Rea.Mass	1.000	Taken as such in next reaction
2	MDCB	0.667	Recovered Dichloroethane	1.092	Recycle
3	Aluminium Chloride	0.602	Ejector Water	1.700	Recycle
4	Dichloroethane	1.150	HCl Gas	0.164	Caustic Scrubber
5	Water	2.500	Aqueous Effluent	3.649	ETP
6	SodiumHydroxide	0.542			
7	Ejector Water	1.600			
	Total Inputs	7.605	Total Outputs	7.605	

Reaction Scheme:-



Scrubber



Material Balance:-

Sr.No.	INPUT	Qty MT/MT	OUTPUT	Qty MT/MT	Remark
1	HCl	0.164	Aqueous Effluent	1.044	ETP
2	Sodium Hydroxide	0.180			
3	Water	0.700			
	Total Inputs	1.044	Total Outputs	1.044	

Step-III

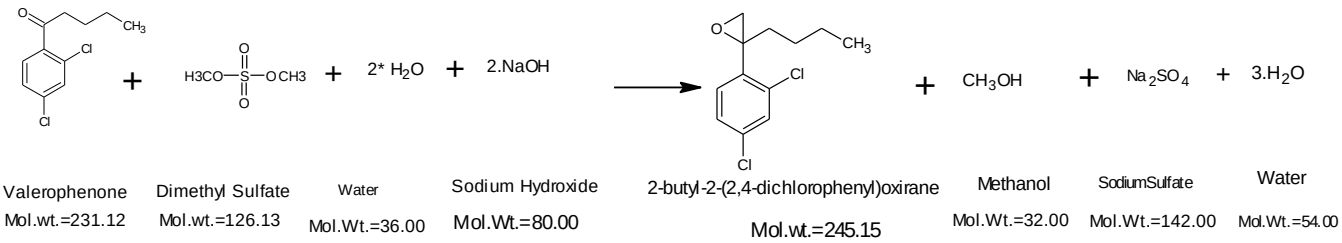
Process:

Valerophenone reacted with Dimethyl Sulfide, Dimethyl sulfate and base potassium hydroxide to give oxirane.

Material Balance:-

Sr.No.	INPUT	Qty MT/MT	OUTPUT	Qty MT/MT	Remark
1	Valerophenone	1.000	Oxirane	1.050	Taken as such for next reaction
2	DMS	1.357	Recovered DMS	1.289	Recycle
3	DMSO4	0.545	Aqueous Effluent	3.293	Aqueous Effluent
5	Sodium Hydroxide	0.346			
6	Water	2.384			
	Total Inputs	5.632	Total Outputs	5.632	

Chemical Reaction



Step-IV

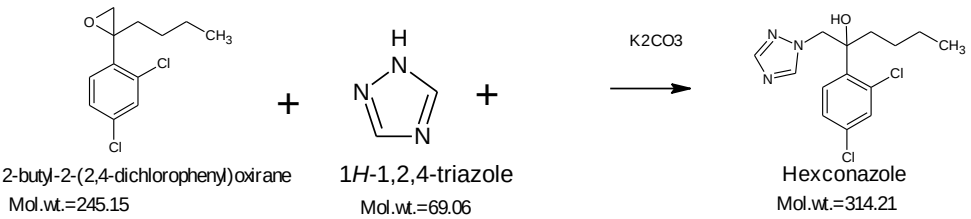
Process:-

Oxirane condensed with 1, 2, 4-Triazole in presence of potassium carbonate and using DMF as a solvent to give Hexaconazole.

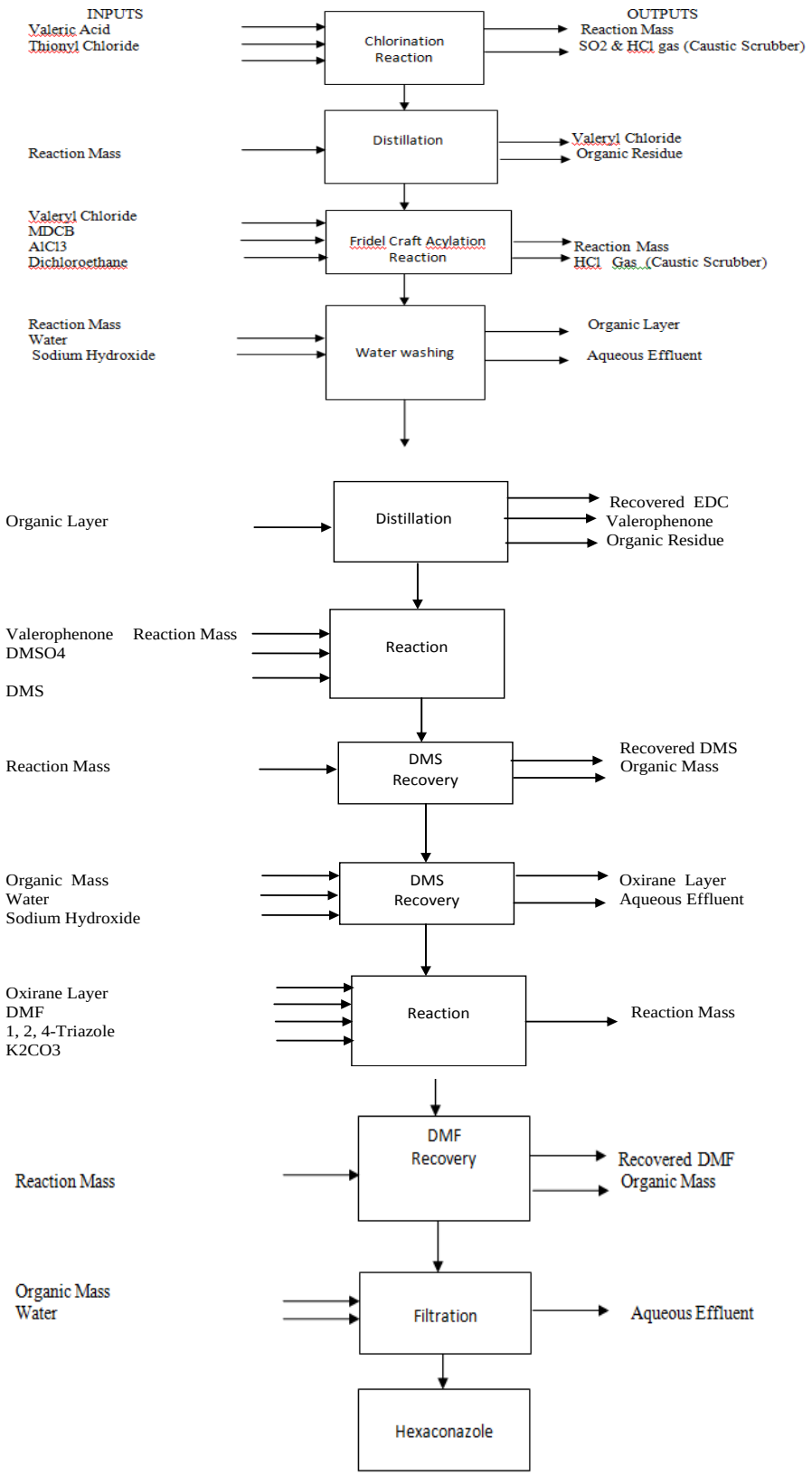
Material Balance:

Sr. No.	INPUT	Qty MT/MT	OUTPUT	Qty MT/MT	Remark
1	Oxirane	1.050	Hexaconazole	1.000	Product
2	DMF	4.155	Recovered DMF	4.000	Recycle
3	1,2,4- Triazol	0.305	Aqueous Effluent	1.215	ETP
4	K2CO3	0.105	Organic Residue	0.400	Incineration
5	Water	1.000			
	Total Inputs	6.615	Total Outputs	6.615	

Chemical Reaction :-



D. Process Flow Diagram of Hexaconazole



3.5.5 Pendimethalein

A. Manufacturing process for the preparation of Pendimethalein

Step-I (Hydrogenation)

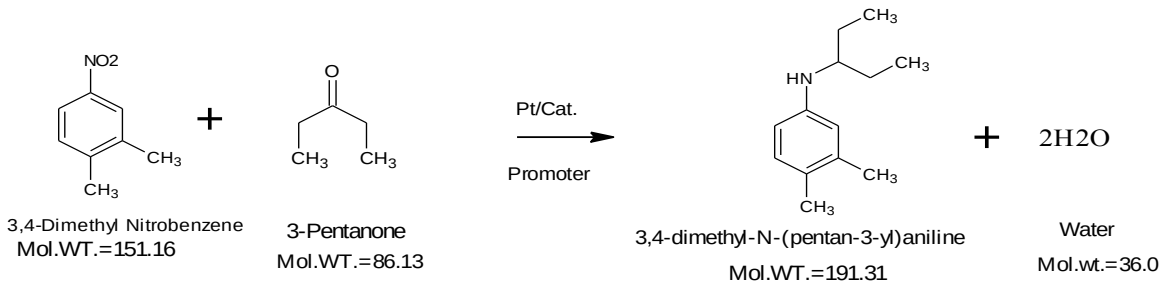
Process:-

Reaction of 4-Nitro-o-xylene with diethyl ketone in presence of Pt/Cat. & promoter at 4 to5 Kg hydrogen pressure in autoclave at 70 to 75°c to give 3, 4-Dimethyl-4-N-(pentan-3-yl)aniline (NAX).After completion of reaction recovered excess Diethyl ketone and resulting concentrate of NAX used as such for next reaction.

B. Material Balance:-

Sr.No.	INPUT	Quantity MT/MT	OUTPUT	Quantity MT/MT	Remark
1	4- Nitro-O-xylene	0.575	Recovered Catalyst	0.010	Recycle
2	Diethyl ketone	0.825	Aqueous Effluent	0.211	ETP
3	Catalyst	0.010	Recovered DEK	0.497	Recycle
4	Promoter	0.003	Step-I	0.727	Taken as such for next reaction
5	Hydrogen gas	0.032			
	Total Inputs	1.445	Total Outputs	1.445	

C. Reaction Scheme



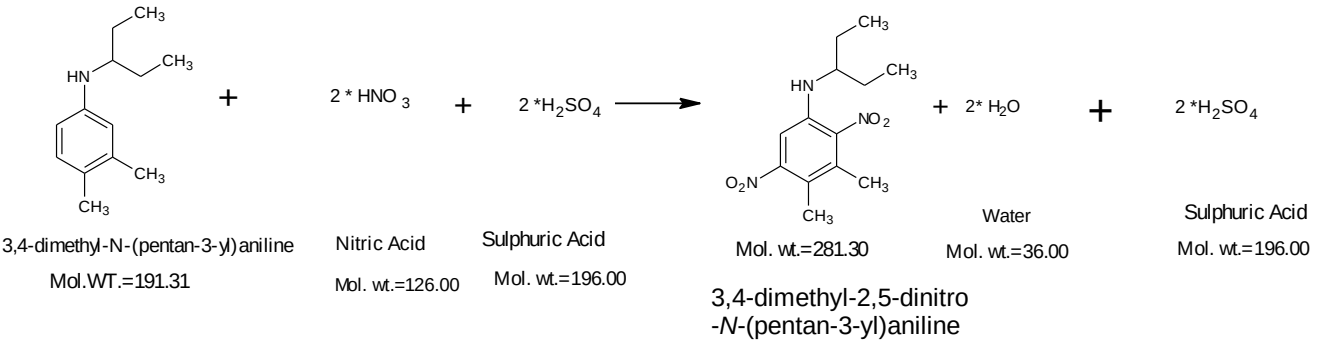
Step-II (Nitration) Process:-

First prepared mixture of Sulphuric acid, nitric acid and water .To this solution charge NAX solution which prepared inDichloroethane.Maintained reaction at 40°c .After completion of reaction remove spent acid from bottom side .Given water wash to remove adsorbed spent acid in organic layer .Organic layer taken as such for next reaction .

Material Balance:-

Sr. No.	INPUT	Quantity MT/MT	OUTPUT	Quantity MT/MT	Remark
1	3,4-dimethyl-*N*-(pentan-3-yl)aniline	0.727	3,4-dimethyl-2,5-dinitro-*N*-(pentan-3-yl)aniline	1.200	Taken as such for next reaction
2	Nitric acid	0.980	Spent Acid	0.700	ETP
3	Sulfuric acid	0.689	Aqueous Effluent	2.316	ETP
4	Water	1.300	Recovered EDC	1.580	Recycle
5	EDC	1.650	Ejector Water	2.100	Recycle
6	HCl	0.550			
7	Ejector Water	2.000			
	Total Inputs	7.896	Total Outputs	7.896	

Reaction Scheme:

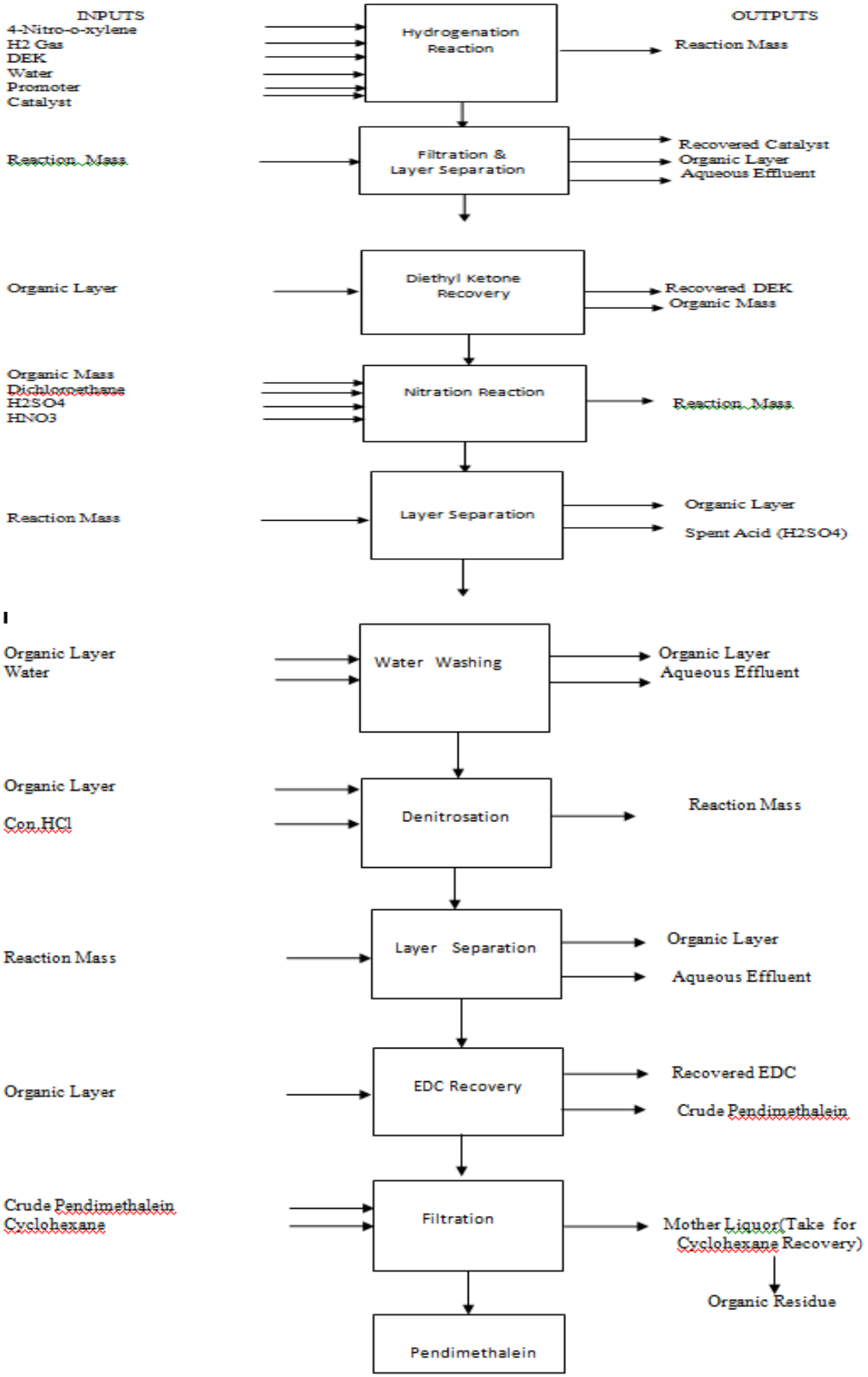


Step-III (Purification)

Crystallized Pendimethalein inCyclohexane to obtain Pendimethalein Technical

Sr. No.	INPUT	Quantity MT/MT	OUTPUT	Quantity MT/MT	Remark
1	Crude Pendimethalein	1.200	Pendimethalein	1.000	Product
2	Cyclohexane	1.450	Recovered Cyclohexane	1.392	Recycle
			Organic Residue	0.258	Incineration
		2.650	Total Outputs	2.650	

D. Process Flow Diagram for the preparation of Pendimethalein



3.5.6 PROPICONAZOLE

A. Manufacturing process for the preparation of Propiconazole

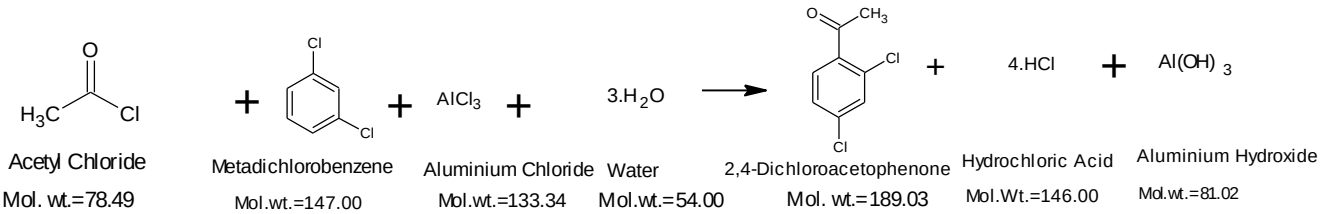
Step-I

Process:- Metadichlorobenzene (MDCB) reacted with acetyl chloride in presence of Aluminum chloride at 15 to 75°c.After completion of reaction , reaction mass quenched in water.Separeted organic layer and taken for MDCB recovery .Resulting concentrate distilled under vacuum to get 2,4-Dichloroacetophenone.

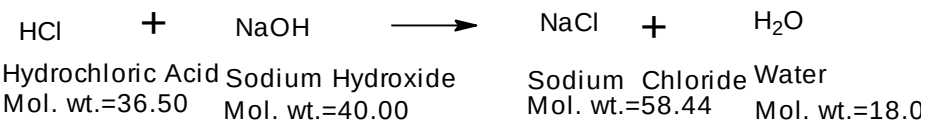
B. Material Balance:-

Sr. No.	INPUT	Qty MT/MT	OUTPUT	Qty MT/MT	Remark
1	Acetyl Chloride	0.392	2,4-Dichloroacetophenone	0.896	Taken as such in next reaction
2	MDCB	1.406	Recovered MDCB	0.650	Recycle
3	Aluminum Chloride	0.845	Aqueous Effluent	3.795	ETP
4	Water	2.300	Ejector Water	1.020	Recycle
5	Ejector Water	1.000	HCl Gas	0.182	Caustic Scrubber
6	SodiumHydroxide	0.600			
7					
	Total Inputs	6.543	Total Outputs	6.543	

C. Chemical Reaction:-



Scrubber



Material Balance:-

Sr.No.	INPUT	Qty MT/MT	OUTPUT	Qty MT/MT	Remark
1	HCl	0.182	Aqueous Effluent	1.262	ETP
2	Sodium Hydroxide	0.200			
3	Water	0.880			
	Total Inputs	1.262	Total Outputs	1.262	

Step-II

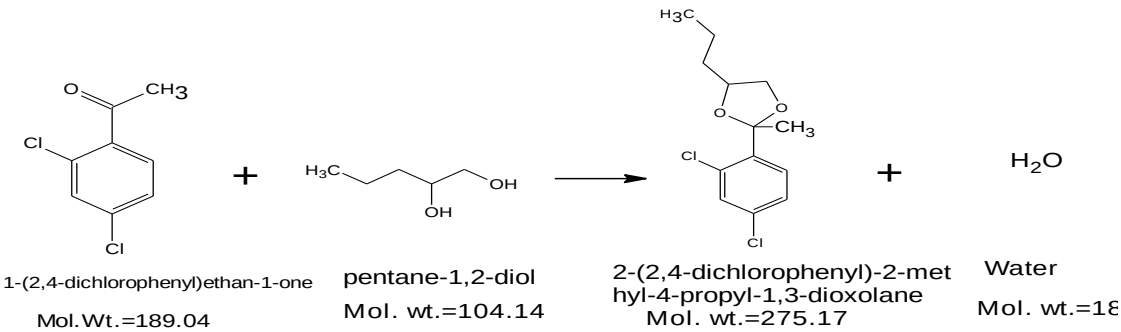
Process:-

1-(2,4-dichlorophenyl)ethanone reacted with 1,2-pentanediol in presence of PTSA by using Toluene as solvent .Water formed in reaction removed azeotropically by dean and stark Apparatus. After completion of reaction recovered Toluene. Resulting concentrate 2-(2, 4-dichlorophenyl)-2-methyl-4-propyl-1, 3-dioxolane (Ketal).

Material Balance:-

Sr.No.	Input	Qty. MT/MT	Output	Qty. MT/MT	Remark
1	2,4-Dichloroacetophenone	0.896	Ketal	1.329	Taken as such for next reaction
2	1,2-Pentanediol	0.550	Recovered Toluene	1.372	Recycle
3	P-Toluene Sulphonic Acid	0.010	Ejector Water	1.060	Recycle
4	Toluene	1.400	Recovered Water	0.095	Recycle
5	Ejector Water	1.000			
	Total	3.856	Total	3.856	

Reaction Scheme:-



Step-III

Process:-

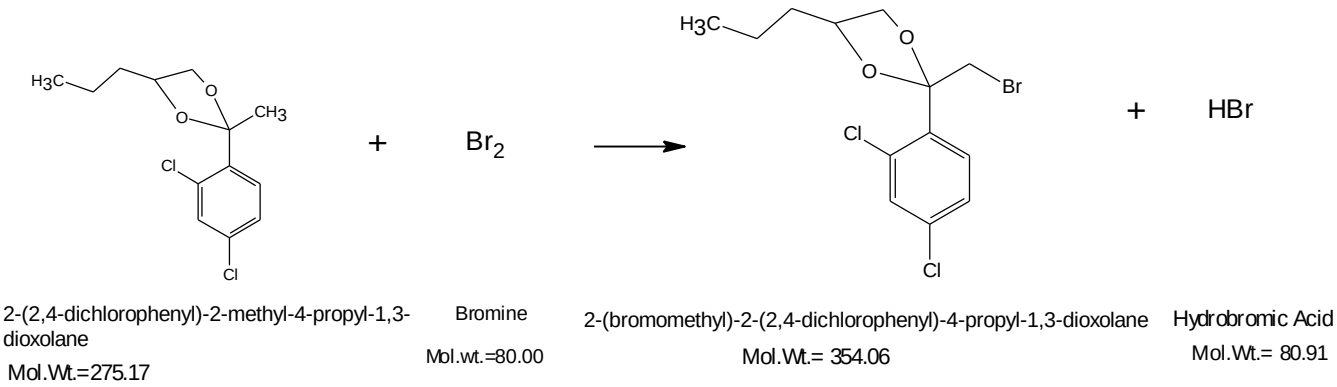
Bromination of 2-(2, 4-dichlorophenyl)-2-methyl-4-propyl-1, 3-dioxolane by using bromine in presence of Dichloroethane solvent .After completion of reaction ,reaction mass quenched in water. After completion of reaction recovered Dichloromethane. Resulting 2-(bromomethyl)-2-(2, 4-dichlorophenyl)-4-propyl-1, 3-dioxolane (Bromo-Ketal) taken as such for next reaction.

Material Balance:-

Sr.No.	Input	Qty MT/MT	Output	Qty MT/MT	Remark
1	Ketal	1.329	Bromo-Ketal	1.118	Taken as such for next reaction
2	Dichloroethane	1.500	Recovered Dichloroethane	1.455	Recycle
3	Bromine	0.698	48% HBr Solution	1.886	Sale

Sr.No.	Input	Qty MT/MT	Output	Qty MT/MT	Remark
4	Water for Scrubber	0.942	Ejector Water	1.010	Recycle
5	Ejector Water	1.000			
	Total Input	5.469	Total Output	5.469	

Reaction Scheme:-



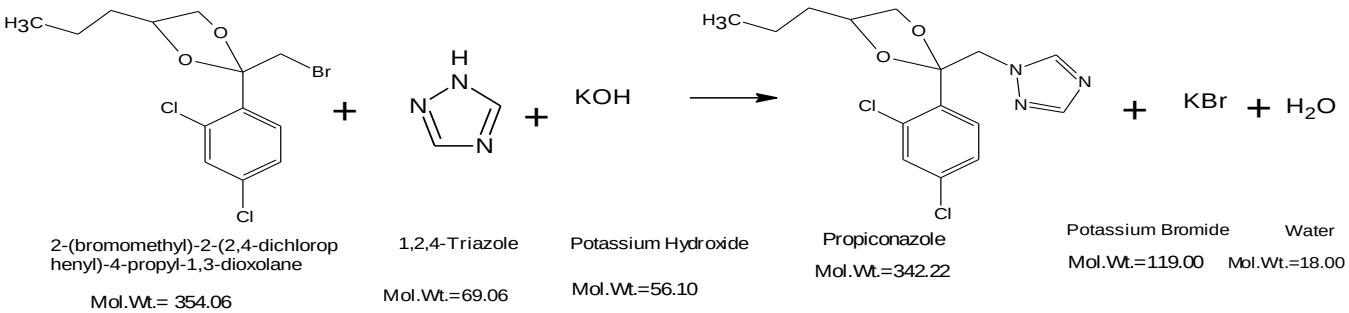
Step-IV

Process:- Reaction of 2-(bromomethyl)-2-(2, 4-dichlorophenyl)-4-propyl-1, 3-dioxolane (Bromo-Ketal) with 1, 2, 4-Triazole and n, n-Dimethyl formamide solvent in presence of potassium Hydroxide at 150 to 180 °c.After completion of reaction recovered DMF under vacuum. Final propiconazole distilled under vacuum to get Pure Propiconazole.

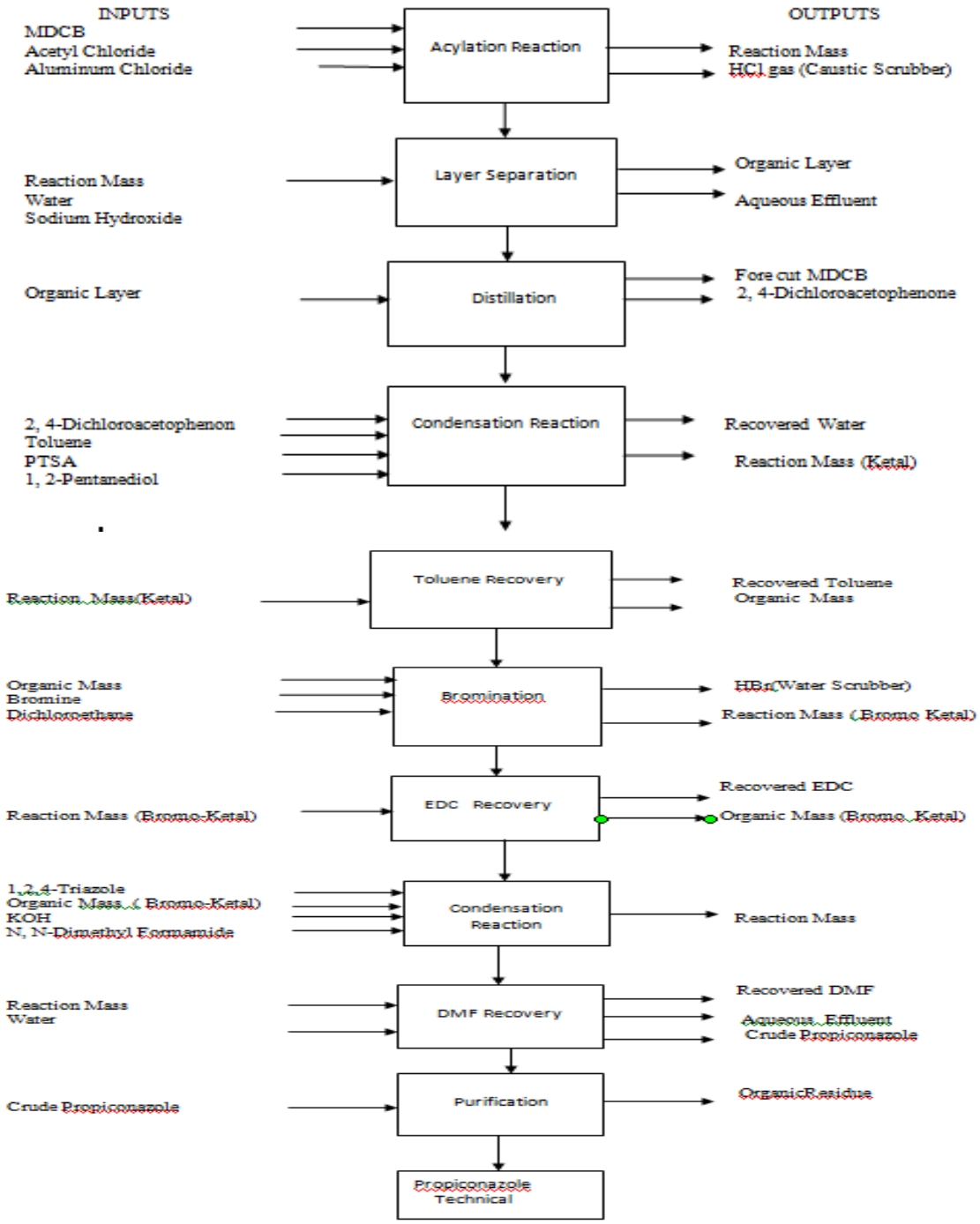
Material Balance:-

Sr. No.	Input	Qty. MT/MT	Output	Qty. MT/MT	Remark
1	Bromo-Ketal	1.118	Propiconazole	1.000	Product
2	1,2,4-Triazole	0.520	Recovered DMF	1.150	Recycle
3	Potassium Hydroxide	0.440	Ejector Water	0.860	Recycle
4	N,N-Dimethyl formamide	1.210	Aqueous Effluent	2.008	ETP
5	Water	1.210	Organic Residue	0.280	Incineration
6	Ejector Water	0.800			
	Total	5.298	Total	5.298	

Chemical Reaction



D. Process Flow Diagram for the preparation of Propiconazole



3.5.7 Sodium-N-Methyl-N-Oleyl Taurate

A. Manufacturing process for the preparation of Sodium-N-Methyl-N-Oleyl Taurate

Step-I

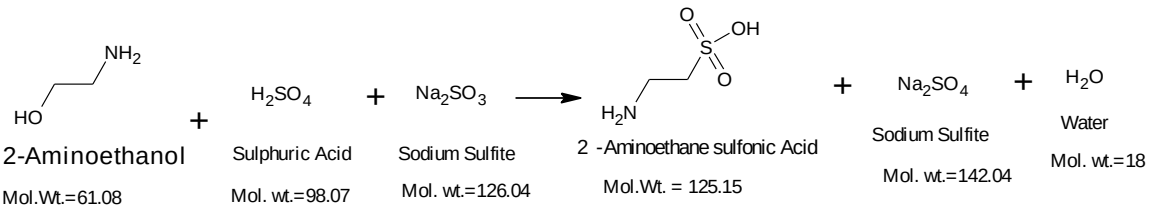
Process:

2-aminoethanol treated with sulphuric acid and Sodium sulfite to give Taurine.

B. Material Balance:-

Sr. No.	Input	Qty. MT/MT	Output	Qty. MT/MT	Remark
1	2-aminoethanol	0.220	Taurine Reac.Mass	1.032	Taken as such for next reaction.
2	Sulphuric Acid	0.352			
3	Sodium Sulfite	0.230			
4	Water	0.230			
	Total	1.032	Total	1.032	

C. Reaction Scheme:-



Step-II:-

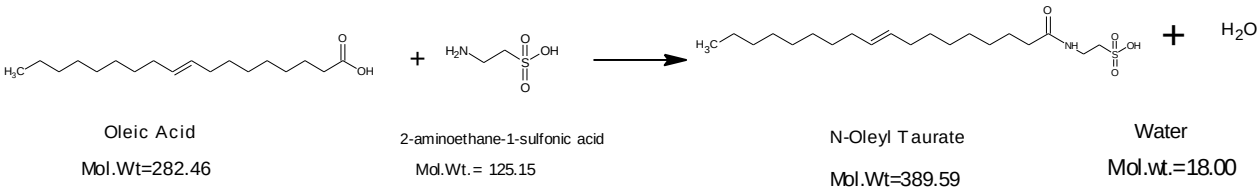
Process:-

Oleic acid treated with Taurine at 190 to 200 °c for 4 hours to give N-Oleyl Taurate.N-Oleyl taurate treated with sodium hydroxide to give Sodium-N-Oleyl Taurate.

Material Balance:-

Sr. No.	Input	Qty. MT/MT	Output	Qty. MT/MT	Remark
1	Taurine	1.032	Sodium -N-Oleyl Taurate	1.941	Taken as such for next reaction
2	Oleic Acid	0.909			
	Total	1.941	Total	1.941	

Chemical Reaction



Step-III

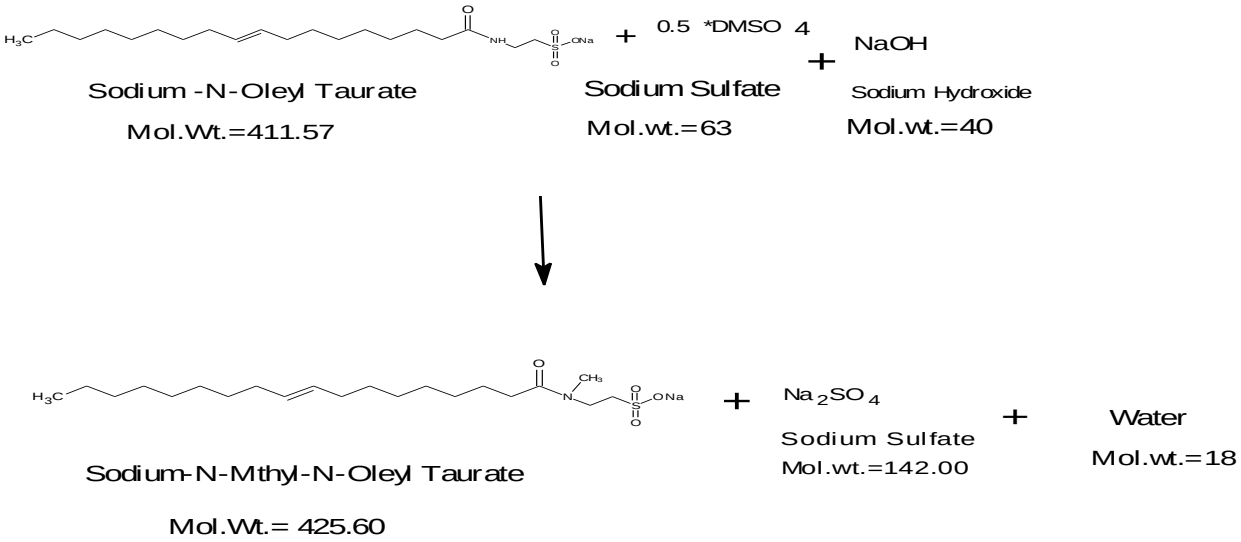
Process:-

Sodium-N-Oleyl Taurate methylated by usuing Dimethyl sulfate at 30 °c to give Sodium-N-methyl-N-Oleyl Taurate .

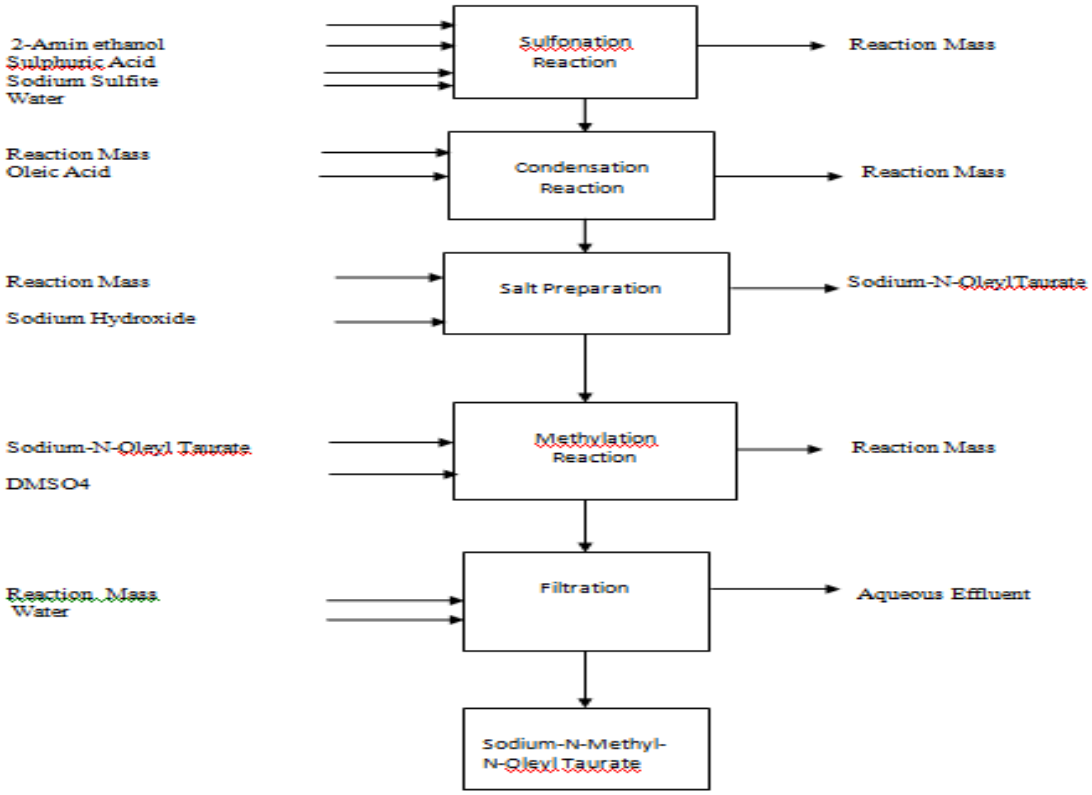
Material Balance:-

Sr. No.	Input	Qty. MT/MT	Output	Qty. MT/MT	Remark
1	Reaction Mass	1.941	Sodium N-Methyl-N-Oleyl Taurate	1.000	Product
2	Sodium Hydroxide	0.150	Aqueous effluent	2.321	ETP
3	Dimethyl Sulfate	0.230			
4	Water	1.000			
	Total	3.321	Total	3.321	

Chemical Reaction :-



D. Process Flow Diagram for the preparation of Sodium-N-Methyl-N-Oleyl Taurate



3.5.8 Diafenoconazole

A. Manufacturing process for the preparation of Diafenoconazole

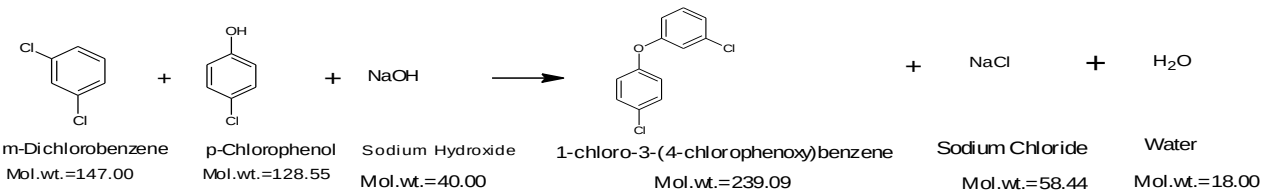
Step-I

Process: - Reaction of MDCB with phenol in presence of sodium hydroxide to form 1-chloro-3-(4-chlorophenoxy) benzene.

B. Material Balance:-

Sr. No.	INPUT	Qty. MT/MT	OUTPUT	Qty. MT/MT	Remark
1	MDCB	6.000	1-chloro-3-(4-chlorophenoxy)benzene	0.919	Taken as such for next reaction
2	4-Chlorophenol	0.580	Recovered MDCB	5.210	Recycle
3	Sodium Hydroxide	0.181	Ejector Water	1.139	Recycle
4	Water	0.791	Aqueous Effluent	1.294	ETP
5	Ejector Water	1.000			
	Total Input	8.552	Total Output	8.552	

C. Reaction Scheme:-



Step-II

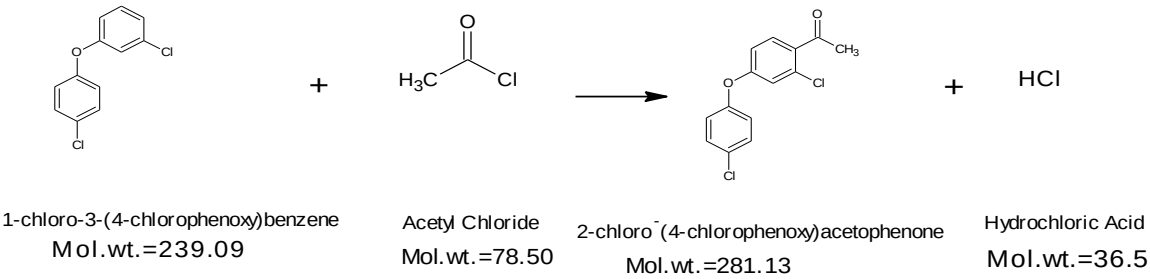
Process:

Reaction of 1-chloro-3-(4-chlorophenoxy) benzene with acetyl chloride in presence of aluminum chloride and Dichloroethane solvent to give 1-[2-chloro-4-(4-chlorophenoxy) phenyl] ethane-1-one (Ketone)

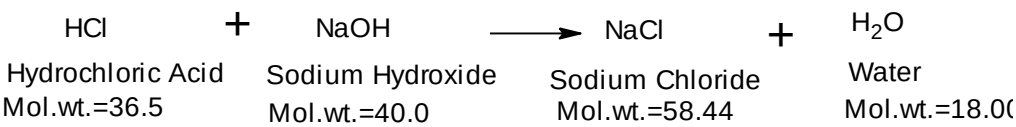
Material Balance:-

Sr. No.	INPUT	Qty. MT/MT	OUTPUT	Qty. MT/MT	Remark
1	1-chloro-3-(4-chlorophenoxy)benzene	0.919	2-chloro-4-(4-chlorophenoxy) benzoyl chloride	0.975	Taken as such for next reaction
2	Dichloroethane	0.919	Recovered EDC	0.900	Recycle
3	Acetyl chloride	0.285	Ejector Water	1.015	Recycle
4	Ejector Water	1.000	Hydrochloric Gas	0.133	Caustic Scrubber
5	Water	2.000	Aqueous Effluent	2.100	ETP
		5.123		5.123	

Reaction Scheme:-



Scrubber



Sr. No.	INPUT	Qty. MT/MT	OUTPUT	Qty. MT/MT	Remark
1	HCl	0.133	Aqueous Effluent	0.918	ETP
2	Sodium Hydroxide	0.145			
3	Water	0.640			
	Total Input	0.918	Total Output	0.918	

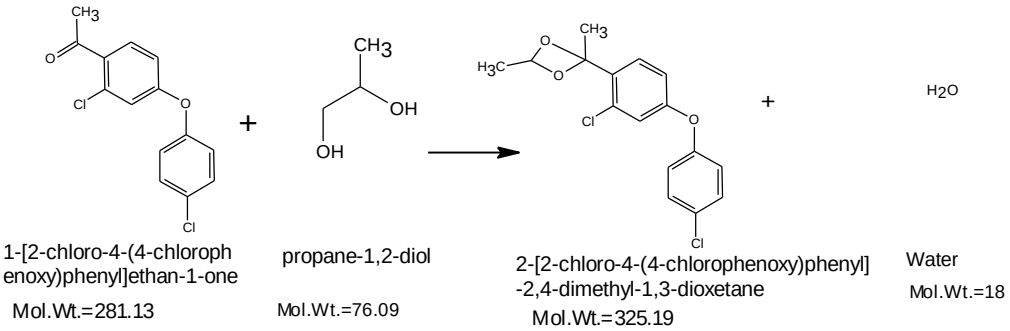
Step-III

Process:-Reaction of 1-[2-chloro-4-(4-chlorophenoxy) phenyl] ethane-1-one with 1.2-propanediol in presence of Toluene solvent and remove water azeotropically to form 2-[2-chloro-4-(4-chlorophenoxy) phenyl]-2, 4-dimethyl-1, 3-dioxetan (Ketal).

Material Balance:-

Sr.No.	INPUT	Qty. MT/MT	OUTPUT	Qty. MT/MT	Remark
1	2-chloro-4(4-chlorophenoxy) acetophenone	0.975	Ketal	1.120	Taken as such for next reaction
2	Toluene	1.000	Recovered Toluene	0.980	Recycle
4	1,2-propanediol	0.225	Ejector Water	1.020	Recycle
5	Ejector Water	1.000	Recovered Water	0.100	Recycle
	Total Input	3.220	Total Output	3.220	

c. **Chemical Reaction**



Step-IV

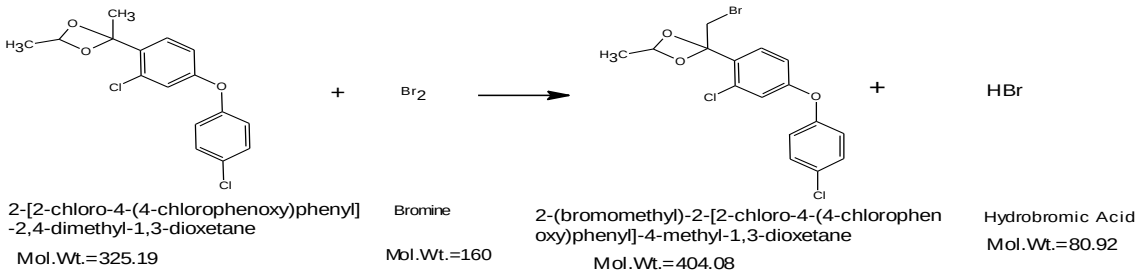
Process:-

Reaction of Ketalwith bromine in presence of Dichloroethane solvent to give the 2-(bromomrthyl)-2-[2-chloro-4-(4-chlorophenoxy) phenyl]-4-dimethyl-1, 3-dioxetan (Bromo Ketal).

Material Balance-

Sr. No.	INPUT	Qty. MT/MT	OUTPUT	Qty. MT/MT	Remark
1	Ketal	1.120	Bromo-Ketal	1.392	Taken as such for next reaction
2	Bromine	0.572	Recovered Dichloroethane	1.092	Recycle
4	Dichloroethane	1.120	Ejector Water	1.028	Recycle
5	Ejector Water	1.000	48% HBr Solution	0.600	Sale
6	Water for scrubbing	0.300			
	Total Input	4.112	Total Output	4.112	

Chemical Reaction:-



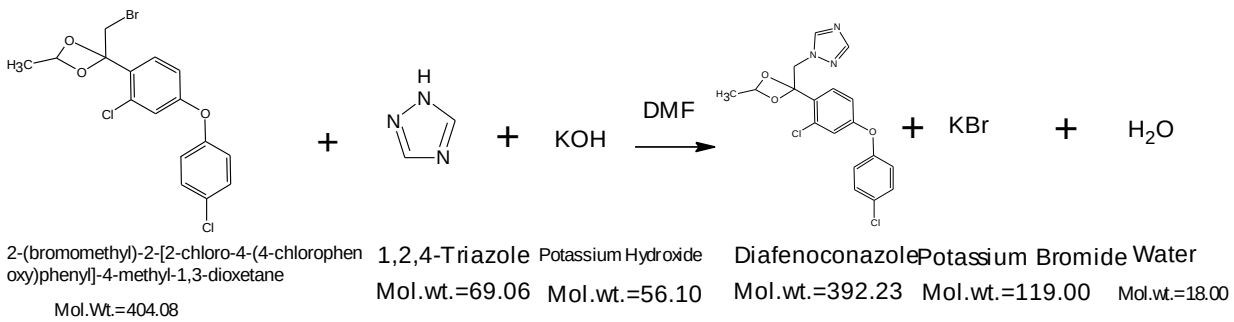
Step-V Process:-

Reaction of bromo-ketal with 1, 2, 4-Triazole in presence of potassium hydroxide and DMF solvent to give the title compound Diafenoconazole. Process Flow Diagram of Diafenoconazole.

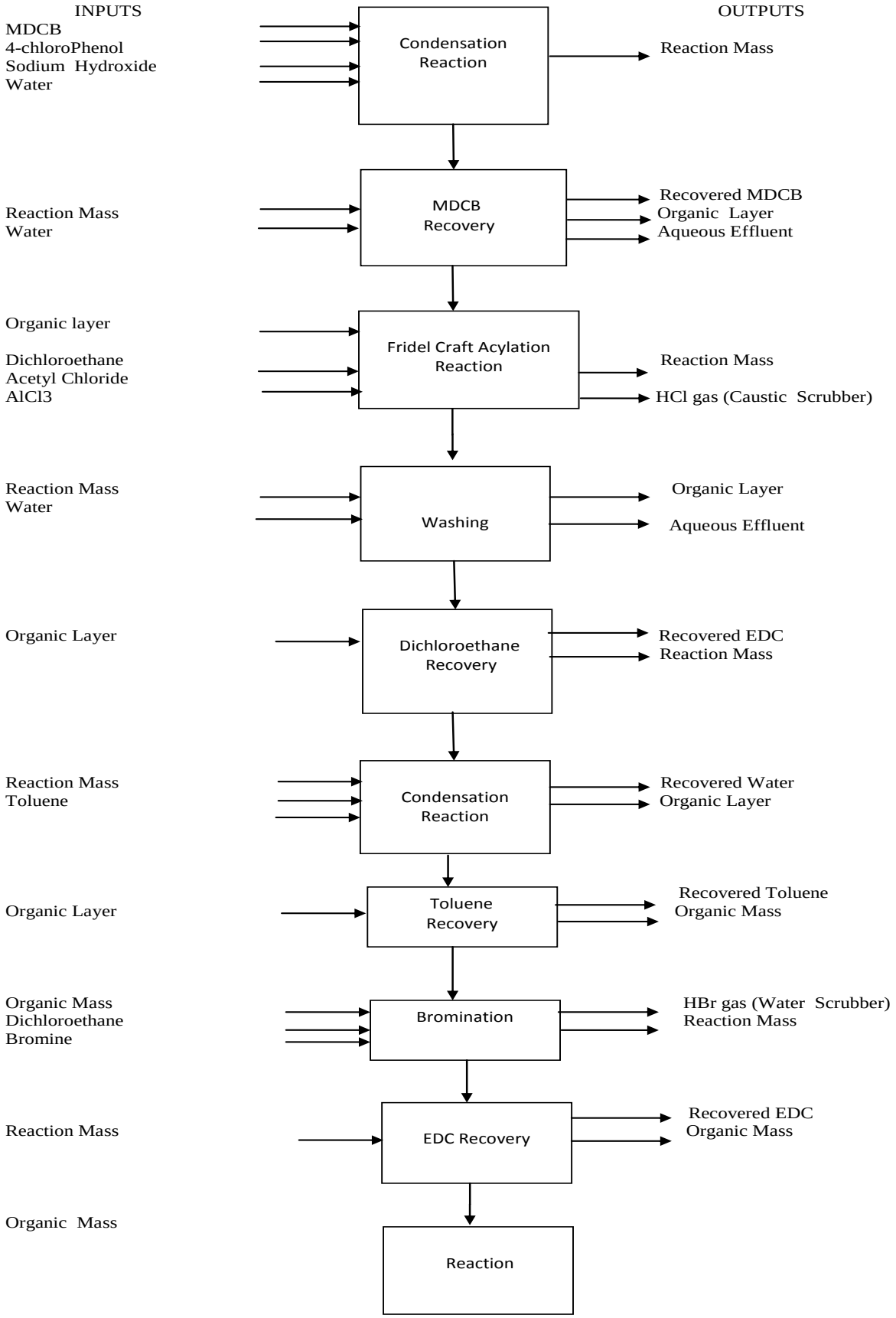
Material Balance:-

Sr.No.	INPUT	Qty. MT/MT	OUTPUT	Qty. MT/MT	Remark
1	Bromo-Ketal	1.392	Diafenoconazole	1.000	Product
2	1,24-Triazole	0.229	Aqueous Effluent	0.953	ETP
3	KOH	0.284	Recovered DMF	1.260	Recycle
4	DMF	1.285	Organic Residue	0.392	Incineration
5	Water	0.500	Ejector Water	1.185	Recycle
6	Ejector Water	1.000	Recovered Hexane	1.900	Recycle
7	Hexane	2.000			
	Total Input	6.690	Total Output	6.690	

Chemical Reaction



D. Process flow diagram for the preparation of Diafenoconazole



3.5.9 Diafenthiuron

A. Manufacturing process for the preparation of Diafenthiuron

Step-I

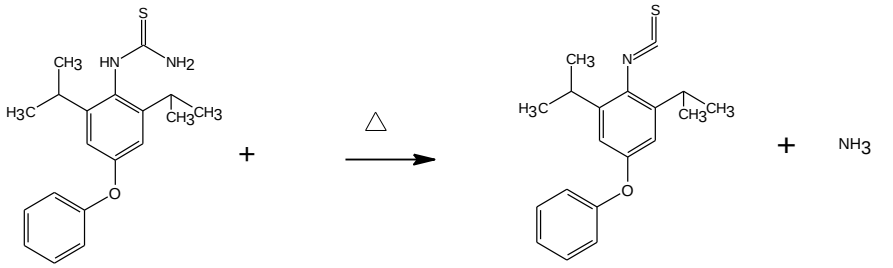
Process:-

Heat the 1-(2, 6-diisopropyl-4-phenoxyphenyl) thiourea up to 150 °c in presence of o-xylene to give 1, 3-diisopropyl-2-isothiocyanate.

B. Material Balance :-

Sr. No.	INPUT	Qty MT/MT	OUTPUT	Qty MT/MT	Remark
1	1-(2, 6-diisopropyl-4-phenoxyphenyl) thiourea	0.975	Isocyanate	0.920	Product
2	O-xylene	1.000	Recovered o-Xylene	0.980	Recycle
3	Water for scrubber	0.180	22% Ammonia Solution	0.205	Sale
4	Ejector Water	1.000	Ejector Water	1.050	Recycle
	Total Inputs	3.155	Total Outputs	3.155	

C. Reaction Scheme:-



N-[4-phenoxy-2,6-di(propan-2-yl)phenyl]thiourea
Mol.Wt.=328.47

2-isothiocyanato-5-phenoxy-1,3-di(propan-2-yl)benzene
Mol.Wt.=311.44

Step-II

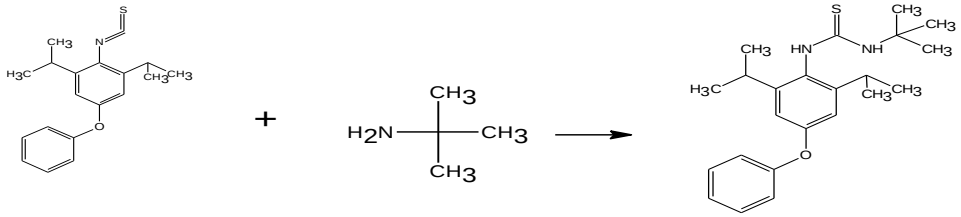
Process:-

Prepared Diafenthiuron by reaction of 1, 3-diisopropyl-2-isothiocyanate with tert-butyl amine in presence of Acetonitrile.

Material Balance :-

Sr. No.	INPUT	Qty MT/MT	OUTPUT	Qty MT/MT	Remark
1	Isocyanate	0.920	Diafenthiuron	1.000	Product
2	Tert-butyl amine	0.235	Recovered CAN	1.520	Recycle
3	Acetonitrile	1.600	Organic Residue	0.155	Incineration
4	Ejector Water	3.400	Ejector Water	3.480	Recycle
	Total Inputs	6.155	Total Outputs	6.155	

Chemical Reaction:-



2-isothiocyanato-5-phenoxy-1,3-di(propan-2-yl) benzene

Mol.Wt.=311.44

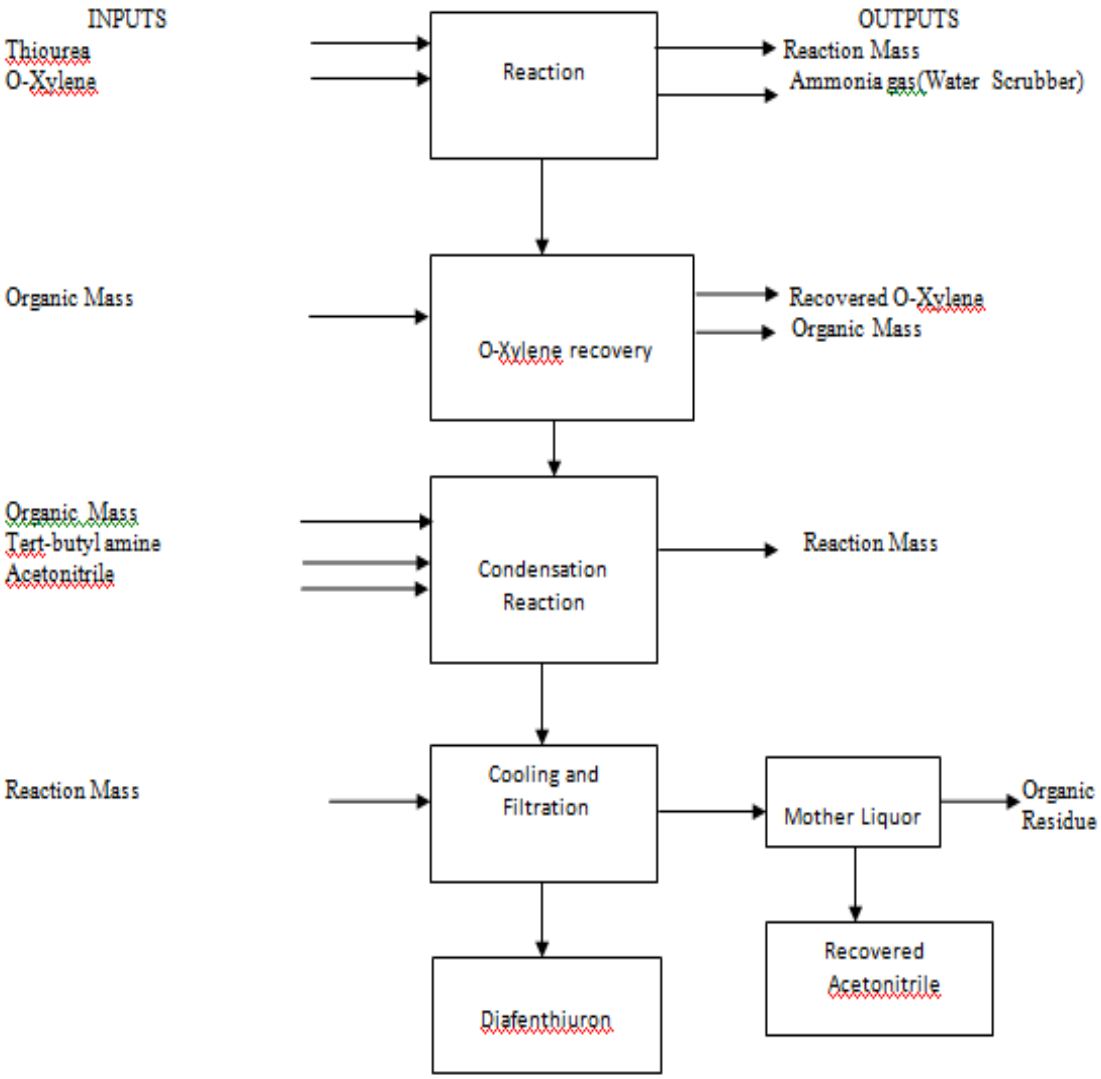
2-methylpropan-2-amine

Mol.Wt.=73.13

Mol.Wt.=384

Diafenthiuron

D. Process Flow Diagram of Diafenthiuron



3.5.10 2-Hydroxyacetophenone and 4-Hydroxyacetophenone

A. Manufacturing process for the preparation of 2-Hydroxyacetophenone and 4-hydroxy - acetophenone

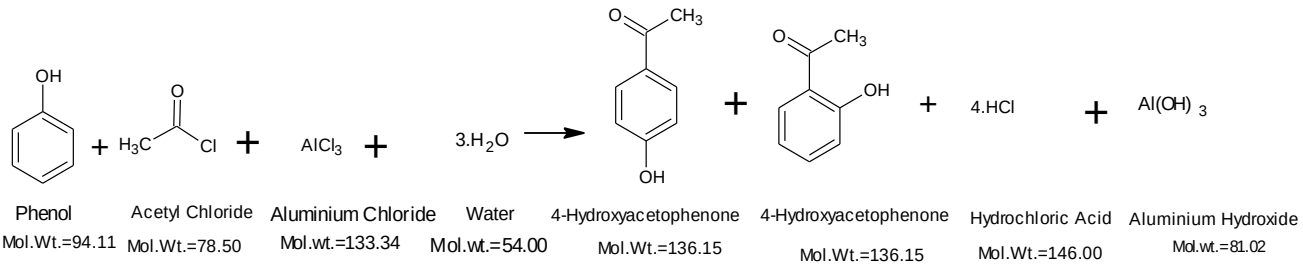
Step-I

Phenol reacted with acetyl chloride in presence of aluminum chloride and Dichloroethane solvent. Heat the reaction mix. To reflux for 4 hrs.to give 2-Hydroxyacetophenone and 4-Hydroxyacetophenone .Separated 2-Hydroxyacetophenone by steam distillation and the resulting residue crystallized in water to give 4-Hydroxyacetophenone.

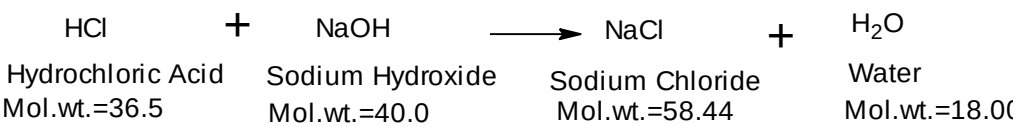
B. Mass Balance

Sr. No.	INPUT	Qty MT/MT	OUTPUT	Qty MT/MT	Remark
1	Phenol	1.390	4-Hydroxyacetophenone	0.500	Product
2	AlCl3	1.964	2-Hydroxyacetophenone	0.500	Product
3	Acetyl Chloride	1.160	Recovered Dichloroethane	2.090	Recycle
4	Dichloroethane	2.200	HCl (gas)	0.539	Caustic Scrubber
5	Water	6.000	Organic Residue	0.200	Incineration
6	SodiumHydroxide	1.773	Aqueous Effluent	10.658	ETP
	Total Inputs	14.487	Total Outputs	14.487	

C. Chemical Reaction:-

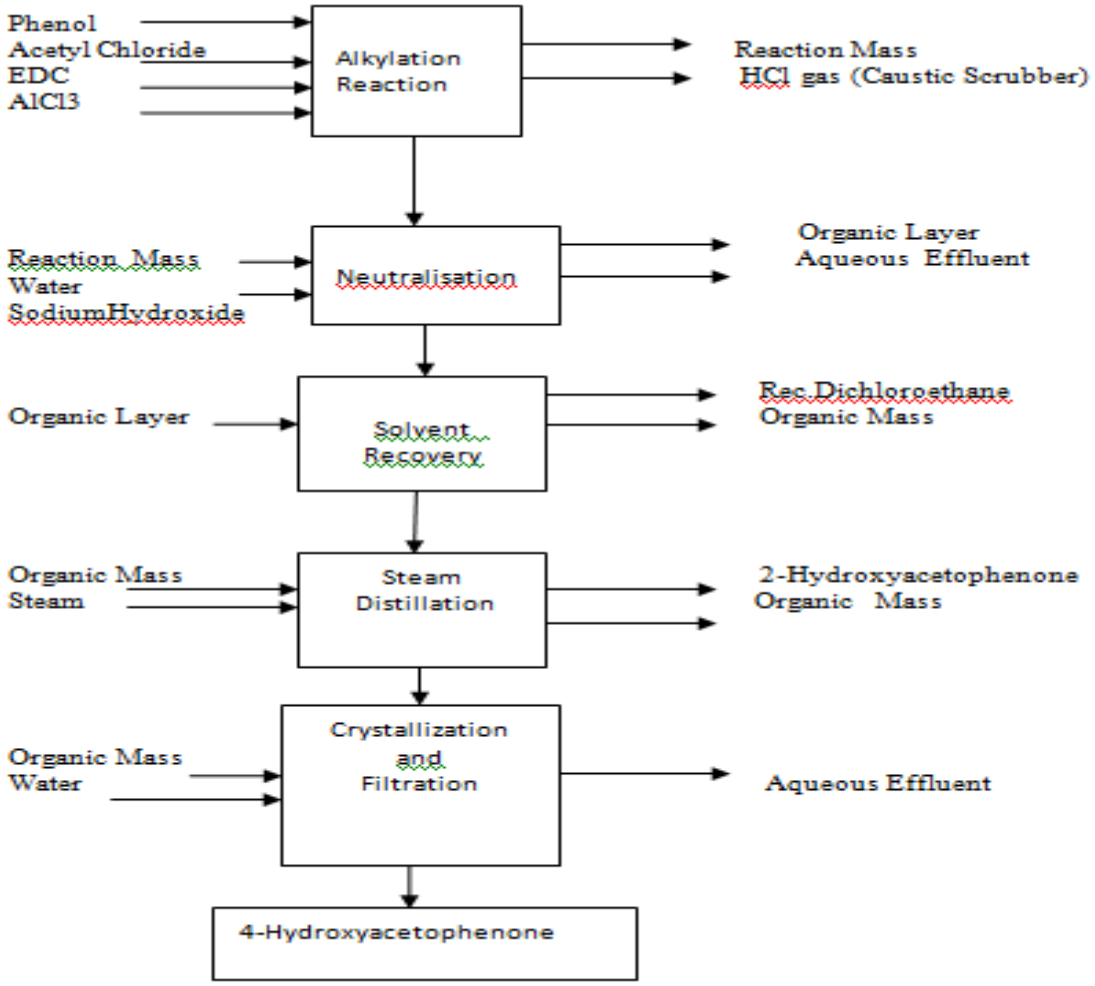


Scrubber



Sr. No.	INPUT	Qty. MT/MT	OUTPUT	Qty. MT/MT	Remark
1	HCl	0.539	Aqueous Effluent	3.229	
2	Sodium Hydroxide	0.590			
3	Scrubber Water	2.100			
	Total Inputs	3.229	Total Outputs	3.229	

D. Process Flow Diagram



3.5.11 4- AMINO-6-TERT-BUTYL-3-MERCAPTO-1, 2, 4-TRIAZIN-5(4H)-ONE TRIAZINONE

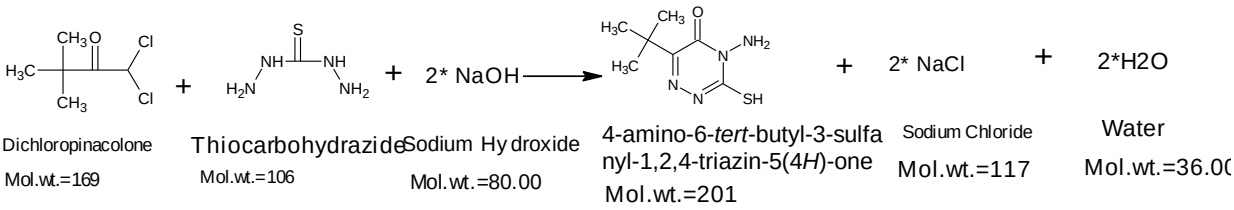
A. Manufacturing process for the preparation of Triazinone

Triazinone prepared by reaction of Dichloropinacolone with Thiocarbohydrazide in presence of catalyst and bleach solution heated at hrs at100°c for 15 to 24 hrs to give s Triazinone.Cool reaction mass to room temperature .Filter and wash with water, dry the product.

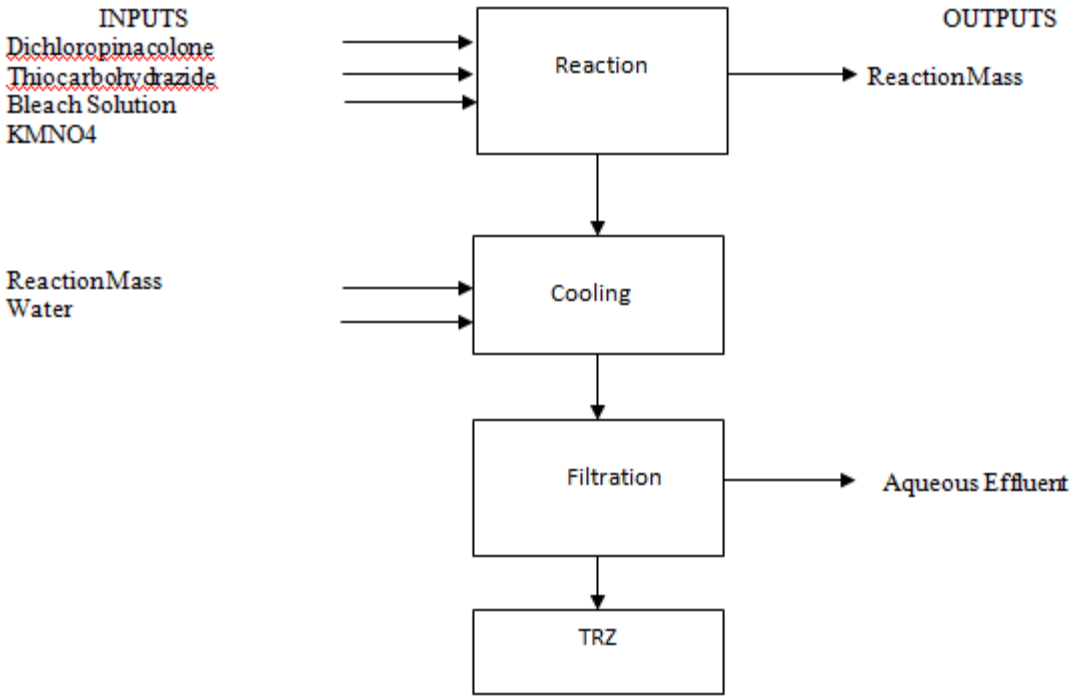
B. Material Balance:

Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	Dichloropinacolone	1.150	Triazinone	1.000	Product
2	KMNO4	1.000	Aqueous Effluent	5.210	ETP
4	Bleach solution	1.480			
5	Thiocarbohydrazide	0.580			
6	Water	2.000			
	Total	6.210	Total	6.210	

C. Chemical Reaction



D. Process Flow Diagram



3.5.12 2-Ethyl Hexyl Glyceryl Ether

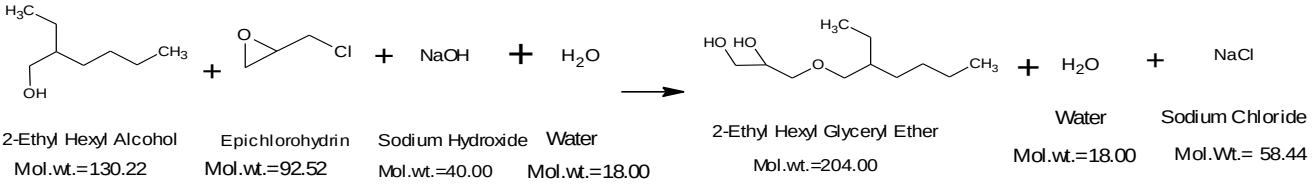
A. Manufacturing Process:

2-Ethyl Hexyl Glyceryl Ether prepared by reaction of 2-Ethyl Hexyl Alcohol with Epichlorohydrin in presence of sodium hydroxide at 30 to 200 °c to form 2-Ethyl Hexyl Glyceryl Ether.

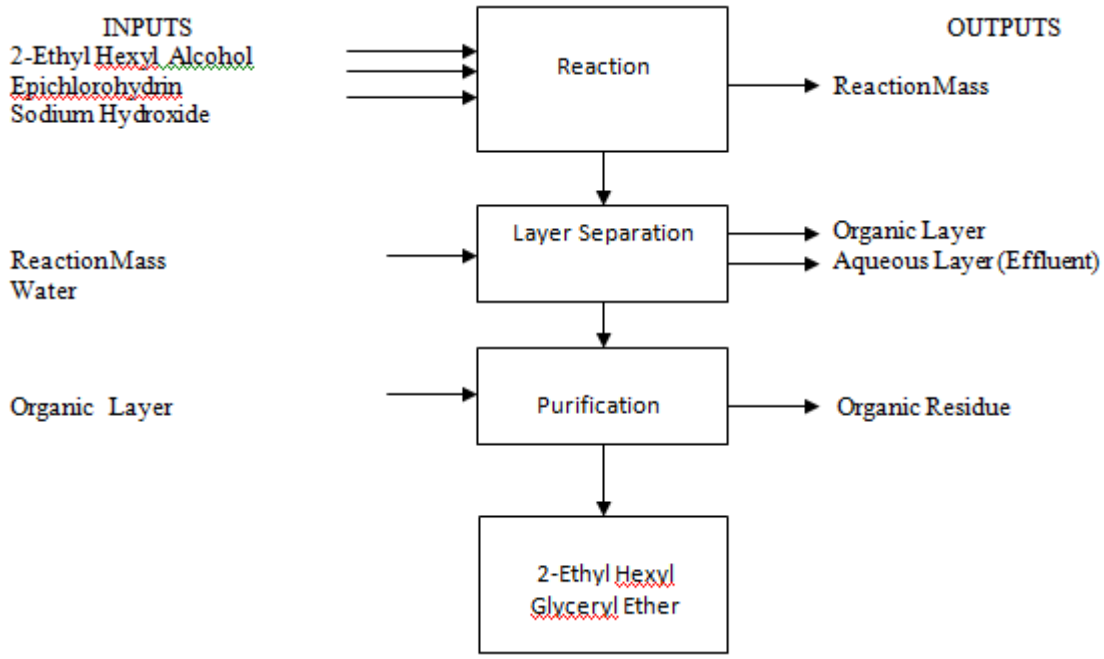
B. Mass Balance

Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	Epichlorohydrin	0.690	2-Ethyl Hexyl Glyceryl Ether	1.000	Product
2	2-Ethyl Hexyl Alcohol	0.490	Aqueous Effluent	1.532	ETP
3	Sodium Hydroxide	0.212	Organic Residue	0.100	Incineration
4	Water	1.240			
	Total	2.632	Total	2.632	

C. Chemical Reaction:



Process Flow Diagram



3.5.13 1,2-Hexanediol

A. Manufacturing process for the preparation of 1,2-Hexanediol

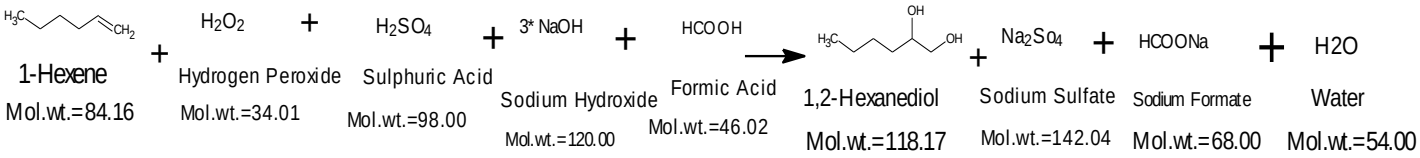
Step-I

Treated 1-Hexene with the Sulphuric acid and Formic Acid in presence of hydrogen peroxide followed by sodium hydroxide to give1, 2-Hexanediol.After distillation get pure product.

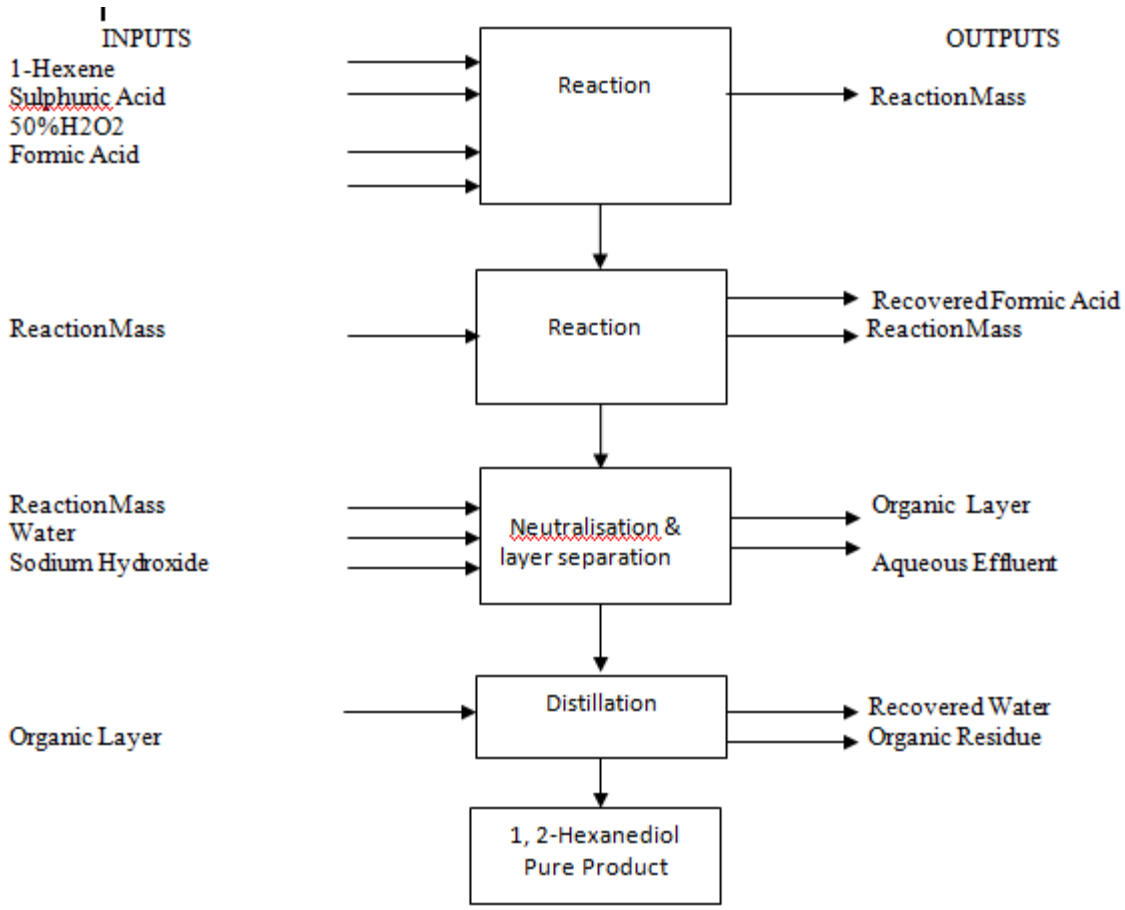
B. Material Balance for the preparation of 1,2-Hexanediol

Sr.No.	INPUT	Quantity(MT/MT)	OUTPUT	Quantity (MT/MT)	Remark
1	1-Hexene	0.890	Aqueous Effluent	3.789	ETP
2	50% Hydrogen Peroxide	0.763	1,2-Hexanediol	1.000	Product
3	Sulphuric Acid 98%	0.938	Recovered Water	0.407	Recycle (Rec. Water)
4	Formic Acid 85%	0.938	Organic Residue	0.150	Incineration
5	Sodium Hydroxide	0.575	Ejector Water	2.200	Recycle
6	Water	2.797	Recovered formic Acid (40 %)	1.355	Sale
7	Ejector Water	2.000			
	Total	8.901	Total	8.901	

C. Chemical Reaction of 1,2-Hexanediol



D. Process Flow Diagram of 1,2-Hexanediol



3.5.14 1,2-Octanediol

A. Manufacturing process for the preparation of 1,2-Octanediol

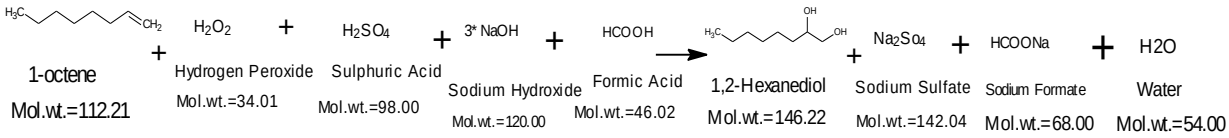
Step-I

Treated 1-Octene with the Sulphuric acid ,formic acid and hydrogen peroxide at 50 ° followed by sodium hydroxide to give 1, 2-Octanediol.After Fractional distillation get pure product.

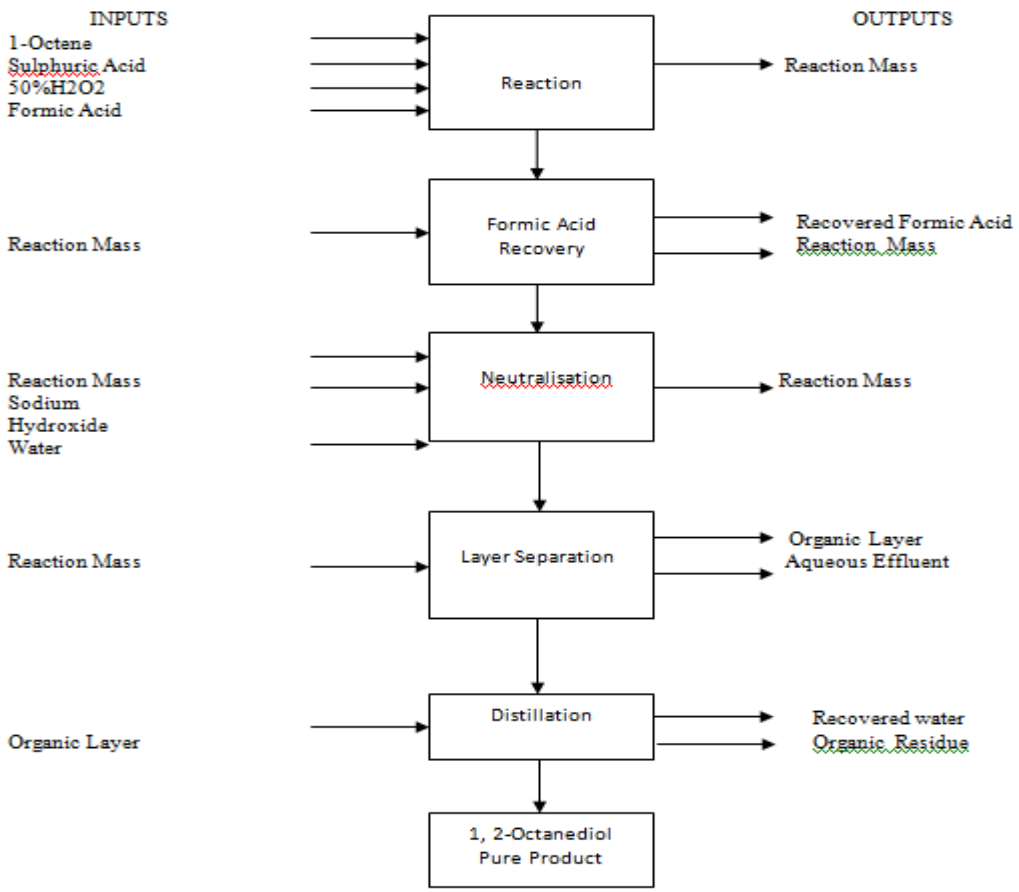
B. Material Balance for the preparation of 1,2-Octanediol

Chemical Name	Quantity(MT/MT)	Chemical Name	Quantity(MT/MT)	Remark
1-Octene	0.940	Aqueous Effluent	3.556	ETP
50% Hydrogen Peroxide	0.733	1,2-Octanediol	1.000	Product
Sulphuric Acid	0.733	Recovered Water	0.524	Recycle
Formic Acid	0.700	Organic Residue	0.180	Incineration
Sodium Hydroxide	0.290	Ejector Water	2.200	Recycle
Water	2.659	Recovered Formic Acid (40%)	0.595	Sale
Ejector Water	2.000			
Total	8.055	Total	8.055	

C. Chemical Reaction of 1,2-Octanediol



D. Process Flow Diagram of 1, 2-Octanediol



3.5.15 1,2-Dodecenediol

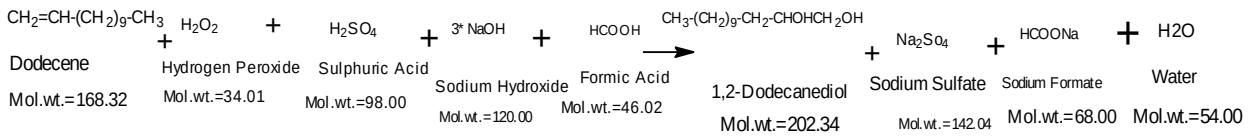
A. Manufacturing process for the preparation of 1,2-Dodecanediol

Treated 1-Dodecene with the Sulphuric acid and Formic Acid in presence of hydrogen peroxide followed by sodium hydroxide to give1, 2-Dodecanediol.After distillation get pure product.

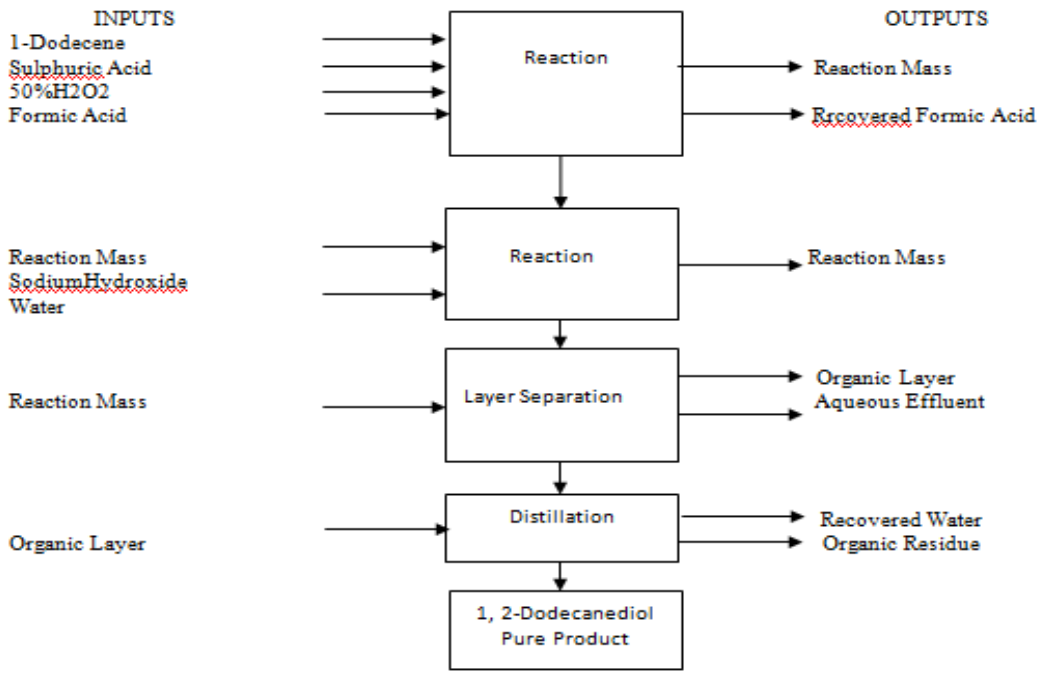
B. Material Balance for the preparation of 1, 2-Dodecanediol

Sr. No.	INPUT	Quantity (MT/MT)	OUTPUT	Quantity (MT/MT)	Remark
1	1-Dodecene	0.927	Aqueous Effluent	2.755	ETP
2	50% Hydrogen Peroxide	0.397	1,2-Dodecanediol	1.000	Product
3	Sulphuric Acid	0.488	Recovered Water	0.212	Recycle
4	Formic Acid	0.488	OrganicResidue	0.147	Incineration
5	Sodium Hydroxide	0.306	Ejector Water	1.147	Recycle
6	Water	2.415	Recovered Formic Acid (40 %)	0.801	Sale
7	Ejector Water	1.041			
	Total	6.062	Total	6.062	

C. Chemical Reaction of 1,2-Dodecanediol



D. Process Flow Diagram of 1,2-Hexanediol



3.5.16 1, 2-Dodecenediol

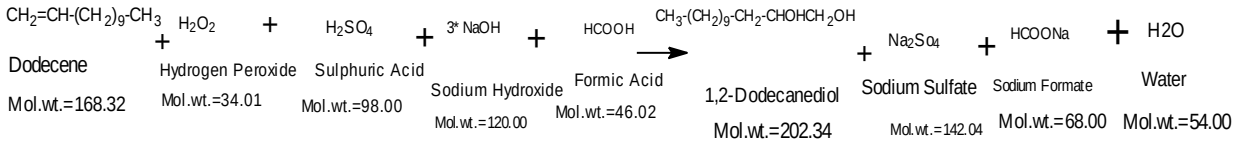
A. Manufacturing process for the preparation of 1,2-Dodecanediol

Treated 1-Dodecene with the Sulphuric acid and Formic Acid in presence of hydrogen peroxide followed by sodium hydroxide to give1, 2-Dodecanediol.After distillation get pure product.

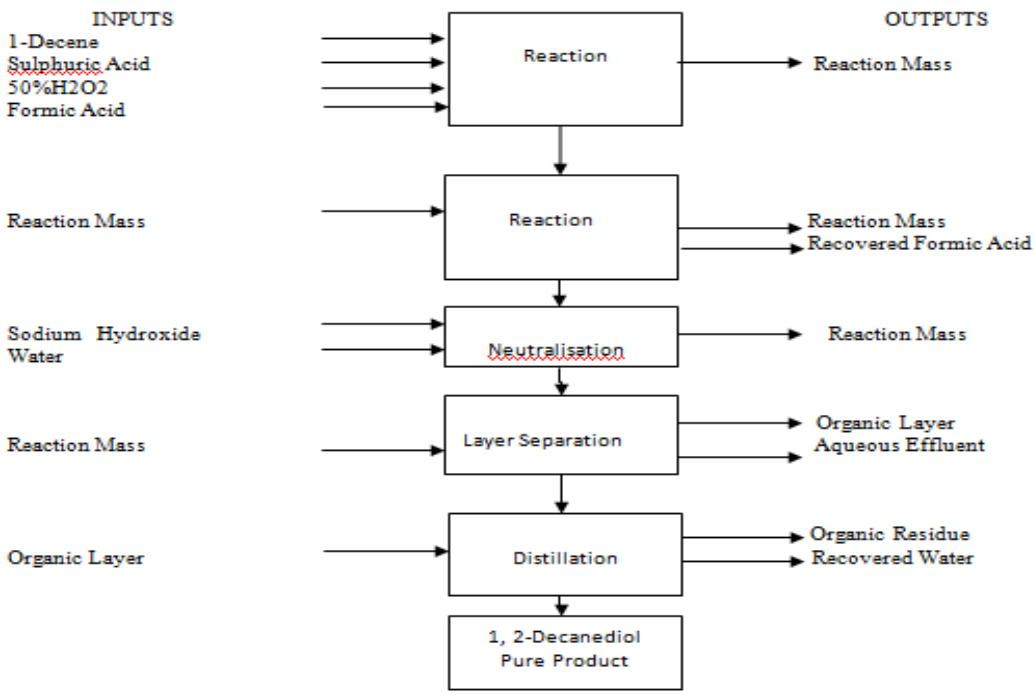
B. Material Balance for the preparation of 1, 2-Dodecanediol

Sr. No.	INPUT	Quantity (MT/MT)	OUTPUT	Quantity (MT/MT)	Remark
1	1-Dodecene	0.927	Aqueous Effluent	2.755	ETP
2	50% Hydrogen Peroxide	0.397	1,2-Dodecanediol	1.000	Product
3	Sulphuric Acid	0.488	Recovered Water	0.212	Recycle
4	Formic Acid	0.488	Organic Residue	0.147	Incineration
5	Sodium Hydroxide	0.306	Ejector Water	1.147	Recycle
6	Water	2.415	Recovered Formic Acid (40 %)	0.801	Sale
7	Ejector Water	1.041			
	Total	6.062	Total	6.062	

C. Chemical Reaction of 1,2-Dodecanediol



D. Process Flow Diagram of 1,2-Decanediol



3.5.17 2 CYANOPHENOL

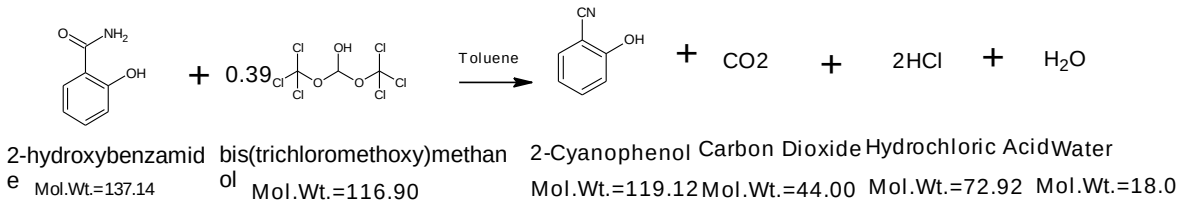
A. Manufacturing Process:

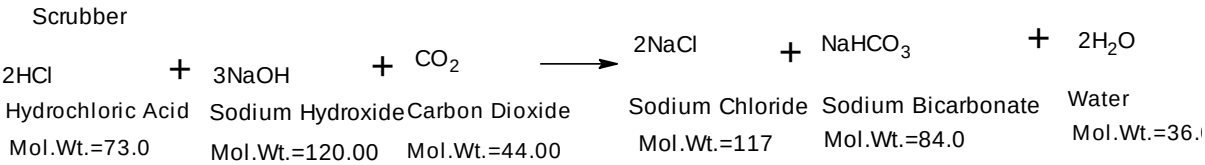
Salicylamide is reacted with triphosgene in presence of toluene to give 2-Cyaphenol & by product was water, carbon dioxide & HCl. Gases are scrubbed into suitable solution.Salicyalamide was fed into the tubular reactor at 200 to 300 °c. Retention time should be 30 to 50 minutes. Output contains 2 cyanophenol as product.

B. Mass Balance

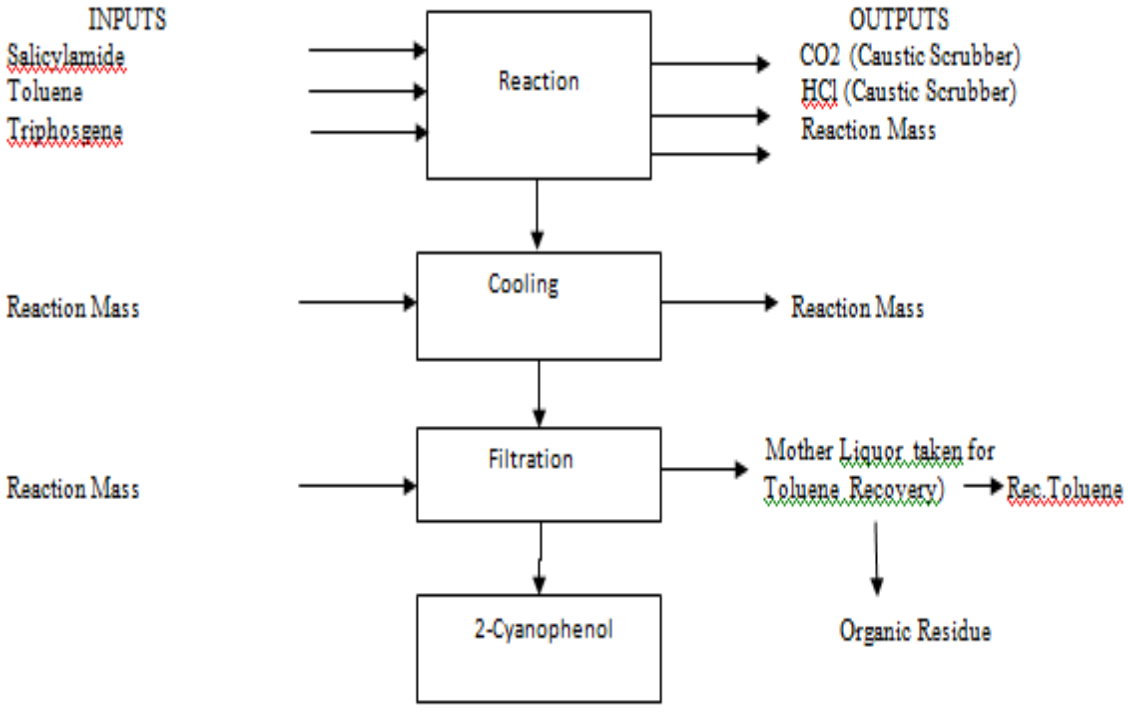
Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	Salicylamide	1.130	2 CP	1.000	Product
2	Triphosgene	0.860	Recovered Toluene	2.490	Recycle
3	Toluene	2.540	Organic Residue	0.100	Incineration
4	Ejector Water	2.000	Ejector Water	2.040	Recycle
5	Scrubber Water	2.247	Scrubber Solution (Aqueous effluent)	4.137	ETP
6	Sodium Hydroxide For Scrubber	0.990			
	Total	9.767	Total	9.767	

C. Chemical Reaction:





D. Process Flow Diagram



4

3.5.18 CYANOPHENOL

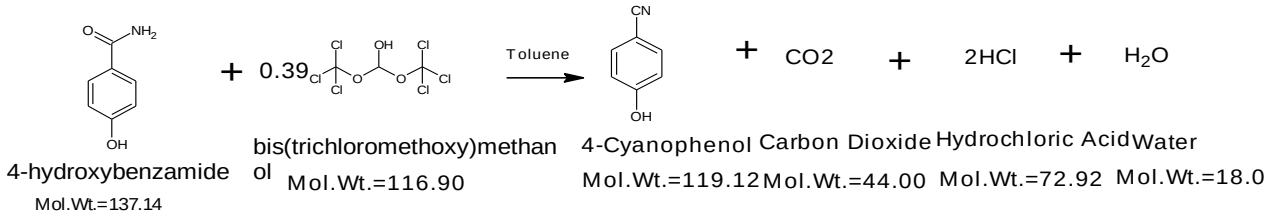
A. Manufacturing Process:

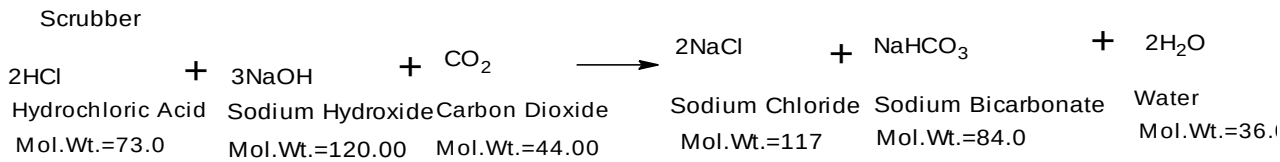
4-Hydroxy benzamide is reactwith triphosgene to give 4 Cyanophenol product& gas like as Co2, HCl and water. This will be scrubbed in caustic solution. 4 hydroxybenzamide was fed into the tubular reactor at 200 to 500 °c. Retention time should be 30 to 50 minutes. Outputs contain water & 4 cyanophenol.

B. Mass Balance

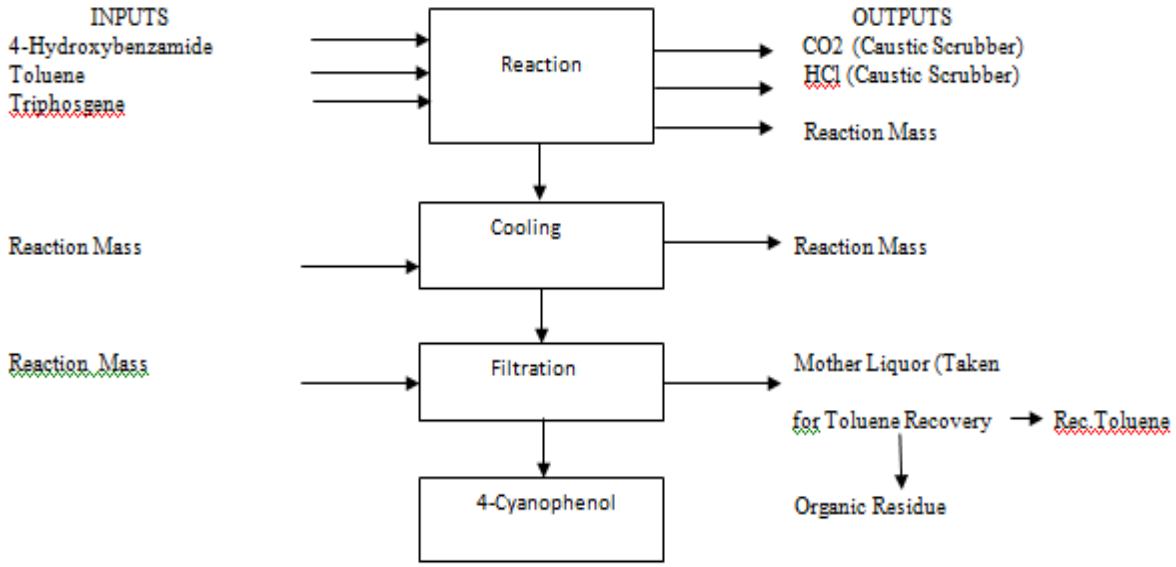
Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	4-Hydroxybenzamide	1.180	4-Cyanophenol	1.000	Product
2	Triphosgene	0.860	Recovered Toluene	2.490	Recycle
3	Toluene	2.540	Organic Residue	0.050	Incineration
4	Ejector Water	2.000	Ejector Water	2.050	Recycle
5	Scrubber Water	2.474	Scrubber Solution(Aqueous effluent)	4.453	ETP
6	Sodium Hydroxide For Scrubber	0.989			
	Total	10.043	Total	10.043	

C. Chemical Reaction:





D. Process Flow Diagram



3.5.19 PHENYL GLYCIDYL ETHER

A. Manufacturing Process:

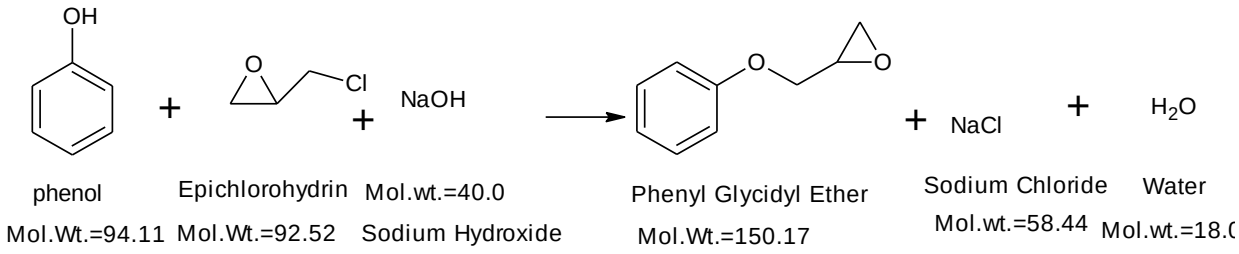
Phenyl Glycidyl Ether prepared by reacting phenol & epichlorohydrin in prescence of sodium hydroxide. Take phenol into the reactor & add epichlorohydrin to the reaction mass & heat to 65 degree centrigrade. Digest for 10 hrs at same temparature. Charge water in the reaction mass and cool to room temperature. Separate the layer to get the product.Pure product obtained by distillation.

B. Material Balance

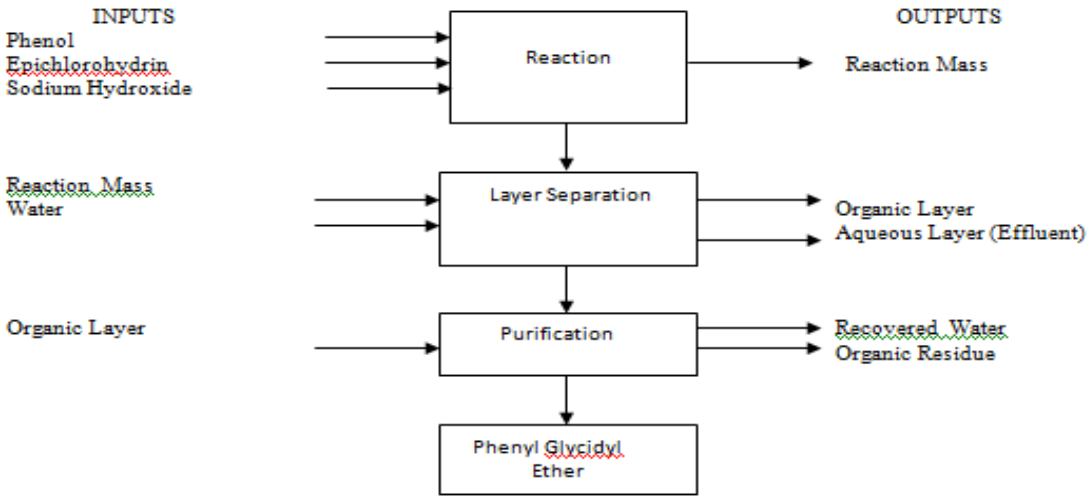
Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	Phenol	0.630	Phenyl Glycidyl Ether	1.000	Product
2	Epichlorohydrin	0.620	Organic Residue	0.040	Incineration
3	Sodium Hydroxide	0.270	Aqueous Effluent	2.000	ETP

Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
4	Water	2.000	Recovered Water	0.480	Recycle
	Total	3.520	Total	3.520	

C. Chemical Reaction



D. Process Flow Diagram



3.5.20 O CRESYL GLYCIDYL ETHER

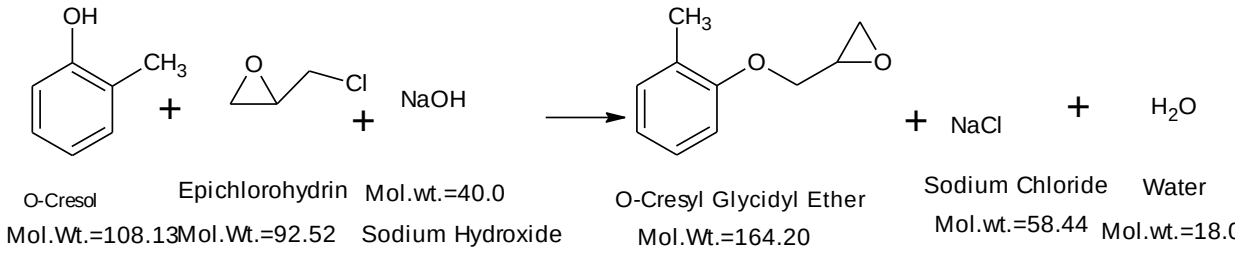
A. Manufacturing Process:

O-Cresyl Glycidyl ether prepared by reacting O-Cresol & epichlorohydrin in prescence of sodium hydroxide. Take O-Cresol into the reactor & add epichlorohydrin to the reaction mass & heat to 65 °c. Digest for 10 hrs at same temparature. Charge water and Cool to room temperature .Separate the layer and purified to get the product.

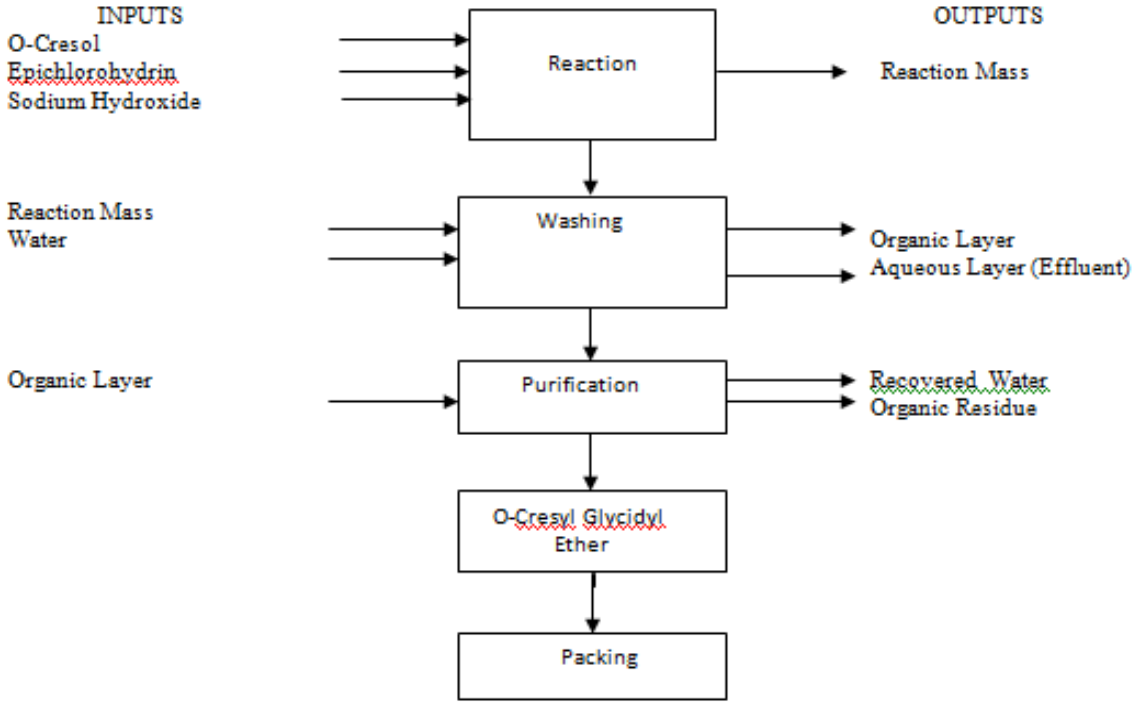
B. Material Balance

Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	O-Cresol	0.660	O-Cresyl Glycidyl Ether	1.000	Product
2	Epichlorohydrin	0.570	Aqueous Effluent	1.000	MEE
3	Sodium Hydroxide	0.250	Organic Residue	0.040	Incineration
4	Water	0.850	Recovered Water	0.290	Recycle
	Total	2.330	Total	2.330	

C. Chemical reaction:



D. Process Flow Diagram



3.5.21 BUTYL GLYCIDYL ETHER

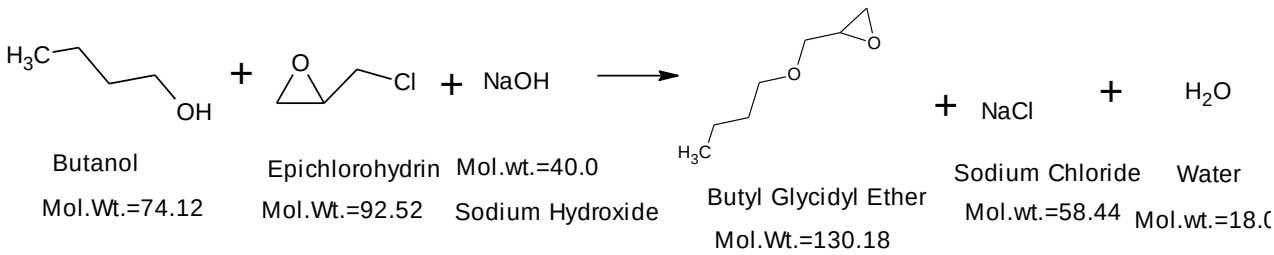
A. Manufacturing Process:

Butyl Glycidyl Ether prepared by reacting butanol& epichlorohydrin in prescence of sodium Hydroxide. Take Butanol into the reactor & add epichlorohydrin to the reaction mass & heat to 55 °C. Digest for 10 hrs at same temparature. Charge water and cool to RT. Separate the layer and purified to get the product.

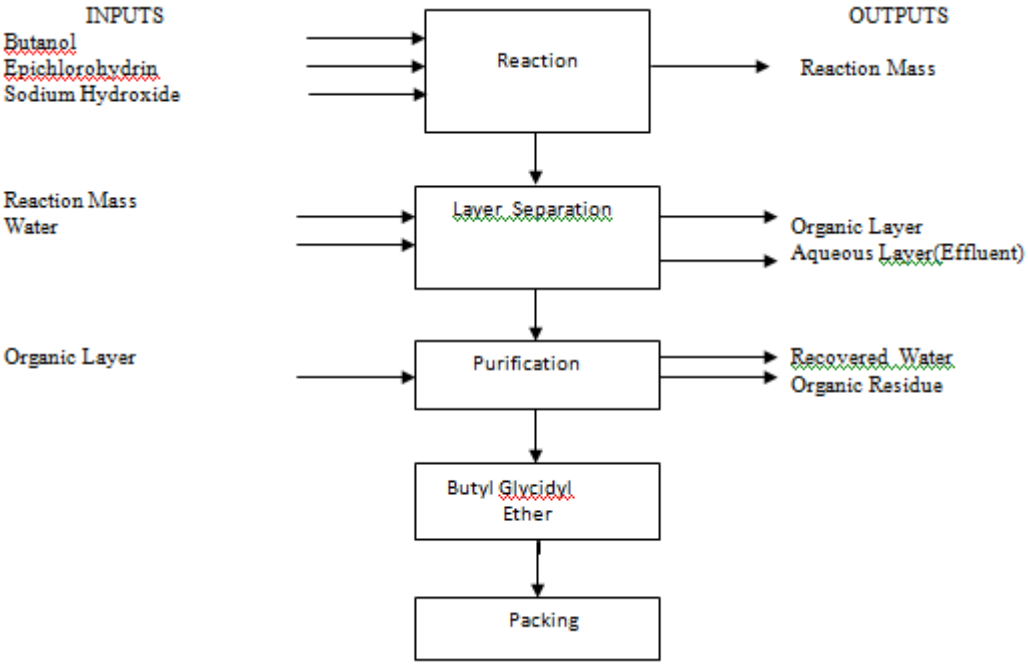
B. Material Balance

Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	Butanol	0.570	Butyl Glycidyl Ether	1.000	Product
2	Epichlorohydrin	0.720	Aqueous Effluent	1.700	ETP
3	Sodium Hydroxide	0.320	Organic Residue	0.060	Incineration
4	Water	1.500	Recovered Water	0.350	Recycle
	Total	3.110	Total	3.110	

C. Chemical reaction



D. Process Flow Diagram



3.5.22 POLY GLYCEROL GLYCIDYL ETHER

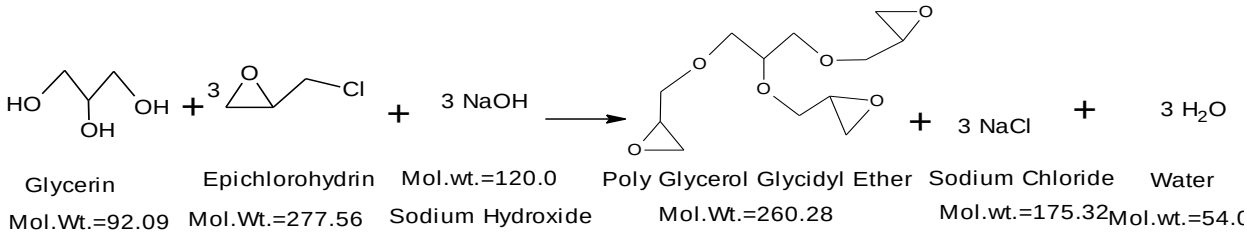
A. Manufacturing Process:

Poly Glycerol Glycidyl Ether prepared by reacting glycerin & epichlorohydrin in prescence of sodium hydroxide . Take Glycerin l into the reactor & add epich tlorohydrin o the reaction mass & heat to 85 °C. Digest for 12 hrs at same temparature. Charge water and cool to roomtemperature . Separate the layer and purified to get the pure Poly Glycerol Glycidyl Ether.

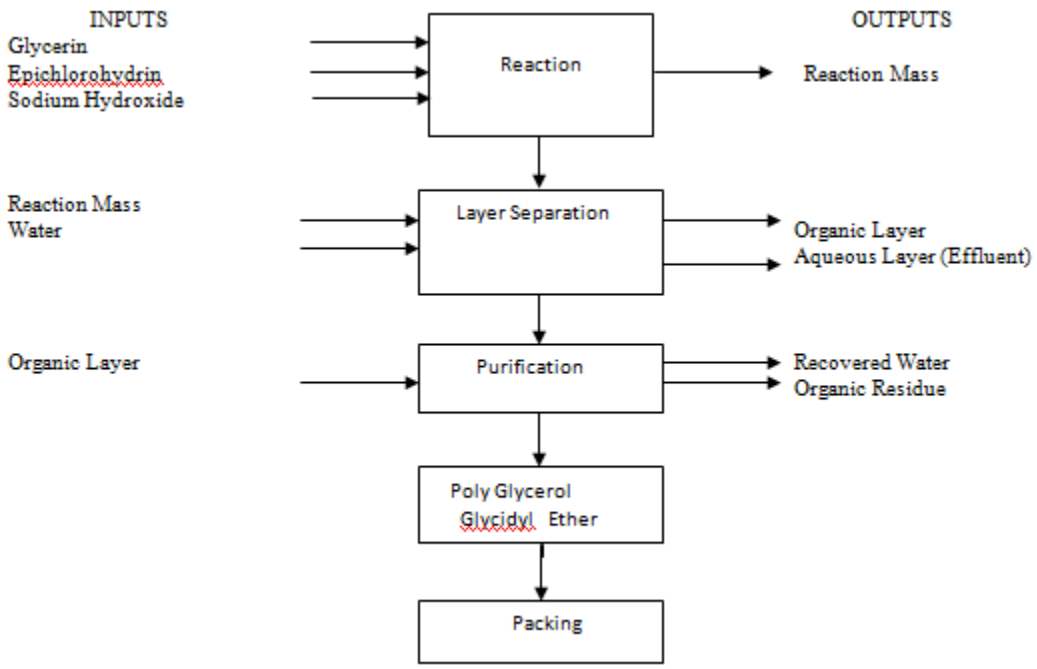
B. Material Balance

Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	Glycerin	0.37	Poly Glycerol Glycidyl Ether	1.00	Product
2	Epichlorohydrin	1.11	Aqueous Effluent	2.345	ETP
3	Sodium Hydroxide	0.53	Organic Residue	0.065	Incineration
4	Water	1.700	Recovered Water	0.300	Recycle
	Total	3.710	Total	3.710	

C. Chemical reaction



D. Process Flow Diagram



3.5.23 PGE DI GLYCIDYL ETHER

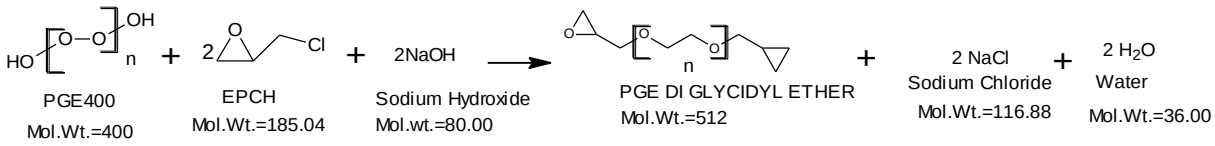
A. Manufacturing Process:

PGE DI Glyceidyl Ether prepared by reacting PGE-400 & epichlorohydrin in prescence of sodium hydroxide . Take PGE -400 into the reactor & add epichlorohydrin to the reaction mass & heat to 95 °c. Digest for 15 hrs at same temparature. Charge water and cool to room temperature. Separate the layer and purified to get the product.

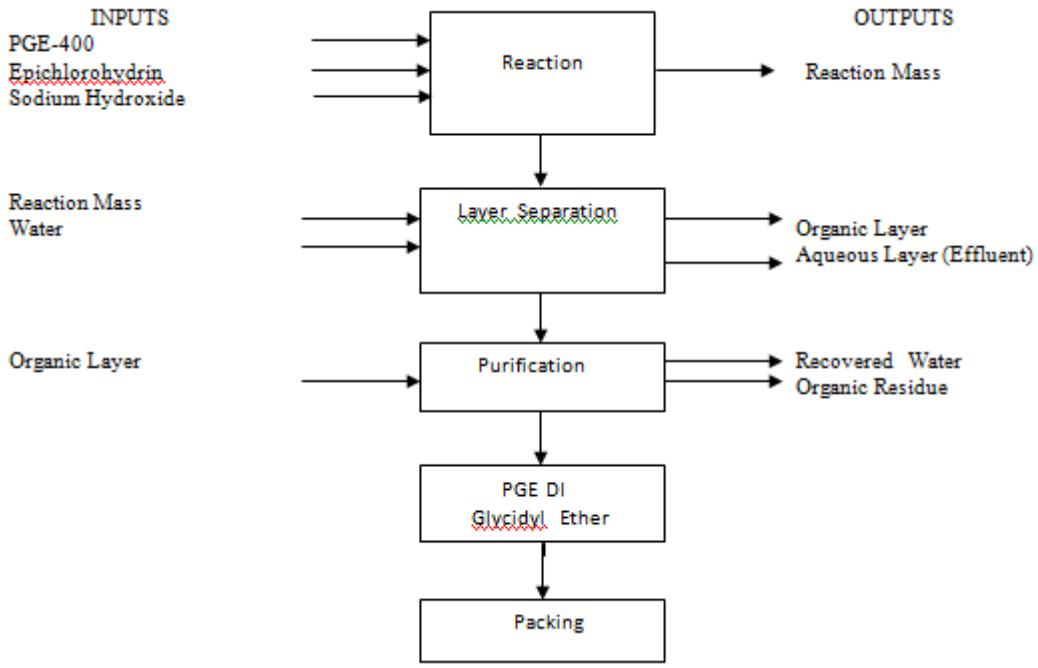
B. Material Balance

Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	PGE 400	0.790	PGE DI Glycidyl Ether	1.000	Product
2	Epichlorohydrin	1.070	Aqueous Effluent	2.000	ETP
3	Sodium Hydroxide	0.420	Organic Residue	0.050	Incineration
4	Water	1.000	Recovered Water	0.230	
	Total	3.280	Total	3.280	

C. Chemical reaction:



D. Process Flow Diagram



3.5.24 ISOPROPYL GLYCIDYL ETHER

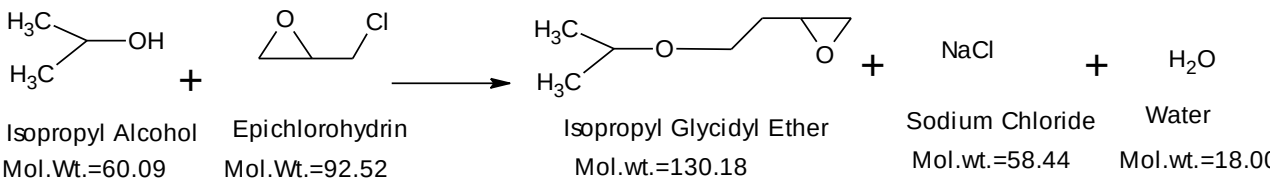
A. Manufacturing Process:

Isopropyl Alcohol Glycidyl Ether prepared by reacting Isopropyl Alcohol & epichlorohydrin in prescence of sodium hydroxide . Take Isopropyl alcohol into the reactor & add epichlorohydrin to the reaction mass & heat to 45 °C. Digest for 10 hrs at same temparature. Charge water and Cool to roomtemperature. Separate the layer and purified to get pure IPA Glycidyl Ether.

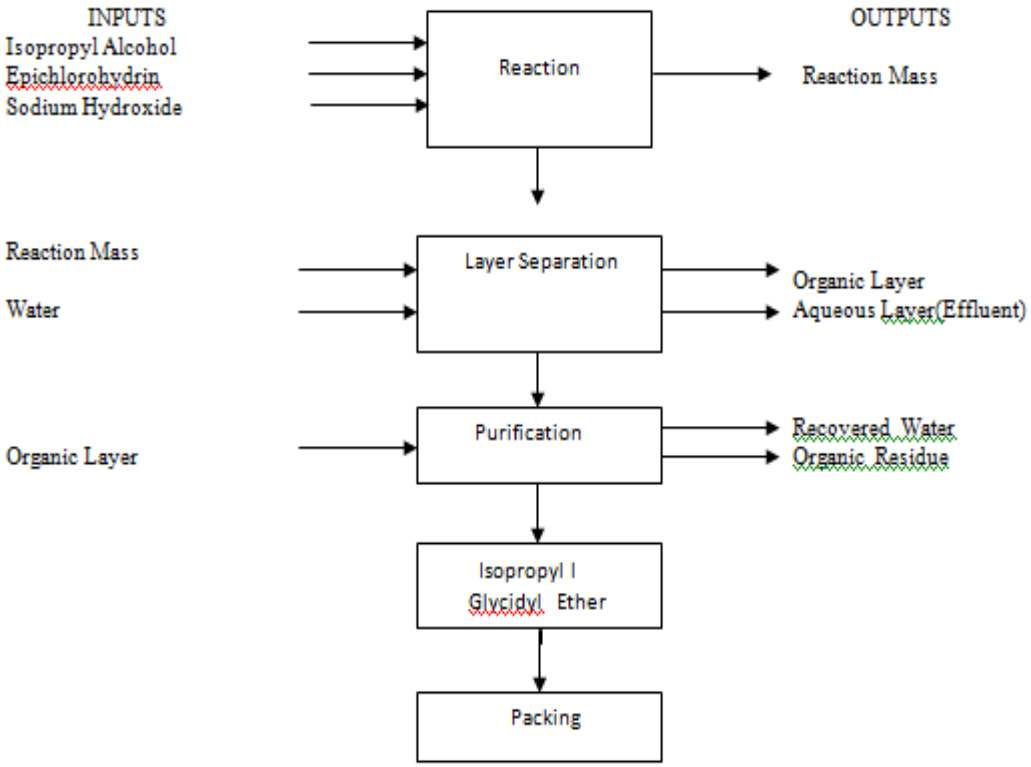
B. Material Balance

Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	Isopropyl Alcohol	0.530	Isopropyl Glycidyl Ether	1.000	Product
2	EPCH	0.820	Aqueous Effluent	2.000	ETP
3	Sodium Hydroxide	0.360	Organic Residue	0.045	Incineration
4	Water	1.600	Recovered water	0.265	Recycle
	Total	3.310	Total	3.310	

C. Chemical reaction



D. Process Flow Diagram



3.5.25 TMBPF

A. Manufacturing Process:

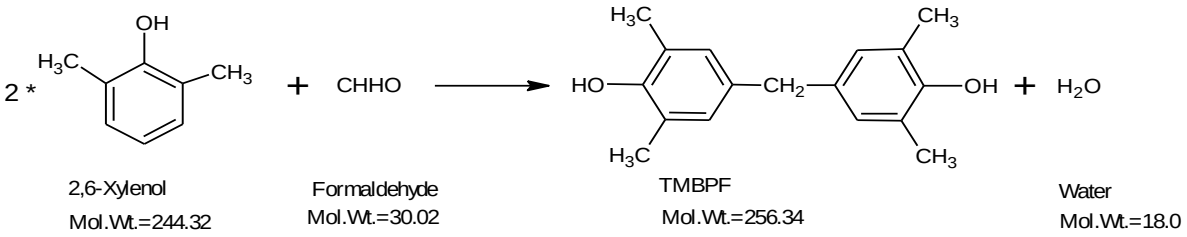
TMBPF prepared by reacting with 2,6 xylenol with formaldehyde in presence of caustic. xylenol & formaldehde taken into reactor. Add sodium hydroxide solution to the reaction mass at 50 °c.Product will precippitate out and then cool to room Tempreture. Filter the product & wash with water.Finally dry the product.

B. Material Balance

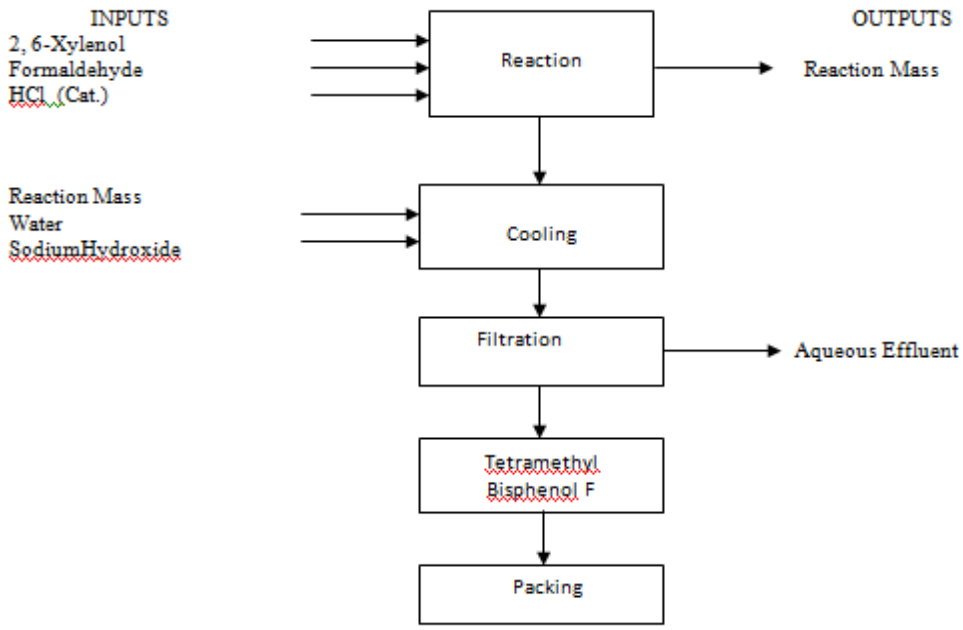
Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	2,6 Xylenol	0.870	TMBPF	1.000	Product
2	Formaldehyde	0.250	Aqueous Effluent	1.447	ETP
3	HCl	0.186			
3	Sodium Hydroxide	0.071			
4	Water	1.070			
	Total	2.447	Total	2.447	

C. Chemical reaction:

TMBPF:



D. Process Flow Diagram



3.5.26 TMBPA

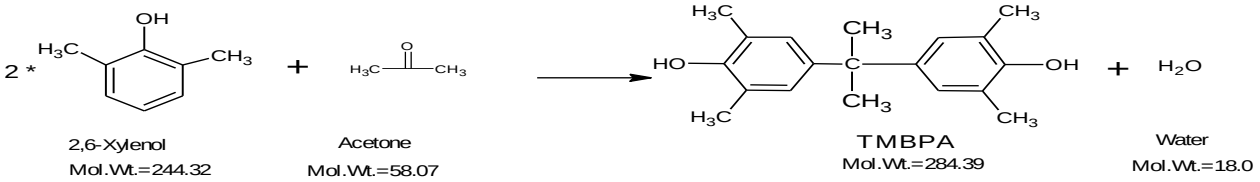
A. Manufacturing Process:

TMBPA prepared by reacting with 2,6-xylenol & acetone in presence of Methane sulphonic acid .2, 6-Xylenol& Methane sulphonic acid taken into reactor. Add acetone to the reaction mass at 70 °c during 3 hrs. Digest for 5 hrs at same temperature. Cool to room temperature. Filter the reaction mass & wash with water. Dry the product.

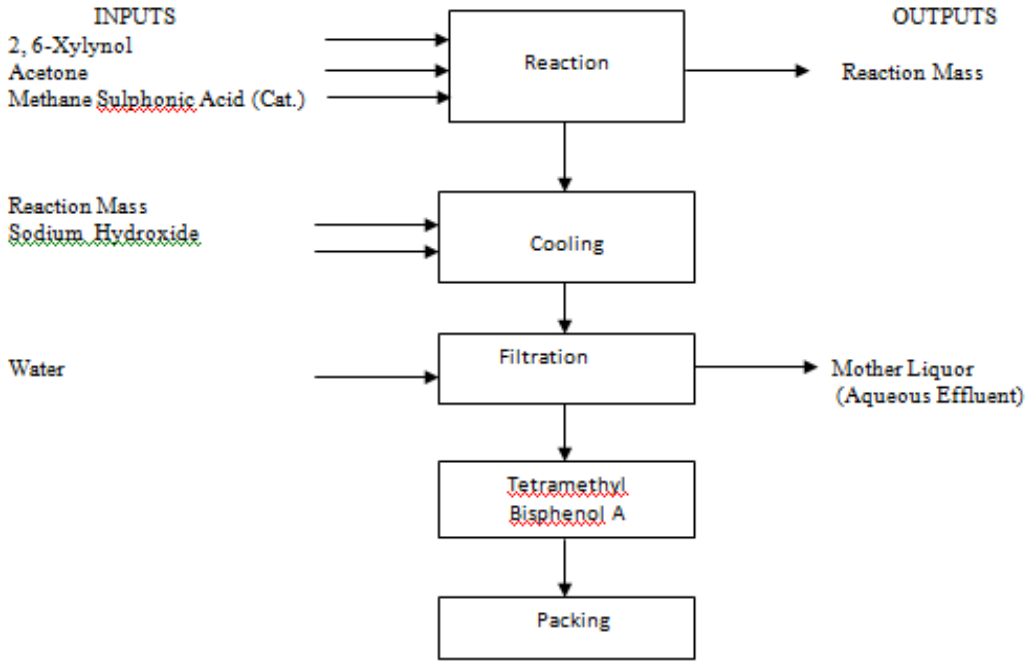
B. Material Balance:

Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	2,6 –Xylenol	0.954	TMBPA	1.000	Product
2	Acetone	0.580	Aqueous Effluent	1.284	ETP
3	Methane sulphonic Acid(cat.)	0.010			
4	Sodium Hydroxide for Neutralisation	0.050			
5	Water	0.690			
	Total	2.284	Total	2.284	

C. Chemical reaction:



D. Process Flow Diagram



3.5.27 TMBP

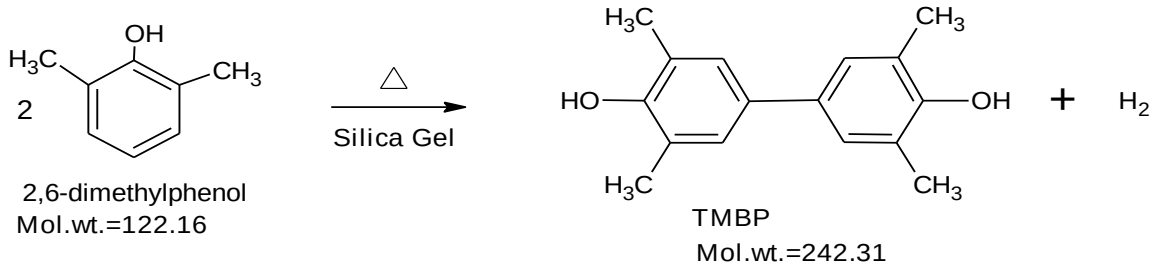
A. Manufacturing Process:

TMBP prepared through coupling of 2,6xylenol in presence catalyst. Xylenol, water & catalyst, heated at reactor for 15 hrs at 150 °C. Digest at 130 °C for 20 hrs. Cool to Room Temperature. Filter & wash with water, Dry the product.

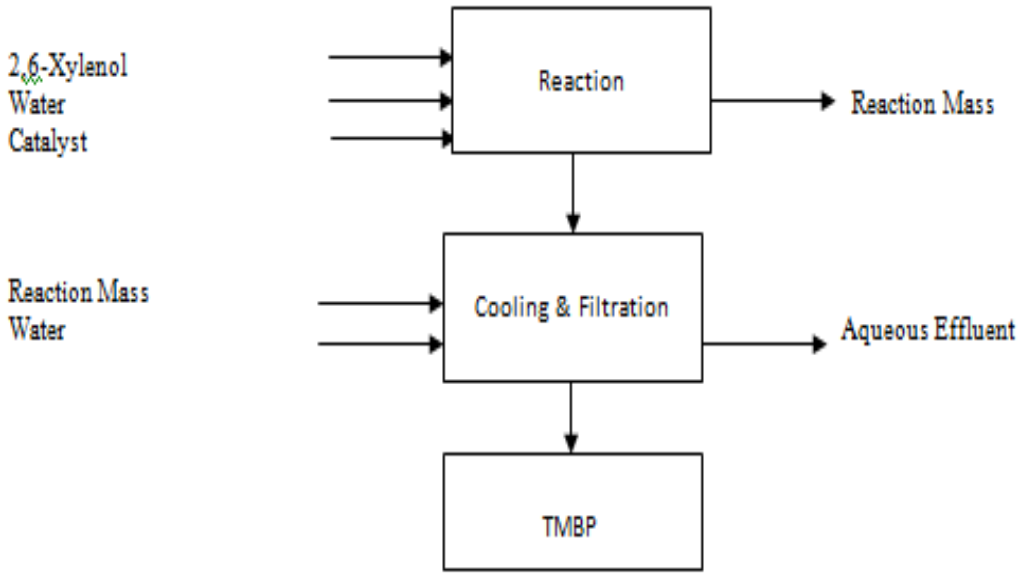
B. Material Balance:

Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	2,6 Xylenol	1.12	TMBP	1.00	Product
2	Silica gel	0.05	Aqueous Effluent	1.55	ETP
3	Water	1.38			
4	Total	2.55	Total	2.55	

C. Chemical reaction:



D. Process Flow diagram



3.5.28 2, 4 DIHYDROXYBENZOPHENONE(2,4 DHP)

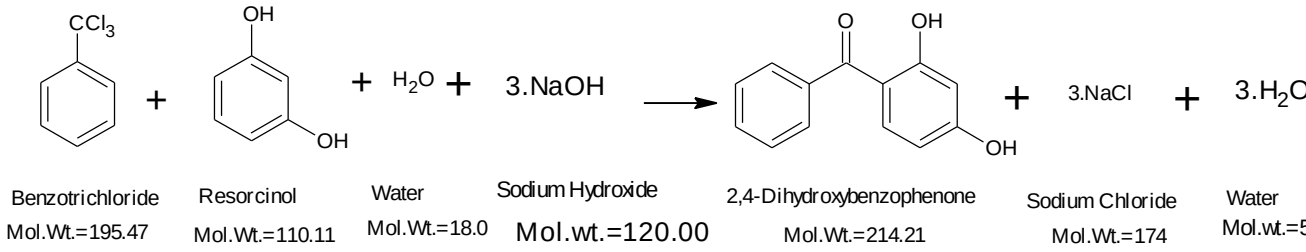
A. Manufacturing Process:

2, 4 DHP is prepared by reacting benzotrichloride & resorcinol in presence of sodium hydroxide. Taken resorcinol, water & heated to 50 °c. Add benzotrichloride during 3 hrs. Digest for 5 hrs. Cool to room temperature Filter & wash with water. Dry the product.

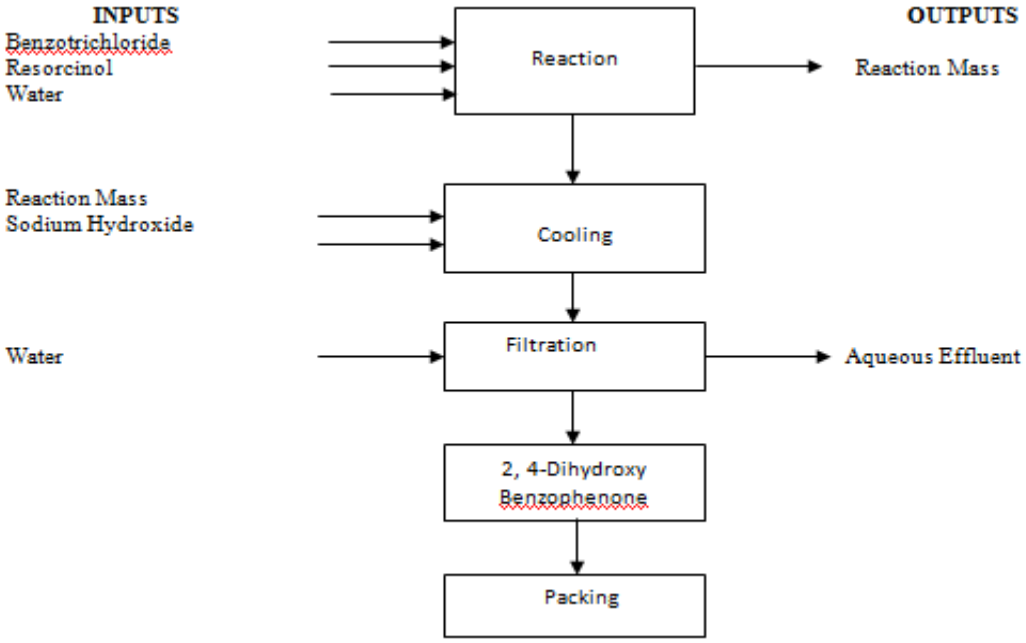
B. Material Balance:

Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	Benzotrichloride	1.170	2,4 DHP	1.000	Product
2	Resorcinol	0.330	Aqueous Effluent	4.143	ETP
3	Sodium Hydroxide	0.718			
4	Water	2.925			
	Total	5.143	Total	5.143	

C. Chemical reaction



D. Process Flow Diagram



3.5.29 BENZOPHENONE 3

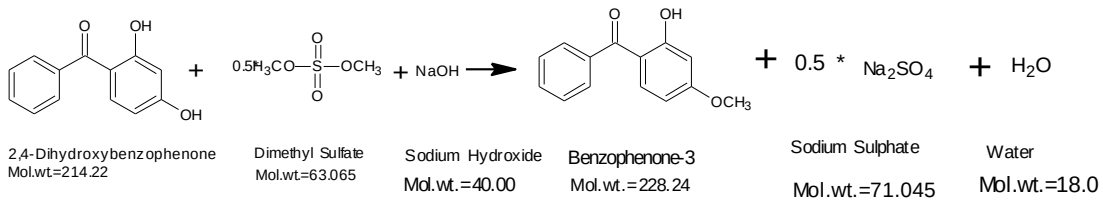
A. Manufacturing Process:

Take2,4-Dihydroxybenzophenone and water into the reactor. Add sodium hydroxide solution to the at 30 to40°c. Then carried out reaction with DMSO4 .Heat to 60°c .After completion of reaction cool reaction mass to room temperature .Filter the product & wash with water. Drying to give Benzophenone -3 product.

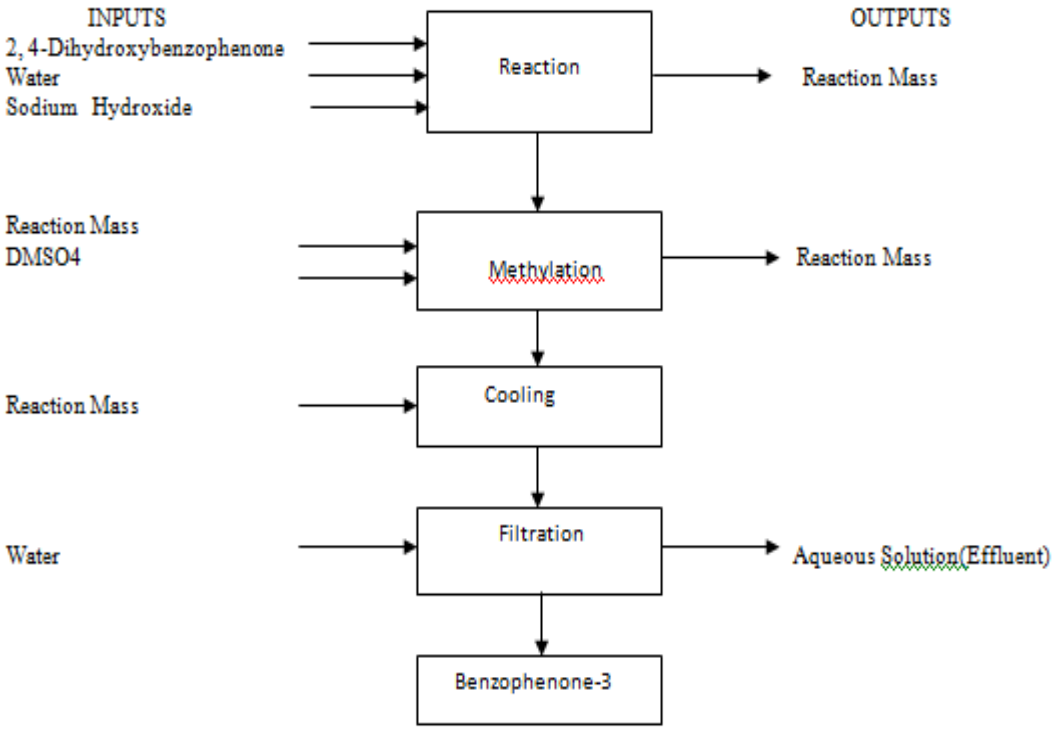
B. Material Balance:

Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	2,4-Dihydroxy-Benzophenone	0.97	Benzophenone- 3	1.00	Product
2	DMSO4	0.49	Aqueous Effluent	1.99	ETP
3	Sodium Hydroxide	0.19			
4	Water	1.34			
	Total	2.99	Total	2.99	

C. Chemical reaction



D. Process Flow Diagram



3.5.30 BENZOPHENONE 4

A. Manufacturing Process:

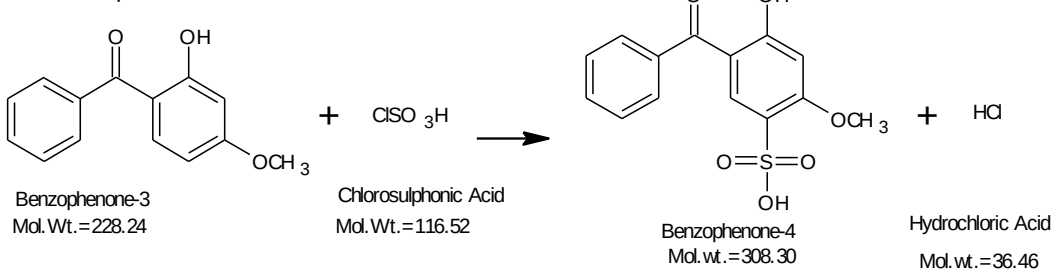
Benzophenone 4 is prepared by reacting Benzophenone 3 with Chlorosulphonic acid. Take benzophenone -3 & Dichloroethane into the reactor. Add chlorosulphunic acid to reaction mass at room temperature. Digest for 6 hrs. Removed Dichloroethane by distillation and isolate product by filtration.

B. Material Balance:

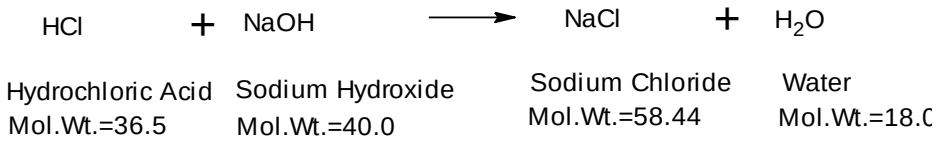
Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	Benzophenone-3	0.910	Benzophenone-4	1.000	Product
2	Chlorosulphonic Acid	0.240	Recovered EDC	1.400	Recycle
3	EDC	1.450	Aqueous Effluent	1.055	ETP
4	Water for washing	1.000	Aqueous Effluent (Scrubber)	0.925	ETP
5	Water for Scrubber	0.620			
6	Sodium hydroxide for Scrubber	0.160			
	Total	4.380	Total	4.380	

C. Chemical reaction:

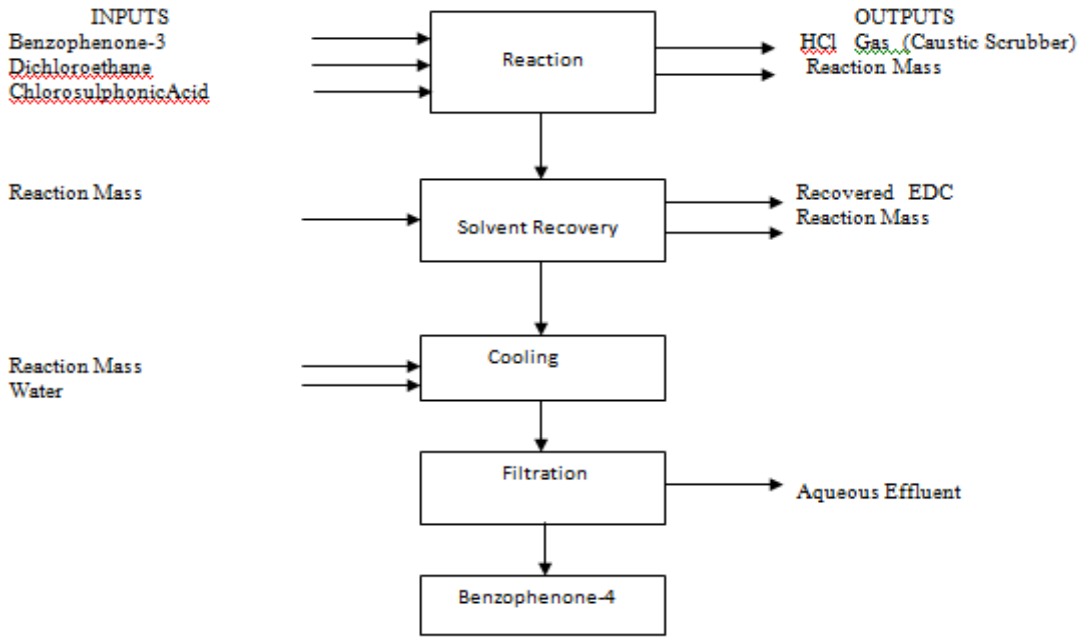
Benzophenone 4:



Scrubber Reaction:-



D. Process Flow Diagram



3.5.31 Allyl Glycidyl Ether

A. Manufacturing Process:

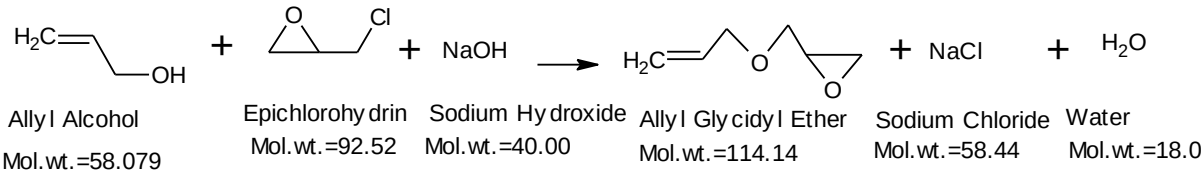
Allyl Glycidyl Ether prepared by reacting allyl alcohol with sodium hydroxide. Then add epichlorohydrin to the reaction mass at 50 °c.Digest for 5hrs at room temperature. After completion of reaction charge water in reaction mass and then separate the layer to get the product.

B. Material Balance:

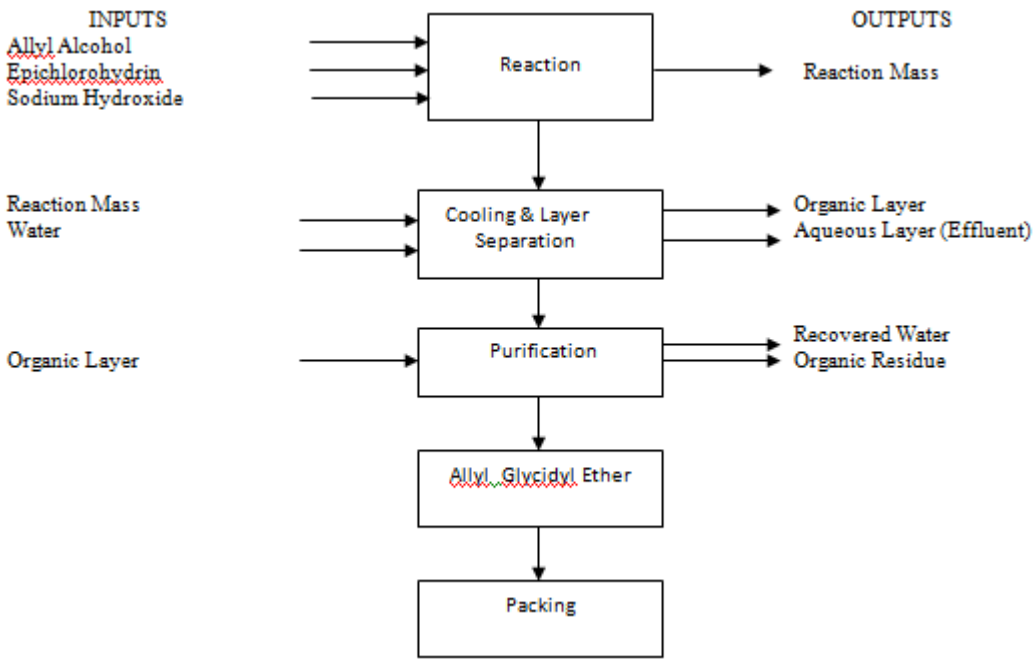
Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	Allyl Alcohol	0.400	Allyl Glycidyl Ether	1.000	Product
2	Epichlorohydrin	0.660	Aqueous Effluent	1.240	ETP
3	Sodium Hydroxide	0.280	Organic Residue	0.100	Incineration
4	Water	1.300	Recovered Water	0.300	Recycle
	Total	2.640	Total	2.640	

C. Chemical Reaction

AGDE:



D. Process Flow Diagram



3.5.32 Bisphenol F

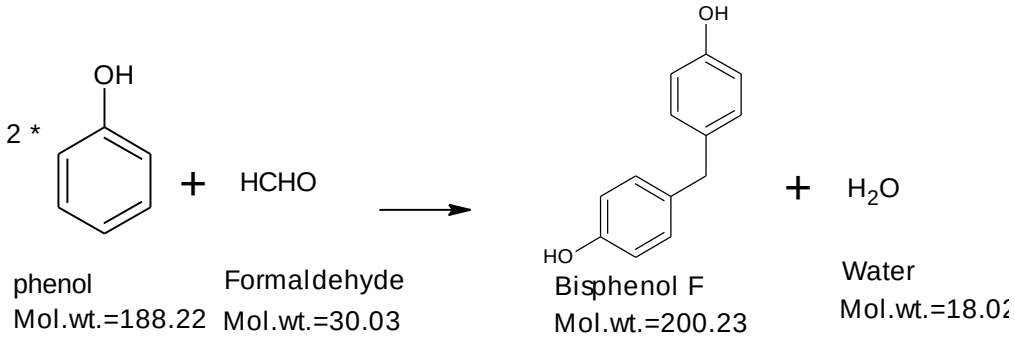
A. Manufacturing process for the preparation of Bisphenol F

Bisphenol F prepared by reacting phenol with formaldehyde in pres. of sodium hydroxide. Take phenol and formaldehyde into the reactor. Add sodium hydroxide solution to the reaction mass at 50°c.Product will precipitate out. Cool to room temperature. Filter the product and wash with water. Finally dry the product.

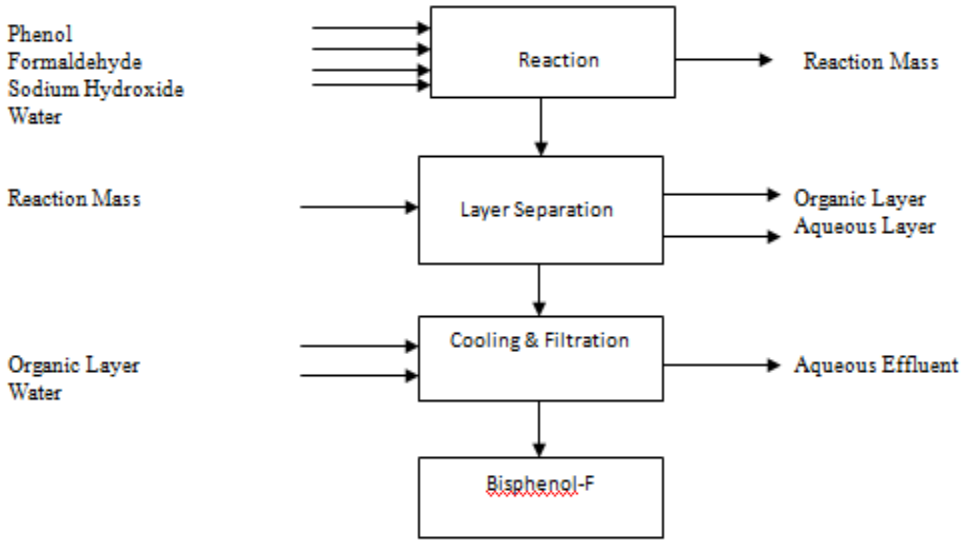
B. Material Balance:

Sr. No.	Raw Material	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	Phenol	0.89	Bisphenol F	1.00	Product
2	Formaldehyde	0.28	Aqueous Effluent	1.28	ETP
3	Sodium Hydroxide	0.04			
4	Water	1.07			
	Total	2.28	Total	2.28	

C. Chemical Reaction



D. Process Flow diagram



3.5.33 Bisphenol S

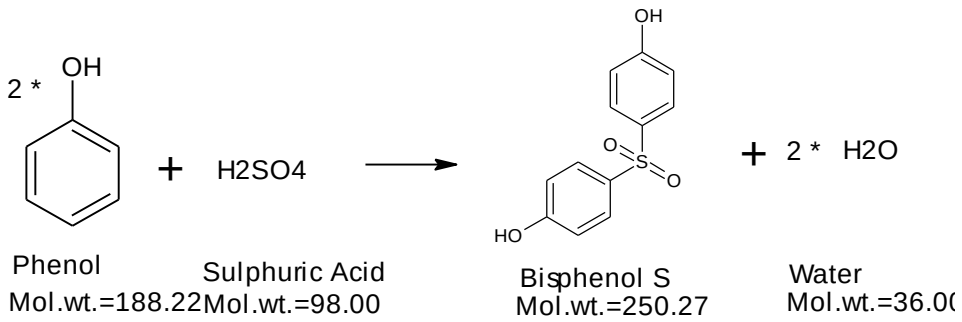
A. Manufacturing process for the preparation of Bisphenol S

Bisphenol S prepared by reacting phenol, sulphuric acid in presence of O-Dichlorobenzene as solvent. Take Phenol O-Dichlorobenzene into reactor .Add sulphuric acid solution to the reaction mass at 70°c during 3 hrs. Digest for 5 hrs at same temperature. Cool to room temperature. Filter the reaction mass and wash with water. Dry the product.

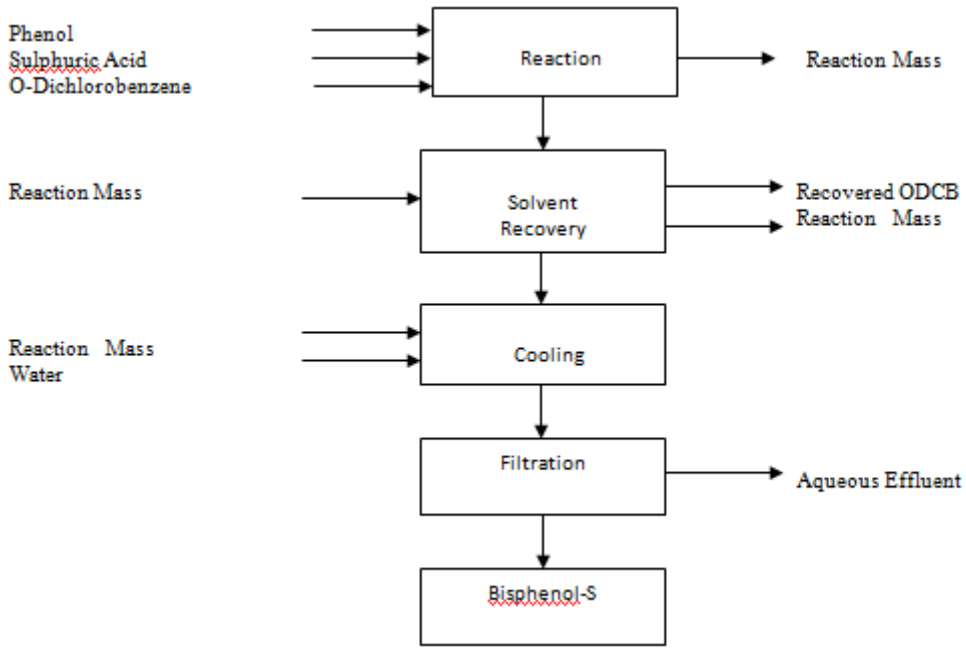
B. Material Balance:

Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	Phenol	0.840	Bisphenol S	1.000	Product
2	Sulphuric Acid	0.230	Aqueous Effluent	1.083	ETP
3	O-Dichlorobenzene	0.700	Recovered ODCB	0.687	Recycle
4	Water	1.000			
	Total	2.770	Total	2.770	

C. Chemical Reaction



D. Process Flow Diagram



3.5.34 1,2-Pentanediol & 1,5-Pentanediol

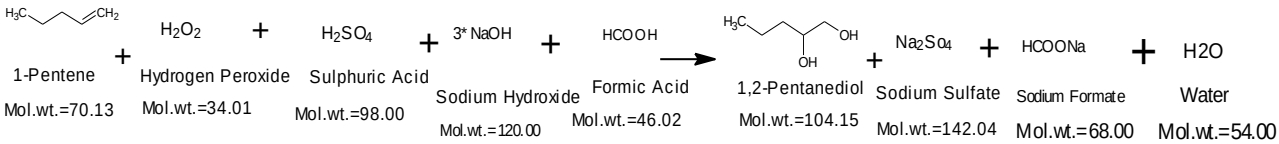
A. Manufacturing process for the preparation of Pentanediol

Treated 1-Pentene with the mix.of Sulphuric acid, formic acid and hydrogen peroxide followed by sodium hydroxide to give 1, 2-Pentanediol.After Fractional distillation get pure product.

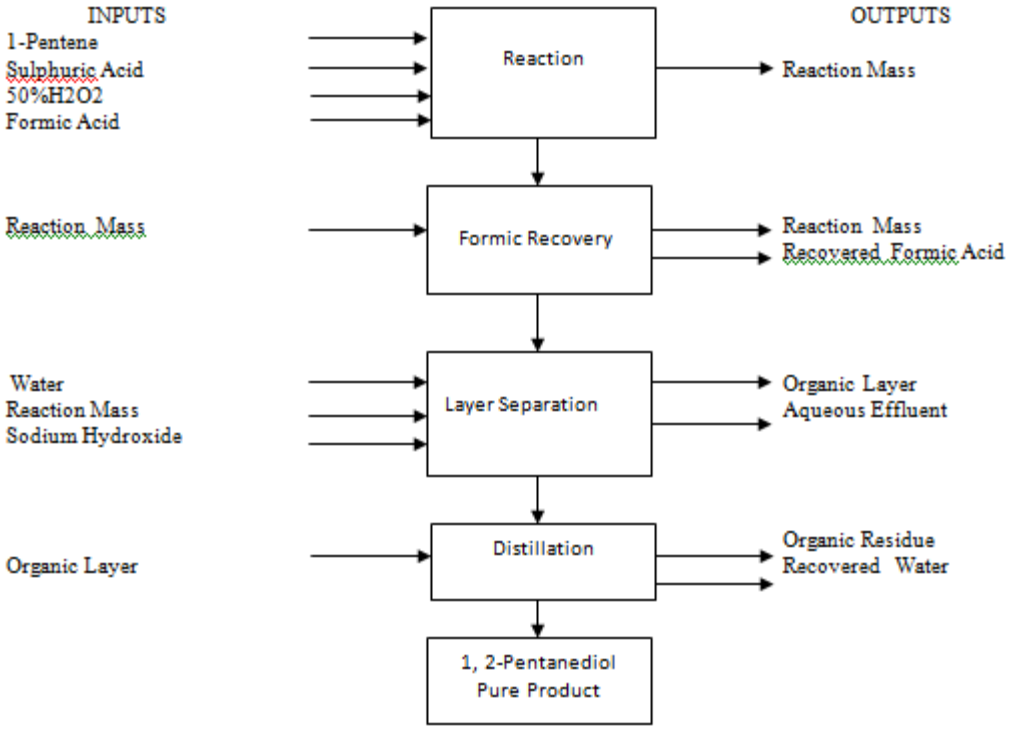
B. Material Balance:

Sr. No.	Input	Qty. (MT/MT)	Out put	Qty. (MT/MT)	Remarks
1	1-Pentene	0.748	1,2-Pentanediol	1.000	Product
2	Sulphuric Acid	0.522	Organic Residue	0.080	Incineration
3	H202	0.725	Aqueous effluent	3.000	ETP
4	HCOOH	0.576	Recovered formic acid (40 to 45%)	0.460	Sale
4	Sodium Hydroxide	0.393	Recovered Water	0.424	Recycle
5	Water	2.000			
	Total	4.964	Total	4.964	

C. Chemical Reaction



D. Process Flow Diagram



3.5.35 PROPIOPHENONE

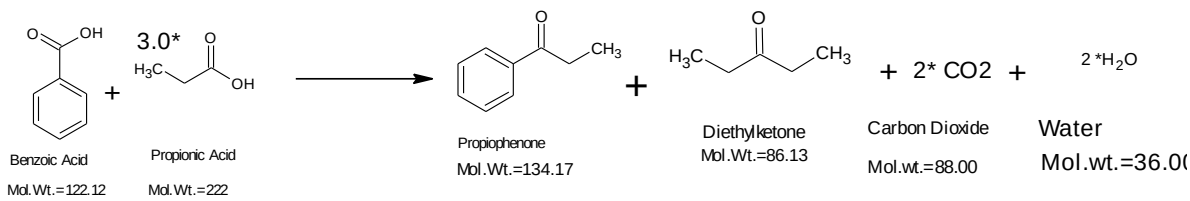
A. Manufacturing process for the preparation of Propiophenone and Diethyl Ketone

Diethyl Ketone and Propiophenone manufactured by passing, propionic acid, benzoic acid and steam through a stainless steel tubular reactor at 200 to 510°c in presence of metal salt . After fractional distillation under vacuum get pure Diethyl Ketone and Propiophenone>98%.

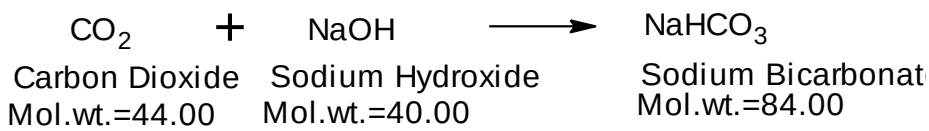
B. Material Balance for the preparation of Propiophenone /Ton & Diethyl Ketone/0.5 Ton

Sr. No.	Raw Material	Quantity (MT/MT)	Output Material	Quantity (MT/MT)	Use
1	Benzoic Acid	1.71	Propiophenone	1.05	Product
2	Propionic Acid	3.12	Diethylketone	0.51	Captive consumption
3	Steam	2.78	Propionic Acid	1.05	Recycle
4	Alumina Catalyst	1.00	Organic Residue	0.60	Incineration
5	Ejector Water	2.20	CO2	0.61	Gas(Scrubber)
6			Recovered Water	3.69	Recycle
7			Catalyst	1.10	Recycle
8			Ejector Water	2.20	Recycle
Total		10.81	Total	10.81	

C. Chemical Reaction for the preparation of Diethyl Ketone and Propiophenone

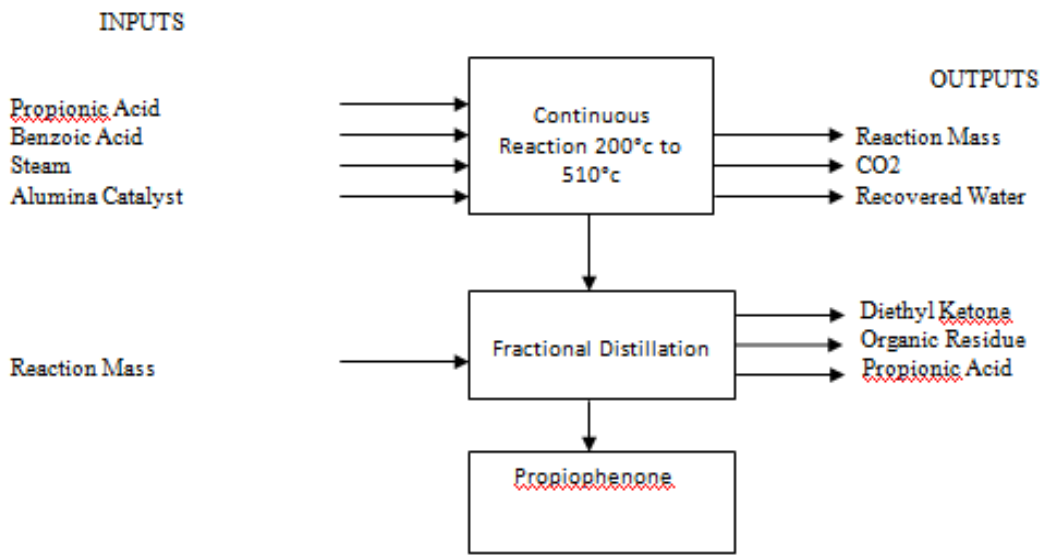


Scrubber



Sr. No.	Raw Material	Quantity(MT/MT)	Output Material	Quantity(MT/MT)	Remark
1	Carbon Dioxide	0.610	Sodium Bicarbonate (Aqueous Effluent)	11.645	ETP
2	Sodium Hydroxide	0.554			
3	Water for scrubber	10.481			
Total		11.645	Total	11.645	

D. Process Flow Diagram of Propiophenone and Diethyl Ketone



3.5.36 PINACOLONE

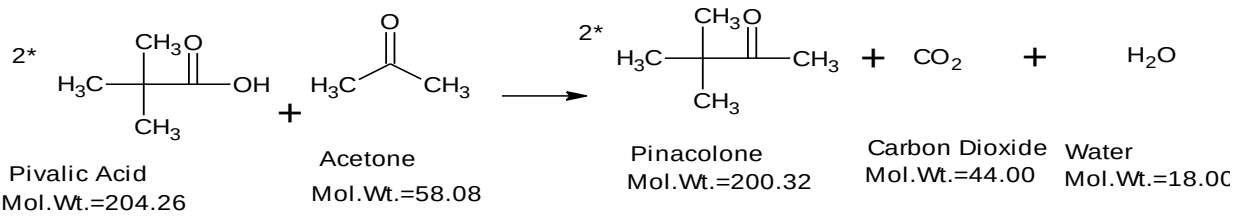
A. Manufacturing process for the preparation of Pinacolone

Pinacolone manufactured by passing pivalic acid, acetone through a stainless steel at 300 to 550 °c over Alumina catalyst. After fractional distillation under vacuum to get pure Pinacolone>98% & Yield = 90%

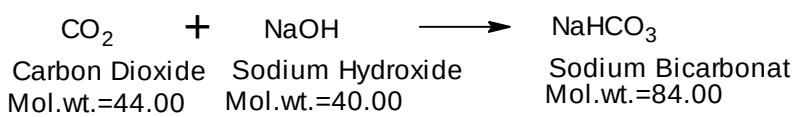
B. Material Balance for the preparation of Pinacolone

Sr. No.	INPUT	Quantity(MT/MT)	OUTPUT	Quantity(MT/MT)	Remark
1	Pivalic Acid	1.145	Pinacolone	1.000	Product
2	Acetone	1.315	Recovered water	0.101	Recycle
3	Alumina Catalyst	0.145	CO2	0.247	Gas(Scrubber)
4	Ejector Water	2.200	Recovered Acetone	0.564	Recycle
5			Alumina Catalyst	0.145	Recycle
6			Organic Residue	0.148	Incineration
			Ejector Water	2.600	Recycle
Total		4.805	Total	4.805	

C. Chemical Reaction for the preparation of Pinacolone

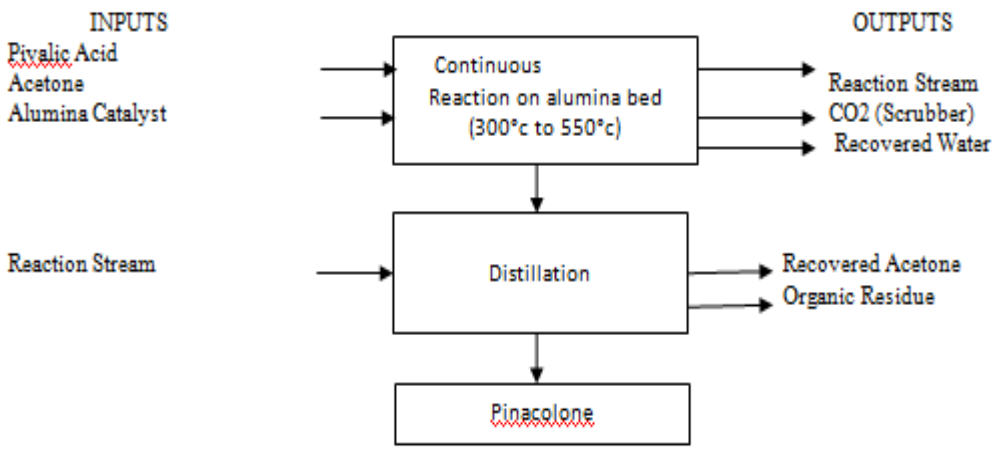


Scrubber



Sr. No.	Raw Material	Quantity(MT/MT)	Output Material	Quantity(MT/MT)	Remark
1	Carbon Dioxide	0.247	Sodium Bicarbonate (Aqueous Effluent)	4.716	ETP
2	Sodium Hydroxide	0.225			
3	Water for scrubber	4.244			
Total		4.716	Total	4.716	

D. Process Flow Diagram of pinacolone



3.6 Raw Material

Raw materials will procure from local market and transported through existing road network. Raw material requirement for proposed project is mentioned in following table.

Table 3-4: Raw Materials Consumption

Sr. No.	Name of Products & Intermediates	Raw Material	RM Consumption		CAS Number
			RM consumption MT/MT of Product	RM consumption MTPM	
1	Metribuzin	Triazinone	0.994	4.142	33509-43-2
		DMSO4	0.648	2.700	
		H2SO4	1.267	5.279	7664-93-9
		Na2CO3	1.6	6.667	
		NaOH lye 48%	1.894	7.892	
2	Tebuconazole	Pinacolone	0.451	1.879	75-97-8
		4-Chlorobenzaldehyde	0.630	2.625	
		Sodium Hydroxide	0.202	0.842	1310-73-2
		Methanol	0.400	1.667	67-56-1
		1-(4-chlorophenyl) - 4,4-dimethylpent-1-en-	1.683	7.013	--

Sr. No.	Name of Products & Intermediates	Raw Material	RM Consumption		CAS Number
			RM consumption MT/MT of Product	RM consumption MTPM	
		3-one (RM)			
		Catalyst	0.010	0.042	--
		Dimethyl sulfide	1.420	5.917	75-18-3
		Dimethyl sulfate	0.715	2.979	75-18-3
		SodiumHydroxide	0.454	1.892	1310-73-2
		2-(tert-butyl)-2-(4-chlorophenylethyl) oxirane	0.910	3.792	80443-63-6
		KOH	0.900	3.750	1310-58-3
		n-Butanol	1.500	6.250	71-36-3
		1,2,4-Triazole	0.278	1.158	288-88-0
		2-Methyl Cyclohexane	1.600	6.667	108-87-2
3	Paclobutrazole	Ketone	0.960	4.000	--
		Br2	0.675	2.813	7726-95-6
		MDC	6.000	25.000	541-73-1
		Bromo Ketone	1.293	5.388	598-31-2
		1,2,4-Triazol	0.285	1.188	288-88-0
		Potassium Carbonate	0.437	1.821	584-08-7
		Methanol	1.300	5.417	67-56-1
		Sodium Hydroxide	0.126	0.525	1310-73-2
		Sodium Borohydride	0.155	0.646	16940-66-2
4	Hexaconazole	Valeric acid	0.435	1.813	109-52-4
		Thionyl chloride	0.538	2.242	7719-09-7
		HCl	0.155	0.646	7647-01-0
		SodiumHydroxide	0.172	0.717	1310-73-2
		Valeryl Chloride	0.544	2.267	7719-09-7
		MDCB	0.667	2.779	541-73-1
		Aluminium Chloride	0.602	2.508	7446-70-0
		Dichloroethane	1.150	4.792	7446-70-0
		SodiumHydroxide	0.542	2.258	1310-73-2
		HCl	0.164	0.683	7647-01-0
		Sodium Hydroxide	0.180	0.750	1310-73-2
		Valerophenone	1.000	4.167	1009-14-9
		DMS	1.357	5.654	77-78-1
		$DMSO_4$	0.545	2.271	77-78-1
		Sodium Hydroxide	0.346	1.442	1310-73-2
		Oxirane	1.050	4.375	75-21-8

Sr. No.	Name of Products & Intermediates	Raw Material	RM Consumption		CAS Number
			RM consumption MT/MT of Product	RM consumption MTPM	
		DMF	4.155	17.313	68-12-2
		1,2,4- Triazol	0.305	1.271	288-88-0
		K2CO3	0.105	0.438	584-08-7
5	Pendimethalin	4- Nitro-O-xylene	0.575	2.396	99-51-4
		Diethyl ketone	0.825	3.438	96-22-0
		Catalyst	0.01	0.042	--
		Promoter	0.003	0.013	--
		Nitric acid	0.98	4.083	7697-37-2
		Sulfuric acid	0.689	2.871	7664-93-9
		EDC	1.65	6.875	107-06-2
		HCl	0.55	2.292	7647-01-0
		Cyclohexane	1.45	6.042	110-82-7
6	Propiconazole	Acetyl Chloride	0.392	1.633	75-36-5
		MDCB	1.406	5.858	541-73-1
		Aluminum Chloride	0.845	3.521	7446-70-0
		SodiumHydroxide	0.6	2.500	1310-73-2
		HCl	0.182	0.758	7647-01-0
		Sodium Hydroxide	0.2	0.833	1310-73-2
		1,2-Pentanediol	0.55	2.292	5343-92-0
		Toluene	1.4	5.833	108-88-3
		Dichloroethane	1.5	6.250	7446-70-0
		Bromine	0.698	2.908	7726-95-6
		1,2,4-Triazole	0.52	2.167	288-88-0
		Potassium Hydroxide	0.44	1.833	1310-58-3
		N,N-Dimethyl formamide	1.21	5.042	68-12-2
7	Sodium-N-Methyl-N-Oleyl-Taurate	2-aminoethanol	0.22	0.917	141-43-5
		Sulphuric Acid	0.352	1.467	7664-93-9
		Sodium Sulfite	0.23	0.958	7757-83-7
		Taurine	1.032	4.300	108-88-3
		Oleic Acid	0.909	3.788	112-80-1
		Sodium Hydroxide	0.15	0.625	1310-73-2
		Dimethyl Sulfate	0.23	0.958	75-18-3
8	Diafenoconazole	MDCB	6	25.000	541-73-1
		4-Chlorophenol	0.58	2.417	106-48-9
		Sodium Hydroxide	0.181	0.754	1310-73-2
		Dichloroethane	0.919	3.829	7446-70-0
		Acetyl chloride	0.285	1.188	75-36-5
		HCl	0.133	0.554	7647-01-0

Sr. No.	Name of Products & Intermediates	Raw Material	RM Consumption		CAS Number
			RM consumption MT/MT of Product	RM consumption MTPM	
		Sodium Hydroxide	0.145	0.604	1310-73-2
		Toluene	1	4.167	108-88-3
		1,2-propanediol	0.225	0.938	5343-92-0
		Bromine	0.572	2.383	7726-95-6
		Dichloroethane	1.12	4.667	7446-70-0
		1,2,4-Triazole	0.229	0.954	288-88-0
		KOH	0.284	1.183	1310-58-3
		DMF	1.285	5.354	68-12-2
		Hexane	2	8.333	110-54-3
9	Diafenthiuron	1-(2, 6-diisopropyl-4-phenoxyphenyl) thiourea	0.975	4.063	135252-10-7
		O-xylene	1	4.167	95-47-6
		Isocyanate	0.92	3.833	86-84-0
		Tert-butyl amine	0.235	0.979	75-64-9
		Acetonitrile	1.6	6.667	75-05-8
10	4-Hydroxyacetophenone & 2-Hydroxyacetophenone	Phenol	1.39	5.792	108-95-2
		AlCl3	1.964	8.183	75-36-5
		Acetyl Chloride	1.16	4.833	75-36-5
		Dichloroethane	2.2	9.167	7446-70-0
		SodiumHydroxide	1.773	7.388	1310-73-2
		HCl	0.539	2.246	7647-01-0
		Sodium Hydroxide	0.59	2.458	1310-73-2
11	4- Amino-6-Tert-butyl-3-Mercapto-1, 2, 4-Triazin-5(4h)-one triazinone	Dichloropinacolone	1.15	4.792	22591-21-5
		KMNO4	1	4.167	7722-64-7
		Bleach solution	1.48	6.167	7681-52-9
		Thiocarbohydrazide	0.58	2.417	2231-57-4
12	2-Ethyl Hexyl Glyceryl Ether	Epichlorohydrin	0.69	8.625	106-89-8
		2-Ethyl Hexyl Alcohol	0.49	6.125	104-76-7
		Sodium Hydroxide	0.212	2.650	1310-73-2
13	1,2-Hexanediol	1-Hexene	0.89	29.667	592-41-6
		50% Hydrogen Peroxide	0.763	25.433	7722-84-1
		Sulphuric Acid 98%	0.938	31.267	7664-93-9
		Formic Acid 85%	0.938	31.267	64-18-6
		Sodium Hydroxide	0.575	19.167	1310-73-2
14	1,2-Octanediol	1-Octene	0.94	11.750	111-66-0
		50% Hydrogen Peroxide	0.733	9.163	7722-84-1
		Sulphuric Acid	0.733	9.163	7664-93-9

Sr. No.	Name of Products & Intermediates	Raw Material	RM Consumption		CAS Number
			RM consumption MT/MT of Product	RM consumption MTPM	
		Formic Acid	0.7	8.750	64-18-6
		Sodium Hydroxide	0.29	3.625	1310-73-2
15	1,2-Dodecanediol	1-Dodecene	0.927	3.863	112-41-4
		50% Hydrogen Peroxide	0.397	1.654	7722-84-1
		Sulphuric Acid	0.488	2.033	7664-93-9
		Formic Acid	0.488	2.033	64-18-6
		Sodium Hydroxide	0.306	1.275	1310-73-2
16	1,2-Decanediol	1-Dodecene	0.927	3.863	112-41-4
		50% Hydrogen Peroxide	0.397	1.654	7722-84-1
		Sulphuric Acid	0.488	2.033	7664-93-9
		Formic Acid	0.488	2.033	64-18-6
		Sodium Hydroxide	0.306	1.275	1310-73-2
17	2-Cyanophenol	Salicylamide	1.13	4.708	65-45-2
		Triphosgene	0.86	3.583	32315-10-9
		Toluene	2.54	10.583	108-88-3
		Sodium Hydroxide (For Scrubber)	0.990	4.125	1310-73-2
18	4-Cyanophenol	4-Hydroxybenzamide	1.18	4.917	619-57-8
		Triphosgene	0.86	3.583	32315-10-9
		Toluene	2.54	10.583	108-88-3
		Sodium Hydroxide (For Scrubber)	0.989	4.121	1310-73-2
19	Phenyl Glycidyl Ether	Phenol	0.63	2.625	108-95-2
		Epichlorohydrin	0.62	2.583	106-89-8
		Sodium Hydroxide	0.27	1.125	1310-73-2
20	O-Cresyl Glycidyl Ether	O-Cresol	0.66	2.750	95-48-7
		Epichlorohydrin	0.57	2.375	106-89-8
		Sodium Hydroxide	0.25	1.042	1310-73-2
21	Butyl Glycidyl Ether	Butanol	0.57	2.375	71-36-3
		Epichlorohydrin	0.72	3.000	106-89-8
		Sodium Hydroxide	0.32	1.333	1310-73-2
22	Poly Glycerol Glycidyl Ether	Glycerin	0.37	1.542	56-81-5
		Epichlorohydrin	1.11	4.625	106-89-8
		Sodium Hydroxide	0.53	2.208	1310-73-2
23	Poly (ethylene glycol) diglycidyl Ether	PGE 400	0.79	3.292	122-60-1
		Epichlorohydrin	1.07	4.458	106-89-8
		Sodium Hydroxide	0.42	1.750	1310-73-2

Sr. No.	Name of Products & Intermediates	Raw Material	RM Consumption		CAS Number
			RM consumption MT/MT of Product	RM consumption MTPM	
24	IPA Glycidyl Ether	Isopropyl Alcohol	0.53	2.208	67-63-0
		EPCH	0.82	3.417	106-89-8
		Sodium Hydroxide	0.36	1.500	1310-73-2
25	TMBPF	2,6 Xylenol	0.87	3.625	576-21-1
		Formaldehyde	0.25	1.042	50-00-0
		HCl	0.186	0.775	7647-01-0
		Sodium Hydroxide	0.071	0.296	1310-73-2
26	TMBPA	2,6 –Xylenol	0.954	3.975	576-21-1
		Acetone	0.58	2.417	67-64-1
		Methane sulphonic Acid(cat.)	0.01	0.042	67-64-1
		Sodium Hydroxide for Neutralisation	0.05	0.208	1310-73-2
27	TMBP	2,6 Xylenol	1.12	4.667	576-21-1
		Silica gel	0.05	0.208	112926-00-8
28	2,4-Dihydroxybenzophenone	Benzotrichloride	1.17	4.875	98-07-7
		Resorcinol	0.33	1.375	108-46-3
		Sodium Hydroxide	0.718	2.992	1310-73-2
29	Benzophenone-3	2,4-Dihydroxy-Benzophenone	0.970	4.042	131-56-6
		DMSO4	0.49	2.042	77-78-1
		Sodium Hydroxide	0.19	0.792	1310-73-2
30	Benzophenone-4	Benzophenone-3	0.91	3.792	131-57-7
		Chlorosulphonic Acid	0.24	1.000	7790-94-5
		EDC	1.45	6.042	107-06-2
		Sodium hydroxide for Scrubber	0.16	0.667	1310-73-2
31	Allyl Glycidyl Ether	Allyl Alcohol	0.4	1.667	107-18-6
		Epichlorohydrin	0.66	2.750	106-89-8
		Sodium Hydroxide	0.28	1.167	1310-73-2
32	Bisphenol-F	Phenol	0.89	3.708	108-95-2
		Formaldehyde	0.28	1.167	50-00-0
		Sodium Hydroxide	0.04	0.167	1310-73-2
33	Bisphenol-S	Phenol	0.84	3.500	108-95-2
		Sulphuric Acid	0.23	0.958	7664-93-9
		O-Dichlorobenzene	0.7	2.917	95-50-1
34	1,2-Pentanediol & 1,5-Pentanediol	1-Pentene	0.748	3.117	109-67-1
		Sulphuric Acid	0.522	2.175	7664-93-9
		H_2O_2	0.725	3.021	7722-84-1

Sr. No.	Name of Products & Intermediates	Raw Material	RM Consumption		CAS Number
			RM consumption MT/MT of Product	RM consumption MTPM	
		HCOOH	0.576	2.400	64-18-6s
		Sodium Hydroxide	0.393	1.638	1310-73-2
35	Propiophenone & Diethyl Ketone	Benzoic Acid	1.71	7.125	65-85-0
		Propionic Acid	3.12	13.000	79-09-4
		Alumina Catalyst	1	4.167	1344-28-1
		Sodium Hydroxide	0.554	2.308	1310-73-2
36	Pinacolone	Pivalic Acid	1.145	4.771	75-98-9
		Acetone	1.315	5.479	67-64-1
		Alumina Catalyst	0.145	0.604	67-64-1
		Sodium Hydroxide	0.225	0.938	1310-73-2

3.6.1 Mode of transportation

All raw materials will be sourced from either local supplier and transported to the site through existing road network. Finished products based on client's requirement will be transported through road network.

3.7 Resource Optimization / Recycling and Reuse In the Project

- Feasibility of rain water harvesting will be worked out and harvested water will be reused after treatment.
- Solar energy will be utilized within plant up to maximum extent.

3.8 Resource Requirement

3.8.1 Investment

It is estimated that Rs. 18.75 Crores will be invested towards land purchase, site development, plant and machineries etc. Capital cost of the project including cost allotted for EMS is bifurcate in following table.

Table 3-5: Project Cost

Sr. No.	Description	Cost in Rs. (Crore)
1.	Land	1.50
2.	Site development	1.25
3.	Building/civil work	2.00
4.	Plant & Machinery/Utility	12.00
5.	Environmental Protection Measures	1.00
6.	Other /Miscellaneous	1.00
	Total	**18.75**

Note: Greenfield project have to contribute 2 % of the capital investment towards CER as per OM regarding "Corporate Environment Responsibility" (CER) no. 22-65/2017 on dated 01/05/2018. Project proponent will make a provision of Rs. 37.5 Lacs as funds for CER activities.

3.8.2 Water

It is estimated that approx. 15 KLD water will be required for domestic and construction activities during construction phase, which is sourced from GIDC water supply network. Water permission from GIDC is attached as **Annexure – 2**.

Construction Phase:

- Domestic : 6 KLD
- Construction activities : 9 KLD

During operation phase for domestic and other industrial activities 47.6 KLD water will be required. Pre-treatment like (RO/DM) to raw water will not require as GIDC is the source of water supply.

Table 3-6: Water Consumption

Sr. No.	Particular	Water Consumption (KLD)	Remarks
A	**Domestic**	2.75	Fresh water
B	**Greenbelt**	10	
C	**Industrial**		Fresh water
1	Process	17.17	
2	Washing	5	
3	Boiler	3.31	
4	Cooling	3.5	
5	Other - scrubber	5.87	
	Total Industrial	**34.85**	
	Total WC	**47.60**	

- Total water requirement for the project: **47.60 KLD**
- Quantity to be recycled: **Nil**

3.8.3 Electricity/ Power

Total 525 kVA power will be required which will supplied by Dakshin Gujarat Vij Company Limited (DGVCL). DG set (500 kVA) will be installed as backup power, which is used only in case of power failure/emergency.

3.8.4 Utilities

Utilities like Boiler, Cooling Tower, Chilling Plant and D.G. Set will be installed at proposed plant. Fuel to be required for operation of utility will purchase from the nearby vendor. Details of utilities and fuel requirement are given in table below:

Table 3-7: Utilities and Fuel

Sr. No.	Particular	Nos.	Capacity of utility
1	Boiler	4	(850 kg/hr.) each
2	Thermo pack	2	(20 k cal/hr) each
3	Thermo pack	2	(10 k cal/hr) each
4	Re-boiler	14	(7 m^3/hr) each

Sr. No.	Particular	Nos.	Capacity of utility
5	D.G. Set	1	500 KVA
6	Cooling Tower	2	300 TR each
7	Chilling plant	1	120 TR
8	Reactor	24	Various capacity i.e. 1 KL to 6 KL

3.8.5 Fuel

Fuel to be required for operation of utility will purchase from the nearby vendor. Details of fuel requirement are given in table below:

Table 3-8: Fuel Requirement

Sr. No.	Particular	Capacity of utility	Type of Fuel	Fuel Requirement
1	Boiler	4 nos. - (850 kg/hr.) each	Natural Gas	80 Nm^3/Hr.
2	Thermo pack	2 nos. - (20 Lacs kcal/hr) each	Natural Gas	120 Nm^3/Hr.
3	Thermo pack	2 nos. - (10 Lacs kcal/hr) each	Natural Gas	100 Nm^3/Hr.
4	D.G. Set	500 KVA	High Speed Diesel (HSD)	65 L/Hr

3.9 Wastes to be Generated and their Management

3.9.1 Wastewater

Sewage to be generated due to domestic activities will be treated in septic tank/soak pit. At the end of the industrial activities, wastewater will be generated from process, washing, utility etc. All process streams are high TDS and Low COD. Only three products have low TDS and one product has high COD. Industrial Effluent will be treated in ETP having primary treatment followed by MEE to achieving CETP, Dahej inlet norms. Treated effluent will be discharge to CETP, Dahej for further treatment and disposal. GIDC letter for allowing effluent discharge in GIDC drain is attached as **Annexure – 3**.

Table 3-9: Wastewater Generation

Sr. No.	Particular	Wastewater Generation (KLD)	Mode of Disposal
A	**Domestic**	2.2	Soak pit
B	**Industrial**		
1	Process	13.23	Effluent will be treated in ETP followed by MEE. MEE condensate will be reuse back in process
2	Washing	5	
3	Boiler	0.81	
4	Cooling	1.0	
5	other – scrubber	7.29	
	Total Industrial	**33.33**	
	Total w/w generation	**35.53**	

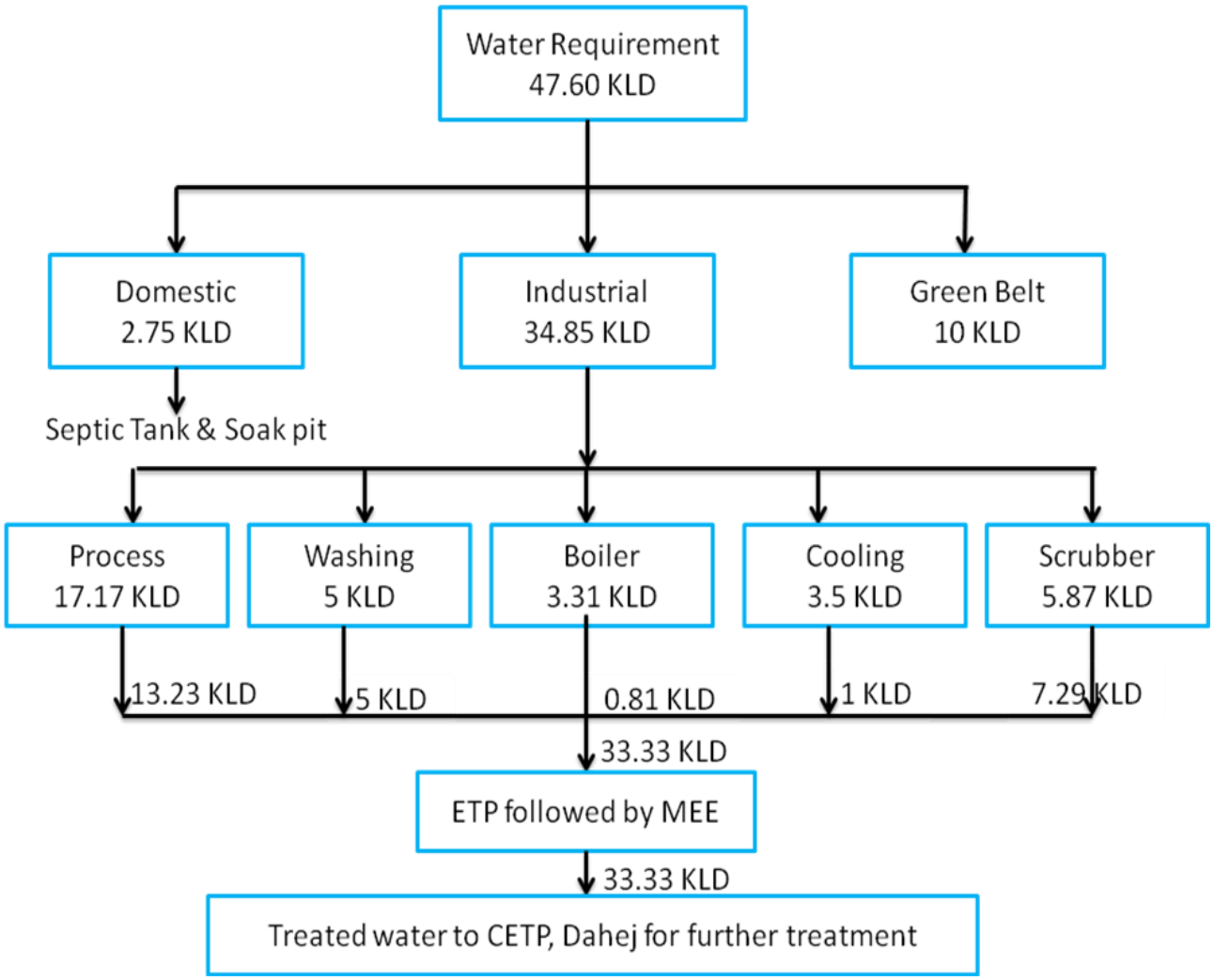


Figure 3-4 Water Balance Diagram

3.9.2 Air Emission

Boilers, Thermopacs and D.G. Set will be main source of flue gas emission from proposed plant. PM, SOx and NOx will be generated as flue gas pollutant. While main source of process gas emission is reactors and mainly HCl, NO_2, HBr, Ammonia will be generated as process gas pollutant. Detail of fuel and process gas emission is mentioned in following tables.

Table 3-10: Flue Gas Emission

Sr. No.	Stack Attached to	Fuel	Stack		Air Pollution Control Measure	Parameter & Permissible Limit
			Height (m)	Diameter (m)		
1	Boiler – 1 & 2	Natural Gas	Common stack – 30	0.5	Adequate stack Height and SMF will be provided for proper dispersion of pollutant	PM < 150 mg/Nm^3 SO_2 < 100 ppm NOx < 50 PPM
2	Boiler – 3 & 4	Natural Gas	Common stack – 30	0.5	Adequate stack Height and SMF will be provided for proper dispersion of pollutant	PM < 150 mg/Nm^3 SO_2 < 100 ppm NOx < 50 PPM
3	Thermo pack	Natural Gas	Common stack – 30	0.8	Adequate stack Height and SMF will be provided for	PM < 150 mg/Nm^3 SO_2< 100 ppm NOx < 50 PPM

Sr. No.	Stack Attached to	Fuel	Stack		Air Pollution Control Measure	Parameter & Permissible Limit
			Height (m)	Diameter (m)		
					proper dispersion of pollutant	
4	Thermo pack	Natural Gas	Common stack – 30	0.6	Adequate stack Height and SMF will be provided for proper dispersion of pollutant	PM < 150 mg/Nm^3 SO_2< 100 ppm NOx < 50 PPM
5	D.G. Set	HSD	11	0.5	Adequate stack Height and SMF will be provided for proper dispersion of pollutant	PM < 150 mg/Nm^3 SO_2< 100 ppm NOx < 50 PPM

Table 3-11: Process Gas Emission

Stack No.	Stack attached to	Vent Height (mtr.)	Vent Diameter (mtr.)	Pollutant	Pollution Control Equipment	CPCB permissible limit
1	2-Cyanophenol	15	0.4	Hydrochloric Acid	Caustic Scrubber	20 mg/Nm^3
2	4-Cyanophenol	15	0.4	Hydrochloric Acid	Caustic Scrubber	20 mg/Nm^3
3	4-Benzophenone	15	0.4	Hydrochloric Acid	Caustic Scrubber	20 mg/Nm^3
4	Paclobutrazole	15	0.4	Hydrobromic Acid	Water Scrubber	20 mg/Nm^3
5	Hexaconazole	15	0.4	Hydrochloric Acid	Caustic Scrubber	20 mg/Nm^3
6	Hexaconazole	15	0.4	Hydrochloric Acid	Caustic Scrubber	20 mg/Nm^3
7	Pendimethalein	15	0.4	Nitrogen Dioxide	Caustic Scrubber	<50 ppm
8	Propiconazole	15	0.4	Hydrochloric Acid	Caustic Scrubber	20 mg/Nm^3
9	Propiconazole	15	0.4	Hydrobromic Acid	Water Scrubber	5 mg/Nm^3
10	Diafenoconazole	15	0.4	Hydrochloric Acid	Caustic Scrubber	20 mg/Nm^3
11	Diafenoconazole	15	0.4	Hydrobromic Acid	Water Scrubber	5 mg/Nm^3
12	4-Hydroxyacetophenone	15	0.4	Hydrochloric Acid	Caustic Scrubber	20 mg/Nm^3
13	Diafenthiuron	15	0.4	Ammonia	Water Scrubber	30 mg/Nm^3

3.9.3 Waste Management

Hazardous waste generated from various industrial activities will be stored in designated area having roof, pucca floor and Leachate collection system. Waste storage and disposed will be done as per the guideline. The sources of wastes generation and its management are as given in the table below:

Table 3-12: Hazardous Waste Generation and Management

Sr. No.	Name of Hazardous Waste	Source	Haz. Waste Category for Schedule – I waste	Quantity (MTPA)	Mode of storage, treatment, transportation & disposal
1	ETP Sludge	From primary treatment of effluent	35.3	5.40	Collection, Storage, Transportation and Disposal at TSDF site for land filling.
2	MEE salt	From MEE	37.3	2319.75	Collection, Storage, Transportation and Disposal at TSDF site for land filling.
3	Organic Residue	Manufacturing Process like 2-Ethyl Hexyl Glyceryl Ether; 2-Cyanophenol; 4-Cyanophenol; Phenyl Glycidyl Ether; O-cresyl Glycidyl Ether; Butyl Glycidyl Ether; Poly Glycerol Glycidyl Ether; PGE DI Glycidyl Ether etc.	29.1	283.60	Collection, Storage, Transportation and Disposal at common incinerator for incineration.
4	Distillation Residue	Manufacturing Process of Pendimethalein	20.3	12.90	Collection, Storage, Transportation and Disposal for incineration.
5	Used/ Spent Oil	From plant and Machineries	5.1	6.00	Collection, Storage, Transportation & Disposal by selling to Registered Preprocessors
6	Spent Catalyst	From manufacturing Process	29.5	95.62	Collection, Storage, Transportation & Disposal at TSDF site for land filling.
7	Discarded Containers	From Raw Materials and product packing	33.1	5000 nos./annum	Collection, Storage, Decontamination & Detoxification, Disposal to authorized recycler or reuse within premises after onsite decontamination
8	Sludge from wet scrubber	From Scrubbers attached with reactors	37.1	15.00	Collection, Storage, Incineration within industrial unit. Disposal at nearest TSDF site for land filling
9	Bleed from Scrubber	From Scrubbers attached with reactors		7.29	Collection, Storage and treated in ETP
10	Spent Carbon or filter medium	From Process	36.2	2.40	Collection, Storage, Transportation & Disposal by selling to Registered Preprocessors
11	Date expired and off	From rejection by Customer	29.3	2.00	Collection, Storage, Incineration within industrial

Sr. No.	Name of Hazardous Waste	Source	Haz. Waste Category for Schedule – I waste	Quantity (MTPA)	Mode of storage, treatment, transportation & disposal
	specification pesticides				unit. Disposal at nearest TSDF site.
12	Spent Acid	From manufacturing Process of 1,2-Pentanediol; 1,2-Hexanediol; 1,2-Octanediol; 1,2-Dodecanediol; 1,2-Decanediol; Pendimethalein	29.6	758.70	Collection, storage, Transportation and disposal by selling to registered party having Rule - 9 permission under the HW Rules – 2016.
13	48% HBr solution (process waste)	From manufacturing Process of Paclobutrazole; Hexaconazole; Pendimethalein; Propiconazole; N-Oleyl Taurate; Diafenoconazole	29.1	157.80	Collection, storage, Transportation and disposal by selling to registered party having Rule - 9 permission under the HW Rules – 2016.
14	22% Ammonia Solution (process waste)	From manufacturing Process of Diafenthiuron	29.1	10.25	Collection, storage, Transportation and disposal by selling to registered party having Rule - 9 permission under the HW Rules – 2016.

3.10 Solvent Recovery

Various solvents like Acetone; Acetonitrile; Cyclohexane; Dichloroethane; Dichloromethane; Diethyl Ketone; Dimethyl sulfide (DMS); Hexane; MDCB; Methanol; N,N-Dimethylformamide (DMF); n-butanol; O-Dichlorobenzene; O-Xylene and Toluene will be used at propose project. There will be in built solvent recovery system in manufacturing process, hence no separate solvent recovery plant will be required to install. Further some solvents will be contributed in manufacturing process as reactant, hence recovery of such solvent will be less compare to other solvents. List of solvents used in process along with its percentage of recovery is mentioned as under,

Table 3-13: Solvent Recovery

Sr. No.	Solvent Name	Name of the product	Solvent Recovery			
			Solvent Used MTPM	Solvent Recovery MTPM	% Recovery	Remarks
1	2-Methyl Cyclohexane	Tebuconazole	6.67	6.54	98.12	-
2	Acetone	Pinacolone	5.48	2.35	42.89	Used as solvent as well as reactant
3	Acetonitrile	Diafenthiuron	6.67	6.33	95.00	-
4	Cyclohexane	Pendimethalein	6.04	5.80	96.00	-
5	Dichloroethane	Benzophenone-4	6.04	5.83	96.55	-
		Pendimethalein	6.88	6.56	95.45	-
		Propiconazole	6.25	6.06	97.00	-
		Diafenoconazole	8.50	8.30	97.69	-
		2-Hydroxyacetophenone and 4-hydroxyacetophenone	9.17	8.71	95.00	-
6	Dichloromethane	Paclobutrazole	25.00	23.96	95.83	-
		Hexaconazole	4.79	4.55	94.98	-
7	Diethyl Ketone	Pendimethalein	3.44	2.07	60.24	Used as solvent as well as reactant
8	Dimethyl sulfide (DMS)	Tebuconazole	5.92	5.79	97.89	-
		Hexaconazole	5.65	5.37	94.99	-
9	Hexane	Diafenoconazole	8.33	7.92	95.00	-
10	MDCB	Propiconazole	5.86	2.71	46.23	Used as solvent as well as reactant
		Diafenoconazole	25.00	21.71	86.83	Used as solvent as well as reactant
11	Methanol	Tebuconazole	1.67	1.63	97.50	-
		Paclobutrazole	5.42	5.15	95.00	-

Sr. No.	Solvent Name	Name of the product	Solvent Recovery			
			Solvent Used MTPM	Solvent Recovery MTPM	% Recovery	Remarks
12	N,N-Dimethylformamide (DMF)	Hexaconazole	17.31	16.67	96.27	-
		Propiconazole	5.04	4.79	95.04	-
		Diafenoconazole	5.35	5.25	97.98	-
13	n-butanol	Tebuconazole	6.25	6.17	98.66	-
14	O-Dichlorobenzene	Bisphenol-S	2.92	2.86	98.14	-
15	O-Xylene	Diafenthiuron	4.17	4.08	98.00	-
16	Toluene	2 Cyanophenol	10.583	10.375	98.03	-
		4 Cyanophenol	10.583	10.375	98.03	-
		Propiconazole	5.83	5.72	98.00	-
		Diafenoconazole	4.17	4.08	98.00	-

3.11 Spent Acid Management

Mainly Formic acid and sulphuric acid will be generated from manufacturing process of 1,2-Pentanediol 1,2-Hexanediol; 1,2-Octanediol; 1,2-Dodecanediol; 1,2-Decanediol and Pendimethalein. Quantity to be generated and its management is mentioned below.

Table 3-14: Spent Acid Management

Sr. No.	Name of the Product	Name of Spent Acid	Acid Generation		Concentration of spent acid	Mode of Disposal
			Ton/Ton. of product	MTPA		
1	1,2-Pentanediol	Formic Acid	0.46	23.00	40 to 45%	Collection, storage, Transportation and disposal by selling to registered party having Rule - 9 permission under the HW Rules – 2016 .
2	1,2-Hexanediol	Formic Acid	1.355	542.00	40 to 45%	
3	1,2-Octanediol	Formic Acid	0.595	89.25	40 to 45%	
4	1,2-Dodecanediol	Formic Acid	0.801	40.05	40 to 45%	
5	1,2-Decanediol	Formic Acid	0.588	29.40	40 to 45%	
6	Pendimethalein	Sulphuric acid	0.700	35.00	40 to 44%	
	Total Acid Generation /Year			**758.70**		

3.12 Applicability of EIA notification

Considering the project activities of proposed project, it is noticed that the proposed project falls under category A of item 5(b) “Intermediates and Pesticides industries and pesticide specific intermediates (excluding formulation)” and Category “B” of item 5(f) “Synthetic Organic Chemicals industry” of the Schedule to the Environment Impact Assessment Notification, 2006 and amended thereafter and requires appraisal at central level. The proposed project will develop within the Dahej – GIDC II, which is Notified Industrial Area and part of PCPIR. Public hearing is exempted as per Para 7 Stage III (3) (i) (b) of the EIA Notification, 2006.

4 SITE ANALYSIS

4.1 Connectivity

Project site and surrounding area is well connected with rest of the country through highways & railways. There are many industries located in nearby vicinity which is either under construction or in operation. The details of the connectivity with distance from the unit are as under:

Table 4-1: Details of Connectivity

Sr. No.	Particular	Description	Distance (km)	Direction
1.	Nearest National & State Highway	SH – 6	0.4	South
		SH - 206	4.41	WSW
2.	Nearest town	Dahej	4.02	West
3.	Nearest Airport	Surat, Airport	65.66	SSE
4.	Nearest Railway station	Bharuch	35.90	East

4.2 Communication

Dahej GIDC is well connected with telephone, telefax etc. all the communication facilities are well developed in the district.

4.3 Infrastructure

GIDC Dahej has all infrastructure facilities like pucca road, water supply network, electrical line etc. Proposed Greenfield project site is open land. All through Social infrastructure like Schools, Hospitals, place of worship, community facilities etc. is available within study area.

4.4 Topography

Topography of the project site land is plane with no bushes. GIDC, Dahej is designated for industrial activities. Nearest residential area is Dahej Village which is located 4.02 km in W. There is no Forest, National park, Wild life sanctuary located within a radius of 10 km from project site. Narmada River is located at around 3.97 km in South direction.

4.5 Soil Classification

Generally districts of Bharuch region have deep black soils. Various type of soil like Deep black, medium black to loamy sand (Goradu) soils to Medium Black poorly drained soils are available in Bharuch.

4.6 Climatic Condition

Bharuch has a tropical savanna climate, moderated strongly by the Arabian Sea. The summer begins in early March and lasts until June. April and May are the hottest months, the average maximum temperature being 40 °C (104 °F). Monsoon begins in late June and the Village receives about 800 millimetres (31 in) of rain by the end of September, with the average maximum being 32 °C (90 °F) during those months. October and November see the retreat of the monsoon and a return of high temperatures until late November. Winter starts in December and ends in late February, with average temperatures of around 23 °C (73 °F).

5 PLANNING BRIEF

5.1 Planning Concept

Jeevan Chemicals has two units at Vapi GIDC and now proposes another unit at Plot No. DP-119, Dahej GIDC – II, Village – Sayakha, Taluka – Vagra, District – Bharuch, Gujarat to meet the indigenous demand of pesticide and organic chemicals. Proposed industrial plant will be developed as per GIDC and local planning authority guideline. Project proponent will plan to develop processing, non-processing and greenbelt area within plant premises of 19453.58 sq. m. area. Land is already in possession with project proponent and copy of possession letter is attached as **Annexure – 4**.

5.2 Land Use Planning

Proposed project site will be developed for industrial use only. Residential area or housing colony will not be required. During operation phase 45 nos. of direct and 10 nos. of indirect personnel will employ. There is no need of housing for the employees as local personnel will be hired. Project proponent has obtained consent to established in Oct. – 2014 to set up formulation plant. Based on the CTE two sheds and security cabin has been constructed at that time. Later on the project was dropped by proponent and no further development in the project as well as at project site. Land use of project site shall be as build up area of buildings, storage facility, roads, greenbelt, and open land etc. and its break-up is as under:

Sr. no.	Particulars	Area (Sq. m)	Area %
1	Production shed	1350	6.94
2	Storage area of raw material & Products	450	2.31
3	Admin office, Lab and Canteen	450	2.31
4	Storage area of Hazardous chemicals	450	2.31
5	Boiler, D.G. etc.	450	2.31
6	Utility area, ETP and Waste storage	450	2.31
7	Greenbelt	6500	33.41
8	Open area	9353.58	48.08
	Total	**19453.58**	**100.00**

5.3 Amenities / Facilities

Adequate storage facility for storage of raw material finished well, chemicals, machinery spares and consumables shall be provided. A small mechanical and electrical/ instrument workshop facilities for repairs and maintenance shall be provided. Internal water supply network, fire hydrants system, piping for utility supply and wastewater treatment etc. will be provided as per project requirement.

6 PROPOSED INFRASTRUCTURE

Following infrastructure facility will be developed within plant premises as per project requirement.

No.	Area	Description
1	Industrial Area	19453.58 sq. m.
2	Residential Area	Not applicable as company will employ staff from the local area.
3	Green Belt	6500 sq. m. (33.41%)
4	Social Infrastructure	Drinking water facility, Canteen, proper sanitation, etc. will be provided to the workers working in plant.
5	Connectivity	Project site is well connecting with road and rail network.
6	Wastewater Management	• Domestic wastewater (2.5 KLD) will be treated in septic tank/soak pit. • Industrial Effluent (33.33 KLD) will be treated in ETP followed by MEE. • Treated water will disposed to CETP, Dahej for further treatment and disposal.
7	Industrial Solid Waste Management	Solid/hazardous waste collection, storage, transportation and disposal will be done as per Hazardous and Other Wastes (Management and. Transboundary Movement) Rules, 2016.

7 REHABILITATION AND RESETTLEMENT (R & R) PLAN

The proposed project will be established on Industrial land, which is already acquired and there is no habitat, so the project proposal does not involve any Rehabilitation & Resettlement.

8 PROJECT SCHEDULE & COST ESTIMATES

8.1 Project Schedule

Implementation of project within a pre-determined time frame is an important factor for the success of a project. Timely implementation may save on various costs like interest, administrative overheads and helps to realize the goals as per pre-determined objectives. Proposed project will take place after getting the necessary clearances from concerned authorities and estimated to be completed within 20 months.

8.2 Project Cost

The total project cost for the proposed project would be around Rs. 18.75 Crore. Project proponent has made budgetary provisions of Rs. 1 crore towards capital cost of EMP. The details of various activities and cost for the same are shown in Section 3.8.1

Recurring cost includes budget earmarked for pollution control equipment; monitoring; operation and maintenance of pollution control facilities, greenbelt development and maintenance, compliance with clearance, health and safety, waste management etc.

8.2.1 Economic Viability

Proposed products are in demand widely in local; national as well as international market as it is widely used in agricultural field as well as textile and other industries respectively. Proposed project to be developed in GIDC, Dahej II. All infrastructure facilities like pucca road, water supply network, power, drainage network etc. as well as easily availability of raw materials and man power within Dahej Notified industrial estate. Existing road network is connected with various parts of country, which will useful for transportation of proposed products. Looking to these points, proposed project is economically viable.

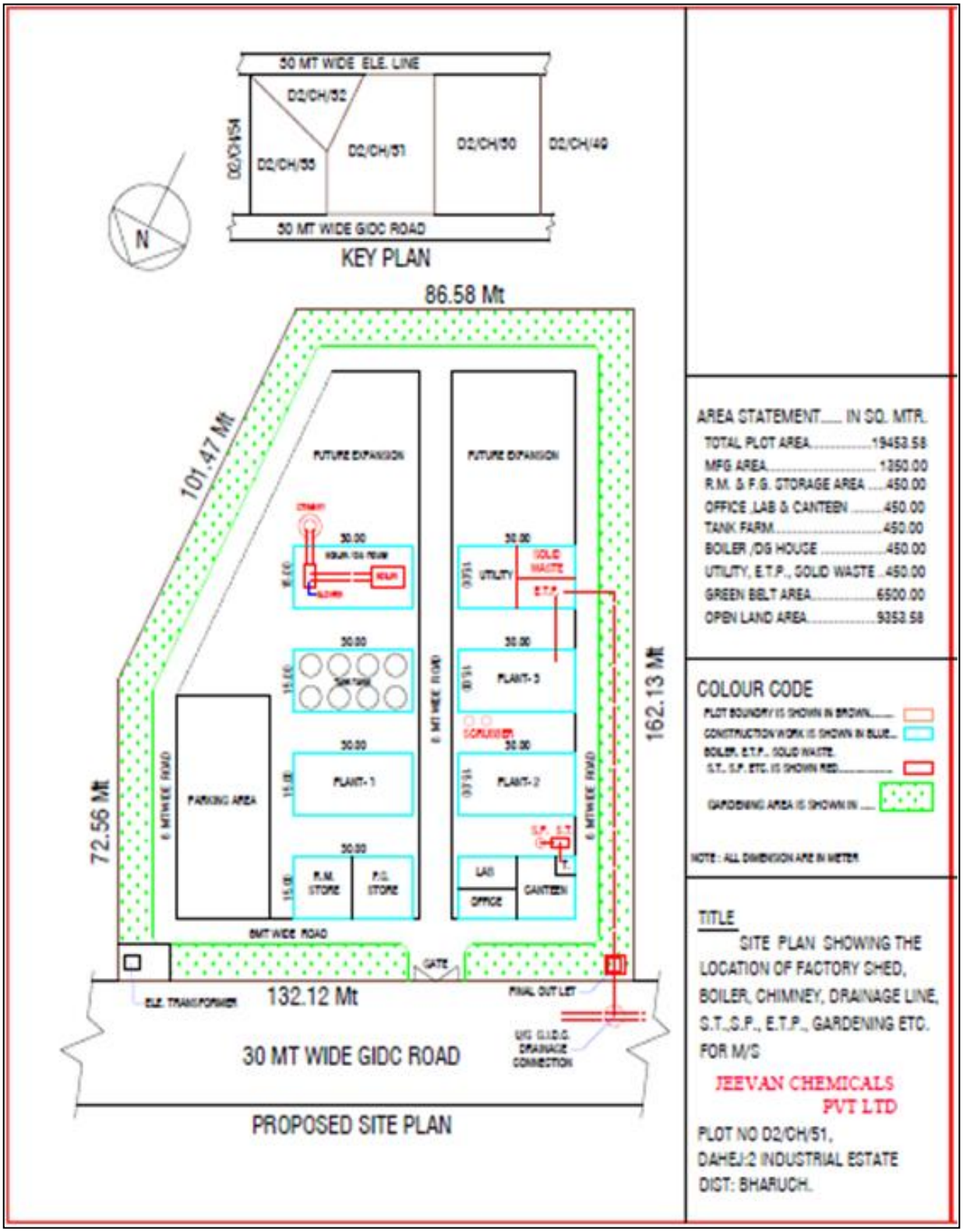
9 ANALYSIS OF PROPOSAL

Proposed project will developed in GIDC notified industrial area and will have direct as well indirect benefits in terms of financial and social welfare. Some benefits due to proposed project are listed below:

- 50 – 70 nos. of unskilled and skilled labour will be hired during construction phase.
- Technical person (55 nos.) will directed employed in plant during operation phase. Further 10-15 people will get indirect benefits due to proposed project.
- Development of other ancillary services/infrastructure.
- Social up-liftment of surrounding villages through CER activities.
- Greenbelt development and rainwater harvesting will have positive impact on environment.

A. ANNEXURES

ANNEXURE 1 LAYOUT PLAN



ANNEXURE 2 GIDC WATER SUPPLY LETTER

GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION
(A GOVT. OF GUJARAT UNDERTAKING
Office Of The Deputy Executive Engineer (Water Supply),
1st Floor, Narmada Comm. Complex,
Station Road, Panchbatti, Bharuch -392001
PH :242432/244184 FAX:(02642)241902

GIDC/DEE(WS)/BRH/576 Date: 25/07/2019

To
M/s. Jeevan Chemicals Pvt. Ltd.,
Plot No-D2/CH/51,
GIDC- Dahej-II.

Sub: Request for assurance letter for water supply of Plot No- D2/CH/51, at Dahej-II.
Ref: Your Letter dated 22/07/2019.

Dear Sir,

Vide letter under reference, you have demanded an assurance letter to provide total of 50 KLPD of water quantity for above said Plot No D2/CH/51 in order to obtain Environment clearance and NOC from GPCB.

In this regard, this office assures that total 50 KL per day of water can be supplied to M/s. Jeevan Chemicals Pvt. Ltd., subject to the following conditions:

1. You will have to made deed of rectification for revision in water quantity, if required.
2. Availability of spare water quantity.
3. The allottee pays the contribution and other applicable charges for the said quantity of water.
4. The allottee has to make their own provision to convey water from GIDC water source i.e. Sump/Reservoir if the quantity demanded is more than the entitled quantity.
5. The water connection would only be released after the approvals from the competent authority.
6. The water connection shall only be released after the submission of GPCB consent as per the approved quantity.
7. GIDC supply the water as per availability of water from source. In case of non-availability / less availability water arrangement shall be made by allottee at their cost.
8. If the quantity of water is not available from the nearby GIDC water supply network, the allottee have to lay the appropriate diameter size line from the nearest GIDC location from where the approved quantity is available at their own cost.

This is for your information please.
Thanking you,

Yours faithfully,

Dy. Executive Engineer (WS),
GIDC Bharuch

ANNEXURE 3 GIDC LETTER FOR EFFLUENT DISCHARGE

GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION

GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION
(A GOVT. OF GUJARAT UNDERTAKING)
Office of the Dy. Executive Engineer (DRG)
1st FLOOR, NARMADA COMM. COMPLEX,
STATION ROAD, PANCHBATTI,
BHARUCH –392001PH:242432/244183 FAX:(02642)241902
Mail ID: drg-dahej@gidcgujarat.org

NO: GIDC/BRH/DEE (DRG)/ 4149

Date: 26 / 07 /2019

To,
M/s. Jeevan Chemicals Pvt. Ltd.
B-11, Manglesh Shimpoli road,
Kastur Park, Borivali West Mumbai

Sub: Assurance letter to discharge of Total 20.00 klpd of Treated Industrial Effluent by M/s. Jeevan Chemicals Pvt. Ltd. Plot no. D-II/CH/51 at Dahej-II.

Ref : - Your Letter no. NIL, Date: 22/07/2019

Dear Sir,

Vide letter under reference, you have demanded an assurance letter to discharge of Total quantity of 20.00 Klpd of Treated Industrial Effluent.

In this regard, this office assures that total 20.00 Klpd of Treated Industrial Effluent can be discharged by M/s. Jeevan Chemicals Pvt. Ltd. Plot no. D-II/CH/51 subject to the following conditions:

1. Availability of infrastructure.
2. Availability of spare quantity in design capacity of sewer line. If the effluent quantity exceeds the entitled quantity, you will have to lay the pipeline up to collection well as directed by engineer in charge.
3. You shall have to become a member of Dahej CETP after commissioning of the same.
4. You will have to pay the contribution and other applicable charge for the said quantity of Treated Industrial Effluent.
5. You will have to make your own arrangement to discharge Treated Industrial Effluent in to GIDC's sewer line or in to collection wells directed by GIDC.
6. The Treated Industrial Effluent discharge connection would only be released after the approvals from the competent authority.
7. The Drainage connection shall only be released after the submission of GPCB consent as per approved quantity.

This is for your Information Please.

Dy. Executive Engineer (DRG),
GIDC Bharuch.

ANNEXURE 4 LAND POSSESSOPM LETTER

GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION
(A GOVT. OF GUJARAT UNDERTAKING)

2nd floor, Narmada Commercial Complex,
Panch Batti, Bharuch.
Phone :(02642) 242432, FAX :(02642): 241902

NO.GIDC / DEE (road) /BRH / 68 DATE: 25/3/11

Ref :	(1) Allotment Order No.	: GIDC / RM /ANK / ALT- /405	Date : 21/01/2011
	(2) Poss. Advice No.	: GIDC / RM /ANK / ALT / 1828	Date : 14/03/2011
	(3) Extension letter No..	: GIDC / RM /ANK / ALT /	Date : ——
	(4) corrigendum Order No.	: GIDC / RM /ANK / ALT /	Date :

Possession Receipt

In pursuance of allotment of Ind. Plot / ~~Service Plot /Comm. plot / Hog. plot No. / Hog. qtr No. /shed No.~~ D-2/CH- 51 admeasuring 20140.34 sq.mt (Tentative) situated in the housing / industrial phase Dahej –II " As is Where is basis " consisting survey No,790/P, 798/P, 791/P, & 793/P& vadadala 224/P,228/P within the village limit of Vdadala at GIDC Industrial estate Dahej ,Ta. Vagra , Dist Bharuch is handed over to day i.e on 25/03/2011 in good condition.

The Said Premises Are Bounded As Follows :

Plot No: D-2 / CH- 51

On towards North By	30.00mt wide Road
On towards South By	35.00mt wide Tower Line
On towards East By	Plot No D-2 / CH / 52&53
On towards West By	Plot No D-2 / CH / 50

Possession Taken Over By :

Shri for JEEVAN CHEMICALS PVT. LTD.

Sign

Desi DIRECTOR

Place GIDC / BRH

Dt:

Possession Handed Over By:

Shri K S Ganji

sign

Desi AAE

place GIDC / BRH

Dt :

Copy to :

(1)Shri. / M/s : Jeevan Chemicals Private Limited,
B-11, Mangalesh Shimpoli road,
Kastur Park, Borivali West Mumbai.

(2) The R M GIDC / Ankleshwar.
(3) The A O GIDC / Ankleshwar.
(4) The Executive Engineer GIDC Bharuch.
(5) The Dy Ex Engineer (W/s) , GIDC Bharuch.
(6) The Dy.Ex Engineer (Drg). GIDC Bharuch.