FORM-1

for

PROPOSED EXPANSION OF SPECIALTY CHEMICALS IN EXISTING UNIT

of

M/s. PAUSHAK LTD.

PLOT NO.: 135, 136, 145, 146, 147, 229 & 230,
VILL.: PANELAV, PO: TAJPURA, TAL.: HALOL,
DIST. PANCHMAHAL – 389 350
GUJARAT

Prepared By:

NABL Accredited Testing Laboratory
ISO 9001:2008 Certified Company

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

APPENDIX I

(See paragraph - 6)

FORM 1

(I) Basic Information

Sr. No.	Item	Details
1.	Name of the project/s	Paushak Ltd.
2.	S. No. in the schedule	5(b) & 5(f)
3.	Proposed capacity/area/length/tonnage to be handled/command area/lease area/number of wells to be drilled	For detail Please refer **Annexure – I**
4.	New/Expansion/Modernization	Expansion
5.	Existing Capacity/Area etc.	--
6.	Category of Project i.e. 'A' or 'B'	'A'
7.	Does it attract the general condition? If yes, please specify.	No
8.	Does it attract the specific condition? If yes, please specify.	No
9.	Location	
	Plot/Survey/Khasra No.	Plot No. 135, 136, 145, 146, 147, 229 & 230
	Village	Panelav,
	Tehsil	Halol
	District	Panchmahal
	State	Gujarat
10.	Nearest railway station/airport along with distance in kms.	Vadodara: 45 Km
11.	Nearest Town, city, District Headquarters along with distance in kms.	Halol: 8 km
12.	Village Panchayats, Zilla Parishad, Municipal Corporation, local body (complete postal address with telephone nos. to be given)	Not applicable
13.	Name of the applicant	Paushak Ltd.
14.	Registered Address	Paushak Ltd. Plot No.: 135, 136, 145, 146, 147, 229 & 230, Vill.: Panelav, PO: Tajpura, Tal.: Halol, Dist. Panchmahal – 389 350 Gujarat
15.	Address for correspondance:	
	Name	Mr. Debangshu Bhattacharya
	Designation (Owner/Partner/CEO)	AVP (Operations)
	Address	Paushak Ltd. Plot No.: 135, 136, 145, 146, 147, 229 & 230, Vill.: Panelav, PO: Tajpura, Tal.: Halol, Dist. Panchmahal – 389 350 Gujarat

	Pin Code	389 350
	E-mail	d.bhattacharya@alembic.co.in ramchandra.kulkarni@alembic.co.in nikunj.bhatt@alembic.co.in
	Telephone No.	(02676) 664441
	Mob. No.	+91 9825483161
	Fax No.	-
16.	Details of Alternative Sites examined, if any. Location of these sites should be shown on a toposheet.	NA
17.	Interlinked Projects	NA
18.	Whether separate application of interlinked project has been submitted?	NA
19.	If yes, date of submission	NA
20.	If no, reason	NA
21.	Whether the proposal involves approval/clearance under: if yes, details of the same and their status to be given. (a) The Forest (Conservation) Act, 1980? (b) The Wildlife (Protection) Act, 1972? (c) The C.R.Z. Notification, 1991?	No
22.	Whether there is any Government Order/Policy relevant/relating to the site?	No
23.	Forest land involved (hectares)	NA
24.	Whether there is any litigation pending against the project and/or land in which the project is propose to be set up? (a) Name of the Court (b) Case No. (c) Orders/directions of the Court, if any and its relevance with the proposed project.	NA

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

(II) Activity

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

Sr. No.	Information/Checklist confirmation	Yes/ No	Details there of with approximate quantities frates, wherever possible) with source of information data
1.1	Permanent or temporary change in land use, land cover or topography including increase intensity of land use (with respect to local land use plan)	No	Proposed expansion within existing unit.
1.2	Clearance of existing land, vegetation and Buildings?	Yes	Minor site clearance activities shall be carried out to clear shrubs and weed.
1.3	Creation of new land uses?	No	The project site is located on level ground, which does not require any major land filling for area grading work.
1.4	Pre-construction investigations e.g. bore Houses, soil testing?	No	
1.5	Construction works?	Yes	For detail Please refer **Annexure – II**
1.6	Demolition works?	No	There will not be Demolition work at the site.
1.7	Temporary sites used for construction works or housing of construction workers?	Yes	
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations	Yes	For detail Please refer **Annexure – II**
1.9	Underground works mining or tunneling?	No	
1.10	Reclamation works?	No	
1.11	Dredging?	No	
1.12	Off shore structures?	No	
1.13	Production and manufacturing processes?	Yes	For detail Please refer **Annexure -III**
1.14	Facilities for storage of goods or materials?	Yes	Areas for storage tank farm, raw materials and finished products will be developed for the proposed Expansion project.
1.15	Facilities for treatment or disposal of solid waste or liquid effluents?	Yes	For detail please refer **Annexure – IV & V.**
1.16	Facilities for long term housing of operational workers?	No	
1.17	New road, rail or sea traffic during Construction or Operation?	No	
1.18	New road, rail, air waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?	No	
1.19	Closure or diversion of existing transport	No	

	routes or infrastructure leading to changes in traffic movements?		
1.20	New or diverted transmission lines or Pipelines?	No	There will not be said work at the site.
1.21	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	No	
1.22	Stream crossings?	No	
1.23	Abstraction or transfers of water form ground or surface waters?	Yes	Water requirement will be met through ground water & external sources.
1.24	Changes in water bodies or the land surface Affecting drainage or run-off?	No	
1.25	Transport of personnel or materials for construction, operation or decommissioning?	Yes	By road only.
1.26	Long-term dismantling or decommissioning or restoration works?	No	
1.27	Ongoing activity during decommissioning which could have an impact on the environment?	No	
1.28	Influx of people to an area either temporarily or permanently?	No	
1.29	Introduction of alien species?	No	
1.30	Loss of native species or genetic diversity?	No	
1.31	Any other actions?	No	

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

Sr. No.	Information/checklist confirmation	Yes/No	Details there of (with approximate quantities frates, wherever possible) with source of information data
2.1	Land especially undeveloped or agricultural land (ha)	No	
2.2	Water (expected source & competing users) unit: KLD	Yes	Water requirement will meet through the ground water and external sources. For detailed water balance please refer **Annexure – IV**
2.3	Minerals (MT)	No	
2.4	Construction material - stone, aggregates, and / soil (expected source - MT)	Yes	Construction materials, like steel, cement, crushed stones, sand, rubble, etc. required for the project shall be procured from the local market of the region.
2.5	Forests and timber (source - MT)	No	

2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW)	Yes	Please Refer **Annexure - VI**
2.7	Any other natural resources (use appropriate standard units)	No	

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

Sr. No.	Information/Checklist confirmation	Yes/No	Details there of (with approximate quantities/rates, wherever possible) with source of information data
3.1	Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)	Yes	For details please refer **Annexure – VII**
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)	No	
3.3	Affect the welfare of people e.g. by changing living conditions?	Yes	Direct/Indirect employment
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.	No	
3.5	Any other causes	No	

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

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

4.7	Construction or demolition wastes	No	
4.8	Redundant machinery or equipment	No	
4.9	Contaminated soils or other materials	No	
4.10	Agricultural wastes	No	
4.11	Other solid wastes	Yes	Please refer **Annexure –V**

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

Sr. No.	Information/Checklist confirmation	Yes/No	Details there of (with approximate quantities/rates, wherever possible) with source of information data
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources	Yes	For details Please refer **Annexure – VI**
5.2	Emissions from production processes	Yes	For details Please refer **Annexure – VI**
5.3	Emissions from materials handling storage or transport	Yes	For details Please refer **Annexure – VI**
5.4	Emissions from construction activities including plant and equipment	No	
5.5	Dust or odors from handling of materials including construction materials, sewage and waste	No	
5.6	Emissions from incineration of waste	No	
5.7	Emissions from burning of waste in open air (e.g. slash materials, construction debris)	No	
5.8	Emissions from any other sources	No	

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

Sr. No.	Information/Checklist confirmation	Yes/No	Details there of (with approximate quantities/rates, wherever possible) with source of information data with source of information data
6.1	From operation of equipment e.g. engines, ventilation plant, crushers	Yes	The Noise level will be within the prescribed limit. At noisy areas adequate preventive & control measures will be taken. No significant noise, vibration or emission of light & heat from the unit.
6.2	From industrial or similar processes	Yes	-do-

6.3	From construction or demolition	No	
6.4	From blasting or piling	No	
6.5	From construction or operational traffic	No	
6.6	From lighting or cooling systems	Yes	Adequate Lighting is provided in unit and also local ventilation system is provided.
6.7	From any other sources	No	

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

Sr. No.	Information/Checklist confirmation	Yes/No	Details there of (with approximate quantities/rates, wherever possible) with source of information data
7.1	From handling, storage, use or spillage of hazardous materials	Yes	For details please refer **Annexure – VII**
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)	Yes	For details please refer **Annexure – IV**
7.3	By deposition of pollutants emitted to air into the and or into water	No	
7.4	From any other sources	No	
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	No	

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

Sr. No.	Information/Checklist confirmation	Yes/No	Details there of (with approximate quantities/rates, wherever possible) with source of information data
8.1	From explosions, spillages, fires etc. from storage, handling, use or production of hazardous substances	Yes	For detail please refer **Annexure – VII**
8.2	From any other causes	No	

8.3	Could the project be affected by natural disasters causing environmental damage (e.g. floods, earthquakes, landslides, cloudburst etc)?	No	

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

Sr. No.	Information/Checklist confirmation	Yes/No	Details there of (with approximate quantities/rates, wherever possible) with source of information data
9.1	Lead to development of supporting. lities, ancillary development or development stimulated by the project which could have impact on the environment e.g. • Supporting infrastructure (roads, power supply, waste or waste water treatment, etc.) • housing development • extractive industry • supply industry • other	Yes	For detail please refer **Annexure – VIII**
9.2	Lead to after-use of the site, which could have an impact on the environment	No	
9.3	Set a precedent for later developments	No	
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects	No	

(II) Environmental Sensitivity

Sr. No.	Areas	Name/ Identity	Aerial distance (within 15 km.) Proposed project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	-	No protected area within 5 km from the proposed expansion project boundary
2	Areas which important for are or sensitive Ecol logical reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	Vishwamitri river Pawagadh Mountain	Vishwamitri river is around 1 Km away from the project site. Pawagadh Mountain is around 5 Km away from the project site.

3	Area used by protected, important or sensitive Species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	-	No protected area or sensitive species within 5 km from the proposed expansion project boundary
4	Inland, coastal, marine or underground waters	-	Vishwamitri river is around 1 Km away from the project site.
5	State, National boundaries	-	N.A.
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	-	N.A.
7	Defense installations	-	N.A.
8	Densely populated or built-up area	Halol	Halol is around 8 km from the proposed expansion project site.
9	Area occupied by sensitive man-made land uses Hospitals, schools, places of worship, community facilities)	-	N.A.
10	Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)	-	N.A.
11	Areas already subjected to pollution environmental damage. (those where existing legal environmental standards are exceeded)or	-	N.A.
12	Are as susceptible to natural hazard which could cause the project to present environmental problems (earthquake s, subsidence ,landslides, flooding erosion, or extreme or adverse climatic conditions)	-	N.A.

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

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

Date: Nov. 6, 2016
Place: Panelav

Debangshu Bhattacharya
AVP (Operations)
Paushak Ltd.
Plot No.: 135, 136, 145, 146, 147, 229 & 230,
Vill: Panelav, PO: Tajpura, Tal: Halol,
Dist. Panchmahal – 389 350
Gujarat

NOTE:

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

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

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

LIST OF ANNEXURES

SR. NO.	NAME OF ANNEXURE
I	List of products with their production capacity
II	Layout Map of the Plant
III	Brief Manufacturing Process Description
IV	Details of Water Consumption Waste water Generation and Treatment
V	Details of Hazardous /Solid Waste Generation, Handling and Disposal
VI	Details of Stacks and Vents, Power & Fuel
VII	Details of Hazardous Chemicals Storage & Handling
VIII	Socio-economic Impacts
IX	Proposed Terms of Reference for EIA studies

ANNEXURE – 1

LIST OF PRODUCTS

Sr. No.	Name of the Product	Quantity (MT/Month)		
		Existing	Additional	Total
1	**Phosgene**	400	800	1200
2	**3,4,4 – Trichlorocarbanilide**	50	-50	0
3	**Carbamyl Chloride**	40	-12	28
	Dimethyl Carbamoyl Chloride			
	Diphenyl Carbamoyl Chloride			
	Diethyl Carbamoyl Chloride			
	N Ethyl N Methyl Carbamoyl chloride			
	N Methyl Piperazine Carbamoyl chloride			
	N, N Bis 2 chloroethyl carbamoyl chloride			
	Morpholine Carbamoyl chloride			
	Any other Carbamoyl Chloride			
4	**Chloroformates**	250	150	400
	Benzyl Chloroformate			
	Isobutyl chloroformate			
	N Pentyl chloroformate			
	N Hexyl chloroformate			
	Phenyl Chloroformate			
	Methyl Chloroformate			
	2 Ethyl Hexyl chloroformate			
	Cetyl chloroformate			
	Myristyl chloroformate			
	Tert-Butyl cyclohexyl chloroformate			
	Sec Butyl chloroformate			
	1 chloro2 methyl propyl chloroformate			
	Any other Chloroformates			
5	**Vinyl Chloroformates / Isopropenyl chloroformate**	1	0	1
6	**4 Nitrophenyl Chloroformate**	10	-5	5
7	**Urea**	10	190	200
	Diuron			
	Tert Butyl Urea			
	3,4,4 Trichloro carbanilide			
	1,3 Diethyl Urea			
	Any other Urea			
8	**Isocyanates**	50	250	300
	Trans 4 Methyl Cyclohexyl Isocyanate			

Sr. No.	Name of the Product	Quantity (MT/Month)		
		Existing	Additional	Total
	2 Phenyl Ethyl Isocyanate			
	Cyclohexyl Isocyanate			
	2 Chloroethyl Isocyanate			
	Isopropyl Isocyanate (75% in toluene)			
	4 Chloro -3 -(trifluoromethyl) phenyl Isocyanate			
	Phenyl Isocyanate			
	Tert Butyl Isocyanate			
	3,4 Dichlorophenyl Isocyanate			
	4 Chloro Phenyl Isocyanate			
	P - Toluene sulfonyl Isocyanate			
	Stearyl Isocyanate			
	Any other Isocyanate			
9	**Carbonates**	20	20	40
	Chloromethyl Isopropyl carbonate			
	Bis 4 Nitro phenyl Carbonate			
	4,5-Dimethyl-1,3-Dioxolen-2-One			
	4-Chloromethyl-5-methyl-1,3-dioxol-2-one			
	4-(Hydroxy Methyl)-5-methyl-1,3-dioxol-2-one			
	2-Methyl Cryloxy Ethyl Vinyl Carbonate			
	Dimethyl Carbonate			
	Any Other Carbonate			
10	**Benzimidazol**	2	-2	0
	2 Benzimidazol			
	Any other Benzimidazol			
11	**Forskoline Carbonate**	0.5	-0.5	0
12	**Chlorides/Acid Chlorides**	22.5	17.5	40
	3 Chloropropionyl chloride - 3 CPC			
	Isobutyryl Chloride			
	5 - chlorovaleroyl chloride			
	Pivaloyl Chloride			
	Other Chlorides/Acid Chlorides			
13	**Carbamates**	22.5	17.5	40
	N Butyl Propargyl carbamate			
	2-Methyl-2-propyl-1,3-propanediol dichlocarbamate (90% in toluene)			
	Benzyl Carbamate			
	Other Carbamates			
14	**Carbodiimides**	10	-5	5

Sr. No.	Name of the Product	Quantity (MT/Month)		
		Existing	Additional	Total
	Dicyclohexyl carbodiimide - DCC			
	Other Carbodiimides			
15	**Protected Amino Acids**	3	-3	0
	CBZ Valine			
	Other Amino Acids			
16	**Nitriles**	5	-4	1
	Ethyl 2-(Hydroxylmino) Cyanoacetate			
	Acetonitrile			
	Other Nitriles			
17	**FTMA**	1	-1	0
18	**Polymers**	0.5	0.5	1
	Polyquat			
	Other Polymers			
19	**Thiadiazole**	0	20	20
	5-Methoxy-1, 3, 4-thiadiazol-2(3H)-one			
20	**Esters**	0	209	209
	Methyl 3-aminocrotonate			
	Phenyl Benzoate			
	Ethylene glycol Dibenzoate			
	Benzyl carbazate			
	Tert Butyl carbazate			
Total		**898**	**1592**	**2490**

By-Products List

Sr.	Name of By-Products	Quantity (MT/Month)		
		Existing	Additional	Total
1	Hydrochloric Acid (30 %)	500	1000	1500
2	$FeCl_2$	6	12	18
3	Recovered Mercury	3.6	3.6	7.2
4	Recovered Mercury Chloride	3.6	3.6	7.2
Total		**513.2**	**1019.2**	**1532.4**

LIST OF RAW MATERIALS

SR. NO.	NAME OF RAW MATERIAL	QUANTITY (MT/Month)		
		Existing	Proposed	Total
1	**Phosgene**			
	Chlorine Gas	300	600	900
	Carbon Dioxide	34.4	68.8	103.2
	Oxygen	43.2	86.4	129.6
	Petroleum Coke	50	100	150
	Caustic Soda Lye	1.6	3.2	4.8
2	**3,4,4' Trichlorocarbanilide**			
	4 CPI (Captive)	25.1	-25.1	0
	3, 4 DCA	26.4	-26.4	0
	MCB	47	-47	0
	Nitrogen Gas	0.05	-0.05	0
	DMF	0.05	-0.05	0
3	**Carbamyl Chloride**			
	Dimethyl Carbamoyl Chloride			
	DMA Gas	18.80	-5.64	13.16
	Toluene	8.60	-2.58	6.02
	Caustic Soda Lye	2.00	-0.60	1.40
	Phosgene (Captive)	50.80	-15.24	35.56
	Diphenyl Carbamoyl Chloride			
	DPA	35.28	-10.58	24.70
	Toluene	72.96	-21.89	51.07
	Phosgene (Captive)	53.52	-16.06	37.46
	Caustic Soda Lye	17.94	-5.38	12.56
	N - Hexane	11.76	-3.53	8.23
	Nitrogen Gas	32.96	-9.89	23.07
	Diethyl Carbamoyl Chloride			
	DEA	23.20	-6.96	16.24
	Phosgene (Captive)	44.00	-13.20	30.80
	Toluene	8.00	-2.40	5.60
	Caustic Soda Lye	2.80	-0.84	1.96
	Nitrogen Gas	1.20	-0.36	0.84
	Soda Ash	1.60	-0.48	1.12
	N Ethyl N Methyl Carbamoyl Chloride			
	Mono Ethyl Amine	60.44	-18.13	42.31
	Benzaldehyde	38.84	-11.65	27.19
	Toluene	137.20	-41.16	96.04
	Caustic soda lye on 100% basis	95.16	-28.55	66.61
	DMS	129.44	-38.83	90.61

SR. NO.	NAME OF RAW MATERIAL	QUANTITY (MT/Month)		
		Existing	Proposed	Total
	Soda Ash	6.48	-1.94	4.54
	Sodium Sulfate	0.92	-0.28	0.64
	EMA	30.92	-9.28	21.64
	Phosgene	160.00	-48.00	112.00
	Toluene	50.20	-15.06	35.14
	Caustic soda lye on 100% basis	15.00	-4.50	10.50
	Nitrogen gas	2.80	-0.84	1.96
	N Methyl Piperazine Carbamoyl Chloride			
	NMPA	22.16	-6.65	15.51
	Phosgene	52.32	-15.70	36.62
	Chloroform loss (31%)	129.72	-38.92	90.80
	BTAC	0.04	-0.01	0.03
	Caustic Soda Lye (100%)	18.48	-5.54	12.94
	Nitrogen gas	1.72	-0.52	1.20
	N, N Bis 2 Chloroethyl Carbamoyl Chloride			
	BCAHCl	20.00	-6.00	14.00
	Toluene	26.00	-7.80	18.20
	Caustic Soda	4.00	-1.20	2.80
	Phosgene	24.00	-7.20	16.80
	Morpholine Carbamoyl Chloride			
	Morpholine	29.64	-8.89	20.75
	Phosgene	67.24	-20.17	47.07
	Toluene (85 % recovery)	35.56	-10.67	24.89
	Nitrogen gas	11.84	-3.55	8.29
	Caustic lye (47%) for scrubber	2.96	-0.89	2.07
4	**Chloroformate**			
	Benzyl Chloroformate			
	Benzyl Alcohol	27.61	16.57	44.18
	Phosgene	39.79	23.87	63.66
	Toluene	48.72	29.23	77.95
	Caustic Soda Lye	6.50	3.90	10.4
	Nitrogen Gas	56.64	33.98	90.62
	Soda Ash	12.18	7.31	19.49
	Phenyl Chloroformate			
	Phenol	64.96	38.98	103.94
	Phosgene	129.92	77.95	207.87
	Nitrogen Gas	16.24	9.74	25.98
	Dimethyl Formamide	1.30	0.78	2.08
	Caustic Soda Lye	16.24	9.74	25.98

SR. NO.	NAME OF RAW MATERIAL	QUANTITY (MT/Month)		
		Existing	Proposed	Total
	Isobutyl Chloroformate			
	Iso Butanol	152.50	91.50	244.00
	Phosgene	350.00	210.00	560.00
	Nitrogen gas	1.25	0.75	2.00
	Acetone	12.50	7.50	20.00
	Caustic	20.00	12.00	32.00
	Soda Ash	1.25	0.75	2.00
	N Pentyl Chloroformate			
	n-Pentanol	167.75	100.65	268.40
	Phosgene	325.00	195.00	520.00
	Caustic flakes	27.75	16.65	44.40
	Nitrogen	0.50	0.30	0.80
	Sodium sulfate	1.75	1.05	2.80
	Soda Ash	1.75	1.05	2.80
	Acetone	10.75	6.45	17.20
	N Hexyl Chloroformate			
	Hexanol	178.50	107.10	285.60
	Phosgene	357.25	214.35	571.60
	Caustic	17.75	10.65	28.40
	Soda Ash	1.75	1.05	2.80
	Anhy. Sodium Sulfate	1.75	1.05	2.80
	Nitrogen gas	7.50	4.50	12.00
	Methyl Chloroformate			
	Phosgene	400.00	240.00	640.00
	Caustic 100%	50.00	30.00	80.00
	Methanol	105.00	63.00	168.00
	Sodium sulfate	7.50	4.50	12.00
	Soda Ash	7.50	4.50	12.00
	2 Ethyl Hexyl Chloroformate			
	2 Ethyl Hexanol	173.50	104.10	277.60
	Phosgene	221.75	133.05	354.80
	Caustic	10.75	6.45	17.20
	Sodium sulfate	1.00	0.60	1.60
	Soda Ash	1.25	0.75	2.00
	Hyflow	0.50	0.30	0.80
	Nitrogen	0.50	0.30	0.80
	Molecular Sieve	0.50	0.30	0.80
	Cetyl Chloroformate			
	Phosgene	541.00	324.60	865.60

SR. NO.	NAME OF RAW MATERIAL	QUANTITY (MT/Month)		
		Existing	Proposed	Total
	Nitrogen	16.50	9.90	26.40
	Caustic	39.25	23.55	62.80
	Cetyl Alcohol	216.25	129.75	346.00
	Myristyl Chloroformate			
	Myristyl Alcohol	210.25	126.15	336.40
	Phosgene	220.25	132.15	352.40
	Nitrogen	16.00	9.60	25.60
	Caustic Lye	38.25	22.95	61.20
	Tert Butyl Cyclohexyl Chloroformate			
	tert Butyl Cyclohexanol	190.00	114.00	304.00
	Phosgene	760.00	456.00	1216.00
	MDC (50% Recovered)	190.00	114.00	304.00
	Hyflow Super Cel	0.50	0.30	0.80
	Caustic Lye	76.00	45.60	121.60
	Nitrogen	212.50	127.50	340.00
	Sec Butyl Chloroformate			
	Sec Butanol	141.25	84.75	226.00
	Phosgene	432.50	259.50	692.00
	BHT	0.33	0.20	0.53
	Sodium Chloride	28.25	16.95	45.20
	Sodium sulfate	7.00	4.20	11.20
	1 Chloro 2 Methyl Propyl Chloroformate			
	Isobutyraldehyde	263.25	157.95	421.20
	Phosgene	789.50	473.70	1263.20
	MDC	526.25	315.75	842.00
	Pyridine	79.00	47.40	126.40
	Sodium sulphate	13.25	7.95	21.20
	Nitrogen gas	105.25	63.15	168.40
	Caustic lye (47%) for scrubber	26.25	15.75	42.00
5	**Vinyl Chloroformate**			
	Isopropenyl Chloroformate			
	$HgCl_2$	4.21	0.00	4.21
	Vinyl Acetate	1.75	0.00	1.75
	Calcium Carbonate	0.79	0.00	0.79
	Acetone	1.67	0.00	1.67
	Phosgene (Captive)	2.00	0.00	2.00
	Nitrobenzene	4.05	0.00	4.05
	Caustic Soda Lye	5.00	0.00	5.00
	Nitrogen Gas	0.63	0.00	0.63

SR. NO.	NAME OF RAW MATERIAL	QUANTITY (MT/Month)		
		Existing	Proposed	Total
6	**4 Nitrophenyl Chloroformate**			
	4-Nitro Phenol	4.82	-2.41	2.41
	N, N - Di methyl Aniline	0.00	0.00	0.00
	Toluene	3.46	-1.73	1.73
	Phosgene	4.98	-2.49	2.49
	Caustic Soda Lye	1.29	-0.64	0.64
	Hexane	15.43	-7.71	7.72
7	**Urea**			
	1,3 Diethyl Urea			
	Ethylamine	6.88	130.72	137.60
	Phosgene ($COCl_2$)	7.60	144.40	152.00
	Toluene	34.48	655.12	689.60
	Diuron			
	3,4 Dichloro Phenyl Isocyanate	6.90	131.02	137.92
	Dimethyl amine	2.07	39.37	41.44
	Toluene	41.86	795.26	837.12
	3, 4, 4 Trichlorocarbanilide			
	4 CPI (Captive)	5.02	95.38	100.4
	3, 4 DCA	5.28	100.32	105.6
	MCB	9.4	178.6	188
	Nitrogen Gas	0.01	0.19	0.2
	DMF	0.01	0.19	0.2
	Tert Butyl Urea			
	Phosgene	4.93	93.76	98.69
	HCl	1.18	22.46	23.64
	DNBA	10.00	189.99	199.99
	Soda Ash	8.74	166.05	174.79
	Caustic Lye	0.11	2.08	2.19
	Acetone	0.15	2.84	2.99
8	**Isocyanate**			
	Cyclohexyl Isocyanate			
	Cyclo Hexa Amine	98.00	490.00	588.00
	Toluene	52.20	261.00	313.20
	Caustic Soda Lye	4.60	23.00	27.60
	Phosgene (Captive)	172.50	862.50	1035.00
	4 Chloro phenyl Isocyanate			
	Para Chloro Aniline	95.70	478.50	574.20
	MCB	10.60	53.00	63.60
	Caustic Soda Lye	5.00	25.00	30.00

SR. NO.	NAME OF RAW MATERIAL	QUANTITY (MT/Month)		
		Existing	Proposed	Total
	Phosgene (Captive)	135.00	675.00	810.00
	Nitrogen Gas	0.10	0.50	0.60
	DMF	0.20	1.00	1.20
	2 Phenyl Ethyl Isocyanate			
	2-PEA	120.00	600.00	720.00
	Phosgene (Captive)	184.50	922.50	1107.00
	Toluene	54.50	272.50	327.00
	Caustic Soda Lye	8.00	40.00	48.00
	2 Chloro Ethyl Isocyanate			
	2-CEA HCl	145.00	725.00	870.00
	EDC	500.00	2500.00	3000.00
	Phosgene (Captive)	220.00	1100.00	1320.00
	Caustic Soda Lye	60.00	300.00	360.00
	Nitrogen Gas	40.00	200.00	240.00
	Phenyl Isocyanate			
	Aniline	110.00	550.00	660.00
	Phosgene (Captive)	210.00	1050.00	1260.00
	Toluene	30.00	150.00	180.00
	Caustic Soda Lye	30.00	150.00	180.00
	Iso Propyl Isocyanate			
	MIPA	100.00	500.00	600.00
	Phosgene (Captive)	290.00	1450.00	1740.00
	Toluene	70.00	350.00	420.00
	Caustic Soda Lye	100.00	500.00	600.00
	Nitrogen Gas	70.00	350.00	420.00
	Trans 4 Methyl Cyclohexyl Isocyanate			
	T4MCHA HCl	153.80	769.00	922.80
	Phosgene	153.80	769.00	922.80
	Toluene	138.50	692.50	831.00
	Caustic Soda lye	30.00	150.00	180.00
	D M F	10.00	50.00	60.00
	Nitrogen Gas	70.00	350.00	420.00
	4 Chloro 3 (Trifluoromethyl) Phenyl Isocyanate			
	4-Chloro-3-(Trifluoromethyl)Aniline	63.05	315.25	378.30
	Phosgene	50.85	254.25	305.10
	Toluene (85 % recovery)	47.25	236.25	283.50
	Nitrogen gas	8.40	42.00	50.40
	Caustic lye (47%) for scrubber	2.10	10.50	12.60
	Tert Butyl Isocyanate			

SR. NO.	NAME OF RAW MATERIAL	QUANTITY (MT/Month)		
		Existing	Proposed	Total
	TBA	44.50	222.50	267.00
	Phosgene	84.50	422.50	507.00
	Caustic	104.50	522.50	627.00
	Sodium Sulfate	9.00	45.00	54.00
	Soda Ash	9.00	45.00	54.00
	OCDB (92% Rec.)	40.00	200.00	240.00
	3, 4 Dichlorophenyl Isocyanate			
	3,4 DCA	45.50	227.50	273.00
	Phosgene	51.50	257.50	309.00
	Caustic	2.00	10.00	12.00
	Nitrogen	65.00	325.00	390.00
	Toluene	18.00	90.00	108.00
	p Toluene Sulfonyl Isocyanate			
	P- toluene sulphonamide	61.75	308.75	370.50
	Phosgene	71.60	358.00	429.60
	MCB (85 % recovery)	46.30	231.50	277.80
	CHI	4.65	23.25	27.90
	Nitrogen gas	24.70	123.50	148.20
	Caustic lye (47%) for scrubber	6.15	30.75	36.90
	Stearyl Isocyanate			
	Stearyl palmityl amine	53.20	266.00	319.20
	Used Toluene	472.35	2361.75	2834.10
	Recovered Toluene (assumed 90%)	425.10	2125.50	2550.60
	Consumed Toluene	47.25	236.25	283.50
	Phosgene	53.20	266.00	319.20
	Nitrogen gas	21.30	106.50	127.80
	Caustic lye (47%) for scrubber	4.60	23.00	27.60
9	**Carbonates**			
	Dimethyl Carbonate			
	Methanol	23.7	23.7	47.4
	Phosgene	40.2	40.2	80.4
	Chloromethyl Isopropyl Carbonate			
	CMCF	22.22	22.22	44.44
	Isopropyl Alcohol	9.56	9.56	19.12
	Sodium Sulfate	0	0	0
	Caustic Soda Lye (100%)	3	3	6
	Benzyltriethyl Ammonium	0.02	0.02	0.04
	Acetone	0.3	0.3	0.6
	Pyridine	0.04	0.04	0.08

SR. NO.	NAME OF RAW MATERIAL	QUANTITY (MT/Month)		
		Existing	Proposed	Total
	Bis 4 Nitrophenyl Carbonate			
	4 Nitro Phenol	20.84	20.84	41.68
	Toluene loss (20%)	31.16	31.16	62.32
	Phosgene	24.16	24.16	48.32
	Caustic Lye	27.5	27.5	55
	TEA	0.84	0.84	1.68
	4,5 - Dimethyl 1,3 - Dioxolen 2 One			
	Acetone	29.85	29.85	59.70
	MDC	93.69	93.69	187.38
	NNDEA	54.71	54.71	109.42
	Phosgene	50.76	50.76	101.52
	Caustic 100%	44.32	44.32	88.64
	IPA	37.22	37.22	74.44
	HCl	11.81	11.81	23.62
	Sodium sulphate	3.41	3.41	6.82
	4 Chloromethyl 5 Methyl 1,3 Dioxolen 2 One			
	DMDO	25.92	25.92	51.84
	MDC	29.03	29.03	58.06
	Chlorine Gas	17.28	17.28	34.56
	Caustic 100%	5.356	5.356	10.712
	ODCB	6.912	6.912	13.824
	4 (Hydroxy Methyl) 5 Methyl 1,3 Dioxolen 2 one			
	DMDOCl	32.794	32.794	65.588
	Chloroform	136.168	136.168	272.336
	TEA	40.68	40.68	81.36
	Sodium Sulfate	0.662	0.662	1.324
	Formic Acid	18.376	18.376	36.752
	Methanol	51.18	51.18	102.36
	HCl	0.574	0.574	1.148
	Toluene	23.116	23.116	46.232
	Nitrogen	2.43	2.43	4.86
	2 Methyl Cryloxy Ethyl Vinyl Carbonate			
	HEMA	22.00	22.00	44.00
	VCF	26.67	26.67	53.34
	Pyridine	16.31	16.31	32.62
	HCl	60.82	60.82	121.64
	NaCl sodium chloride	67.80	67.80	135.60
	NaOH sodium hydroxide	21.11	21.11	42.22
	MDC	268.68	268.68	537.36

SR. NO.	NAME OF RAW MATERIAL	QUANTITY (MT/Month)		
		Existing	Proposed	Total
	Cuprous Chloride	0.01	0.01	0.02
	Sodium Sulfate	3.33	3.33	6.66
	2,5 Dimethyl-p-Benzoquenone	0.01	0.01	0.02
	Silica Gel	22.00	22.00	44.00
	1,1'-Bis 2 Naphthol	0.00	0.00	0.00
	Acetone	222.22	222.22	444.44
10	**Benzimidazol**			
	2 Benzimidazol			
	2-Amino Aniline	1.92	-1.92	0.00
	Phosgene	1.92	-1.92	0.00
	Monochlorobenzene	9.6	-9.6	0.00
11	**Forskoline Carbonate**			
	Forskohlin	0.59	-0.59	0.00
	Phosgene	0.16	-0.16	0.00
	Pyridine	0.25	-0.25	0.00
	Dichloromethane	2.95	-2.95	0.00
12	**Chlorides/Acid Chlorides**			
	Pivaloyl Chloride			
	Pivalic Acid	21.15	16.45	37.60
	Phosgene	20.48	15.93	36.41
	3 Chloropropionyl Chloride			
	Acrylic Acid	15.75	12.25	28.00
	Phosgene	43.43	33.78	77.21
	DMF	0.23	0.18	0.41
	Caustic lye	0.90	0.70	1.60
	Isobutyryl Chloride			
	Isobutyric acid	22.50	17.50	40.00
	D.M.F.	0.11	0.09	0.20
	Phosgene	51.75	40.25	92.00
	Nitrogen	2.30	1.79	4.09
	Caustic lye for scrubber	3.33	2.59	5.92
	5 Chlorovaleroyl Chloride			
	Delta-Valerolacton	21.38	16.63	38.01
	Phosgene	31.73	24.68	56.41
	D.M.F.	0.86	0.67	1.53
	Nitrogen gas	9.00	7.00	16.00
	Caustic lye (47%) for scrubber	2.25	1.75	4.00
13	**Carbamates**			
	Benzyl Carbamate			

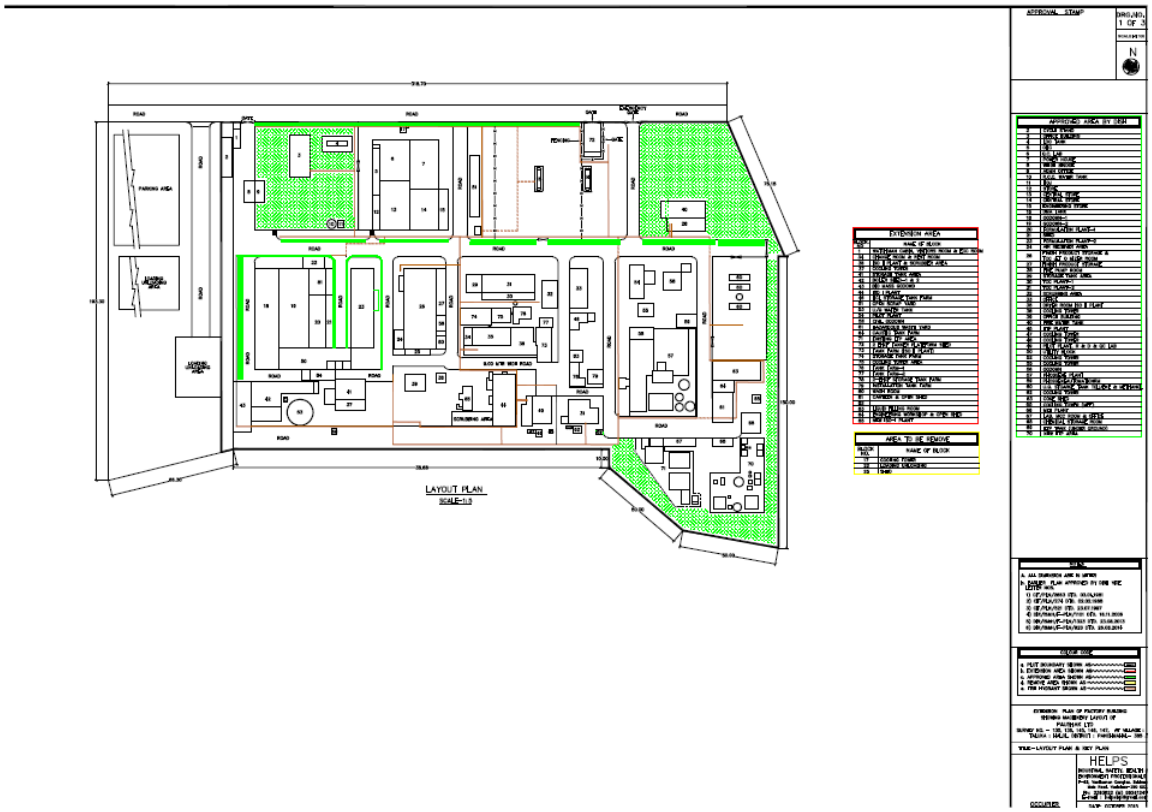
SR. NO.	NAME OF RAW MATERIAL	QUANTITY (MT/Month)		
		Existing	Proposed	Total
	Benzyl Chloroformate (50%)	57.15	44.45	101.60
	Liq. NH3 (25%)	27.23	21.18	48.41
	N Butyl Propargyl Carbamate			
	PGCF	18.16	14.12	32.28
	Soda	4.38	3.40	7.78
	n- Butyl Amine	11.43	8.89	20.32
	Sulphate	0.97	0.76	1.73
	2 Methyl 2 Propyl 1,3 Propanediol Dichlocarbamate			
	2 Methyl 2 Propyl 1,3 Propandiol	12.24	9.52	21.76
	Toluene loss (8%)	19.15	14.89	34.04
	Triethyl Amine	18.74	14.58	33.32
	Phosgene	53.44	41.56	95.00
	Nitrogen	1.49	1.16	2.65
	Caustic	10.55	8.21	18.76
	Anhy. Sodium Sulfate	1.22	0.95	2.17
14	**Carbodiimides**			
	Dicyclohexyl Carbodiimide			
	Cyclohexylamine	13.70	-6.85	6.85
	Phosgene	13.40	-6.70	6.70
	2 Sodium Hydroxide	5.50	-2.75	2.75
	EtOAc	119.20	-59.60	59.60
	Ammonia	2.30	-1.15	1.15
	Hexane	74.50	-37.25	37.25
15	**Protected Amino Acids**			
	CBZ Valine			
	L-Valine	1.75	-1.75	0.00
	Sodium Hydroxide	1.20	-1.20	0.00
	Benzyl Chloroformate	2.54	-2.54	0.00
	Hydrochloric Acid -30%	1.81	-1.81	0.00
	Sodium Chloride	1.41	-1.41	0.00
16	**Nitriles**			
	Acetonitrile			
	Acetamide	8.45	-6.76	1.69
	Phosgene	17.00	-13.60	3.40
	Nitrobenzene	33.80	-27.04	6.76
	Ethyl 2 (hydrolmino) Cyanoacetate			
	Ethyl Cyanoacetate	5.25	-4.20	1.05
	Phosphoric Acid	2.10	-1.68	0.42

SR. NO.	NAME OF RAW MATERIAL	QUANTITY (MT/Month)		
		Existing	Proposed	Total
	Sodium Nitrite	3.31	-2.65	0.66
	Conc. HCl	4.83	-3.86	0.97
17	**FTMA**			
	1-Chloro-4-Trifluoromethoxy Benzene (CTMB)	5.40	-5.40	0.00
	Nitric Acid (HNO3)	3.42	-3.42	0.00
	Sulphuric Acid	32.40	-32.40	0.00
	Dichloromethane	5.40	-5.40	0.00
	Potassium Fluoride (KF)	1.93	-1.93	0.00
	18-Crown-6	0.19	-0.19	0.00
	Palladium (Pd/C)	0.01	-0.01	0.00
	Toluene	4.48	-4.48	0.00
	Hydrogen	0.04	-0.04	0.00
18	**Polymers**			
	Polyquat			
	Trans-1,4-Dichloro butane	0.26	0.26	0.52
	Dimethyl Amine	1.45	1.45	2.90
	Toluene	1.37	1.37	2.74
	Dil. Sodium Hydroxide (NaOH -40%)	0.27	0.27	0.54
	Sodium Chloride (NaCl)	1.14	1.14	2.28
	Methanol (MeOH)	8.50	8.50	17.00
	Triethanolamine	0.02	0.02	0.04
	Sodium Hydroxide	0.04	0.04	0.08
	Hydrochloric Acid	0.01	0.01	0.02
19	**Thiazole**			
	5-Methoxy-1, 3, 4-thiadiazol-2(3H)-one			
	Potassium Hydroxide	0	25.6	25.6
	Carbon disulfide	0	31.6	31.6
	Methanol	0	66	66
	Hydrazine Hydrate	0	19.4	19.4
	HCl	0	88.4	88.4
	Caustic flakes	0	31.6	31.6
	O-methyl hydrazine carbothioate	0	237.6	237.6
	MDC	0	108.4	108.4
	Phosgene	0	70.6	70.6
20	**Esters**			
	Methyl 3-aminocrotonate			
	Methyl Acetoacetate	0	209	209
	Liq Ammonia (23%)	0	190.19	190.19
	Methanol	0	123.31	123.31

SR. NO.	NAME OF RAW MATERIAL	QUANTITY (MT/Month)		
		Existing	Proposed	Total
	Phenyl Benzoate			
	Phenol	0	104.50	104.50
	Benzoyl chloride	0	156.75	156.75
	Caustic lye (48 %)	0	96.14	96.14
	Ethylene Glycol Dibenzoate			
	Ethylene glycol	0	66.04	66.04
	Benzoyl chloride	0	275.04	275.04
	Caustic lye (48 %)	0	187.06	187.06
	Benzyl Carbazate			
	Benzyl Chloroformate (BCF)	0	209.00	209.00
	80% Hydrazine Hydrate	0	300.96	300.96
	Methylene Dichloride (MDC)	0	1492.26	1492.26
	Sodium sulfate	0	20.90	20.90
	Tert Butyl Carbazate			
	Tert Butyl alcohol	0	209.00	209.00
	Pyridine	0	223.63	223.63
	Methylene dichloride (MDC)	0	547.58	547.58
	Phenyl chloroformate	0	438.90	438.90
	30% Hydrochloric acid	0	112.86	112.86
	Sodium sulfate	0	62.70	62.70
	80% Hydrazine Hydrate solution	0	102.41	102.41
	Sodium hydroxide flakes	0	171.38	171.38

ANNEXURE – 2

PLANT LAYOUT



ANNEXURE – III

BRIEF MANUFACTURING PROCESS

PHOSGENE

Process Description

Carbon Monoxide Gas is manufactured by incomplete combustion of coal in presence of Carbon Dioxide. The Carbon Monoxide thus manufactured is further condensed with Chlorine in presence of Activated Charcoal to produced Phosgene. The excess Carbon Monoxide is recycling in the system, while the excess of gas being scrubbed suitably.

Chemical Reaction

$$3C + CO_2 + O_2 + 4Cl_2 \longrightarrow 4COCl_2$$

Material Balance

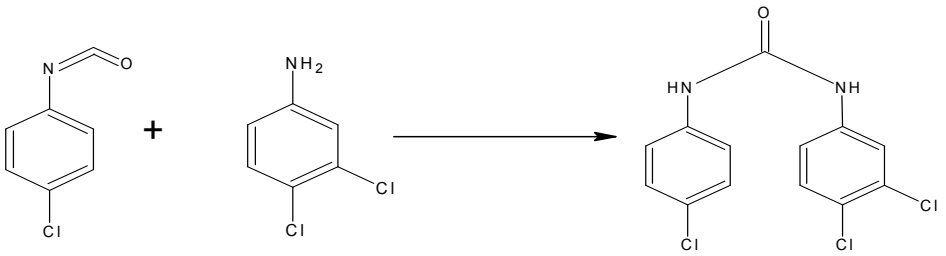
Input (kg)		Output (kg)	
CO_2 Gas	0.086	Phosgene	1.00
Chlorine Gas	0.75	Off Gases	0.073
Oxygen	0.108		
Petroleum Coke	0.125		
Caustic Soda Lye	0.004		
Total	**1.073**	**Total**	**1.073**

3, 4, 4' TIRCHLOROCARBANILIDE (TO BE DISCONTINUED)

Process Description

4 Chloro Phenyl Isocyanate / 3,4 Di Chloro Phenyl Isocyanate react with 3,4 Di Chloroaniline / P- Chloro Aniline in solvent (Toluene / Mono Chloro Benzene) media at controlled temperature to forms 3,4,4' Trichlorocarbanilide. Afterwards the slurry is filter to separate the solvent, and then material is dried at controlled temperature in rotary vacuum drier followed by milling in air jet mill.

Chemical Reaction



4- Chlorophenylisocyanate 3,4-dichloroaniline 3, 4, 4' - TRICHLOROCARBANILIDE

Material Balance

Input (kg)		Output (kg)	
4 CPI	0.502	TCC	1.00
3, 4 DCA	0.528	MCB	0.93
MCB	0.94	Tar	0.042
Nitrogen Gas	0.001		
DMF	0.001		
Total	**1.972**	**Total**	**1.972**

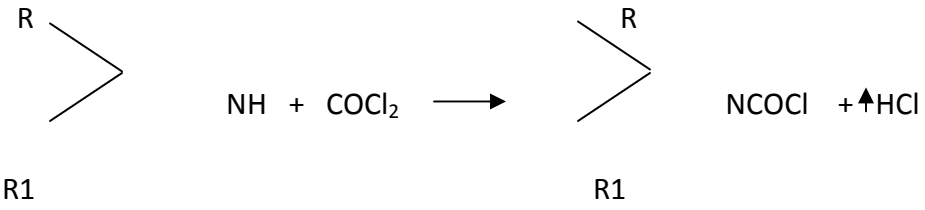
CARBAMYL CHLORIDE GROUP

DIMETHYL CARBAMOYL CHLORIDE

Process Description

Aromatic / Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled to get pure product.

Chemical Reaction



Material Balance

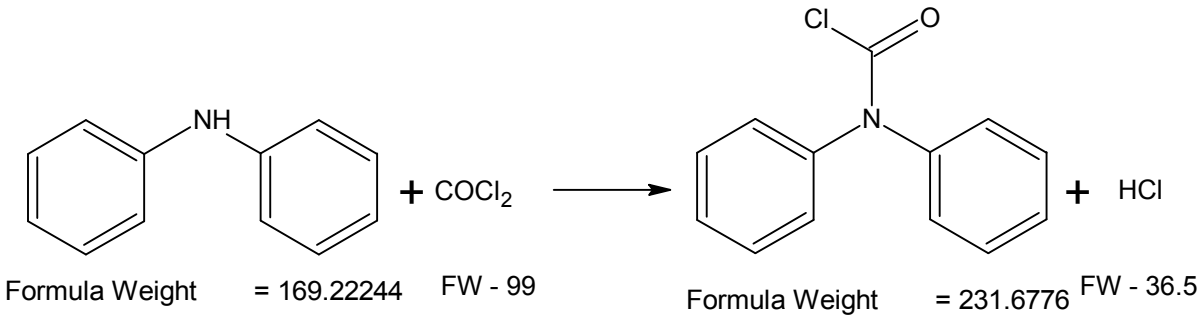
Input (kg)		Output (kg)	
Dimethyl Amine	0.47	DMCC	1.00
Phosgene Gas	1.27	Tar	0.04
Solvent	0.10	HCl 30%	1.94
Nitrogen	0.03		
NaOH	0.07		
Water	1.04		
Total	**2.98**	**Total**	**2.98**

DIPHENYL CARBAMOYL CHLORIDE

Process Description

Diphenyl amine is reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled to get pure product.

Chemical Reaction



Material Balance

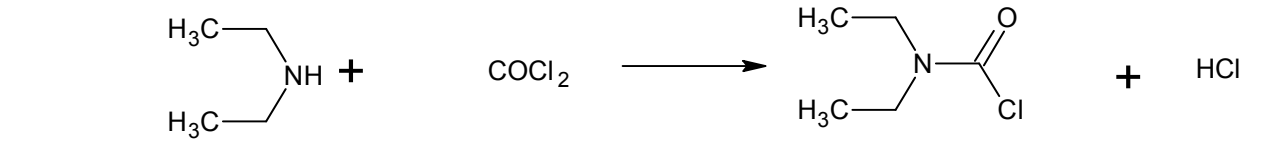
Input (kg)		Output (kg)	
DPA	0.85	DPCC	1.00
Phosgene	1.20	Residue	0.12
Toluene	3.63	Toluene	3.45
NaOH	0.03	Toluene Loss	0.18
		HCl	0.91
		NaCl	0.05
Total	**5.71**	**Total**	**5.71**

DIETHYL CARBAMOYL CHLORIDE

Process Description

Diethyl Amine is reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled to get pure product.

Chemical Reaction



Formula Weight = 73.13684 FW - 99 Formula Weight = 135.592 FW - 36.5

Material Balance

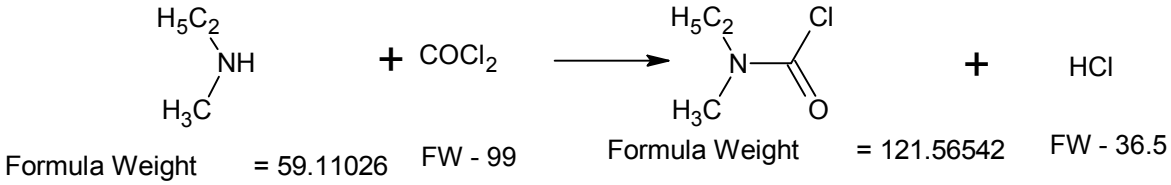
Input (kg)		Output (kg)	
DEA	0.56	DECC	1.00
Phosgene	1.08	Residue	0.02
NaOH	0.01	HCl	0.61
		NaCl	0.02
Total	**1.65**	**Total**	**1.65**

N ETHYL N METHYL CARBAMOYL CHLORIDE

Process Description

Ethyl Methyl Amine is reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled to get pure product.

Chemical Reaction



Material Balance

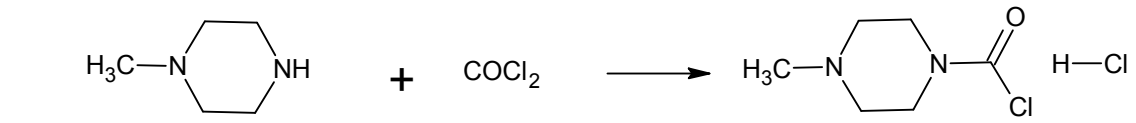
Input (kg)		Output (kg)	
EMA	0.78	EMCC	1.00
Phosgene	1.70	Residue	0.29
Toluene	3.16	Toluene	3.00
NaOH	0.04	Toluene Loss	0.26
		HCl	1.07
		NaCl	0.06
Total	**5.68**	**Total**	**5.68**

N METHYL PIPERAZINE CARBAMOYL CHLORIDE

Process Description

NMPCC HCl is reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled to get pure product.

Chemical Reaction



Formula Weight = 100.16218 FW - 99 Formula Weight = 199.07828

Material Balance

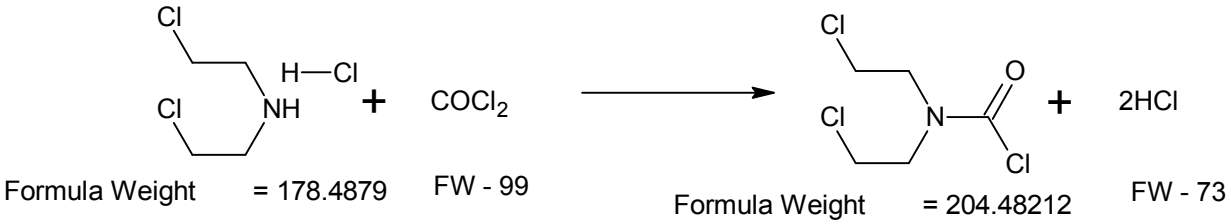
Input (kg)		Output (kg)	
NMPCC HCl	0.56	NMPCC	1.00
Phosgene	1.06	Residue	0.05
Chloroform	10.71	Chloroform	10.07
NaOH	0.02	Chloroform Loss	0.64
		HCl	0.56
		NaCl	0.03
Total	**12.35**	**Total**	**12.35**

N, N BIS 2 CHLOROETHYL CARBAMOYL CHLORIDE

Process Description

2CEA HCl is reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled to get pure product.

Chemical Reaction



Formula Weight = 178.4879 FW - 99

Formula Weight = 204.48212 FW - 73

Material Balance

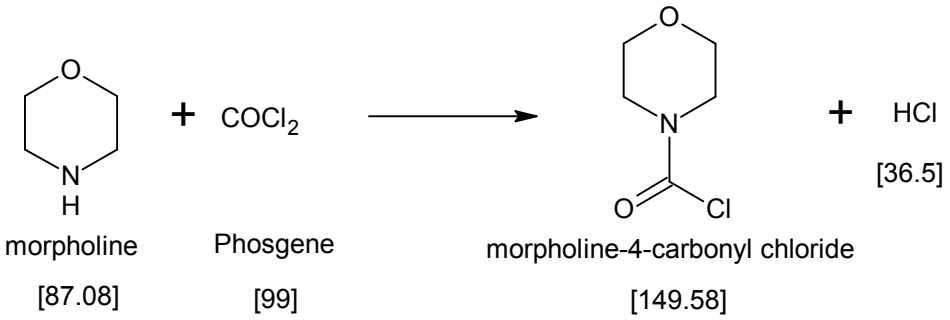
Input (kg)		Output (kg)	
2CEA HCl	1.02	BCC	1.00
Phosgene	0.73	Residue	0.14
NaOH	0.01	HCl	0.60
		NaCl	0.02
Total	**1.76**	**Total**	**1.76**

MORPHOLINE CARBAMOYL CHLORIDE

Process Description

Morpholine is reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled to get pure product.

Chemical Reaction



morpholine [87.08] + Phosgene [99] → morpholine-4-carbonyl chloride [149.58] + HCl [36.5]

Material Balance

Input (kg)		Output (kg)	
Morpholine	0.74	MOCC	1.00
Phosgene	1.68	Toluene	0.89
Toluene (85 % recovery)	0.89	HCl	1.30
Nitrogen gas	0.30	NaCl	0.46
Caustic lye	0.07	Residue	0.03
Total	**3.68**	**Total**	**3.68**

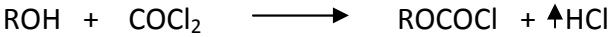
CHLOROFORMATE GROUP

BENZYL CHLOROFORMATE

Process Description

Aromatic/Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Material Balance

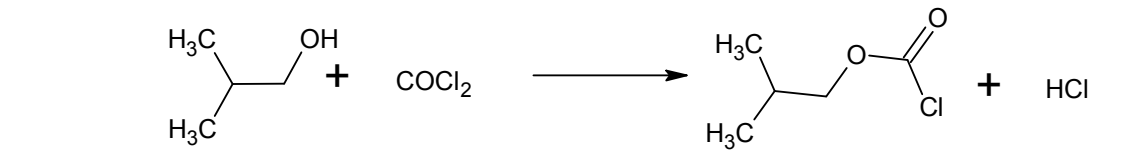
Input (kg)		Output (kg)	
Benzyl Alcohol	0.672	Benzyl Chloroformate	1.00
Phosgene Gas	0.98	HCl 30%	1.45
Nitrogen	0.03	NaCl	0.035
Water	0.843	Tar	0.07
NaOH	0.03		
Total	**2.555**	**Total**	**2.555**

ISOBUTYL CHLOROFORMATE

Process Description

Aromatic/Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Formula Weight = 74.1216 FW - 99 Formula Weight = 136.57676 FW - 36.5

Material Balance

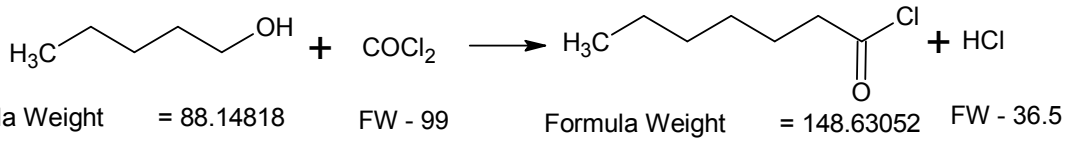
Input (kg)		Output (kg)	
IBA	0.60	IBCF	1.00
Phosgene	1.06	Residue	0.06
NaOH	0.01	HCl	0.59
		NaCl	0.02
Total	**1.67**	**Total**	**1.67**

N PENTYL CHLOROFORMATE

Process Description

Aromatic/Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Material Balance

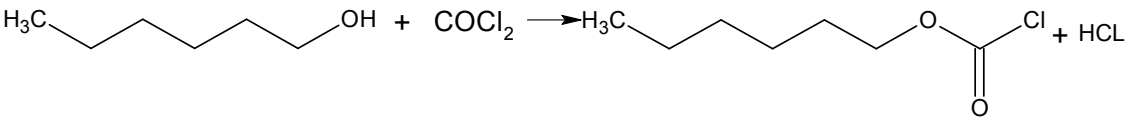
Input (kg)		Output (kg)	
n-Pentanol	0.74	PTCF	1.00
Phosgene	1.09	Residue	0.16
NaOH	0.02	HCl	0.67
		NaCl	0.02
Total	**1.85**	**Total**	**1.85**

N HEXYL CHLOROFORMATE

Process Description

n-Hexanol is reacted with phosgene, the reactions is completed and then quench the reaction mass in to the water for removed excess phosgene & HCl and to give pure n-Hexyl Chloroformate.

Chemical Reaction



Material Balance

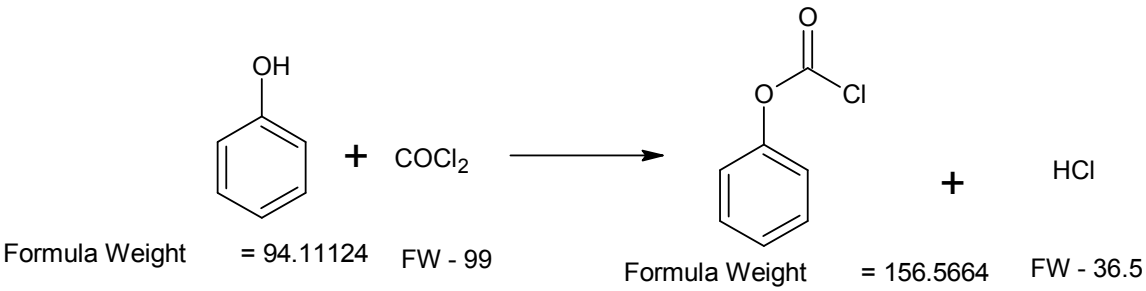
Input (kg)		Output (kg)	
Hexanol	0.71	HCF	1.00
Phosgene	1.43	Anhy. Sodium Sulfate	0.01
Caustic	0.07	Residue	0.01
Soda Ash	0.01	HCl	0.91
Anhy. Sodium Sulfate	0.01	NaCl	0.30
Nitrogen gas	0.03	Nitrogen	0.03
Total	**2.26**	**Total**	**2.26**

PHENYL CHLOROFORMATE

Process Description

Aromatic/Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Material Balance

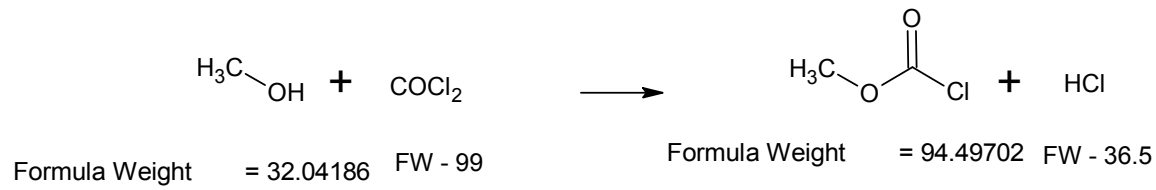
Input (kg)		Output (kg)	
Phenol	0.78	PCF	1.00
Phosgene	1.04	Residue	0.17
NaOH	0.02	HCl	0.63
		NaCl	0.04
Total	**1.84**	**Total**	**1.84**

METHYL CHLOROFORMATE

Process Description

Aromatic/Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Material Balance

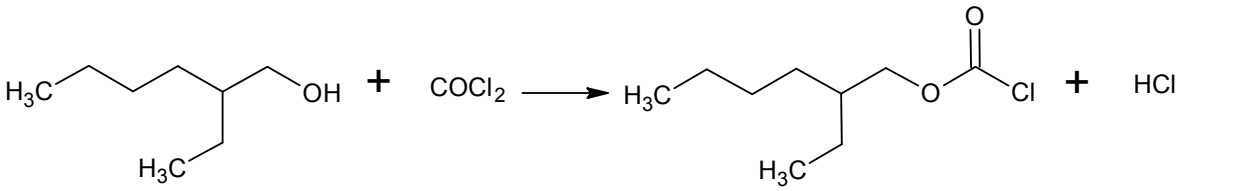
Input (kg)		Output (kg)	
Methanol	0.59	MCF	1.00
Phosgene	1.88	Residue	0.25
NaOH	0.03	HCl	1.21
		NaCl	0.04
Total	**2.50**	**Total**	**2.50**

2 ETHYL HEXYL CHLOROFORMATE

Process Description

Aromatic/Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Formula Weight = 130.22792 FW - 99

Formula Weight = 192.68308 FW - 36.5

Material Balance

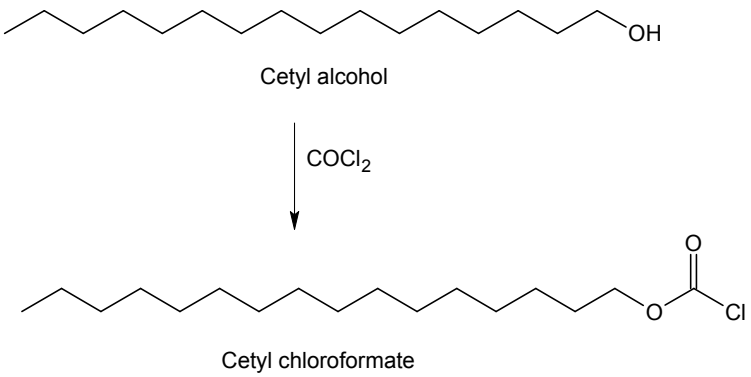
Input (kg)		Output (kg)	
EHA	0.69	EHCF	1.00
Phosgene	0.80	Residue	0.01
NaOH	0.01	HCl	0.47
		NaCl	0.02
Total	**1.50**	**Total**	**1.50**

CETYL CHLOROFORMATE

Process Description

Aromatic/Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Material Balance

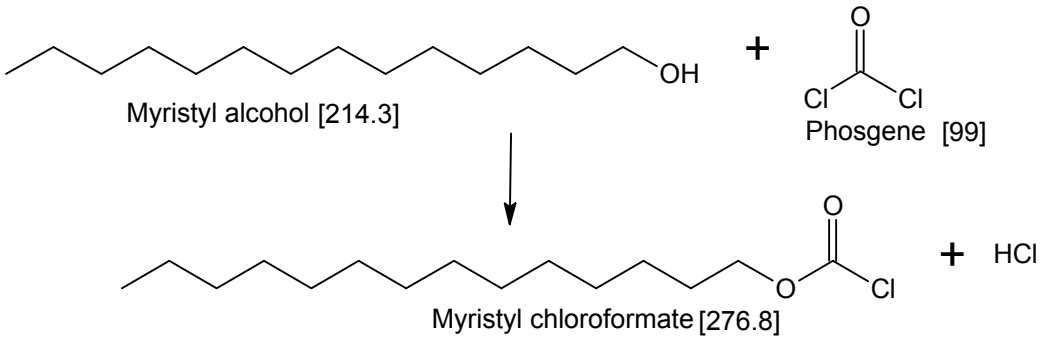
Input (kg)		Output (kg)	
Cetyl alcohol	0.85	CETCF	1.00
Phosgene	0.51	HCl	0.36
Total	**1.36**	**Total**	**1.36**

MYRISTYL CHLOROFORMATE

Process Description

Aromatic/Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Material Balance

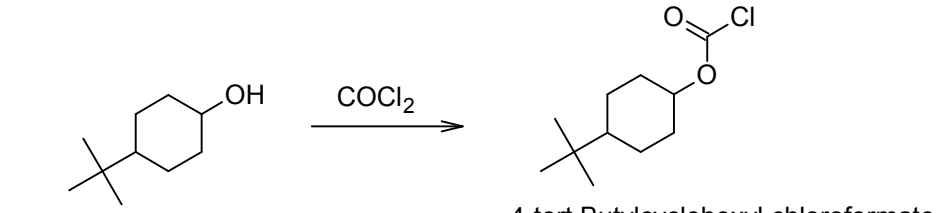
Input (kg)		Output (kg)	
Myristyl alcohol	0.82	CETCF	1.00
Phosgene	0.57	HCl	0.45
Caustic for scrubber	0.15	NaCl	0.09
Total	**1.54**	**Total**	**1.54**

TERT-BUTYL CYCLOHEXYL CHLOROFORMATE

Process Description

Aromatic/Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



4-tert Butylcyclohexanol
MW:- 156.26

4-tert Butylcyclohexyl chloroformate
MW:- 218.72

Material Balance

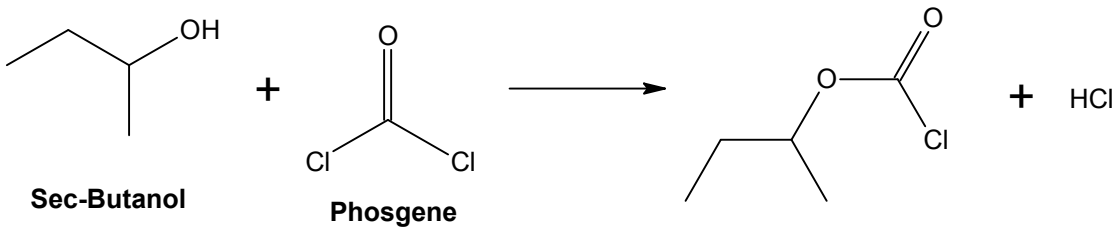
Input (kg)		Output (kg)	
4-tert-Butylcyclohexanol	0.79	TBCHCF	1.00
Phosgene	0.79	HCl	0.54
Caustic for scrubber	0.16	NaCl	0.20
Total	**1.74**	**Total**	**1.74**

SEC BUTYL CHLOROFORMATE

Process Description

Aromatic/Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Sec-Butanol
MW :-74

Phosgene
MW :-99

Sec-Butylchloroformate
MW :-136.5

Material Balance

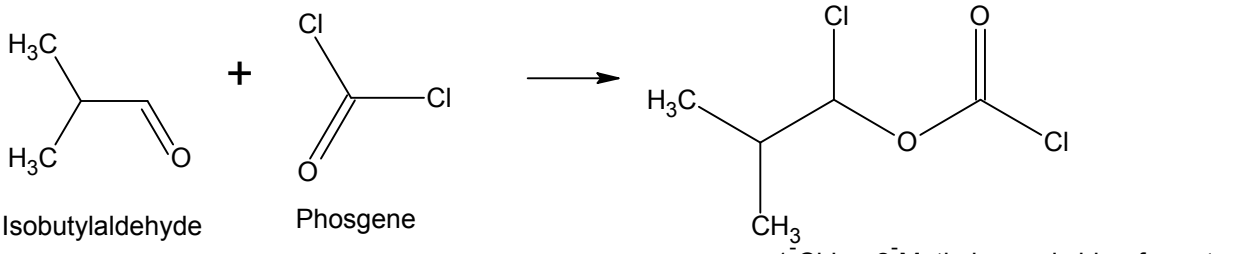
Input (kg)		Output (kg)	
Sec-Butanol	0.57	SBUCF	1.00
Phosgene	1.73	Residue	0.01
NaOH		HCl	1.14
		NaCl	0.15
Total	**2.30**	**Total**	**2.30**

1 CHLORO 2 METHYL PROPYL CHLOROFORMATE

Process Description

Aromatic/Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Isobutylaldehyde

M.W.-72

Phosgene

M.W.-99

1-Chloro2-Methyl propyl chloroformate

M.W.-171

Material Balance

Input (kg)		Output (kg)	
Isobutyraldehyde	1.05	CMPCF	1.00
Phosgene	1.38	MDC	2.11
MDC	2.11	Pyridine	0.32
Pyridine	0.32	Residue	1.43
Sodium sulphate	0.05	Nitrogen	0.42
Nitrogen gas	0.42	NaCl	0.15
Caustic lye	0.10		
Total	**5.43**	**Total**	**5.43**

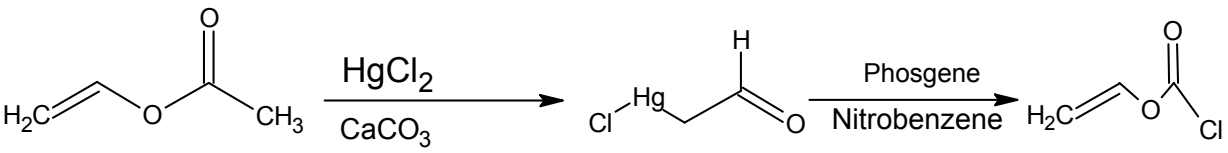
VINYL CHLOROFORMATE GROUP

VINYL CHLOROFORMATE

Process Description

Vinyl Acetate reacts with Mercuric Chloride mix together to form Chloro Mercuric Acetaldehyde; this Chloro Mercuric Acetaldehyde is reacted with Phosgene in solvent media to form Crude Vinyl Chloroformate and residual Mercuric Salts. Crude Vinyl Chloroformate is distilled out to get pure product and mercuric salt is/are react with Iron to produce metal Mercury.

Chemical Reaction



Material Balance

Input (kg)		Output (kg)	
Caustic Soda Lye	10.0	Vinyl Chloroformate	1.00
Vinyl Acetate	3.49	Mercury	3.10
$CaCO_3$	1.57	Ferric Chloride	3.92
Mercuric Chloride	8.41	Mercuric Chloride	4.20
Acetone	3.33	Acetone	3.00
Nitrogen Gas	1.25	Water	53.00
Water	63.0	Nitrobenzene	8.00
Nitro Benzene	8.1	HCl 30%	25.90
Phosgene	4.00	NaCl	1.03
Total	**103.15**	**Total**	**103.15**

ISOPROPENYL CHLOROFORMATE

Process Description

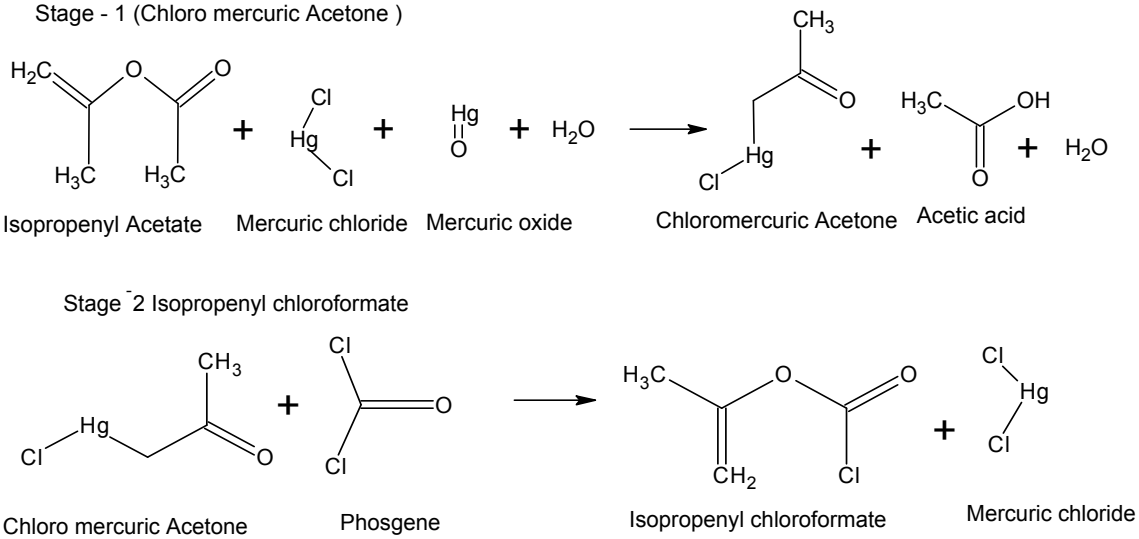
STAGE: - 1

Isopropenyl Acetate is reacted with a mercuric chloride in the presence of water and an acid acceptor preferably mercuric oxide to produce chloro-mercuricacetone.

STAGE: - 2

Phosgene is reacted with chloro-mercuricacetone in the presence of a solvent preferably nitro benzene to produce Isopropenyl chloroformate (IPECF).

Chemical Reaction



Material Balance

STAGE: - 1

Input	Quantity (Kg)	Output	Quantity (Kg)
Isopropenyl Acetate	3.850	chloro-mercuricacetone	7.000
Mercuric chloride	4.025	Filtrate ML	14.91
Mercuric oxide	3.234	Loss	1.029
Process water for reaction	11.830		
Total	**22.939**		**22.939**

STAGE: - 2

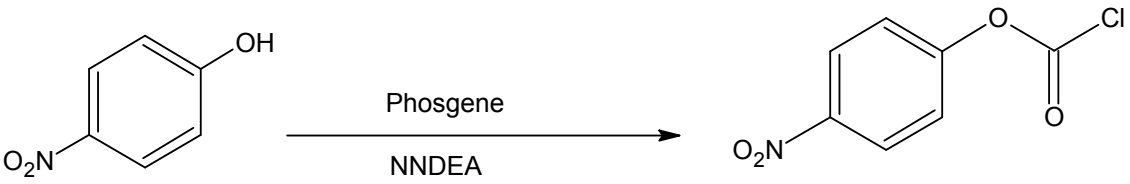
Input	**Quantity (Kg)**	**Output**	**Quantity (Kg)**
chloro-mercuricacetone	7.00	Isopropenyl chloroformate	1.000
Nitro benzene	18.000	Residual mass	24.400
Phosgene	4.300	Loss	3.900
Total	**29.300**		**29.300**

4-NITROPHENYL CHLOROFORMATE

Process Description

In the solution of 4-Nitrophenol & Toluene, Phosgene is purged and Diethyl Aniline is added to it. After reaction completion Dil. HCl and Water are added to the reaction mass and after layer separation toluene is distilled under vacuum. Residue is cooled and Hexane is added to crystallize the product. Product is filtered and dried under Vacuum.

Chemical Reaction



4-nitrophenol

4 - Nitro phenylchloroformate

Material Balance

Input	Quantity (Kg)	Output	Quantity (Kg)
4-Nitro Phenol	0.86	4-Nitrophenyl Chloroformate (4-NPCF)	1.00
Phosgene ($COCl_2$)	0.80	DPCO	0.19
N,N Diethyl Aniline (NNDEA)	1.21	Dil. Hydrochloric Acid (HCl)	1.56
Dil. Hydrochloric Acid (HCl)	1.27	Water (H_2O)	2.34
Sodium Hydroxide (NaOH)	0.41	N,N Diethyl Aniline (NNDEA)	1.21
Water (H_2O)	2.46	Sodium Chloride (NaCl)	0.60
Toluene	7.27	Carbon Dioxide (CO_2)	0.11
Hexane	12.07	Residue	2.15
		Toluene	6.33
		Hexane	10.86
Total	**26.35**		**26.35**

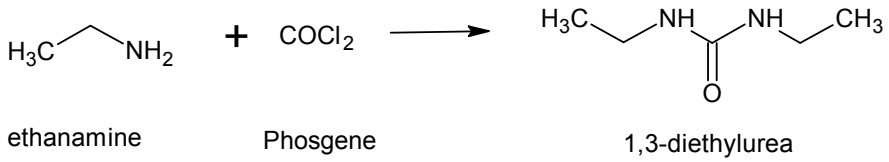
UREA GRUOUP

1, 3-DIETHYL UREA

Process Description

Two moles of Amine is reacted with Phosgene at controlled temperature in solvent media to form Urea. The solvent is then separated out suitably and recycled. The Off gas (HCl) generated is scrubbed out in scrubber. The scrubbed material (HCl 30%) is sold out.

Chemical Reaction



ethanamine Phosgene 1,3-diethylurea

Material Balance

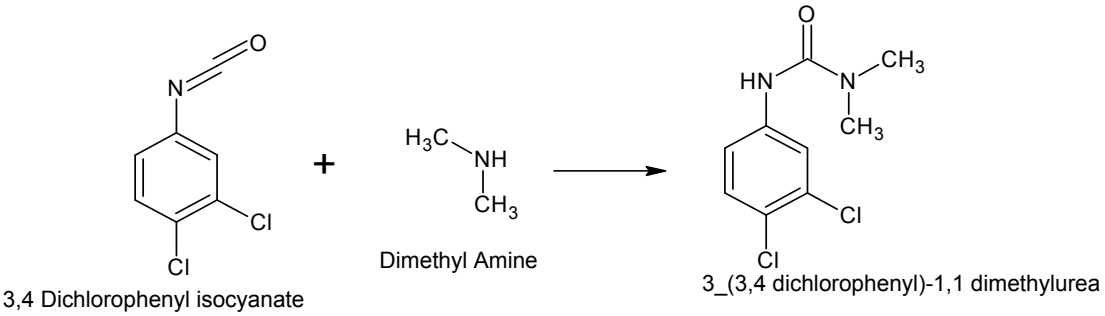
Input	Quantity (Kg)	Output	Quantity (Kg)
Ethylamine	0.86	DEU	1.00
Phosgene ($COCl_2$)	0.95	HCl	0.7
Toluene	4.31	Toluene	4.05
		Residue	0.37
Total	**6.12**		**6.12**

3-(3, 4-DICHLOROPHENYL)-1, 1-DIMETHYL UREA (DIURON)

Process Description

3, 4 Dichloro Phenyl Isocyanate is reacted with Dimethyl Amine to produce 3-(3, 4-Dichlorophenyl)-1, 1-Dimethyl Urea. (Diuron/DCMU)

Chemical Reaction



3,4 Dichlorophenyl isocyanate

Dimethyl Amine

3_(3,4 dichlorophenyl)-1,1 dimethylurea

Material Balance

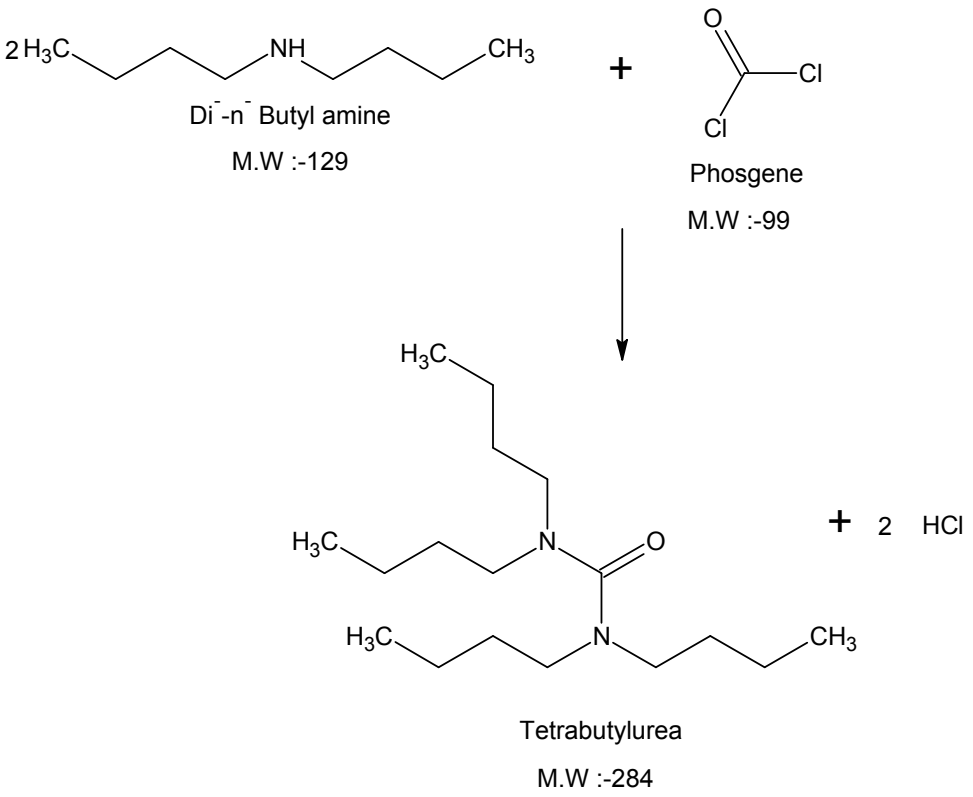
Sr.	In put		Out put	
	Name	**Qty. in Kg**	**Name**	**Qty. in Kg**
1	3,4 Dichloro Phenyl Isocyanate	0.862	Diuron	1.0
2	Dimethyl Amine	0.259	Filtrate	4.71
3	Toluene	5.232	Loss	0.643
	TOTAL	**6.353**	**TOTAL**	**6.353**

TERT BUTYL UREA

Process Description

Two moles of Amine is reacted with Phosgene at controlled temperature in solvent media to form Urea. The solvent is then separated out suitably and recycled. The Off gas (HCl) generated is scrubbed out in scrubber. The scrubbed material (HCl 30%) is sold out.

Chemical Reaction



Material Balance

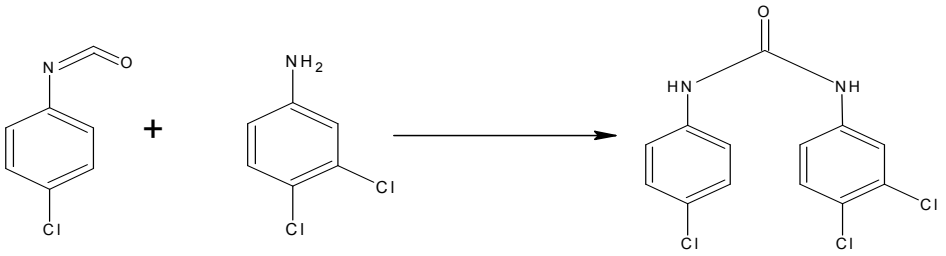
Input (kg)		Output (kg)	
Phosgene	0.49	TBU	1.00
HCl	0.12	NaCl	1.38
DBA	1.00	HCl	0.12
Soda Ash	0.87		
Caustic Lye	0.02		
Total	**2.50**	**Total**	**2.50**

3, 4, 4 TRICHLORO CARBANILIDE

Process Description

Two moles of Amine is reacted with Phosgene at controlled temperature in solvent media to form Urea. The solvent is then separated out suitably and recycled. The Off gas (HCl) generated is scrubbed out in scrubber. The scrubbed material (HCl 30%) is sold out.

Chemical Reaction



4- Chlorophenylisocyanate 3,4-dichloroaniline 3, 4, 4' - TRICHLOROCARBANILIDE

Material Balance

Input (kg)		Output (kg)	
4 CPI	0.502	TCC	1.00
3, 4 DCA	0.528	MCB	0.93
MCB	0.94	Tar	0.042
Nitrogen Gas	0.001		
DMF	0.001		
Total	**1.972**	**Total**	**1.972**

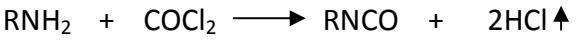
ISOCYANATE GROUP

CYCLOHEXYL ISOCYANATE

Process Description

Aromatic / Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Material Balance

Input (kg)		Output (kg)	
Cyclo Hexyl Amine	0.98	Cyclohexyl Isocyanate	1.00
Phosgene Gas	1.725	Tar	0.237
Solvent	0.1	HCl 30%	4.514
Nitrogen	0.001	NaCl	0.073
Water	2.968		
NaOH	0.05		
Total	**5.824**	**Total**	**5.824**

TRANS 4 METHYL CYCLOHEXYL ISOCYANATE

Process Description

Aromatic / Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction

Material Balance

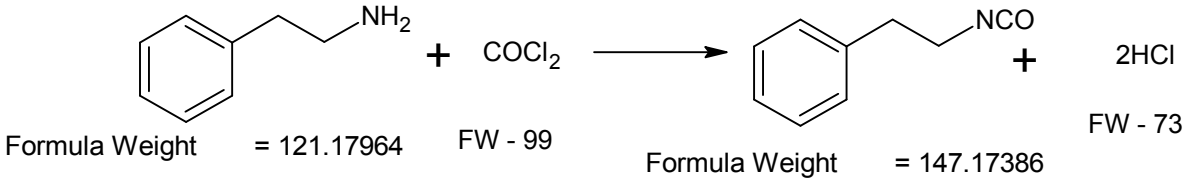
Input (kg)		Output (kg)	
T4CHA	1.18	T4MCHI	1.00
Phosgene	1.57	Residue	0.47
Toluene	4.30	Toluene	4.09
NaOH	0.04	Toluene Loss	0.22
		HCl	1.26
		NaCl	0.05
Total	**7.09**	**Total**	**7.09**

2 PHENYL ETHYL ISOCYANATE

Process Description

Aromatic / Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Material Balance

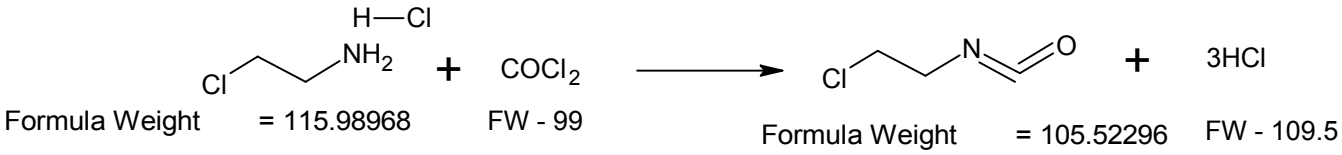
Input (kg)		Output (kg)	
PEA	1.14	2PEI	1.00
Phosgene	2.10	Residue	0.32
Toluene	4.65	Toluene	4.42
NaOH	0.06	Toluene Loss	0.23
		HCl	1.92
		NaCl	0.06
Total	**7.95**	**Total**	**7.95**

2 CHLOROETHYL ISOCYANATE

Process Description

Aromatic / Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Material Balance

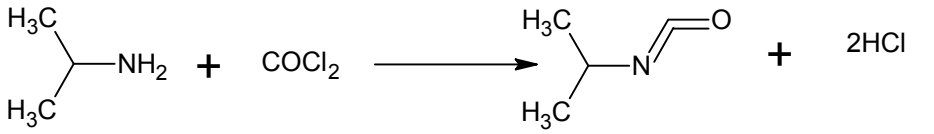
Input (kg)		Output (kg)	
CEA	1.20	2CEI	1.00
Phosgene	2.00	Residue	0.10
EDC	6.19	EDC	5.88
NaOH	0.04	EDC loss	0.31
		HCl	2.08
		NaCl	0.06
Total	**9.43**	**Total**	**9.43**

ISOPROPYL ISOCYANATE (75% IN TOLUENE)

Process Description

Aromatic / Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Formula Weight = 59.11026 FW - 99 Formula Weight = 85.10448 FW - 73

Material Balance

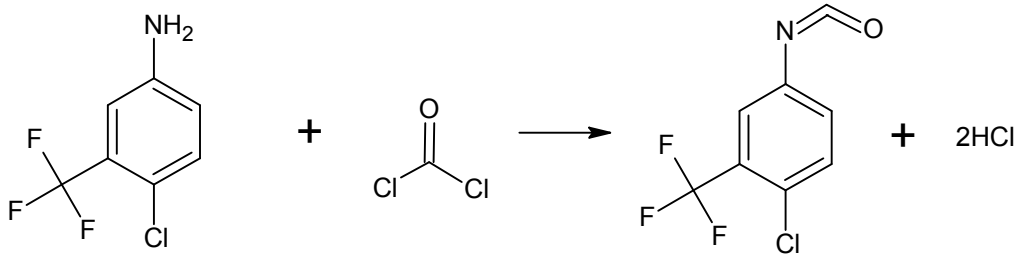
Input (kg)		Output (kg)	
IPAM	0.93	IPIC	1.00
Phosgene	2.83	Residue	0.23
NaOH	0.07	HCl	2.50
		NaCl	0.10
Total	**3.83**	**Total**	**3.83**

4 CHLORO -3 - (TRIFLUOROMETHYL) PHENYL ISOCYANATE

Process Description

Aromatic / Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Material Balance

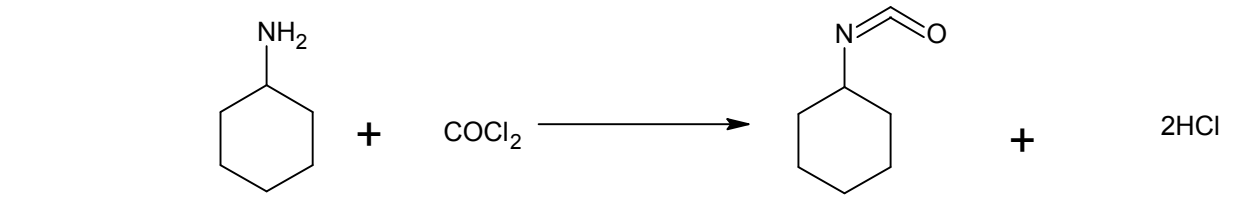
Input (kg)		Output (kg)	
4-Chloro-3-(trifluoromethyl) Aniline	1.26	CTPIC	1.00
Toluene	5.42	Recovered Toluene	5.15
Phosgene	0.95	Toluene Loss	0.27
		Residue	0.07
		HCl	1.05
		NaCl	0.09
Total	**7.63**	**Total**	**7.63**

PHENYL ISOCYANATE

Process Description

Aromatic / Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Material Balance

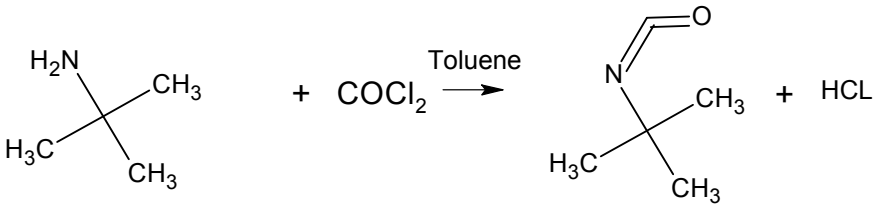
Input (kg)		Output (kg)	
Aniline	1.05	PI	1.00
Phosgene	1.60	Residue	0.27
Toluene	3.00	Toluene	2.85
NaOH	0.03	Toluene Loss	0.15
		HCl	1.37
		NaCl	0.04
Total	**5.68**	**Total**	**5.68**

TERT BUTYL ISOCYANATE

Process Description

Aromatic / Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Material Balance

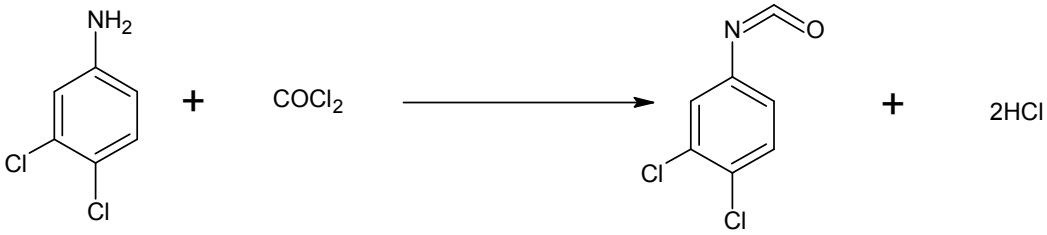
Input (kg)		Output (kg)	
TBA	0.89	TBI	1.00
Phosgene	1.69	Residue	0.02
Caustic	2.09	ODCB	0.8
Sodium Sulfate	0.18	HCl	0.98
Soda Ash	0.18	NaCl	3.03
OCDB (92% Rec.)	0.8		
Total	**5.83**	**Total**	**5.83**

3, 4 DICHLOROPHENYL ISOCYANATE

Process Description

Aromatic / Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Formula Weight = 162.0166 FW - 99 Formula Weight = 188.01082 FW - 73

Material Balance

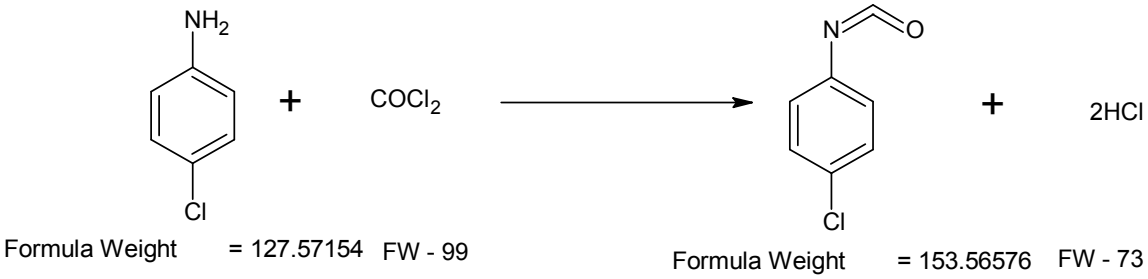
Input (kg)		Output (kg)	
DCA	0.88	DCPI	1.00
Phosgene	1.21	Residue	0.02
MCB	4.74	MCB	4.62
NaOH	0.03	MCB Loss	0.12
		HCl	1.05
		NaCl	0.05
Total	**6.86**	**Total**	**6.86**

4 CHLORO PHENYL ISOCYANATE

Process Description

Aromatic / Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Formula Weight = 127.57154 FW - 99

Formula Weight = 153.56576 FW - 73

Material Balance

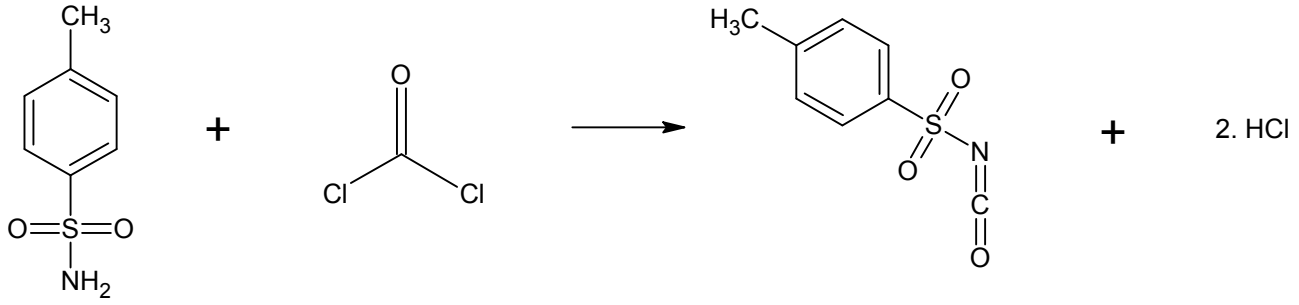
Input (kg)		Output (kg)	
PCA	0.91	4CPI	1.00
Phosgene	1.22	Residue	0.07
NaOH	0.02	MCB	4.70
MCB	4.82	MCB	0.12
		HCl	1.05
		NaCl	0.03
Total	**6.97**	**Total**	**6.97**

P - TOLUENE SULFONYL ISOCYANATE

Process Description

Aromatic / Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction



Para -toluenesulfonamide
M.Wt. = 171.21

Phosgene
M.Wt. = 98.92

Para-Toluenesulfonyl isocyanate
M.Wt. = 197.21

Hydrochloric acid
M.Wt. = 36.5 x 2 = 73

Material Balance

Input (kg)		Output (kg)	
P- Toluene Sulfonamide	1.24	PTSI	1.00
Phosgene	1.43	MCB	0.93
MCB (85 % recovery)	0.93	CHI	0.09
CHI	0.09	HCl	1.54
Nitrogen gas	0.49	NaCl	0.74
Caustic lye	0.12		
Total	**4.30**	**Total**	**4.30**

STEARYL ISOCYANATE

Process Description

Aromatic / Aliphatic primary or secondary amines are reacted with Phosgene in suitable solvent under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber. The crude product is distilled under vacuum to get pure product.

Chemical Reaction

$$R\text{-}NH_2 + COCl_2 \rightarrow R\text{-}N{=}C{=}O + 2\ HCl$$

Material Balance

Input (kg)		Output (kg)	
Stearyl palmityl amine	1.06	SICPIC	1.00
Toluene	0.95	Residue	0.02
Phosgene	1.06	Toluene	0.95
Nitrogen gas	0.43	Nitrogen	0.43
Caustic lye	0.09	HCl	1.04
		NaCl	0.15
Total	**3.59**	**Total**	**3.59**

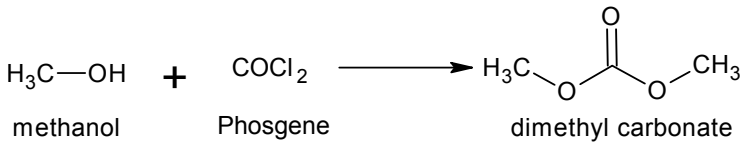
CARBONATES GROUP

DIMETHYL CARBONATE

Process Description

Methanol is reacted with Phosgene to give Crude Dimethyl Carbonate, which is further distilled to give pure Dimethyl Carbonate.

Chemical Reaction



Material Balance

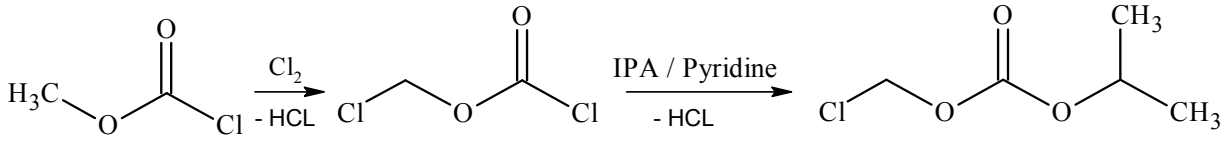
Input	Quantity (Kg)	Output	Quantity (Kg)
Methanol	0.79	Dimethyl Carbonate (DMC)	1.00
Phosgene	1.34	2 Hydrochloric Acid (2HCl)	0.90
		MCF	0.23
Total	**2.13**		**2.13**

CHLOROMETHYL ISOPROPYL CARBONATE

Process Description

Chloromethyl Chloroformate is reacted with Isopropyl Amine to give Crude Chloromethyl Isopropyl Carbonate, which is further distilled to give pure Chloromethyl Isopropyl Carbonate.

Chemical Reaction



Methyl Chloroformate Chloromethyl Chloroformate Chloromethyl isopropyl carbonate

Material Balance

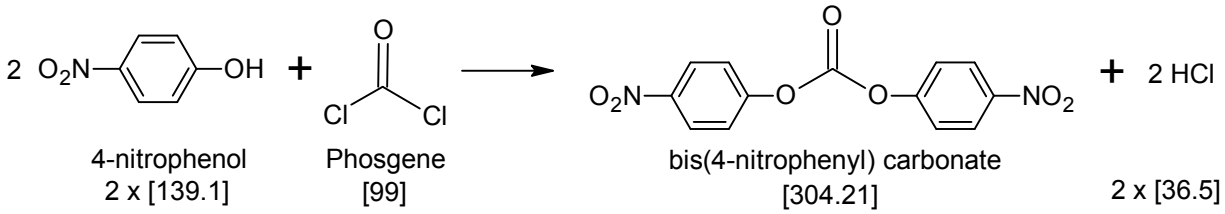
Input (kg)		Output (kg)	
CMCF	1.11	CMIC	1.00
Isopropyl Alcohol	0.48	Pyridine	0.00
Sodium Sulfate	0.00	HCl	0.53
Caustic Soda Lye	0.15	NaCl	0.21
Pyridine	0.00		
Total	**1.74**	**Total**	**1.74**

BIS 4 NITRO PHENYL CARBONATE

Process Description

4 Nitro Phenol is reacted with Phosgene to give crude Bis 4 Nitrophenyl Carbonate, which is further distilled to give pure Bis 4 Nitrophenyl Carbonate.

Chemical Reaction



4-nitrophenol
2 x [139.1]

Phosgene
[99]

bis(4-nitrophenyl) carbonate
[304.21]

2 x [36.5]

Material Balance

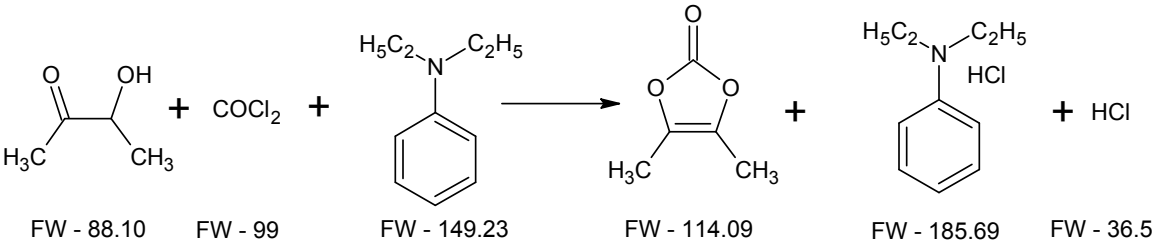
Input (kg)		Output (kg)	
4 Nitro Phenol	1.04	BNPCO	1.00
Toluene loss (20%)	1.56	Toluene	1.56
Phosgene	1.21	TEA	0.04
Caustic Lye	1.38	NaCl	2.63
TEA	0.04		
Total	**5.23**	**Total**	**5.23**

4, 5-DIMETHYL-1, 3-DIOXOLEN-2-ONE

Process Description

Acetone is reacts with Phosgene in presence of N, N Diethyl Aniline to get crude 4, 5-DIMETHYL-1, 3-DIOXOLEN-2-ONE, which is further distilled to give pure Bis 4 Nitrophenyl Carbonate.

Chemical Reaction



FW - 88.10 FW - 99 FW - 149.23 FW - 114.09 FW - 185.69 FW - 36.5

Material Balance

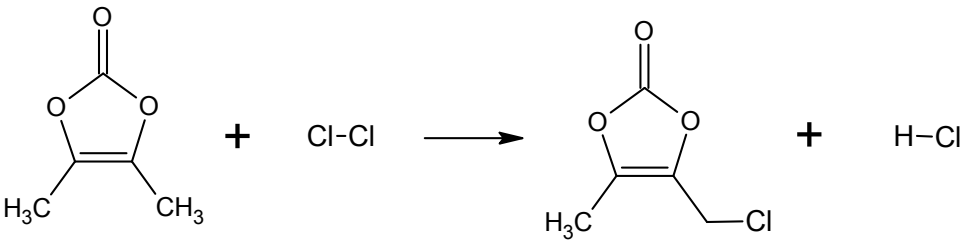
Input (kg)		Output (kg)	
Acetone	1.25	DMDO	1.00
Phosgene	1.81	Residue	0.47
N,NDEA	2.49	N,N DEA	2.49
NaOH	0.04	Aq HCl	3.00
HCl (28%)	3.00	MDC	9.91
MDC	10.77	MDC	0.86
Toluene	1.77	Toluene	1.68
		Toluene Loss	0.09
		HCl	1.56
		NaCl	0.06
Total	**21.11**	**Total**	**21.11**

4-CHLOROMETHYL-5-METHYL-1, 3-DIOXOL-2-ONE

Process Description

4 Dimethyl 5 Methyl 1, 3 Dioxolen One is reacts with Chlorine in solvent to get crude 4, 5-DIMETHYL-1, 3-DIOXOLEN-2-ONE, which is further distilled to give pure 4 Chloromethyl 5 Methyl 1, 3 Dioxolen One.

Chemical Reaction



Material Balance

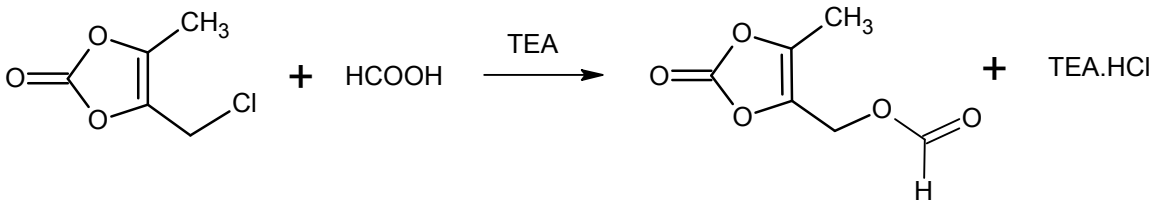
Input (kg)		Output (kg)	
DMDO	1.30	DMDOCl	1.00
MDC	1.45	MDC	1.45
Chlorine Gas	0.86	ODCB	0.35
Caustic 100%	0.27	HCl	0.52
ODCB	0.34	NaCl	0.90
Total	**4.22**	**Total**	**4.22**

4-(HYDROXY METHYL)-5-METHYL-1, 3-DIOXOL-2-ONE

Process Description

4 Dichloromehtyl 5 Methyl 1,3 Dioxol 2 One is reacts with Formic Acid in presence of Triethyl Amine to get 4 Hydroxy Methyl 5 Methyl 1,3 Dioxol 2 One & Triethyl Amine Hydrochloride.

Chemical Reaction



Material Balance

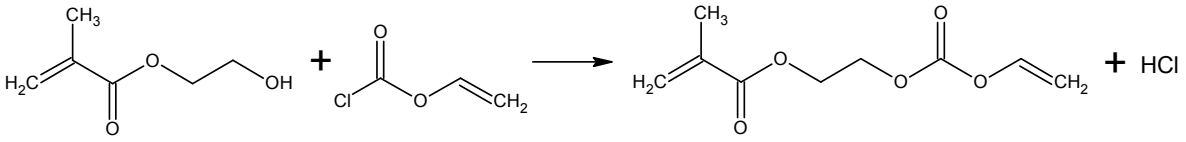
Input (kg)		Output (kg)	
DMDOCl	1.64	HMMDO	1.00
Chloroform	6.81	Chloroform	6.81
TEA	2.03	TEA HCl	3.62
Sodium Sulfate	0.03	Methyl Formate	2.56
Formic Acid	0.92	Sodium Sulfate	0.03
Methanol	2.56	Nitrogen	0.12
HCl	0.03		
Nitrogen	0.12		
Total	**14.14**	**Total**	**14.14**

2-METHYL CRYLOXY ETHYL VINYL CARBONATE

Process Description

2 Hydroxyethyl 2 Methacrylate reacts with Vinyl Chloroformate to get crude 2 Methyl Cryloxy Ethyl Vinyl Carbonate and Hydrochloric Acid.

Chemical Reaction



2-Hydroxyethyl 2-methacrylate [130.1] + Vinyl chloroformate [106.5] → 2-Methacryloxyethyl vinyl carbonate [200.19] + [36.5]

Material Balance

Input (kg)		Output (kg)	
HEMA	1.10	HEMAVC	1.00
VCF	1.33	Pyridine HCl	5.28
Pyridine	0.82	MDC	13.43
HCl	3.04	Silica Gel	1.10
NaCl	3.39	2,5 Dimethyl-p-Benzoquenone	0.00
NaOH	1.06	1,1'-Bis 2 Naphthol	0.00
MDC	13.43	Residue	0.01
Cuprous Chloride	0.00	Cuprous Chloride	0
Sodium Sulfate	0.17	Sodium Sulfate	0.17
2,5 Dimethyl-p-Benzoquenone	0.00	NaCl	3.39
Silica Gel	1.10	NaOH	1.06
1,1'-Bis 2 Naphthol	0.00		
Total	**25.44**	**Total**	**25.44**

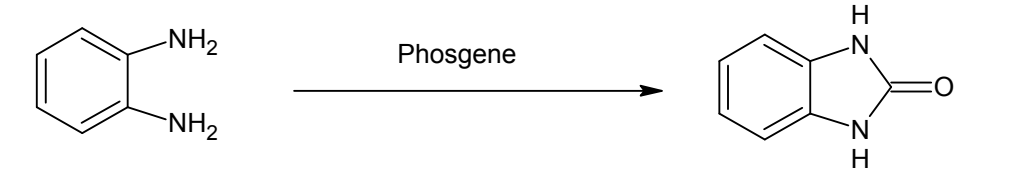
BENZIMIDAZOL GROUP (TO BE DISCONTINUED)

2 BENZIMIDAZOL

Process Description

2-Aminoaniline is reacted with Phosgene to give Crude Benzimdazolone which is further purified to give Pure Benzimdazolone.

Chemical Reaction



benzene-1,2-diamine

1,3-dihydro-2*H*-benzimidazol-2-one

Material Balance

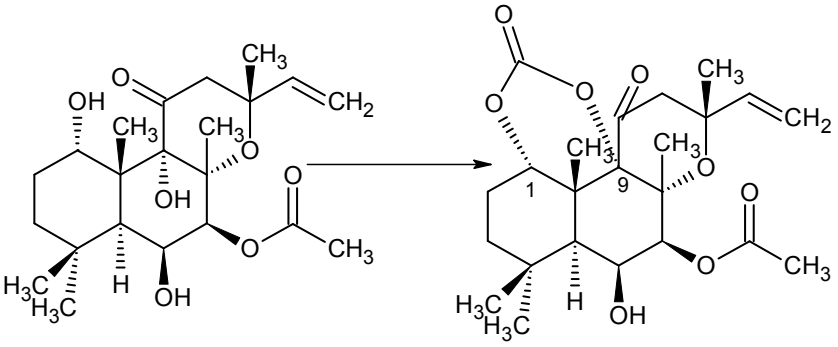
Input	Quantity (Kg)	Output	Quantity (Kg)
2-Amino Aniline	0.96	2-Benzimdazolone	1.00
Phosgene ($COCl_2$)	0.96	2 Hydrochloric Acid (2HCl)	0.71
Water (H_2O)	0.02	Carbon Dioxide (CO_2)	0.04
Monochlorobenzene (MCB)	4.80	Monochlorobenzene (MCB)	4.80
		Residue	0.19
Total	**6.74**		**6.74**

FORSKOLINE CARBONATE (TO BE DISCONTINUED)

Process Description

Forskohlin, Pyridine are reacted with Phosgene in MDC solvent. After reaction completion Pyridine Hydrochloride is removed by Water washing and MDC is distilled to get the Product Forskohlin Carbonate.

Chemical Reaction



Material Balance

Input	Quantity (Kg)	Output	Quantity (Kg)
Forskohlin	1.18	Forskohlin Carbonate	1.00
Phosgene ($CoCl_2$)	0.31	Pyridine Hydrochloride	0.66
Pyridine	0.50	Dichloromethane (MDC)	5.31
Dichloromethane (MDC)	5.90	Residue	0.93
Water (H_2O)	11.80	Water	11.79
Total	**19.69**		**19.69**

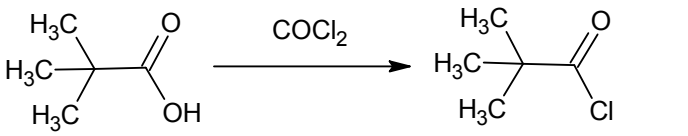
CHLORIDES/ACID CHLORIDES GROUP

PIVALOYL CHLORIDE

Process Description

Pivalic Acid is reacted with Phosgene in the presence of Phosgene to give Crude Pivaloyl Chloride which is further distilled under vacuum to give Pivaloyl Chloride.

Chemical Reaction



pivalic acid 2,2-dimethylpropanoyl chloride

Material Balance

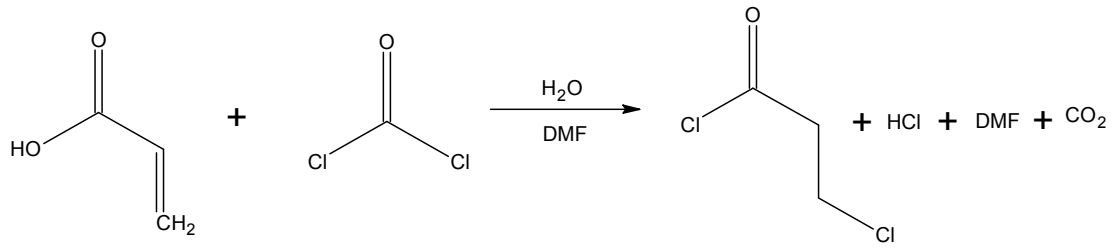
Input	Quantity (Kg)	Output	Quantity (Kg)
Pivalic Acid	0.94	Pivaloyl Chloride (PVCl)	1.00
Phosgene	0.91	Carbon Dioxide (CO_2)	0.41
		Hydrochloric Acid (HCl)	0.34
		Residue	0.10
Total	**1.85**		**1.85**

3 CHLOROPROPIONYL CHLORIDE - 3 CPC

Process Description

Phosgene is passed through acrylic acid and water until reaction is completed. 3-Chloropropionyl chloride is prepared and purified by distillation.

Chemical Reaction



Acrylic acid

MW: 72.06 g/mol

Phosgene

MW: 98.92 g/mol

3-Chloropropionyl chloride

MW: 72.06 g/mol

Material Balance

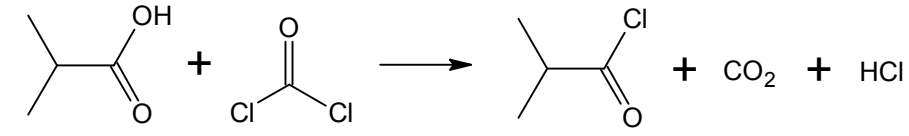
Input (kg)		Output (kg)	
Acrylic Acid	0.738	3CPC	1.000
Phosgene	1.628	HCl	0.453
DMF	0.004	CO_2	0.723
Water	0.112	Residue	0.120
		Loss	0.080
		Inter Cut	0.080
Total	**2.48**	**Total**	**2.48**

ISOBUTYRYL CHLORIDE

Process Description

Iso Butyric Acid reacts with Phosgene under control condition of temperature and pressure, the resultant mass is degassed to remove free HCl & free Phosgene through scrubber to give Iso Butyryl Chloride.

Chemical Reaction



Iso butyric acid Phosgene Iso butyrylchloride

Material Balance

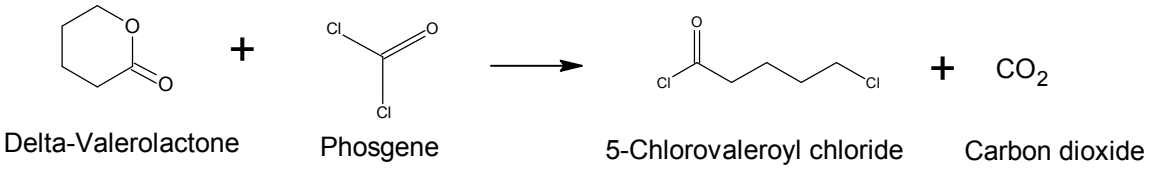
Input (kg)		Output (kg)	
Isobutyric acid	1.00	Isobutyryl chloride (IBCL)	1.00
D.M.F.	0.01	Carbon dioxide (CO2)	1.00
Phosgene	2.30	Hydrochloric Acid (HCl)	1.29
Nitrogen	0.10	Residue /(Loss)	0.27
Caustic lye for scrubber	0.15		
Total	**3.56**	**Total**	**3.56**

5 - CHLOROVALEROYL CHLORIDE

Process Description

Delta-Valerolactone is reacted with Phosgene in presence of catalyst at suitable condition to give 5-Chlorovaleroyl Chloride.

Chemical Reaction



Delta-Valerolactone | Phosgene | 5-Chlorovaleroyl chloride | Carbon dioxide

Material Balance

Input (kg)		Output (kg)	
Delta-Valerolactone	1.00	5-Chlorovaleroyl Chloride (5-CVCL)	1.00
D.M.F.	0.04	Carbon dioxide (CO2)	1.10
Phosgene	2.00	Residue /(Loss)	1.14
Nitrogen	0.10		
Caustic lye for scrubber	0.10		
Total	**3.24**	**Total**	**3.24**

CARBAMATES GROUP

BENZYL CARBAMATE

Process Description

Benzyl Chloroformate (in Toluene) is reacted with Liq. Ammonia at suitable condition to give Benzyl Carbamate as a Product which is further filtered and washed with water. After filtration product is dried under vacuum to give Benzyl Carbamate.

Chemical Reaction

benzyl chlorocarbonate

Molecular Formula = $C_8H_7ClO_2$
Formula Weight = 170.59298

benzyl carbamate

Molecular Formula = $C_8H_9NO_2$
Formula Weight = 151.16256

Material Balance

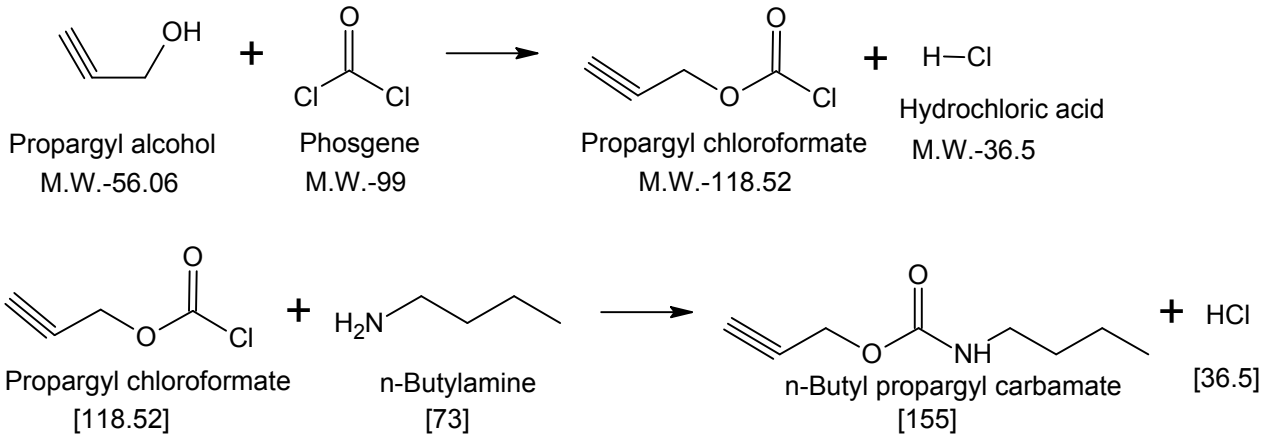
Input	Quantity (Kg)	Output	Quantity (Kg)
Benzyl Chloroformate (BCF-50%)	2.54	Benzyl Carbamate (BCM)	1.00
Liq. Ammonia (~25%)	1.21	Ammonium Chloride (NH_4Cl)	0.39
		Toluene	1.19
		Residue	0.20
		Ammonia solution	0.97
Total	**3.75**		**3.75**

N BUTYL PROPARGYL CARBAMATE

Process Description

Propargyl Alcohol is react with Phosgene under control condition of temperature and pressure to get Propargyl Chloroformate which is to be further n Butyl Amine to get n Butyl Propargyl Carbamater.

Chemical Reaction



Material Balance

Input (kg)		Output (kg)	
Propargyl alcohol	0.39	PGCF	0.76
BHT	0.00	Aq. layer	0.92
Phosgene	1.02	Residue /(Loss)	0.51
Water wash	0.78		
Total	**2.19**	**Total**	**2.19**

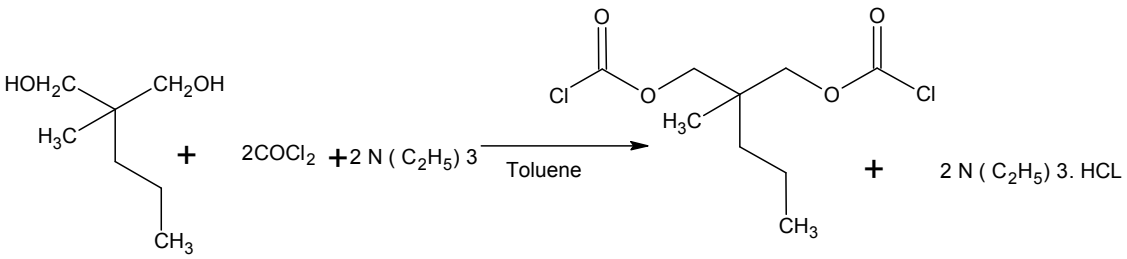
Input (kg)		Output (kg)	
Propargyl chloroformate	0.76	NBPC	1.00
Sodium carbonate	0.38	Aq. layer	3.51
N-Butyl amine	0.48	Residue /(Loss)	0.17
Water for sodium carbonate	3.06		
Total	**4.68**	**Total**	**4.68**

2-METHYL-2-PROPYL-1,3-PROPANEDIOL DICHLOCARBAMATE (90% IN TOLUENE)

Process Description

2-Methyl-2-propyl-1,3-propanediol is reacted with Phosgene (in Toluene), in the presence of Triethylamine to give 2-Methyl-2-propyl-1,3-propanediol dichlorocarbamate (crude, MPPBC) and Triethylamine hydrochloride (TEA.HCl). TEA.HCl is then removed by water wash. Toluene layer separated is distilled under vacuum to get the product, 2-Methyl-2-propyl-1, 3-propanediol dichlorocarbamate.

Chemical Reaction



2-methyl-2-propylpropane-1,3-diol

2 -methyl- 2 -propyl- 1, 3 propanediol dichlorocarbamate

or

2-{[(chlorocarbonyl)oxy]methyl}-2-methylpentyl chloridocarbonate

Material Balance

Input (kg)		Output (kg)	
2 Methyl 2 Propyl 1,3 Propandiol	0.54	MPPBC	1.00
Toluene loss (8%)	0.85	Toluene	0.85
Triethyl Amine	0.83	TEA HCl	2.54
Phosgene	2.38	Anhy. Sodium Sulfate	0.05
Nitrogen	0.07	Nitrogen	0.07
Caustic	0.47	NaCl	0.68
Anhy. Sodium Sulfate	0.05		
Total	**5.19**	**Total**	**5.19**

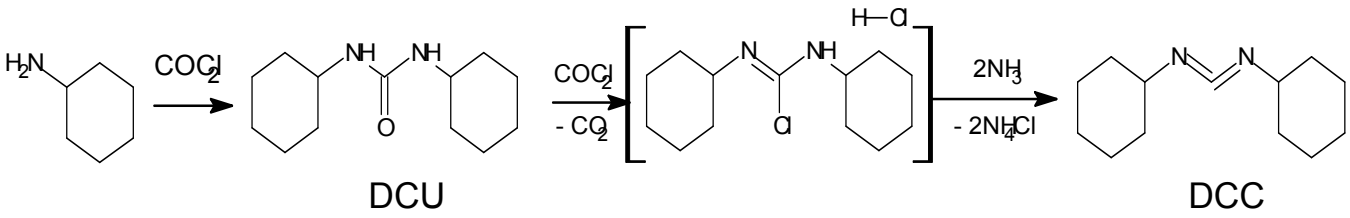
CARBODIIMIDES GROUP

DICYCLOHEXYL CARBADIIMIDES (DCC)

Process Description

CHA is reacted with Phosgene in the presence of Caustic (at below 60°C) to give Dicyclohexyl Urea (DCU). DCU is reacted with Phosgene at 15°C to give Chloroformamidinium Salt, which is further reacted with Ammonia at 0 to 5°C gives DCC.

Chemical Reaction



DCU DCC

Material Balance

Step –I

Input	Quantity (Kg)	Output	Quantity (Kg)
Cyclohexylamine (CHA)	1.37	Dicyelohexylurea (DCU)	1.49
Phosgene ($COCl_2$)	0.68	2 Sodium Chloride (2NaCl)	0.81
2 Sodium Hydroxide (NaOH)	0.55	Water (H_2O)	0.25
		Impurity	0.05
Total	**2.6**		**2.6**

Step –II

Input	Quantity (Kg)	Output	Quantity (Kg)
Dicyelohexylurea (DCU)	1.49	Dicyclohexylcarbadiimide (DCC)	1.00
Phosgene ($COCl_2$)	0.66	EtOAc	11.32
EtOAc	11.92	Hexane	6.71
Ammonia (NH_3)	0.23	Carbon Dioxide (CO_2)	0.29
Hexane	7.45	Ammonium Chloride (NH_4Cl)	0.71
		Residue	1.72
Total	**21.75**		**21.75**

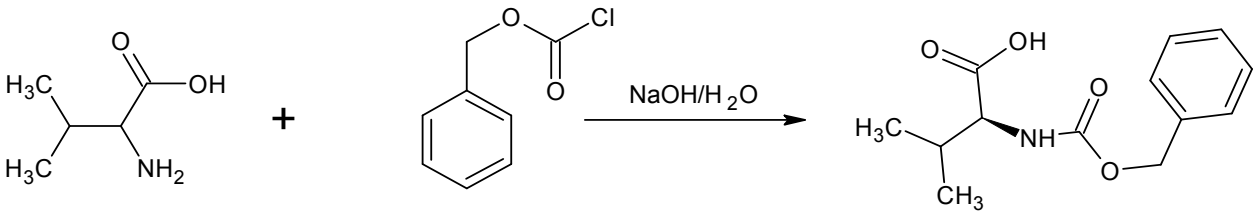
PROTECTED AMINO ACIDS GROUP (TO BE DISCONTINUED)

CBZ VALINE

Process Description

L-Valine is reacted in controlled temperature with Benzylchloroformate in diluted Sodium Hydroxide solution. Toluene is added to the reaction mass and Aq. layer is separated. To the Aq. Layer Hydrochloride acid is added and product is extracted in Ethyl Acetate. Ethyl Acetate layer is separated and distilled to get crude product. Crude product is crystallized using Cyclohexane solvent and after filtration dried to get the pure product.

Chemical Reaction



L -Valine **Benzylchloroformate** **CBZ -L -Valine**

Material Balance

Input	Quantity (Kg)	Output	Quantity (Kg)
L-Valine	0.583	N-Benzyloxy carbonyl CBZ-L -Valine	0.998
Sodium Hydroxide (NaOH)	0.399	Benzyl Alcohol (BzOH)	0.107
Benzyl Chloroformate (BCF -100%)	0.848	Sodium Chloride (NaCl)	1.053
Hydrochloric Acid -30% (HCl)	0.603	Carbon Dioxide (CO_2)	0.044
Sodium Chloride (NaCl)	0.470	Water (H_2O)	5.884
Water (H_2O)	5.300	Valine	0.117
Total	**8.203**		**8.203**

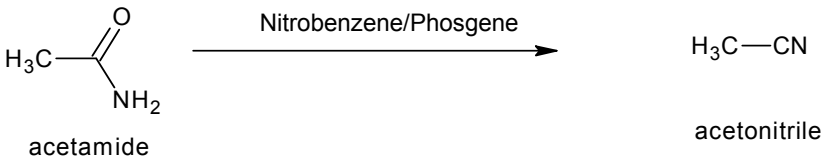
NITRILES GROUP

ACETONITRILE

Process Description

To the solution of Nitro Benzene & Acetamide Phosgene is purged till the reaction mass becomes clear. After reaction is over, reflux is continued to remove the excess Phosgene and HCl. The reaction mass is further heated to distill the Acetonitrile as a pure product.

Chemical Reaction



acetamide

acetonitrile

Material Balance

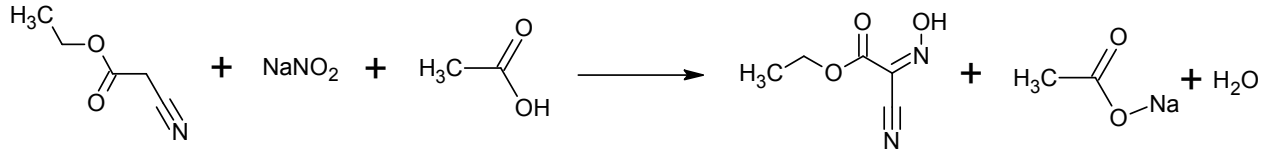
Input	Quantity (Kg)	Output	Quantity (Kg)
Acetamide	1.69	Acetonitrile (ACN)	1.0
Phosgene	3.40	Carbon Dioxide (CO_2)	1.26
Nitrobenzene	6.76	Hydrochloric Acid (HCl)	2.09
		Residue	0.37
		Phosgene ($COCl_2$)	0.57
		Nitrobenzene	6.56
Total	**11.85**		**11.85**

ETHYL 2-(HYDROXYLMINO) CYANOACETATE

Process Description

To a mixture of Ethyl Cyanoacetate, sodium nitrite & water, Acetic acid is added at low temperature. After completion of addition, mass is heated to get clear solution. Cool the mass & add HCl at low temperature. Chill the mass & filter. Wash the cake with chilled water. Dry the cake and packed as final product.

Chemical Reaction



ethyl cyanoacetate
M.W :-113.11

Sodium nitrite
[69]

Ethyl 2-(hydroxyimino)cyanoacetate
M.W :-142.11

Material Balance

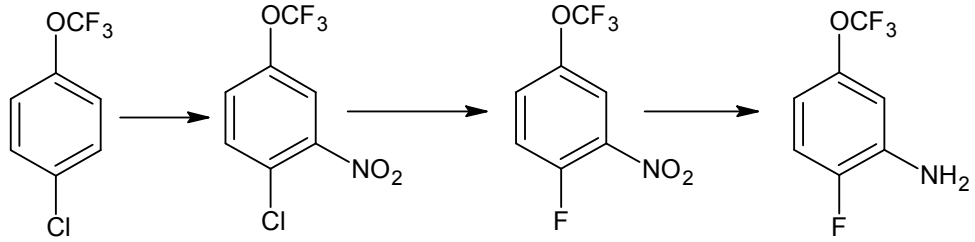
Input (kg)		Output (kg)	
Ethyl Cyanoacetate	1.05	EHICA	1.00
Acetic Acid	0.42	HCl	0.97
Sodium nitrite	0.66	Sodium Acetate	1.13
Conc.HCl	0.97		
Total	**3.10**	**Total**	**3.10**

2-FLUORO-5-(TRIFLUOROMETHOXY) ANILINE (FTMA) (TO BE DISCONTINUED)

Process Description

1-Chloro-4-(Trifluoromethoxy) Benzene is nitrated in the presence of Nitric Acid and Sulphuric Acid to give Stage-I. Stage-I is further reacted with Potassium Fluoride and 18-Crown-6 to give Fluorinated Product (Stage-II) which is further reduced with Pd/Carbon in Toluene to give (Stage-III) Amine Derivative. Amine Derivative is reacted with Phosgene to give Carbamoyl Chloride as a product.

Chemical Reaction



Material Balance

Stage –I

Input	Quantity (Kg)	Output	Quantity (Kg)
1-Chloro-4-Trifluoromethoxy Benzene (CTMB)	5.4	1-Chloro-2-nitro 4-(trifluoromethoxy) Benzene (FTMA-I)	6.17
Nitric Acid (HNO_3)	3.42	Sulphuric Acid (H_2SO_4)	32.4
Sulphuric Acid (H_2SO_4)	32.4	Water (H_2O)	7.26
Water (H_2O)	5.4	Residue	0.79
Dichloromethane (MDC)	5.4	Dichloromethane (MDC)	5.4
Total	**52.02**		**52.02**

Stage –II

Input	Quantity (Kg)	Output	Quantity (Kg)
1-Chloro-2-nitro 4-(trifluoromethoxy) Benzene (FTMA-I)	6.17	1-Fluoro-2-Nitro-4(trifluoro methoxy) benzene	1.35
Potassium Fluoride (KF)	1.93	Hydrogen Fluoride (HF)	0.51
18-Crown-6	0.19	Carbonyl Difluoride (COF_2)	1.68
		Potassium Chloride (KCl)	1.904
		Isomer	2.846
Total	**8.29**		**8.29**

Stage –III

Input	Quantity (Kg)	Output	Quantity (Kg)
FTMA-III	1.35	2-Fluoro -5-(Trifluoromethoxy) Aniline (FTMA)	1.00
Palladium (Pd/C)	0.01	Palladium (Pd/C)	0.01
Toluene	4.48	Residue	0.39
Hydrogen	0.04	Toluene	4.26
		H_2O	0.22
Total	**5.88**		**5.93**

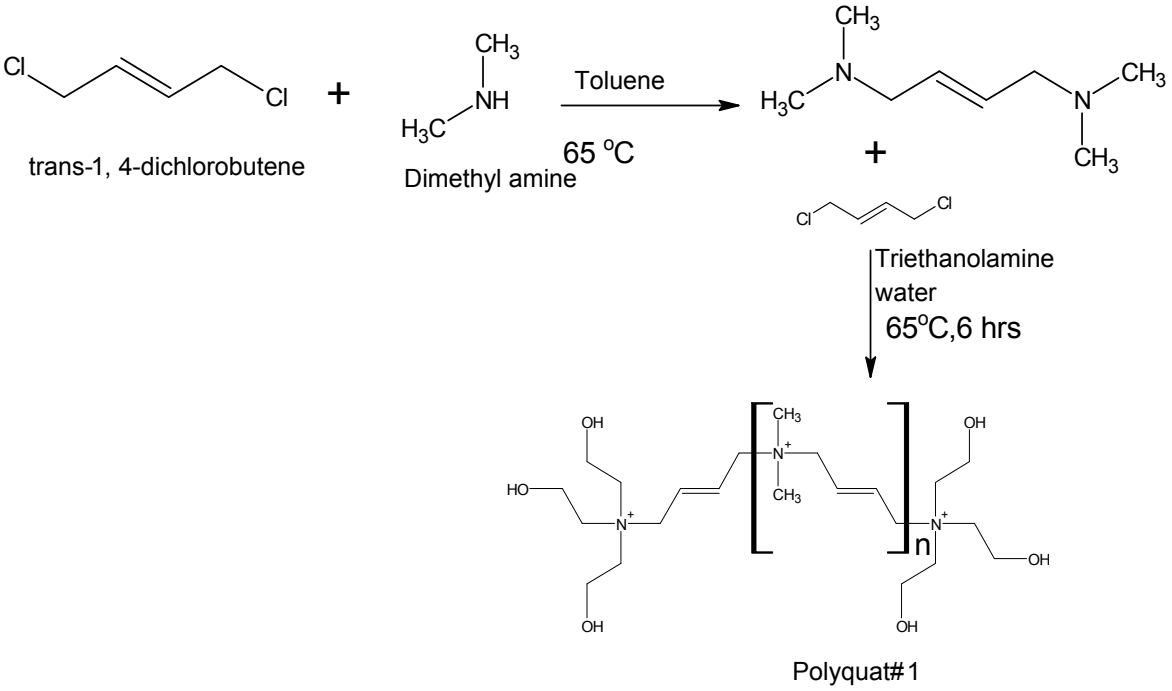
POLYMERS GROUP

POLYQUAT

Process Description

Dimethylamine is reacted with Trans-1, 4-Dichlorobutene in Toluene solvent. After reaction completion Caustic and Sodium Chloride is added in it. Aq. layer is separated. In Toluene layer after drying with Sodium Sulfate, Methanol is added and azeotropic distillation is done. Residue obtained is distilled under vacuum to give pure product Tetramethyl -1, 4-Diaminobutene which is further reacted with 1, 4-Dichlorobutene in the presence of Triethanolamine, Caustic & Hydrochloric Acid to give product Polyquat.

Chemical Reaction



Polyquat#1

Material Balance

Stage -I

Input	Quantity (Kg)	Output	Quantity (Kg)
Trans-1,4-Dichloro Butane	0.34	Step-I	0.17
Dimethyl Amine	2.9	Toluene+Methanol	19.59
Toluene	2.73	Residue	0.82
Dil. Sodium Hydroxide (NaOH -40%)	0.54	Water (H_2O)	2.61
Sodium Chloride (NaCl)	2.27	Sodium Chloride (NaCl)	2.59
Methanol (MeOH)	17.0		
Total	**25.78**		**25.78**

Stage -II

Input	Quantity (Kg)	Output	Quantity (Kg)
Step –I	0.17	Polyquat (POL)	1.00
Triethanolamine	0.04	Water	0.35
Water (H_2O)	0.88		
Trans1,4-Dichloro Butane	0.17		
Sodium Hydroxide (NaOH)	0.08		
Hydrochloric Acid (HCl)	0.01		
Total	**1.35**		**1.35**

THIADIAZOLE

5-METHOXY-1, 3, 4-THIADIAZOL-2(3)-ONE [METDO]

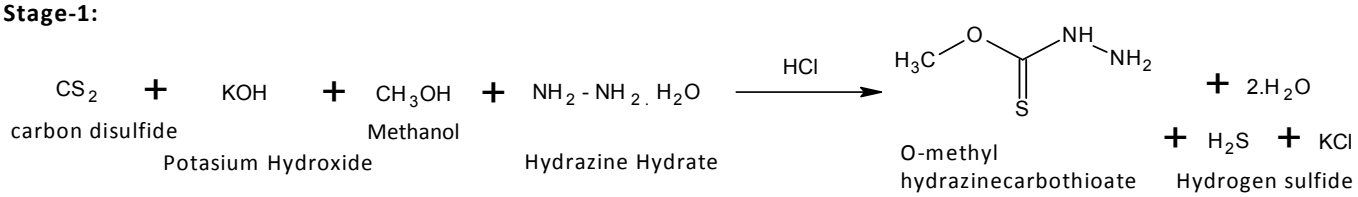
Process Description

Stage-1: Potassium Hydroxide is reacted with Methanol and Carbon Disulfide followed by reaction with Hydrazine Hydrate to get *O*-Methyl Hydrazine Carbothioate.

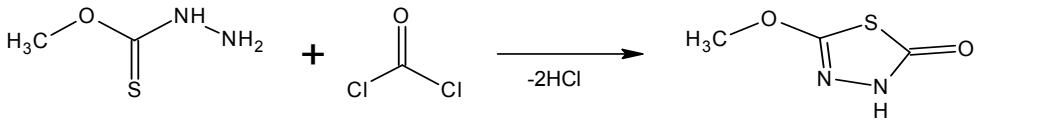
Stage-2:- *O*-Methyl Hydrazine Carbothioate is reacted with Phosgene to give product 5-Methoxy-1, 3, 4-Thiadiazol -2 (3H) – One (METDO).

Chemical Reaction

Stage-1:



Stage-2: 5-Methoxy-1,3,4-Thidiazole-2(3H)-one: [METDO]



Material Balance

Stage 1:

In put Raw Material	**Qty. Kg**	**Out put**	**Qty. Kg**
Potassium Hydroxide	1.28	*O*-Methyl Hydrazine Carbothioate	11.88
Carbon Disulfide	1.58		
Methanol	0.63		
Water	3		
Hydrazine Hydrate	0.97		
HCl	4.42		
Caustic Flakes	1.58	Scrubber Solution	15.75
Water for Caustic Solution	14.17		
Total	**27.63**		**27.63**

Stage 2:

In put Raw Material	**Qty. Kg**	**Out put**	**Qty. Kg**
O-Methyl Hydrazine Carbothioate	11.88	METDO	1.00
MDC	5.42	Recovered MDC	3.52
Phosgene	3.53	HCl Gas Generated	2.6
Water	3.64	CO_2 Gas Generated	0.84
Methanol	2.67	Aq. Layer Crude	10.783
		Mother Liquor	6.05
		Loss (Solvent & Other)	1.997
		Insoluble Salt	0.35
Total	**27.14**	**Total Output**	**27.14**

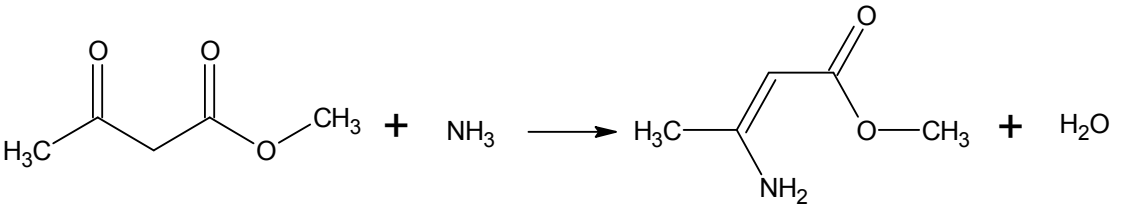
ESTERS GROUP

METHYL 3-AMINOCROTONATE

Process Description

Methyl Acetoacetate is reacted with Ammonia to give Methyl 3-Aminocrotonate as a Product.

Chemical Reaction



Methyl Acetoacetate | Ammonia | Methyl 3-aminocrotonate | Water

Material Balance

Input Raw material	**Quantity (Kg)**	**Output**	**Quantity (Kg)**
Methyl Acetoacetate	1.00	Methyl 3-Aminocrotonate (MAC)	0.72
Liq Ammonia (23%)	0.91	Water	1.2
Methanol	0.59	Ammonia in Water	0.20
Water	0.4	Methanol	0.50
		Residue /(Loss)	0.28
Total	**2.9**		**2.9**

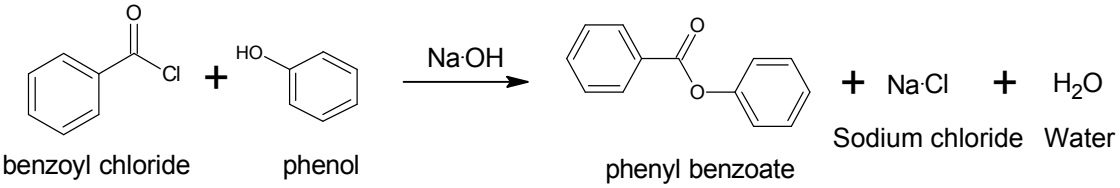
PHENYL BENZOATE

Process Description

Benzoyl Chloride is reacted with Phenol to give Phenyl Benzoate as a Product.

Chemical Reaction

Route of synthesis:-



benzoyl chloride phenol phenyl benzoate Sodium chloride Water

Material Balance

Input **Raw material**	**Quantity (Kg)**	**Output**	**Quantity (Kg)**
Phenol	0.500	Phenyl Benzoate (PHB)	1.00
Benzoyl Chloride	0.750	Sodium Chloride Soln. (NaCl)	4.062
Caustic Lye (48 %)	0.460	Residue /(Loss)	0.148
water	3.500		
Total	**5.21**		**5.21**

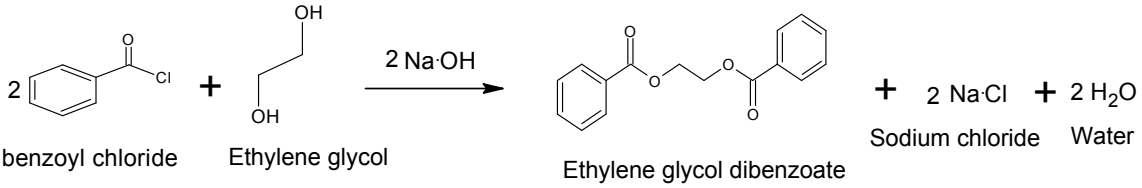
ETHYLENE GLYCOL DI BENZOATE

Process Description

Benzoyl Chloride is reacted with Ethylene Glycol to give Ethylene Glycol Dibenzoate as a Product.

Chemical Reaction

Route of synthesis:-



benzoyl chloride Ethylene glycol Ethylene glycol dibenzoate Sodium chloride Water

Material Balance

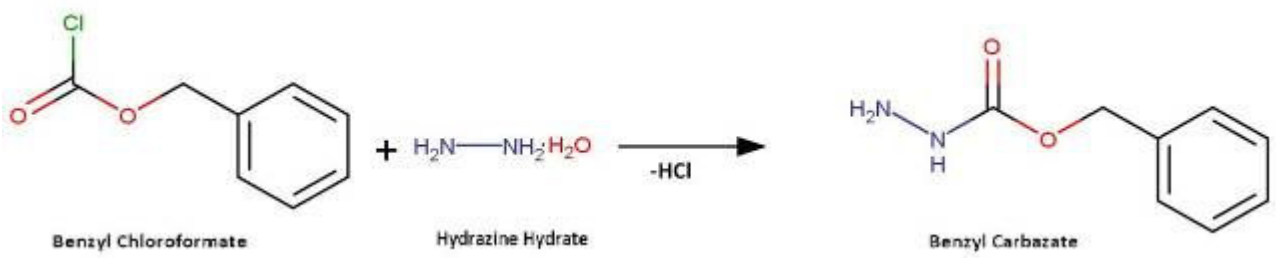
Input Raw material	**Quantity (Kg)**	**Output**	**Quantity (Kg)**
Ethylene Glycol	0.316	Ethylene Glycol Dibenzoate (EGDB)	1
Benzoyl Chloride	1.316	Sodium Chloride Soln. (NaCl)	6.029
Caustic Lye (48 %)	0.895	Residue /(Loss)	0.13
Water	4.632		
Total	**7.159**		**7.159**

BENZYL CARBAZATE

Process Description

Benzyl Chloroformate is reacted with Hydrazine Hydrate to give Benzyl Carbazate as a product.

Chemical Reaction



Material Balance

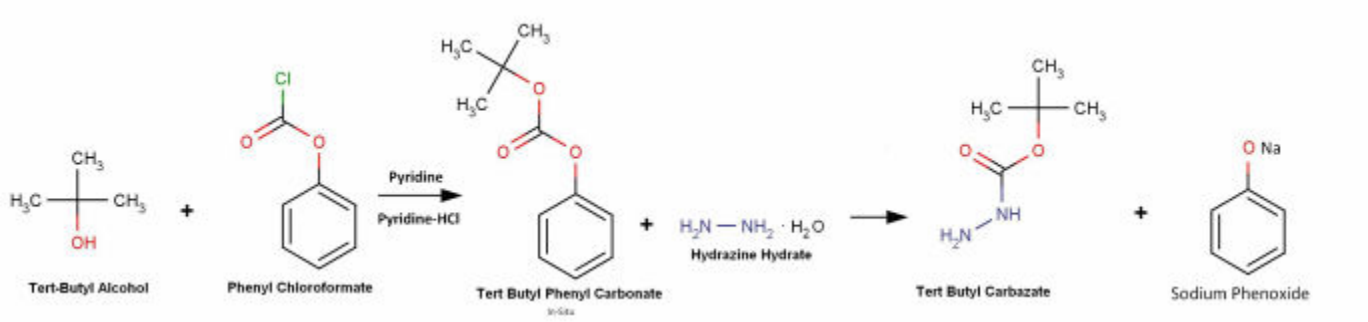
Input Raw material	Quantity (Kg)	Output	Quantity (Kg)
Benzyl Chloroformate (BCF)	1.00	Methylene Dichloride (MDC) (Recovery)	6.43
80% Hydrazine Hydrate	1.44	Aqueous Layer	4.30
Methylene Dichloride (MDC)	7.14	Residue /(Loss)	2.32
Sodium Sulfate	0.10	Benzyl Carbazate (Product)	0.63
Water	4.00		
Total	**13.68**		**13.68**

TERT-BUTYL CARBAZATE

Process Description

Tert Butyl Alcohol is reacted with Phenol Chloroformate to give Tert Butyl Phenyl Carbonate as a Stage-1 (In-situ) which is further reacted with Hydrazine Hydrate to give *Tert*-Butyl Carbazate as a product.

Chemical Reaction



Material Balance

Input Raw material	**Quantity (Kg)**	**Output**	**Quantity (Kg)**
Tert Butyl Alcohol	1.00	Pyridine-HCl Solution	2.56
Pyridine	1.07	Methylene Dichloride (MDC) (Recovery)	2.36
Methylene Dichloride (MDC)	2.62	Sodium Phenoxide Solution	9.70
Phenyl Chloroformate	2.10	Aqueous Layer	2.10
30% Hydrochloric Acid	0.54	Tert-Butylcarbazate (Product)	1.32
Sodium Sulfate	0.30		
80% Hydrazine Hydrate Solution	0.49		
Sodium Hydroxide Flakes	0.82		
Water	9.10		
Total	**18.04**		**18.04**

ANNEXURE – IV

WATER CONSUMPTION & WASTEWATER GENERATION

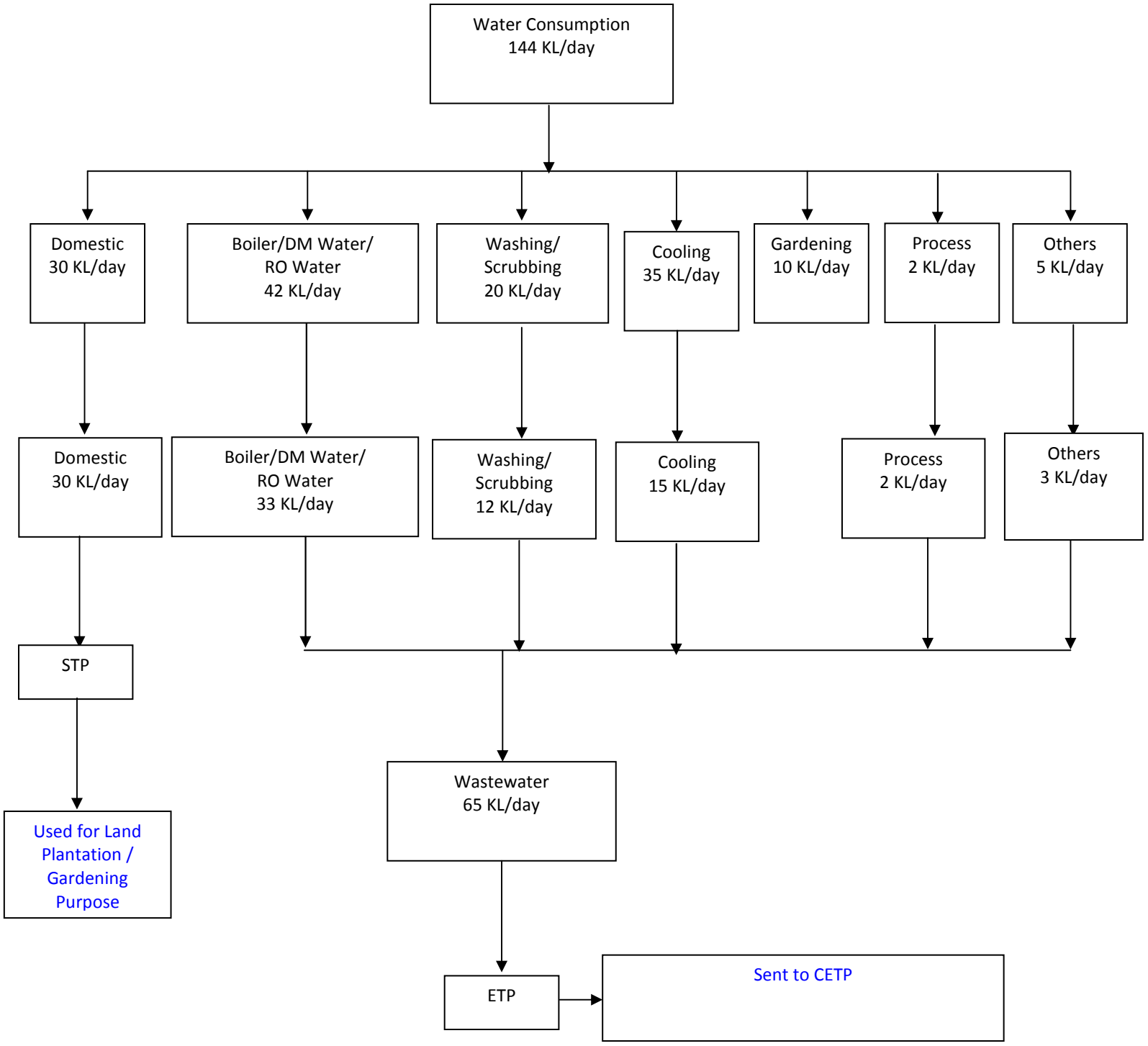
WATER CONSUMPTION

SR.		USAGE	QUANTITY (KL/DAY)		
			Existing	Additional	Total
A		DOMESTIC	30	60	90
B		INDUSTRIAL			
	1	Processing	2	95	97
	2	Cooling	35	70	105
	3	Washing/ Scrubbing	20	40	60
	4	Boiler /DM water/ RO Water	42	84	126
		Gardening	10	20	30
		Others	5	15	20
		TOTAL INDUSTRIAL	**114**	**324**	**438**
		TOTAL	**144**	**384**	**528**

WASTEWATER GENERATION

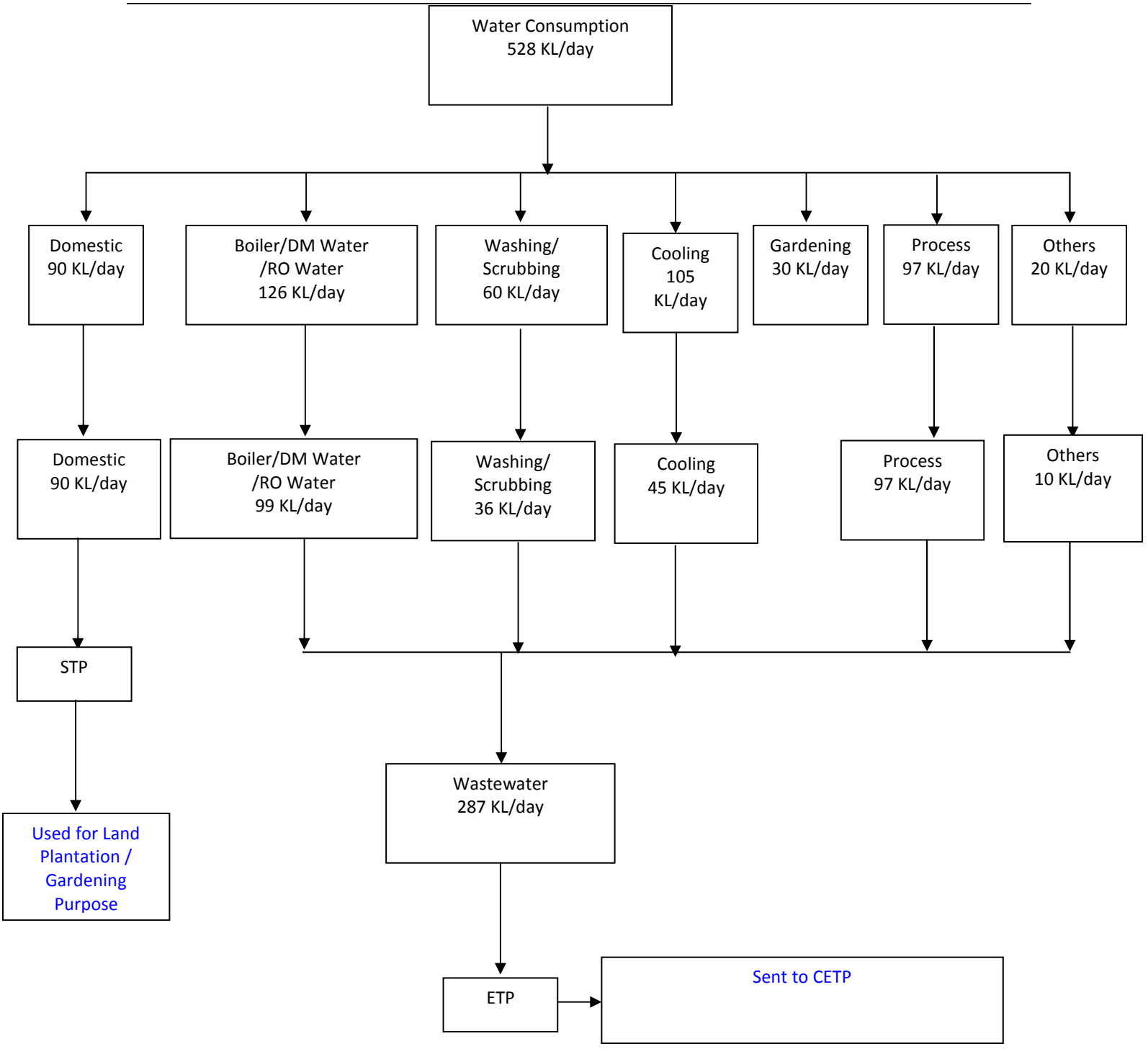
SR.		USAGE	QUANTITY (KL/DAY)		
			Existing	Additional	Total
A		DOMESTIC	30	60	90
B		INDUSTRIAL			
	1	Processing	2	95	97
	2	Cooling	15	30	45
	3	Washing/ Scrubbing	12	24	36
	4	Boiler /DM water/ RO Water	33	66	99
		Gardening	0	0	0
		Others	3	7	10
		TOTAL INDUSTRIAL	**65**	**222**	**287**
		TOTAL	**95**	**282**	**377**

WATER BALANCE DIAGRAM (EXISTING)



Note: Final treated effluent in existing scenario (i.e. 65 KL/day) is disposed to CETP of M/s. Enviro Infrastructure Co. Ltd., Umraya, Dist: Vadodara.

WATER BALANCE DIAGRAM (TOTAL PROPOSED)



Note: Final treated effluent (i.e. 287 KL/day) after proposed expansion shall also be disposed to CETP of M/s. Enviro Infrastructure Co. Ltd., Umraya, Dist: Vadodara.

ANNEXURE – IV

WASTEWATER TREATMENT

PROCESS DESCRIPTION

HIGH TDS EFFLUENT TREATMENT PLANT:

Following start-up and commissioning procedures to be followed:

1.0 EQUALIZATION TANK:

The HTDS effluent from plant and tank farm shall be taken to equalization tank. The effluent shall be always under mixing through blower operation. When tank is 65 % full with effluent start transferring the effluent to neutralization tank.

2.0 NEUTRALIZATION TANK:

The effluent from equalization tank shall be taken to neutralization tank I. The effluent shall be always under mixing through blower operation. When tank is full with effluent switch the effluent to neutralization tank II for collection. Neutralize the effluent.

3.0 FLASH MIXER:

Prepare alum solution of 30 % in Dosing tank. Put on the Alum Dosing System. Put on the Flash mixer agitator

4.0 FLOCCULATOR:

Prepare poly solution of 0.5 TO 1 % in Dosing tank. Put on the Poly Dosing System, Put on the Flocculator agitator

5.0 TUBE SETTLER:

The effluent from Flocculator will come to tube settler through gravity line. The pH at this stage shall have to be between 8.0 to 8.5. The clarified water shall go to MEE feed tank. Operate the sludge valve such as to drain settled sludge at every 3 hrs.

6.0 MEE FEED TANK:

The effluent from Tube settler will come to MEE feed tank through gravity line.

7.0 MULTI EFFECT EVAPORATOR:

Remove Total Dissolve Solid in Multi Effect Evaporator.

LOW TDS EFFLUENT TREATMENT PLANT:

Following start-up and commissioning procedures to be followed:

1.0 EQUALIZATION CUM NEUTRALIZATION TANK (SAMPLING POINT-06):

The effluent from plant and utility and filtrate from filter press shall be taken to equalization tank. The effluent shall be always under mixing through blower operation. When tank is full with effluent switch the effluent to equalization tank II for collection.

2.0 FLASH MIXER:

Prepare alum solution of 30 % in Dosing tank. Put on the Alum Dosing System. Put on the Flash mixer agitator.

3.0 FLOCCULATOR:

Prepare poly solution of 0.1 % in Dosing tank. Put on the Poly Dosing System. Put on the Flocculator agitator.

4.0 TUBE SETTLER:

The effluent from Flocculator will come to tube settler through gravity line.

5.0 TRIKLING FILTER:

Supernatant of aeration tank shall be kept under recycling mode during start up until actual effluent is received. During commissioning, the clarified overflow shall be taken to the feed sump, from where it is to be pumped to trickling filter.

6.0 AERATION TANK:

The treated effluent from feed sump shall be pumped to Aeration Tank after ensuring pH between 7.5 and 8.5. The COD inlet to Aeration Tank shall be always maintained below 5000 mg/l.

7.0 SECONDARY CLARIFIER (SST):

The effluent from Aeration Tank I will come to SST through gravity line.

8.0 HOLDING TANK:

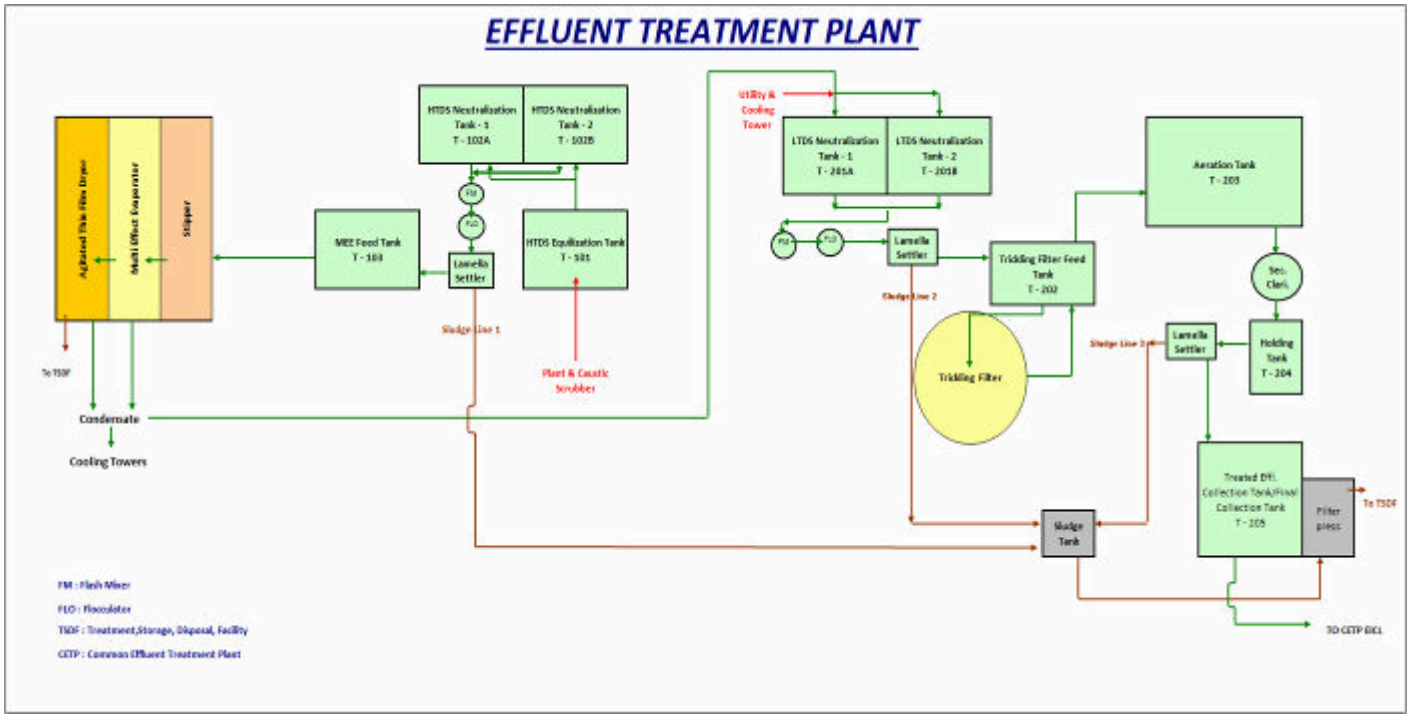
The supernatant from clarifier will come to holding tank through gravity line.

9.0 TERTIARY TUBE SETTLER:

The treated effluent from holding tank shall be pumped to tertiary tube settler.

Note: *After Proposed Expansion, Treatment scheme will remain same only volume will be increased i.e. it will be modification of Existing ETP.*

ETP DIAGRAM


EFFLUENT TREATMENT PLANT
HTDS Neutralisation Tank - 1 T - 102A
HTDS Neutralisation Tank - 2 T - 102B
Utility & Cooling Tower
LTDS Neutralisation Tank - 1 T - 201A
LTDS Neutralisation Tank - 2 T - 201B
Aeration Tank T - 203
Agitated Thin Film Dryer
Multi Effect Evaporator
Stripper
MEE Feed Tank T - 101
Lamella Settler
HTDS Equilization Tank T - 101
Plant & Caustic Scrubber
Lamella Settler
Trickling Filter Feed Tank T - 202
Sec. Clari.
Trickling Filter
Lamella Settler
Holding Tank T - 204
To TSDF
Condensate
Cooling Towers
Sludge Tank
Treated Eff. Collection Tank/Final Collection Tank T - 205
Filter press
To TSDF
TO CETP (DC)
FM : Flash Mixer
FLO : Flocculator
TSDF : Treatment,Storage, Disposal, Facility
CETP : Common Effluent Treatment Plant

DETAILS OF UNITS

MEE Pre-Treatment HTDS								
Equipment List for HTDS								
Treatment Units								
Sr.	**Treatment Unit**	**Size (Meter)**			**Volume (m^3)**	**No. of Tanks**	**MOC**	**Remarks**
		L	**W**	**H**				
1	Equilisation Tank	3	3	3.3	29.7	1	RCC	Tile Lining
2	Neutralization Tank	3.2	3.2	2.8	28.7	2	RCC	Tile Lining
3	Flash Mixer				0.5	1	HDPE	
4	Flocculator				0.75	1	HDPE	
5	MEE Feed Tank	3	3	3.3	29.7	1	RCC	
6	Condensate Collection Tank	3	3	3.3	29.7	1	RCC	
Equipments								
1	Equilisation Tank (3.0 x 3.0 x 3.3 m)							
	Blower	2	Capacity 25 m^3/Hr; 0.4 kg/cm^2					
	Diffuser	4	Silicon based Coarse bubble diffuser					
2	Neutralization Tank (3.3 x 3.3 x 2.8 m)							
	Blower	2	Capacity 100 m^3/Hr; 0.35 kg/cm^2					
	Diffuser	8	Silicon based Coarse bubble diffuser					
3	Feed Pump	2	Cast Iron, 1.5 m^3/hr and 14 mlc					
4	Flash Mixer 0.5 kl HDPE Tank							
	Dosing System	1	PDP Head - pp, flow 0-20 LPH					
	Agitator	1	100 RPM, Watted part MOC - SS316L and MS Epoxy					
5	Flocculator 0.750 Kl HDPE Tank							
	Dosing System	1	PDP Head - SS316L, flow 0-20 LPH					
	Agitator	1	20 RPM, Watted part MOC - SS316L and MS Epoxy					
6	Lamella Settler	1	Size: 1.6 x 1.6 x 3.3; MOC - MS Epoxy					
7	Lamella U-Flow Pump	2	SP, MOC - CI, 5 m^3/hr and 30 mlc (to be reviewed)					

Sr.	**Treatment Unit**	**Size (Meter)**			**Volume (m^3)**	**No. of Tanks**	**MOC**	**Remarks**
		L	**W**	**H**				
1	Neutralization Tank	3	3	3.3	29.7	2	RCC	Tile Lining
2	Flash Mixer	1.1	-	1.225	1	1	HDPE	
3	Flocculator	1.35	-	1.265	1.5	1	HDPE	
4	Trickling Filter	5		7.5	147	1	RCC	
5	Feed Sump	2	2	2.8	10	1	RCC	
6	Aeration Tank	6.7	6.7	5	225	1	RCC	
7	Secondary Clarifier	2	-	2.8	8.8	1	RCC	
8	Holding Tank	2	2	2.8	10	1	RCC	
9	Flocculator	1.35	-	1.265	1.5	1	HDPE	

10	Final Collection Tank	6	6	3	108	1	RCC	
11	Sludge Sump	2	2	2.8	10	1	RCC	
Equipments								
1	Neutralization Tank (3.0 x 3.0 x 3.3 m)							
	Pump	2	Cast Iron, 3 m^3/hr and 14 mlc					
	Blower	2	Capacity 50 m^3/hr; 0.4 kg/cm^2					
	Diffuser	4	Silicon Based coarse bubble diffuser					
2	Flash Mixer (1.1 ø x 1.225 m)							
	Dosing System	1	PDP Head-PP, Flow 0-20 LPH					
	Agitator	1	100 RPM, Watted Part MOC - MS Epoxy					
3	Flocculator (1.35 m ø x 1.265 m)							
	Dosing System	1	PDP Head-SS316L, Flow 0-20 LPH					
	Agitator	1	20 RPM, Watted Part MOC - MS Epoxy					
4	Lamella Settler	1	Size: 1.5 x 1.5 x 4.3; MOC - MS Epoxy					
5	Lamella Sludge Pump	2	SP, MOC-CI, 3 m^3/hr and 30 mlc					
6	Trickling Filter Media		PVC, Volume - 120 m^3 of packing					
7	Trickling Filter Mechanism	2	30 m^3/hr, hydraulic feed type					
8	Trickling Filter Recycle Pump	2	Cast Iron, 30 m^3/hr and 25 mlc					
9	Aeration Tank Blower	2	Capacity 300 m^3/hr; 0.7 kg/cm^2					
10	Aeration Tank Diffuser	30	Silicon Based Fine Bubble Diffusers					
11	Secondary Clarifier Mechanism	1	0.08 RPM for 2.0 dia (2.5+0.3), MOC-MS Epoxy					
12	Holding Tank Transfer Pump	2	Cast Iron, 2.1 m^3/hr and 14 mlc					
13	Secondary Clarifier U-Flow Pump	2	SP, MOC-CI, 10 m^3/hr and 30 mlc					
14	Flocculator (1.35 m ø x 1.265 m)							
	Dosing System	1	PDP Head-SS316L, Flow 0-20 LPH					
	Agitator	1	20 RPM, Watted Part MOC - MS Epoxy					
15	Lamella Settler	1	Size: 1.5 x 1.5 x 4.3; MOC - MS Epoxy					
16	Filter Press	1	Vendor Package					

CHARACTERISTICS OF EFFLUENT

Design Basis	COD mg/l		TDS mg/l		pH		SS mg/l	
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
HTDS	50,000	<5,000	1,00,000	5,000	1-9	6-8	5,000	1,000
LTDS	5,000	<2,000	5,000	--	6-8	6-8	1,000	600

Design Basis	Colour		O&G mg/l		Cl^- mg/l		SO_4^{-2} mg/l		NH_4-N mg/l	
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
HTDS	Yellow	Pale Yellow	70	--	95,000	2,500	1,000	1,000	3,000	500
LTDS	Pale Yellow	--	--	--	2,500	--	1,000	--	500	<50

EXISTING STP PROCESS DESCRIPTION

Collection Well

Sewage from factory & colony flow by gravity & is collected in the Collection Well followed by BOD Well. The sewage is further pumped to Aeration Tank for biological process.

Aeration Tank

Sewage is subject to suspended aerobic biological treatment in the Aeration Tank. The oxygen & mixing requirement of Mixed Liquor (ML) of the Aeration Tank consisting of aerobic biomass is sufficed by surface aerator. The aerobic biomass oxidises the dissolved & particulate carbonaceous organic matter into simple end products & additional biomass, as represented by the following equation for aerobic biological oxidation of organic matter.

$$\text{Organic Matter} + O_2 + NH_3 + PO_4 \rightarrow \overset{\text{micro organism}}{\rightarrow} \text{New Cell} + CO_2 + H_2O$$

Oxygen (O_2), Ammonia (NH_3) & Phosphate (PO_4) are the nutrients need for conversion of the organic matter to simple end products, i.e., Carbon dioxide (CO_2) & water (H_2O).

Secondary Settling Tank

The ML from Aeration Tank flows to the Secondary Settling Tank. The ML is subjected to quiescent state in the Settling Tank, the biological sludge settles at the bottom & clear supernatant overflow to Treated Water Collection Tank. Portion of the settled sludge is returned back to Aeration Tank to maintain the MLSS concentration & balance is waste to Sludge Drying Beds for dewatering & drying.

Treated Water Collection Tank

Treated effluent from secondary treatment is collected in Treated Water Collection Tank is further subjected to tertiary treatment prior to disposal.

Pressure Sand Filter

The treated wastewater is pumped through Pressure Sand Filter to further remove suspended solids. The Filter is backwashed periodically by water to maintain the filtration rate.

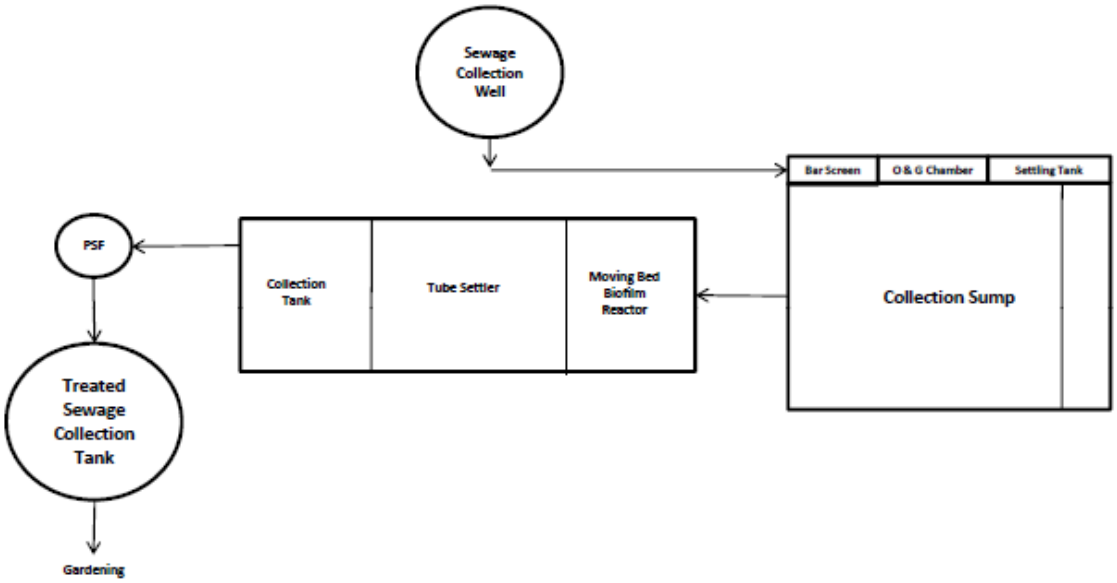
Sludge Drying Beds

The sludge is subjected to dewatering & drying at the Sludge Drying Beds. The dry biological sludge is collected stored at Waste Storage Shed for its final disposal. The treated sewage is disposed on land for plantation.

LIST OF STP UNITS (EXISTING)

Sr. No.	Name of unit	No. of unit	Dimension in (meter)	Volume Capacity (KL)
1	Collection Well	1	2.0 x 8.0	25.12
2	Collection Sump	1	2 X 3 X 4	24.0
3	Aeration tank	1	2.8 X 1.24 X 1.5	5.20
4	Tube Settler	1	1.7 X 0.9 X 1.5	2.30
	Collection Tank	1	1 X 1.25 X 1.5	1.87
5	Sludge drying bed	3	2 X 2 X 1.1	4.40
6	Sand Filter	2	--	--
7	Treated Effluent	1	3 X 7	21.00

DIAGRAM OF STP



ANNEXURE – V

LIST OF HAZARDOUS WASTE

SR. NO.	NAME OF WASTE	CATEGORY	QUANTITY		MODE OF DISPOSAL
			EXISTING	TOTAL AFTER PROPOSED EXPANSION	
1	Used Oil	5.1	1 MT/Yr	2 MT/Yr	Collection, Storage, Transportation, Disposal by Selling to Registered Refiner
2	ETP Sludge	35.3	50 MT/Yr	150 MT/Yr	Collection, Storage, Transportation, Disposal at TSDF of NECL, Nandesari
3	MEE Salt	37.3	-	250 MT/Yr	
4	Discarded Container (Drums / Bags)	33.1	400 Nos. / Yr 8,000 Nos. /Yr	1,500 Nos. /Yr 24,000 Nos. /Yr	Collection, Storage, Transportation & given to registered vendors
5	Spent Carbon	28.3	1 MT/Yr	5 MT/Yr	Collection, Storage, Transportation, given for co-processing in cement industries/RSPL, Panoli or disposal at CHWIF of NECL, Nandesari
6	Residue & Waste (from VCF Process)	28.1	6 MT/Yr	20 MT/Yr	
7	Distillation Residue	20.3	20 MT/Yr	60 MT/Yr	
8	Distillation Residue (from contaminated organic solvents)	36.1	45 MT/Yr	135 MT/Yr	
9	Toxic Metal residue (from water purification plant)	26.1	5 MT/Yr	10 MT/Yr	Collection, Storage, Transportation, Disposal at TSDF of NECL, Nandesari/RSPL, Panoli
10	Hydrochloric Acid (30 %)	-	500 MT/M	1500 MT/M	Collection, Storage, Transportation & Sell to authorized end users
11	$FeCl_2$	-	6 MT/M	18 MT/M	
12	Recovered Mercury	-	3.6 MT/M	7.2 MT/M	
13	Recovered Mercury Chloride	-	3.6 MT/M	7.2 MT/M	

ANNEXURE – VI

STACK & VENT DETAILS

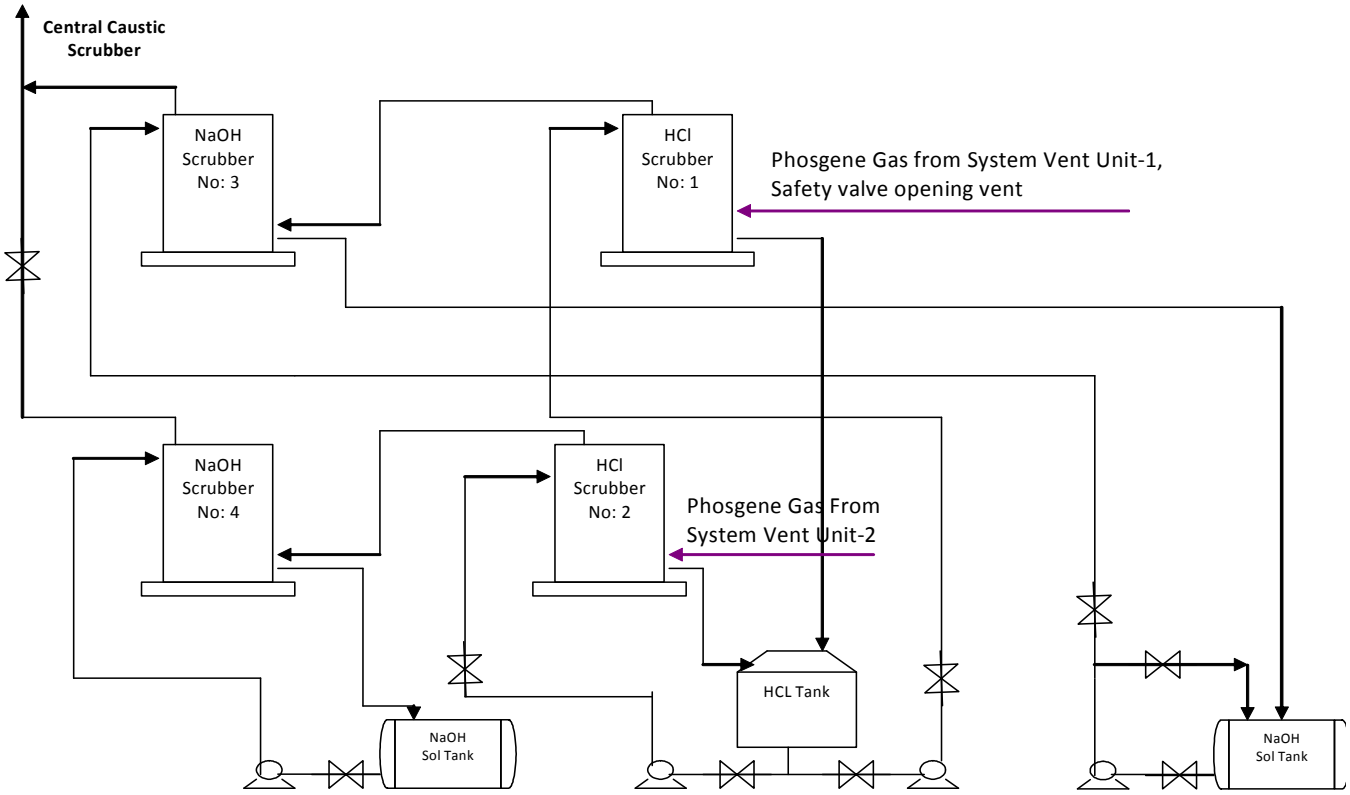
DETAILS OF STACKS & VENTS (Existing):

Sr. No.	Source of Emission	Stack Height (meter)	Stack Diameter (meter)	Pollution Control Equipment	Air Pollutant	Concentration
1	3 TPH Boiler	30	1	Bag Filter	SPM	< 150 mg/Nm^3
					SO_2	< 100 ppm
					NOx	< 50 ppm
2	Final Caustic Scrubber	15	0.4	Caustic Scrubber	Phosgene	---
					HCl	20 mg/ Nm^3
	Central Scrubber (Alkali Scrubber)				Cl_2	9 mg/ Nm^3
3	DG Set – 625 KVA (Stand by)	10	0.3	Silencer	SPM SO_2 NOx	< 150 mg/ Nm^3 < 100 ppm < 50 ppm
	DG Set – 320 KVA (Stand by)					
4	DG Set – 125 KVA (Stand by)	5	0.1	Silencer		

DETAILS OF STACKS & VENTS (Total Proposed):

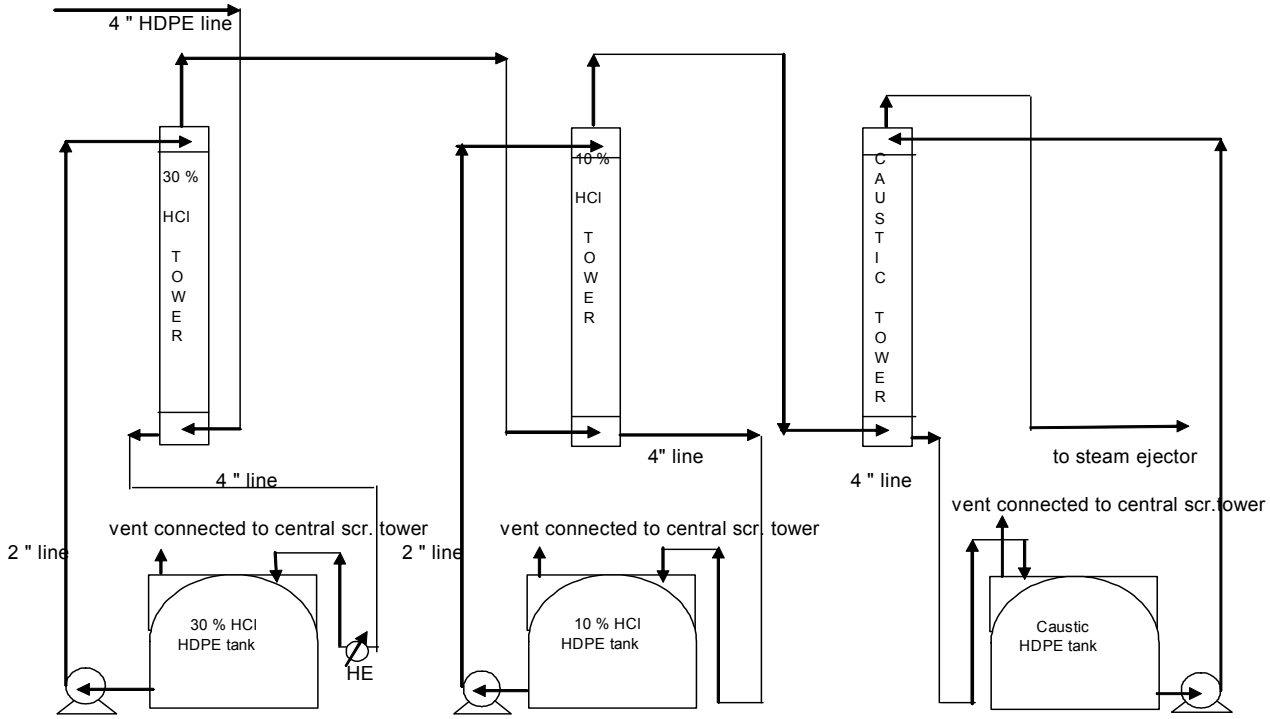
Sr. No.	Source of Emission	Stack Height (meter)	Stack Diameter (meter)	Pollution Control Equipment	Air Pollutant	Concentration
1	10 TPH Boiler	60	1	Electro Static Precipitator (ESP)	SPM	< 150 mg/ Nm^3
					SO_2	< 100 ppm
					NOx	< 50 ppm
2	3TPH Boiler (Stand by)	30	1	Bag Filter	SPM	< 150 mg/ Nm^3
					SO_2	< 100 ppm
					NOx	< 50 ppm
3	Final Caustic Scrubber	15	0.4	Caustic Scrubber	Phosgene	---
					HCl	20 mg/ Nm^3
	Central Scrubber (Alkali Scrubber)				Cl_2	9 mg/ Nm^3
4	DG Set – 320 KVA (Stand by)	10	0.3	Silencer	SPM SO_2 NOx	< 150 mg/ Nm^3 < 100 ppm < 50 ppm
	DG Set – 625 KVA (Stand by)					
5	DG Set – 125 KVA (Stand by)	5	0.1	Silencer		
6	DG Set - 1000 KVA (Stand by)	15	0.3	Silencer		

PHOSGENE PLANT SCRUBBER SYSTEM

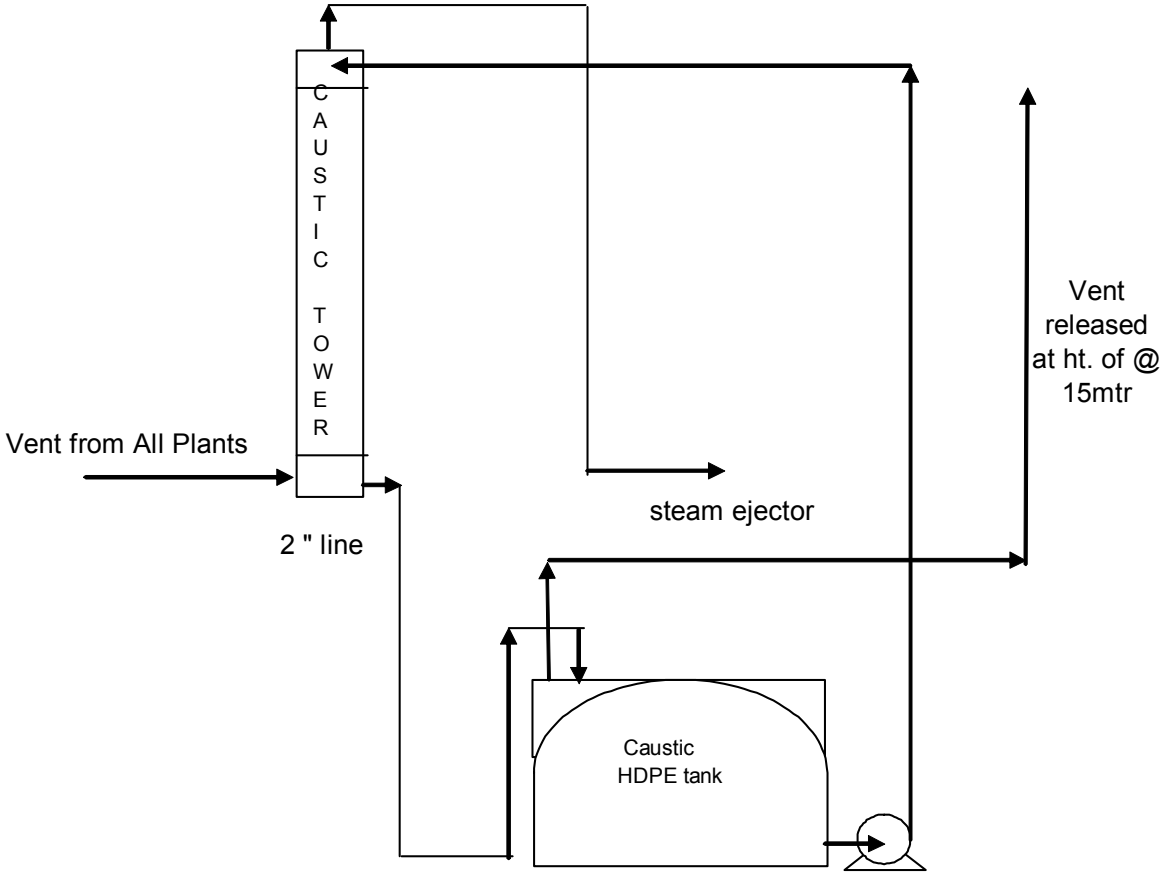


SCRUBBING SYSTEM

Vent Coming from Reactors



CENTRAL SCRUBBING SYSTEM



ANNEXURE – VI (CONTD.)

FUEL & POWER REQUIREMENT

TOTAL POWER REQUIREMENT (KW)

Sr.	Scenario	Total
1	Existing	1,200 KW
2	Total after Proposed Expansion	3,000 KW

SOURCE OF POWER (KW)

Sr.	Scenario	SEB/Grid	DG Set
1	Existing	MGVCL	620 KVA, 325 KVA & 125 KVA (used in emergency only)
2	Total Proposed	MGVCL	1000 KVA + 620 KVA + 325 KVA & 125 KVA (shall be used in emergency only)

DETAILS ON FUEL & SOURCE (EXISTING + PROPOSED)

Sr.	Fuel	Consumption		
		Existing	Additional	Total
1	Bio Mass (Agro Waste) or FO or Coal (MT/Day)	30	30	60
2	LDO (Lit./Day)	5,400	5,400	10,800
3	Diesel (Lit./Day)	15	15	30

ANNEXURE – VII

STORAGE DETAILS OF HAZARDOUS CHEMICALS

Name of the Hazardous Substance (Mention concentration if any)	Quantity		Place of its storage	State & Operating Pressure & Temperature	Type of Hazard Possible (fire, explosion, toxic release etc.)	Control measure provided
	Maximum that can be stored	Actually stored (including process & handling)				
Chlorine	45 MT	35 MT	Phosgene Plant	Liquefied @ RT 10 kg/cm^2	Toxic Release	Online Gas Sensors, Pressure Gauge, Emergency Kit, Caustic Scrubbing System, SCBA Set
Phosgene	<750 Kgs	300 Kgs	Phosgene Plant	Gas, NTP	Toxic Release	Water Sprinkler, Pressure gauge, Temperature gauge, Scrubbers, Sensors, Safety Valves
Di – Methyl Amine	17 KL	10 KL	DMA Storage Area	Liquefied 2 kg/cm^2 @ 40 ^{0}C	Fire, Toxic	Control Measures has been taken as per license approved by Dept. of Explosives. Flameproof area, static Earthing, Water Sprinklers, Safety Valve, Scrubber, fenced area.
Toluene	138 KL	69 KL	Solvent Yard	Liquid	Fire	Control Measures has been taken as per license approved by Dept. of Explosives. Flameproof area, static Earthing, fire fighting facility, flame arrester, fenced area.
Mono Chloro Benzene	20 KL	15 KL	TCC Plant	Liquid	Fire	Flame Proof area, Flame arresters, Dyke – bund wall Earthing – bonding,
Di – Ethyl Amine	10 KL	5 KL	ISO Plant	Liquid	Fire	Bund wall, fire fighting facility, flam arrester, etc.
Hydrochloric Acid	20 KL	10 KL	ISO Plant	Liquid	Spillage/leakage	Bund Wall, scrubbers
Light Diesel Oil	69 KL	40 KL	LDO Storage Yard	Liquid	Fire	Bund wall, Earthing – bonding, fire fighting facility, fencing.
2 Ethyl Hexanol	40 KL	20 KL	ISO – 2 Plant	Liquid	Fire	Bund wall, Earthing – bonding, fire fighting facility, fencing.
Benzyl Alcohol	40 KL	20 KL	ISO – 2 Plant	Liquid	Fire	Bund wall, Earthing – bonding, fire fighting facility, fencing.
Isopropyl Alcohol	20 KL	10 KL	TCC Plant	Liquid	Fire	Bund wall, Earthing – bonding, fire fighting facility, fencing.

ANNEXURE-VIII

SOCIO - ECONOMIC IMPACTS

1) EMPLOYMENT OPPORTUNITIES

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

2) INDUSTRIES

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

3) PUBLIC HEALTH

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

4) TRANSPORTATION AND COMMUNICATION

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

ANNEXURE-IX

PROPOSED TERMS OF REFERENCE FOR EIA STUDIES

1. **Project Description**

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

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

- Micrometeorological data for wind speed, direction, temperature, humidity and rainfall in 5 km area.
- Study of Data from secondary sources.
- Other industries in the impact area
- Prevailing environment quality standards
- Existing environmental status vis a vis air, water, noise, soil in 5 km area from the project site. For SPM, RSPM, SO_2, NOx.
- Ground water quality at 5 locations within 5 km.
- Complete water balance

3. **Socio Economic Data**

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

4. **Impacts Identification and Mitigatory Measures.**

- Impact on air and mitigation measures including green belt
- Impact on water environment and mitigation measures
- Soil pollution source and mitigation measures
- Noise generation and control.
- Solid waste quantification and disposal.
- Control of fugitive emissions

5. Environmental Management Plan

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

6. Risk Assessment

- Objectives, Philosophy and methodology of risk assessment
- Details on storage facilities
- Identification of hazards
- Consequence analysis through occurrence & evaluation of incidents
- Recommendations on the basis of risk assessment done
- Disaster Management Plan.
- Safety precautions for the storage of Chemicals and vapour condensation.

7. Information for Control of Fugitive Emissions

8. Post Project Monitoring Plan for Air, Water, Soil and Noise.

9. Occupational Health and Safety Program for the Project.

10. Information on Rain Water Harvesting

11. Green Belt Development Plan