FORM – I

FOR

THE PROPOSED EXPANSION OF CRESOLS, AROMATIC PRODUCTS

BY

ATUL LIMITED-A ZERO LIQUID DISCHARGE UNIT

(AROMATICS DIVISION)

297, 297/1, GIDC INDUSTRIAL ESTATE,
VILLAGE ANKLESHWAR, TALUKA ANKLESHWAR,
DISTRICT BHARUCH, GUJARAT - 393002

(I) Basic Information:

S. NO.	ITEM	DETAILS
1.	Name of the projects	Proposed expansion of Cresols, Aromatic products by Atul Limited, Ankleshwar.
2.	S. No. in the schedule	5(f)
3.	Proposed capacity/area/length/tonnage to be handled/command area/lease area/number wells to be drilled	Existing Production Capacity: **10,038.1 TPM** Proposed Production Capacity: **9067.00 TPM** Total Production Capacity: **19,105.01 TPM**
4.	New/Expansion/Modernization	Expansion Project
5.	Existing Capacity/Area etc.	Existing Production Capacity **10,038.1 TPM**
6.	Category o f Project i.e. 'A' or 'B'	B
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	GIDC Ankleshwar
	Plot/Survey No.	297, 297/1, GIDC Industrial Estate
	Village	Ankleshwar
	Tehsil	Ankleshwar
	District	Bharuch
	State	Gujarat
10.	Nearest railway station/airport along with distance in kms	Ankleshwar: 2.0 km in West Direction Surat Airport: 60 km in SW Direction
11.	Nearest Town, city, District Headquarters Along with distance in kms.	District Headquarters 10 km in NNW direction
12.	Village Panchayats, Zilla Parishad Municipal Corporation, Local body (complete postal addresses with telephone no's to be given)	Plot No. 624, Admn. Complex, GIDC Industrial Estate, Walia Road, Ankleshwar 393002. 02646 – 221351, 02646 - 221403
13.	Name of the applicant	Mr. Syamal Kumar De
14.	Registered address	-
15.	Address for correspondence	-
	Name	Mr. Syamal Kumar De
	Designation(Owner/Partner/CEO)	General Manager
	Address	Atul Limited, Gujarat, India

S. NO.	ITEM	DETAILS
	Pin Code	393 002
	E-mail	syamal_de@atul.co.in
	Telephone No.	02632-230000,02646-22518, 09824361214 (M)
	Fax No.	02632-233619
16.	Details of Alternative Sites examined if any. Location of these sites should be shown on a topo sheet.	Not Applicable, as the proposed project is expansion project
17.	Interlinked Project	None
18.	Whether separate application of interlinked project has been submitted?	None
19.	If yes, date of submission	Not Applicable
20.	If no, reason	Not Applicable
21.	Whether the proposal involves approval/clearance under: if yes, details of the same and their status will be given (a) The Forest (Conservation) Act, 1980? (b) The Wildlife (Protection) Act, 1972? (c) The C.R.Z. Notification, 1991?	Not Applicable
22.	Whether there is any Government Order/Policy relevant/relating to the site?	Not Applicable
23.	Forests land involved (hectares)	Not Applicable
24.	Whether there is any litigation pending against the project and/or land in which the project is proposed to be set up? (a) Name of the Court (b) Case No. (c) Order/Directions of the Court, if any and its relevance with the proposed project.	No litigation is pending against the project and/ or land.
24.	Project Cost	For the proposed expansion project cost: Rs. 6,934 (Lacs)

(II) Activity

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

Sr. No.	Information/Checklist confirmation	Yes/ No	*Details thereof (with approximate quantities /rates, wherever possible) with source of information data*
1.1	Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan)	No	The project site is located in the GIDC Ankleshwar, District Bharuch, which is well developed designated industrial area and well connected with roads and rail network.
1.2	Clearance of existing land, vegetation and buildings?	No	There will not be any clearance of vegetations.
1.3	Creation of new land uses?	No	Not Applicable
1.4	Pre-construction investigations e.g. bore houses, soil testing?	No	Not Applicable, as the project is already established in notified industrial area of GIDC Ankleshwar
1.5	Construction works?	Yes	Minor construction activity is required.
1.6	Demolition works?	No	Not Applicable
1.7	Temporary sites used for construction works or housing of construction workers?	No	Local workers will be employed for the construction activity
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations	No	Minor construction activity will be required
1.9	Underground works including mining or tunneling?	No	Not Applicable
1.10	Reclamation works?	No	Not Applicable
1.11	Dredging?	No	Not Applicable
1.12	Offshore structures?	No	Not Applicable
1.13	Production and manufacturing processes?	Yes	Refer Annexure –II for Manufacturing Process
1.14	Facilities for storage of goods or materials?	Yes	Solid/ liquid raw material and product will be stored in designated area or Tank, Cylinder, Drums, Carboys, etc.
1.15	Facilities for treatment or disposal of solid waste or liquid effluents?	Yes	Treated effluent from ETP is fed to RO plant which is monitored continuously by magnetic flow meter, TOC analyzer and pH recorder. RO permeate is reused in boiler, cooling tower & washing activities while reject is fed to MEE. MEE concentrate is feed to ATFD and while MEE condensate is reused in cooling tower. MEE & ATFD salts are taken to TSDF site for final disposal. Thus unit is maintaining zero liquid discharge.

			In case of RO plant maintenance, treated waste water will be disposed off in U/G pipeline of BEAIL (NCTL) for further treatment in FETP and final discharge to Arabian Sea. Solid waste will be sent to authorized TSDF site for the safe disposal.
1.16	Facilities for long term housing of operational workers?	No	Operational staff of about 238 has been employed for the existing activity and additional 55 people shall be employed for expansion. They are from local area.
1.17	New road, rail or sea traffic during construction or operation?	No	Not Applicable, as the project site is located in the Notified Industrial Area of GIDC Ankleshwar.
1.18	New road, rail, air waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?	No	Not Applicable, as the project site is located in the Notified Industrial Area of GIDC Ankleshwar.
1.19	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	No	Not Applicable, as the project site is located in the Notified Industrial Area of GIDC Ankleshwar.
1.20	New or diverted transmission lines or pipelines?	No	Not Applicable, as the project site is located in the Notified Industrial Area of GIDC Ankleshwar.
1.21	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	No	Not Applicable, as the project site is located in the Notified Industrial Area of GIDC Ankleshwar.
1.22	Stream crossings?	No	Not Applicable, no stream is crossing from the project site.
1.23	Abstraction or transfers of water form ground or surface waters?	No	Water is/will be sourced from GIDC Ankleshwar
1.24	Changes in water bodies or the land surface affecting drainage or run-off?	No	Not Applicable
1.25	Transport of personnel or materials for construction, operation or decommissioning?	Yes	Transport of personnel or materials for construction, operation or decommissioning will be primarily through road
1.26	Long-term dismantling or decommissioning or restoration works?	No	Not Applicable
1.27	Ongoing activity during decommissioning which could have an impact on the environment?	No	Not Applicable
1.28	Influx of people to an area in either temporarily or permanently?	Yes	Only additional 55 personnel will be employed from local area.
1.29	Introduction of alien species?	No	Not Applicable
1.30	Loss of native species or genetic diversity?	No	Not Applicable
1.31	*Any other actions?*	*No*	Not Applicable

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 thereof (with approximate quantities /rates, wherever possible) with source of information data
2.1	Land especially undeveloped or agricultural land (ha)	No	The project site is located in Notified Industrial Area of GIDC Ankleshwar, Total Plot area is 1,33,110.0 m^2
2.2	Water (expected source & competing users) unit: KLD	Yes	Source: GIDC Ankleshwar Existing : 1,622 m^3/Day Proposed : 178 m^3/Day Total : 1,800 m^3/Day
2.3	Minerals (MT)	No	Not Applicable
2.4	Construction material – stone, aggregates, sand / soil (expected source – MT)	Yes	Minor construction activity is required, for this material will be purchased from the local market
2.5	Forests and timber (source – MT)	No	Not Applicable
2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW)	Yes	Dakshin Gujarat Vij Company : Existing: 5000 kVA Proposed: 7125 kVA Total After Expansion: 11125 kVA Cogen: Existing: 4500 kVA Proposed: -3375 kVA Total After Expansion: 1125 kVA DG Set: Existing: 1250 kVA X 1 Nos Proposed: -- Total After Expansion: 1250 kVA X 1 Nos
2.7	Any other natural resources (use appropriate standard units)	No	Not Applicable

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

Sr. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
3.1	Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)	Yes	Hazardous chemicals like Toluene, Sulphuric Acid 98%, Caustic Lye 48 %, Nitric Acid 60%, Di-Methyl Sulphate, Mono chloro Benzene, Acetic Acid, Sodium Sulphide Lye 25 %, Furnace Oil, Diesel, Sulfur trioxide , Sulphur Dioxide, Methanol, Hydrogen gas,Acetic Anhydride etc. are utilized for the for the production activity at site.

Sr. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)	No	Not Applicable
3.3	Affect the welfare of people e.g. by changing living conditions?	No	Not Applicable
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.,	No	Not Applicable
3.5	Any other causes	No	Not Applicable

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

Sr. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
4.1	Spoil, overburden or mine wastes	No	Not Applicable
4.2	Municipal waste (domestic and or commercial wastes)	No	Not Applicable
4.3	Hazardous wastes (as per Hazardous Waste Management Rules)	Yes	Refer Annexure-III for details of Hazardous waste
4.4	Other industrial process wastes	No	None
4.5	Surplus product	No	None
4.6	Sewage sludge or other sludge from effluent treatment	No	Not Applicable as domestic waste is treated in ETP with industrial effluent.
4.7	Construction or demolition wastes	No	Not Applicable
4.8	Redundant machinery or equipment	No	Not Applicable
4.9	Contaminated soils or other materials	No	Not Applicable
4.10	Agricultural wastes	No	Not Applicable
4.11	Other solid wastes	No	Not Applicable

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

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

Sr. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with Approximate quantities/rates, wherever possible) with source of information data
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources	Yes	Emission of PM, SO_2 and NO_X will be will be within the limit prescribed by CPCB/GPCB from the stacks attached with boiler, CPP etc.
5.2	Emissions from production processes	Yes	Emission of SO_2 and NO_X will be within the limit prescribed by CPCB/GPCB.
5.3	Emissions from materials handling including storage or transport	Yes	The material handling including storage and transportation may contribute to fugitive emission.
5.4	Emissions from construction activities including plant and equipment	Yes	Fugitive dusts from minor activities of construction are expected, which will be temporary in nature.
5.5	Dust or odours from handling of materials including construction materials, sewage & waste	No	All the waste shall be stored in designated place within premises.
5.6	Emissions from incineration of waste	No	Not Applicable, as incinerable waste will be sent to authorized common incineration facility (BEIL).
5.7	Emissions from burning of waste in open air (e.g. slash materials, construction debris)	No	Not Applicable, no open burning of waste is/will be carried out.
5.8	Emissions from any other sources	No	Not Applicable

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

S. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, Wherever possible) with source of information data
6.1	From operation of equipment e.g. engines, ventilation plant, crushers	Yes	The noise levels near the sources such as Boiler, D. G. Set etc., will be in the limit prescribed by CPCB/GPCB.
6.2	From industrial or similar processes		
6.3	From construction or demolition	Yes	During construction, minor noise will be generated.
6.4	From blasting or piling	No	Not Applicable
6.5	From construction or operational traffic	No	Not Applicable
6.6	From lighting or cooling systems	No	Not Applicable
6.7	From any other sources	No	Not Applicable

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

Sr. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
7.1	From handling, storage, use or spillage of hazardous materials	Yes	All the liquid and solid materials are stored separately in the designated storage area and in dedicated closed storage tanks.
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)	No	Treated effluent from ETP is fed to RO plant which is monitored continuously by magnetic flow meter, TOC analyzer and pH recorder. RO permeate is reused in boiler, cooling tower & washing activities while reject is fed to MEE. MEE concentrate is feed to ATFD and while MEE condensate is reused in cooling tower. MEE & ATFD salts are taken to TSDF site for final disposal. Thus unit is maintaining zero liquid discharge. In case of RO plant maintenance, treated waste water will be disposed off in U/G pipeline of BEAIL (NCTL) for further treatment in FETP and final discharge to Arabian Sea. Solid waste will be sent to authorized TSDF site for the safe disposal.
7.3	By deposition of pollutants emitted to air into the land or into water	No	The project is located in the notified industrial area of GIDC, Ankleshwar
7.4	From any other sources	No	Not Applicable
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	No	Not Applicable, as expected impact on air, water and land is insignificant

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 thereof (with approximate quantities/rates, wherever possible) with source of information data
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous substances	Yes	Risk of fire, Explosion and toxic effect due to storage of chemicals and process. The risk assessment has been carried out and all mitigative measures are implemented and taken care off to avoid any untoward incidence.
8.2	From any other causes	No	Not Applicable
8.3	Could the project be affected by natural	No	There is no history of flood in

	disasters causing environmental damage (e.g. floods, earthquakes, landslides, cloudburst etc)?		Ankleshwar. The plant is designed and will modified considering seismic zone-III

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

Sr. No.	Information/Checklist confirmation	Yes /No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
9.1	Lead to development of supporting. 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 industries • Supply industries • Other	No.	The project site is located in well developed notified industrial area of GIDC Ankleshwar, having all the required Infrastructures.
9.2	Lead to after-use of the site, which could have an impact on the environment	No	Not Applicable
9.3	Set a precedent for later developments	No	Not Applicable
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects	No	Not Applicable

(III) Environmental Sensitivity

S. 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	The proposed expansion project is located in the notified industrial area of GIDC Ankleshwar, District Bharuch, Gujarat.
2.	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	Yes	Narmada River 6.5 km in North Direction
3.	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging,	No	None within 40 km

	resting, over wintering, migration		
4.	Inland, coastal, marine or underground waters	Arabian Sea Narmada River	45 km in west direction 6.5 km in North Direction
5.	State, National boundaries	No	None within 15 km
6.	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	No	None within 15 km
7.	Defense installations	None	Within 40 km
8.	Densely populated or built-up area	Yes	Ankleshwar
9.	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)	Yes	Hospitals, schools, places of worship, community facilities are presents within 15 km
10.	Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)	Narmada	The site has established recycling of treated waste water completely and in operation last two years leading to reduction freshwater consumption 500 KLD though business has increased manifolds.
11.	Areas already subjected to pollution or environmental damage. (Those where existing legal environmental standards are exceeded)	Yes	GIDC Ankleshwar
12.	Areas susceptible to natural hazard which could cause the project to present environmental problems (earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions)	No	The project site fall in seismic zone III.

(IV). Proposed Terms of Reference for EIA studies: -

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

Date: 10/05/2019

Place: Ankleshwar

On behalf of M/S ATUL LIMITED

(Aromatics Division)

ATUL LTD. Plot No. 297,297/1 Ankleshwar G.I.D.C. AROMATICS BUSINESS

Syamal Kumar De
(General Manager)

LIST OF ANNEXURE

ANNEXURE	TITLE
I	LIST OF PRODUCTS
II	DETAILS OF PRODUCTION AND MANUFACTURING PROCESSES
III	LIST OF RAW MATERIALS
IV	WATER BALANCE DIAGRAM
V	DETAILS OF SOLID & HAZARDOUS WASTE GENERATION DURING OPERATION
VI	EMISSIONS FROM COMBUSTION OF FOSSIL FUELS FROM STATIONARY OR MOBILE SOURCES
VII	PROPOSED TERMS OF REFERENCE FOR EIA STUDIES

ANNEXURE – I

LIST OF PRODUCTS AND PRODUCTION CAPACITY

Sr. No.	Product Name	CAS No.	Quantity (MT/Month)			End Use	Physical Form
			Existing	Proposed	Total after Expansion		
1	Cresols	1319-77-3	1500	1400	2900	Aroma ingredients, BHT, Dye intermediates, High end antioxidants, Resins, Sunscreens, Trimethoprim (TMP), UV absorbers	Liquid
2	Para Anisaldehyde	123-11-5	700	0	700	A key intermediate used in a range of applications such as floral accords, pharmaceuticals and sunscreens	Liquid
3	Para Anisyl Alcohol	105-13-5	200	50	250	A key raw material used in a range of pharmaceuticals.	Liquid
4	Para Cresidine	120-71-8	50	30	80	A unique intermediate that finds an application in vinyl sulfones and food colours	Solid
5	Para Anisic Acid (from para Anisaldehyde plant)	100-09-4	15	0	15	It has antiseptic properties. It is also used as an intermediate in the preparation of more complex organic compounds.	Solid
6	Anisyl Acetate	104-21-2	10	0	10	flavor and fragrance	Liquid

Sr. No.	Product Name	CAS No.	Quantity (MT/Month)			End Use	Physical Form
			Existing	Proposed	Total after Expansion		
						agents	
7	Manganese Sulphate (from para Anisaldehyde)-Solid	10034-96-5	1100	1000	2100	Agriculture, Animal Feed, Feed additives, Soil micronutrients, Premixes	Solid
8	Manganese Sulphate (from para Anisaldehyde)-Liquid	10034-96-5	2000	1000	3000	Utilized as animal feed additive and ingredient for micro nutrients.	Liquid
9	4-Methoxy Acetophenone	100-06-1	50	0	50	Aroma ingredients	Solid
10	Sodium Sulphite (from Cresol plant)[1]	7757-83-7	1500	3900	5400	Chemical admixtures, Oxygen scavengers, Packaging paper, Pulp, Reducing agents, Water treatment (antichlor bleaching agent)	Solid
11	Sodium Sulphate (from Cresol plant)[2]	7757-82-6	2000	2000	4000	A widely used additive, particularly by the Paper, Glass, Dyestuff and Home Care industry	Solid
12	Para Toluene Sulphonic Acid	6192-52-5	600	-300	300	It is widely used as catalyst agent in the synthesis of pharmaceuticals, polymerization stabilizer	Solid

[1] This is pure and export quality product used for pulp & paper and water treatment applications. Largely exported to USA, Canada and SA

[2] This is pure and export quality product used for detergent and pulp & paper applications. Both products together bring about 120 crores revenue in the business.

Sr. No.	Product Name	CAS No.	Quantity (MT/Month)			End Use	Physical Form
			Existing	Proposed	Total after Expansion		
						and organic synthesis (esters, etc.), paint intermediates and resin curing agent. And it is also the commonly used acid catalyst in organic synthesis.	
13	Octyl Methoxy Cinnamate	5466-77-3	250	-100	150	Its primary use is in sunscreens and other cosmetics to absorb UV-B rays from the sun, protecting the skin from damage. It is also used to reduce the appearance of scars.	Liquid
14	Anethole	4180-23-8	0	50	50	Aroma ingredients	Liquid
15	Para Cresyl Acetate	140-39-6	1.66	0	1.66	Aroma ingredients	Liquid
16	Avobenzone	70356-09-1	0	15	15	It is an oil-soluble ingredient used in sunscreen products to absorb the full spectrum of UVA rays.	Solid
17	Para Cresyl Phenyl Acetate	101-94-0	3	0	3	Aroma ingredients	Solid
18	Para Anisyl Propanal	5462-06-6.	4	0	4	An aroma ingredient with sweet, floral, fennel and basil-like, mildly fruity odour. The	Liquid

Sr. No.	Product Name	CAS No.	Quantity (MT/Month)			End Use	Physical Form
			Existing	Proposed	Total after Expansion		
						product finds a major application in oral care products, flavours and fragrances.	
19	4-Methoxy phenyl Acetonitrile	104-47-2	25	10	35	A key pharmaceutical intermediate used to make anti-depressants such as Venlafaxine	Liquid
20	Para Cresyl Caprylate	59558-23-5	1	0	1	Perfumery ingredients	Liquid
21	Para Cresyl Isoebutyrate	103-93-5	1	0	1	Aroma ingredients	Liquid
22	Para Cresyl Formate	1864-97-7	1	0	1	Aroma ingredients	Liquid
23	Para Anisyl Formate	122-91-8	1.25	0	1.25	Aroma ingredients and used for making soap and perfumes	Liquid
24	Para Anisyl Phenyl Acetate	102-17-0	1.66	0	1.66	Perfumery ingredients and active pharma ingredient	Liquid
25	4-Methoxy Phenyl Acetic Acid	104-01-8	3	12	15	A key building block for Dextromethorphan, a widely used formulation to treat cough and cold.	Solid
26	4-Methoxy Phenyl Ethyl Amine	41851-59-6	5.5	0	5.5	Pharma active ingredient	Liquid
27	Perfumery ingredients	Not Applicable	15	0	15	Perfume manufacturing	Liquid
		Total	**10038.1**	**9067**	**19105.1**		

DETAILS OF PRODUCTION AND MANUFACTURING PROCESSES

1.1 Process Description

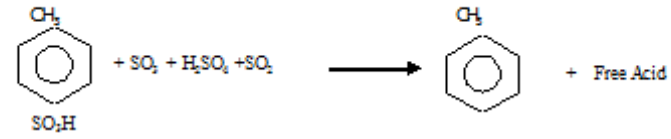
1.1.1 Cresols

A. Manufacturing Process

Toluene is sulphonated with liquid sulphur trioxideto give Toluene Sulphonic Acid in a continuous reactor. This is an unique technology which does generate any excess free acid. This is green process. Process is highly efficient and atom efficiency is as high as 99%. Sulfonated mass is neutralized with sodium sulphite and caustic soda to make sodium salt of toluene sulphonic acid. In this sulphonation process, no solid gypsum is generated. Sodium toluene sulphonate and Caustic soda lye are concentrated separately and then fused together at high temperature. Fused mass is quenched with water and sodium sulphite is separated by centrifuging as another key product which is exported. Cresolate solution from centrifuge is neutralized with sulpher-di-oxide in vapour phase to make mixed cresols and sulphuric acid is used to generate sulpherdi-oxide in-situ to yield mixture of cresols. In the process sulpher di oxide generation, 99% pure sodium sulphate is generated as another key product which is used for soap and detergent and zinc formulation and exported. Crude Cresol is distilled further under vacuum to give purified Cresols. All cresols (p-Cresol, o-cresol, cresol mixture cresol dimer) are sold as products in the market for various applications.

B. Chemical Reaction

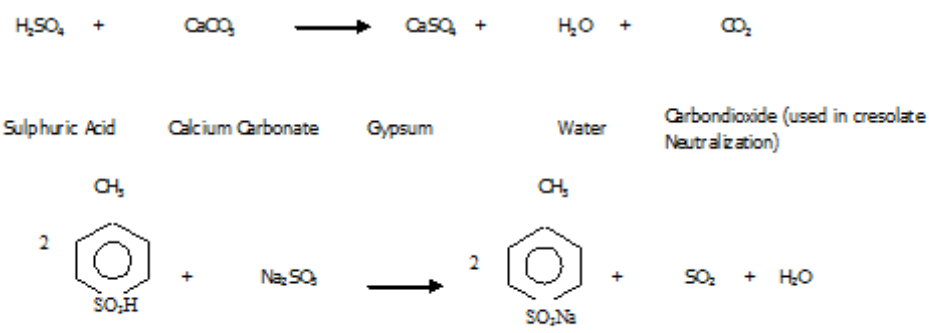
1) SULPHONATION:



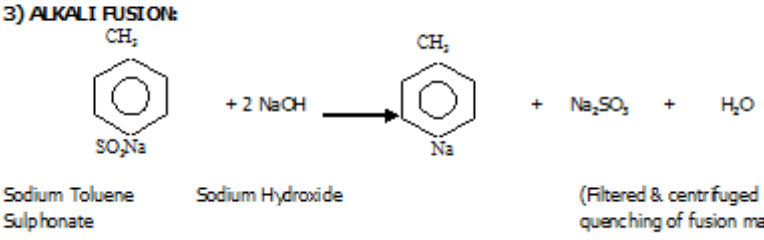
Toluene

Toluene Sulphonic Acid

2) NEUTRALISATION:

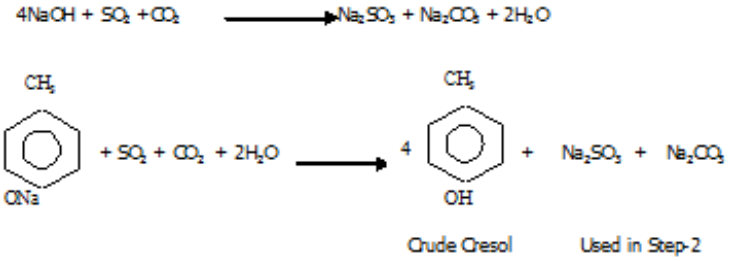


3) ALKALI FUSION:

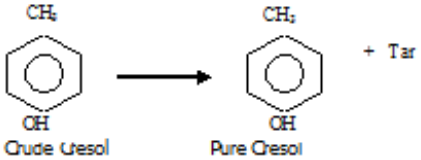


4) NEUTRALISATION: Free Alkali & Cresolate neutralization by Off Gases of Neutralization

(Step2)



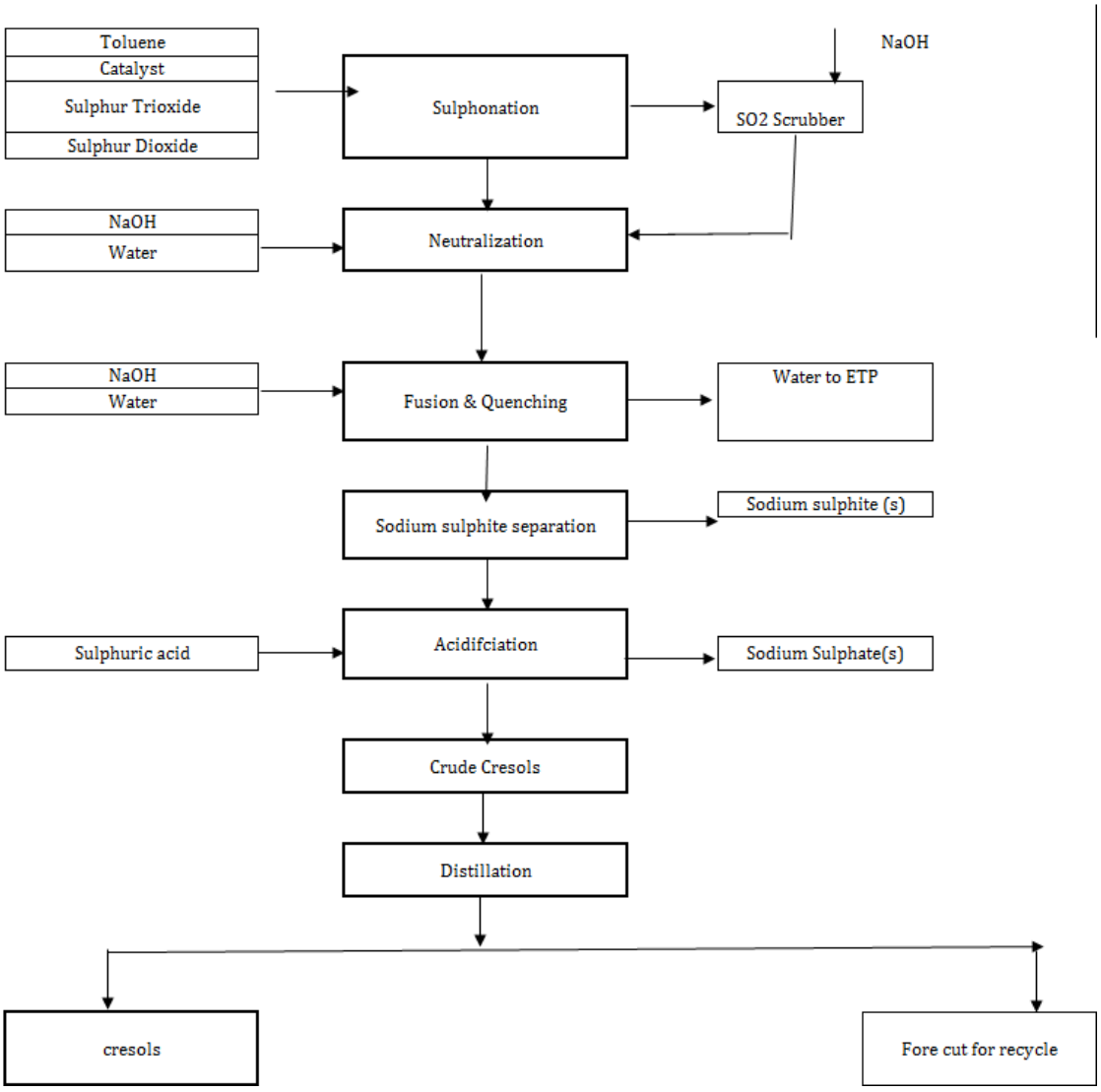
5) DISTILLATION OF CRUDE CRESOLATE



C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
Toluene	0.93	Cresols	1.00	Product for sale
Catalyst	0.02	Sodium Sulphite	1.86	Product for sale
Sulphur Trioxide	0.90	Sodium sulphate	1.00	Product for sale
Sulphur Dioxide	0.09	Fore cut	0.29	Reuse in process
Sulphuric acid	0.60	Wastewater	1.79	To ETP
Sodium Hydroxide (48%)	1.80			
Water	1.60			
Total	5.94	Total	5.94	

D. Process Flow Diagram



1.1.2 Para Anisaldehyde

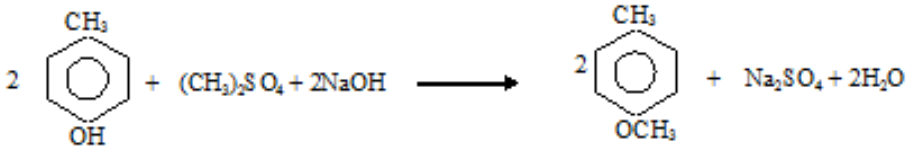
A. Manufacturing Process

Methylation: Para Cresol (99%) is methylated by dimethyl sulphate in presence of Caustic soda to give Para Cresyl methyl ether.
Oxidation: Para Cresyl Methyl Ether is oxidized by Manganese Dioxide and dilute Sulphuric Acid to give crude para Anisaldehyde.
Extraction: Crude Para Anisaldehyde is extracted by using toluene as a solvent. Manganese sulphate solution is separated out. Manganese sulphate Solution is extracted by toluene to recover all organic matters from it. Toluene is separated and sent to distillation. Manganese sulphate is processed and made one of key feed grade Manganesesulphate powder which is 100% exported as micronutrient.
Washing: Extracted toluene layer is washed with water to remove unreacted acid. Toluene layer and wash water are separated. Wash water is neutralized and sent to ETP for treatment. Toluene layer is sent to distillation.

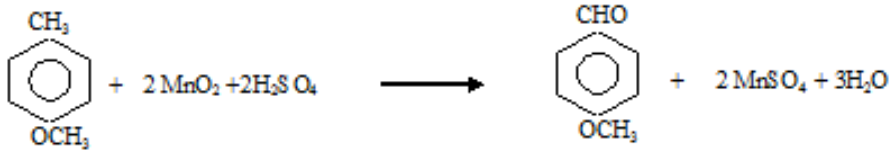
Distillation: For separation of toluene, unreacted Para Cresyl Methyl Ether and Para Anisaldehyde fractional distillation is carried out. Para Anisaldehyde fraction separated as a main product. Toluene and Para Cresyl methyl Ether are collected in storage & recycled.

B. Chemical Reaction

METHYLATION:



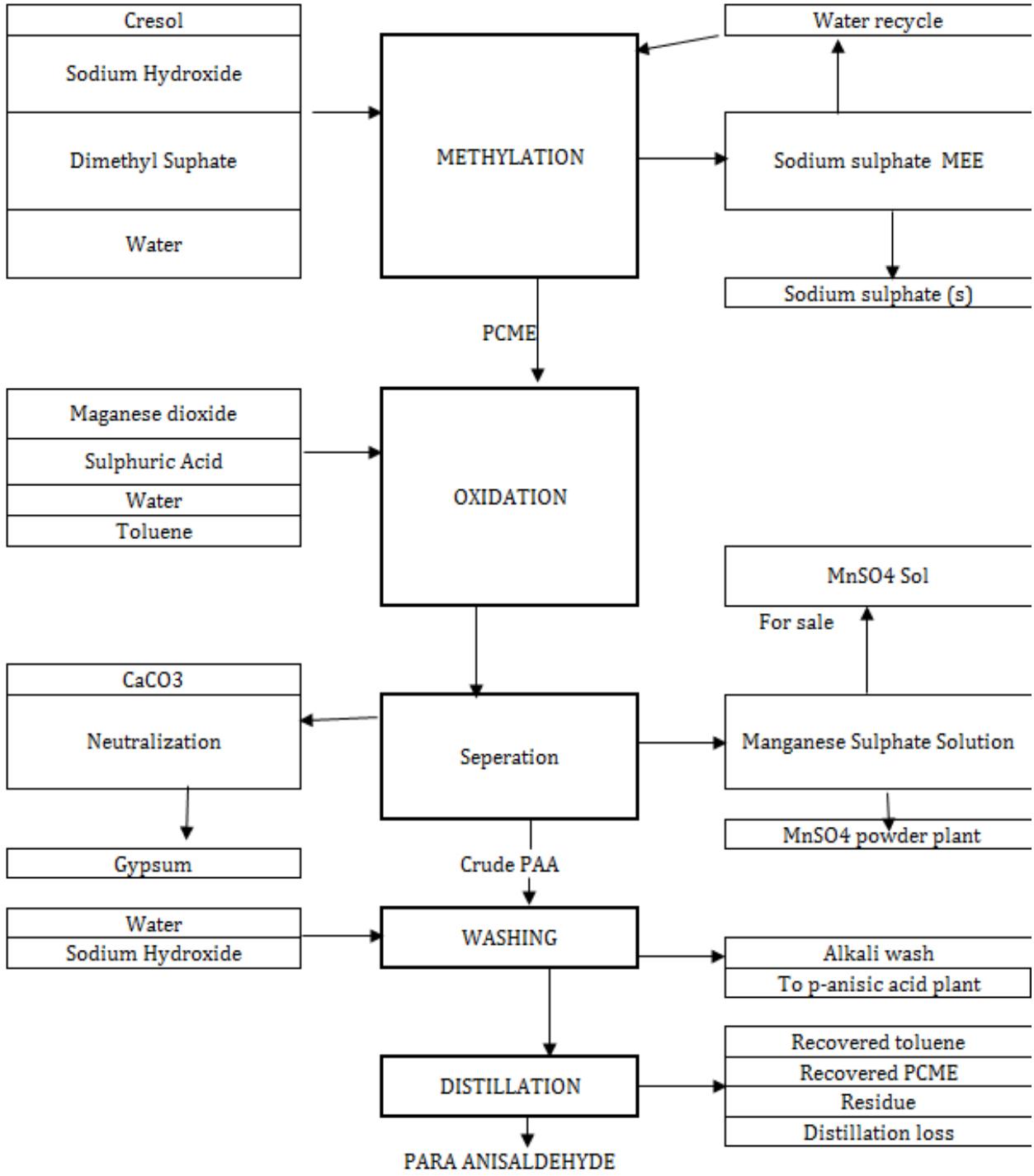
OXIDATION:



C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
p-Cresol	1.050	P-Anisaldehyde	1.000	Product for sale
Sodium Hydroxide	0.530	Manganese Sulphate (Liquid)	4.200	Product for sale
Dimethyl Suphate	0.830	$MnSO_4$ Solution	8.500	To MnSO4 plant
Water	8.428	Sodium sulphate powder	1.570	Product for sale
Maganese dioxide	2.850	Recovered PCME	0.122	Reuse in process
Sulphuric Acid	2.784	Distillation residue	0.04	To CHWIF
Toluene	1.919	Recovered toluene	1.878	Reuse in process
CaCO3	0.350	Distillation loss	0.001	
		Gypsum solid	1.000	To TSDF
		Alkali wash	0.430	To para anisic acid plant
Total	18.741	Total	18.741	

D. Process Flow Diagram

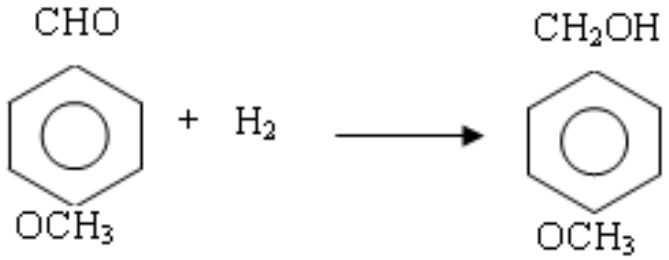


1.1.3 Para Anisyl Alcohol

A. Manufacturing Process

HYDROGENATION: Para Anisaldehyde is hydrogenated by using Hydrogen gas in the presence of Nickel Catalyst. Para Anisyl Alcohol is formed.
FILTRATION: Para Anisyl Alcohol formed, which contain Nickel Catalyst is filtered to separate the spent catalyst cake and it is taken for reuse in next batch.
DISTILLATION: For the separation of unreacted Para Anisaldehyde, PCME and Para Anisyl Alcohol fraction distillation is carried out. Para Anisyl Alcohol is collected as product Para Anisaldehyde PCME are recovered and recycled.

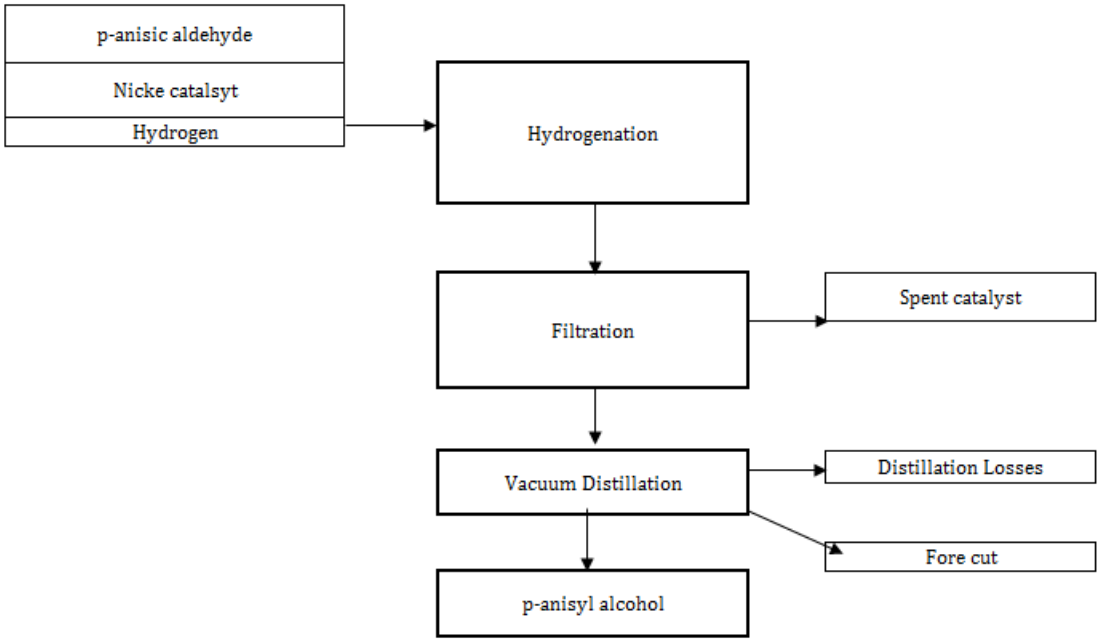
B. Chemical Reaction



C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
Para Anisaldehyde (PAA)	1.02	P- Anisyl Alcohol	1	Product for sale
Nickel Catalyst	0.003	Spent nickle catalyst	0.003	Approved recycler
Hydrogen	0.02	Distillation Losses	0.001	
		Fore cut	0.039	Reuse in process
Total	1.043	Total	1.043	

D. Process Flow Diagram



1.1.4 Para Cresidine

A. Manufacturing Process

Nitration: p-Cresol is nitrated with nitric acid at low temperature by controlling temperature by indirect cooling. After nitration is over, 3-Nitro-P-Cresol is collected in separate vessel and neutralized with Caustic soda Solution. 3-Nitro-P-Cresol is transferred to Methylator vessel for methylation reaction.

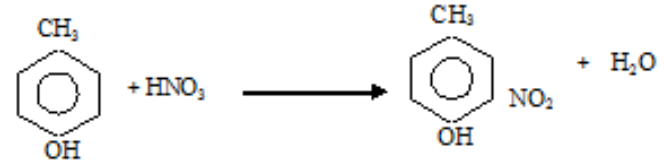
Methylation: 3-Nitro-P-Cresol is methylated with dimethyl sulphate. During methylation, the temperature is controlled by indirect cooling. After methylation is over, the reaction mixture is diluted with water. The organic phase is separated from the aquous phase and collected in a separate vessel. The organic phase oil transferred for reduction.

Reduction: Methylated 3-Nitro-P-Cresol (oil) is reduced by hydrogenation to make crude p-cresidine under controlled pressure and temperature. Hydrogenated mass is transferred to distillation.

Distillation: P-Cresidine is recovered by distillation in a vessel with provision for indirect heating with steam. Initially toluene cut is separated in toluene day tank and then inter cut is removed .PCD main cut is collected separately. Flaking of Liquid PCD is carried out in Flaker.

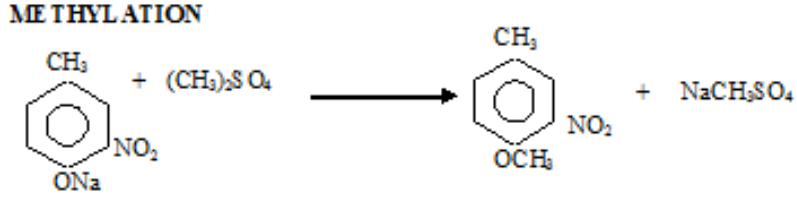
B. Chemical Reaction

NITRATION

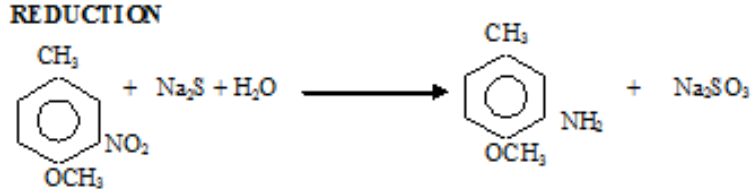


SODATION

METHYLATION



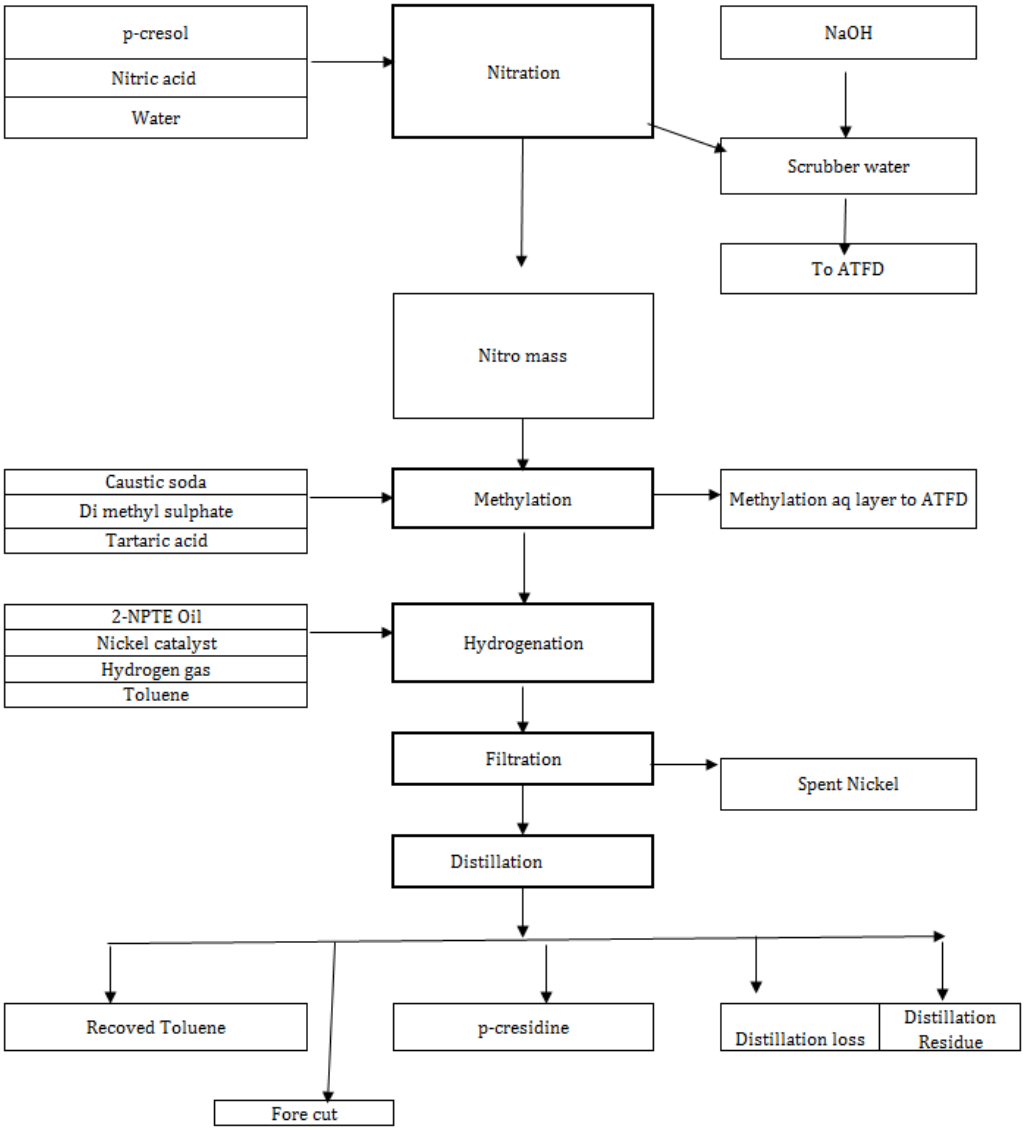
REDUCTION



C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
P-Cresol	0.9	Para Cresidine	1	Product for sale
Nitric Acid	1.204	Scrubber water	0.13	To ETP
Water	1	Methylation aq layer	4.52	To ETP
Sodium Hydroxide (48%)	0.77			
Di methyl sulphate	1.8	Spent catalyst	0.0170	Approved recycler
Tartaric acid	0.014	Recovered Tol	2.475	Reuse in process
Nickel catalyst	0.0164	Distillation loss	0.005	
Toluene	2.5	Ditilliation Residue	0.02	To CHWIF
Hydrogen gas	0.02	Fore cut	0.0574	Reuse in process
Total	8.2244	Total	8.2244	

D. Process Flow Diagram

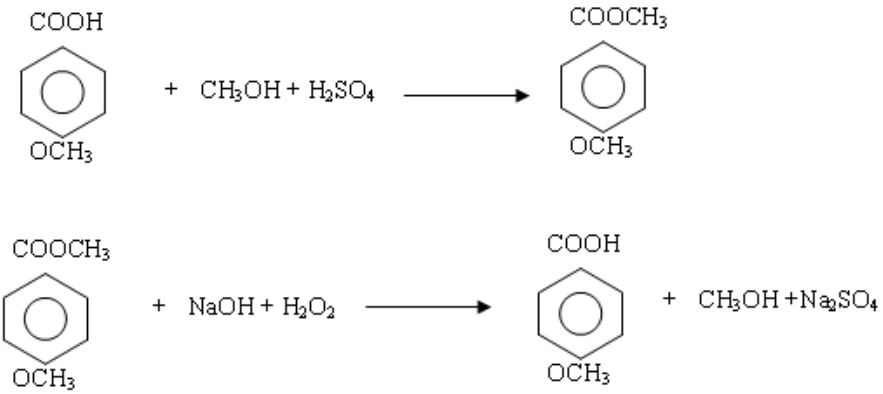


1.1.5 Para Anisic Acid (from para Anisaldehyde plant)

A. Manufacturing Process

The alkaline wash of paraanisaldehyde is purified and acidified to pH-2. The paraanisic acid is filtered, centrifuged and dried. Pure Para anisic acid is recovered in acidic medium.It is centrifuged and dried in Tray Dryer. The aqueous layer after neutralization is treated in ETP (ZLD).

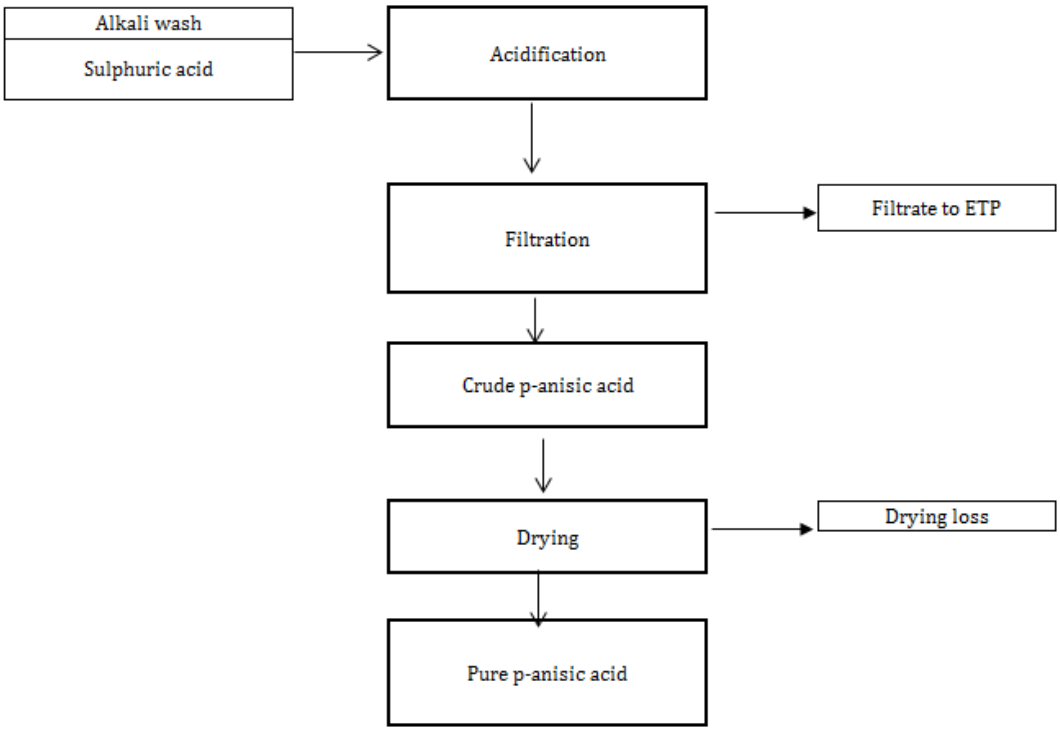
B. Chemical Reaction



C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
Alkali wash	10	p-Anisic acid	1	Product for sale
Sulfuric acid	1.35	Filtrate	10.25	to ETP
		Loss on drying	0.1	
Total	11.35	Total	11.35	

D. Process Flow Diagram

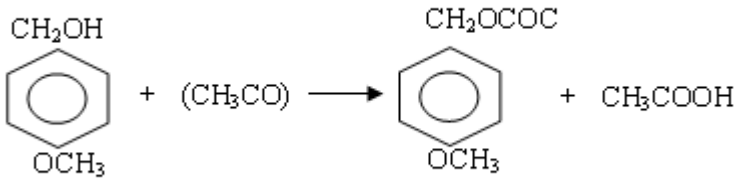


1.1.6 Anisyl Acetate

A. Manufacturing Process

P-anisyl alcohol is reacted with acetic anhydride at high temperature under agitation and reflux. The reaction mass is washed with water and then with dilute sodium bicarbonate solution to remove the acetic acid formed. The organic layer is separated out. The aqueous effluent is discharged after neutralization to ETP for treatment. The crude product is taken for distillation.

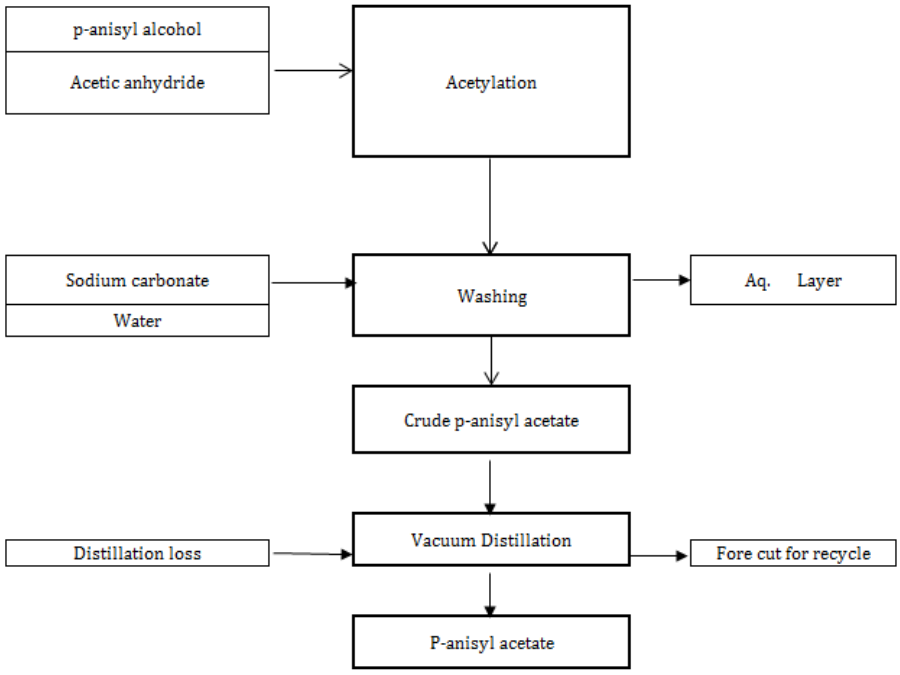
B. Chemical Reaction



C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
P-anisyl alcohol	0.700	Anisyl Acetate	1	product for sale
Acetic anhydride	0.6	Aq. Layer	1.25	To ETP
Sodium bicarbonate	0.05	Fore cut	0.095	Reuse in process
Water	1.000	Distillation loss	0.005	
Total	2.350		2.35	

D. Process Flow Diagram



1.1.7 Manganese Sulphate (from para Anisaldehyde)-Solid

A. Manufacturing Process

Manganese sulphate solution is neutralized by MnO natural ore & filtered. The filtrate is sent for evaporation and drying to give white $MnSO_4$ feed grade powder product, which is sold (100%)in the export market.

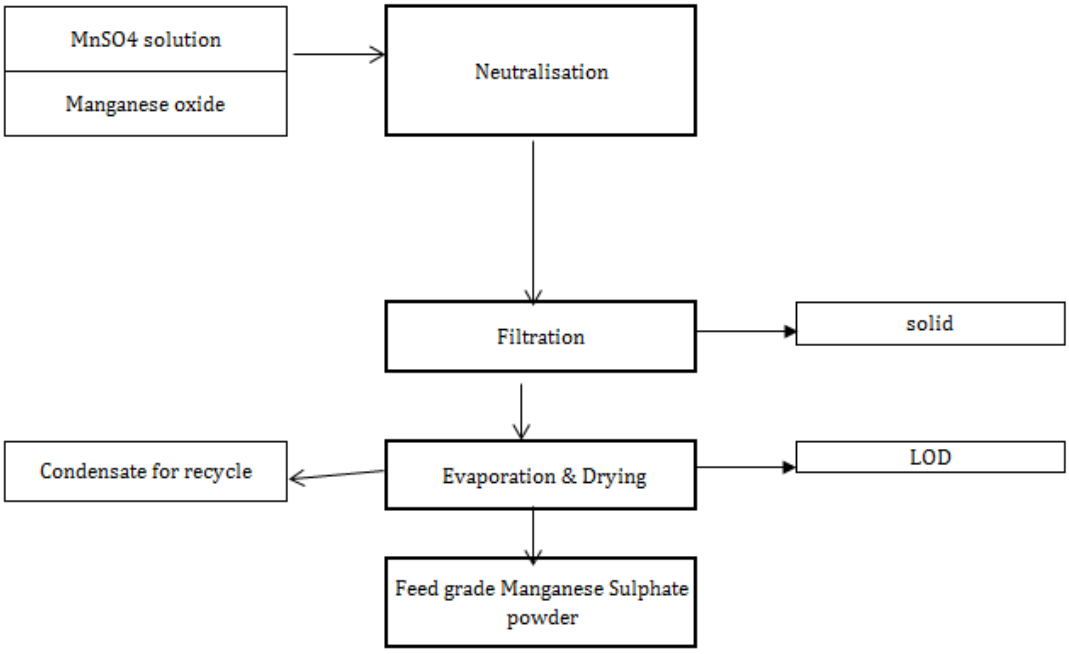
B. Chemical Reaction

$$H_2SO_4 + MnO \longrightarrow MnSO_4 + H_2O$$

C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
Manganese Sulphate Solution	8.5	Manganese Sulphate powder	3	Product
Manganese Oxide	0.2	Process residue	0.1	Natural soild impurities to TSDF
		Evaporation & Drying	0.1	
		Condensate for recycle	5.5	Recycled back in process
Total	8.7	Total	8.7	

D. Process Flow Diagram

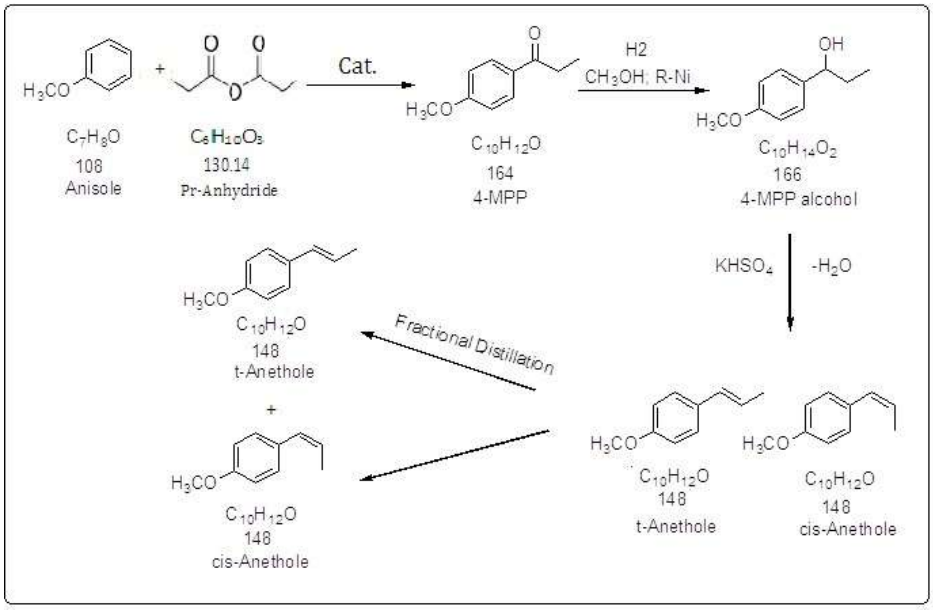


1.1.8 Anethole

A. Manufacturing Process

Anisole is acylated with propionic anhydride or propionic chloride in presence of a suitable catalyst to make 4-MPP which is hydrogenated in presence nickel catalyst to 4-MPP alcohol. 4-MPP alcohol is then dehydrated in presence of potassium sulphateat high temp to make Anethole. This goes as an ingredient tooth paste manufacturing like Coalgate / Refresh, chewing gum,soap and confectionary applications. Currently, no one makes this product in India.

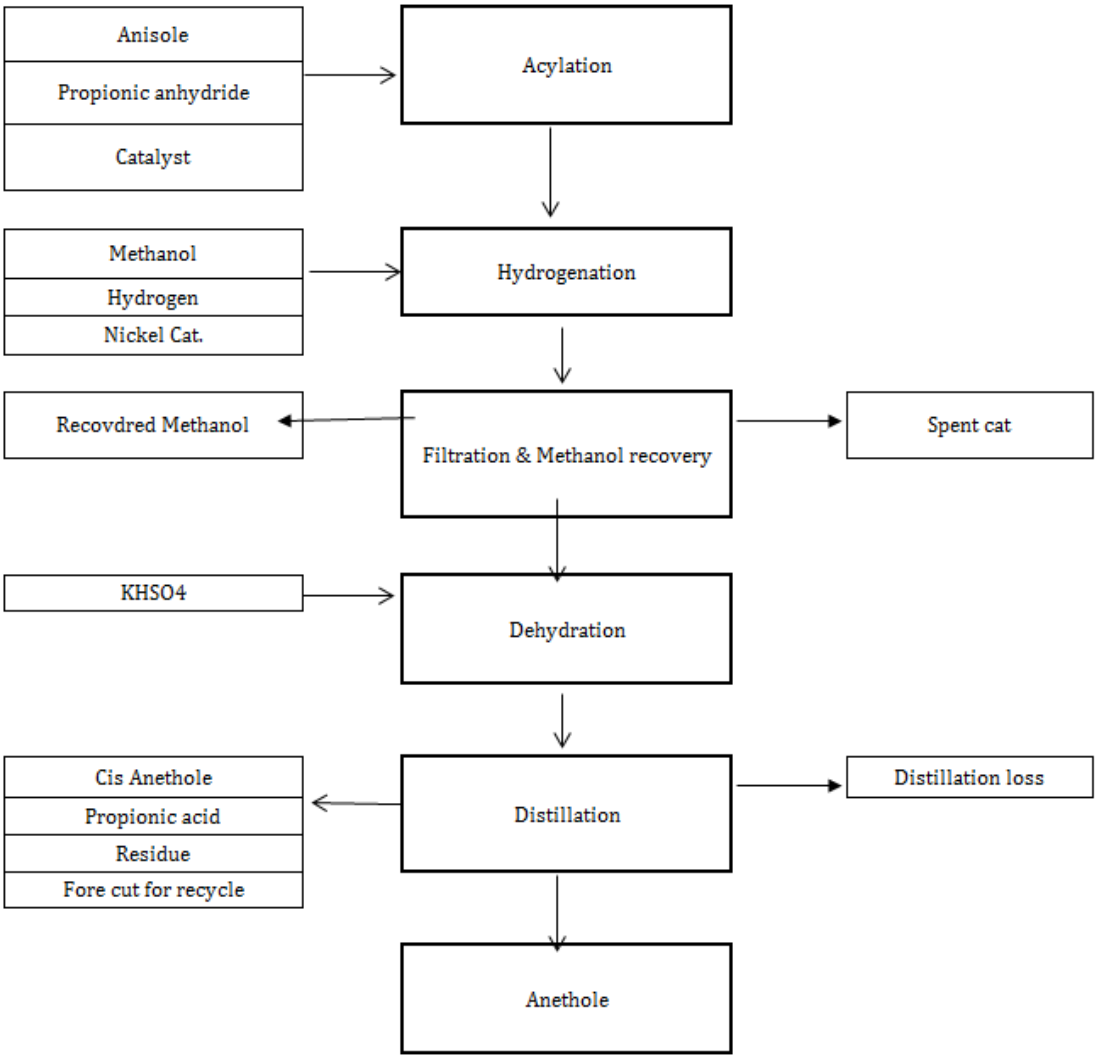
B. Chemical Reaction



C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
Anisole	0.95	Anethole	1	Product for sale
Propionic anhydride	0.90	Spent cat	0.002	Approved recycler
Catalyst	0.01	Distillation loss	0.001	
Methanol	1.00	Cis Anethole	0.15	Reuse in process
Hydrogen	0.02	Propionic acid	0.432	reuse in acylation
Nickel Cat.	0.002	Distillation Residue	0.029	CHWIF
KHSO4	0.01	Fore cut for recycle	0.306	Reuse in process
		Recovered Methanol	0.970	Reuse in process
Total	2.89		2.89	

D. Process Flow Diagram

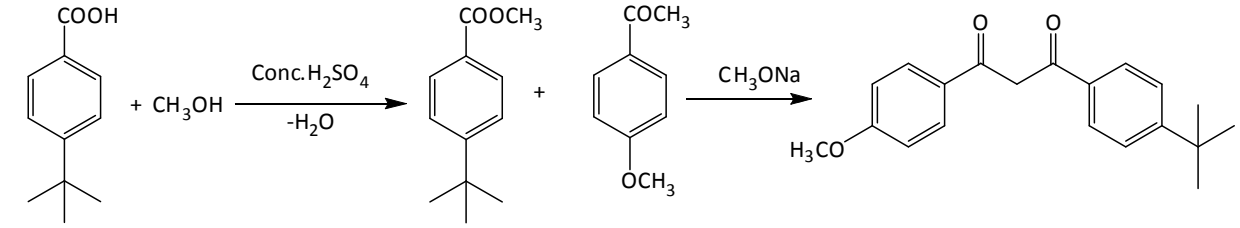


1.1.9 Avobezone

A. Manufacturing Process

Butyl benzoic is esterified using methanol to make methyl –t-butyl benzoate. Methyl –t-butyl benzolate is then condensed with 4-methoxy acetophenone at room temperature in presence of sodium methoxide to make avobenzone which is UV-A blockers.

B. Chemical Reaction



$C_{11}H_{14}O_2$
178.2
4-t-butyl benzoicacid

CH_4O
32
Methanol

$C_{12}H_{16}O_2$
192.3
Methyl 4-t-butyl benzoate

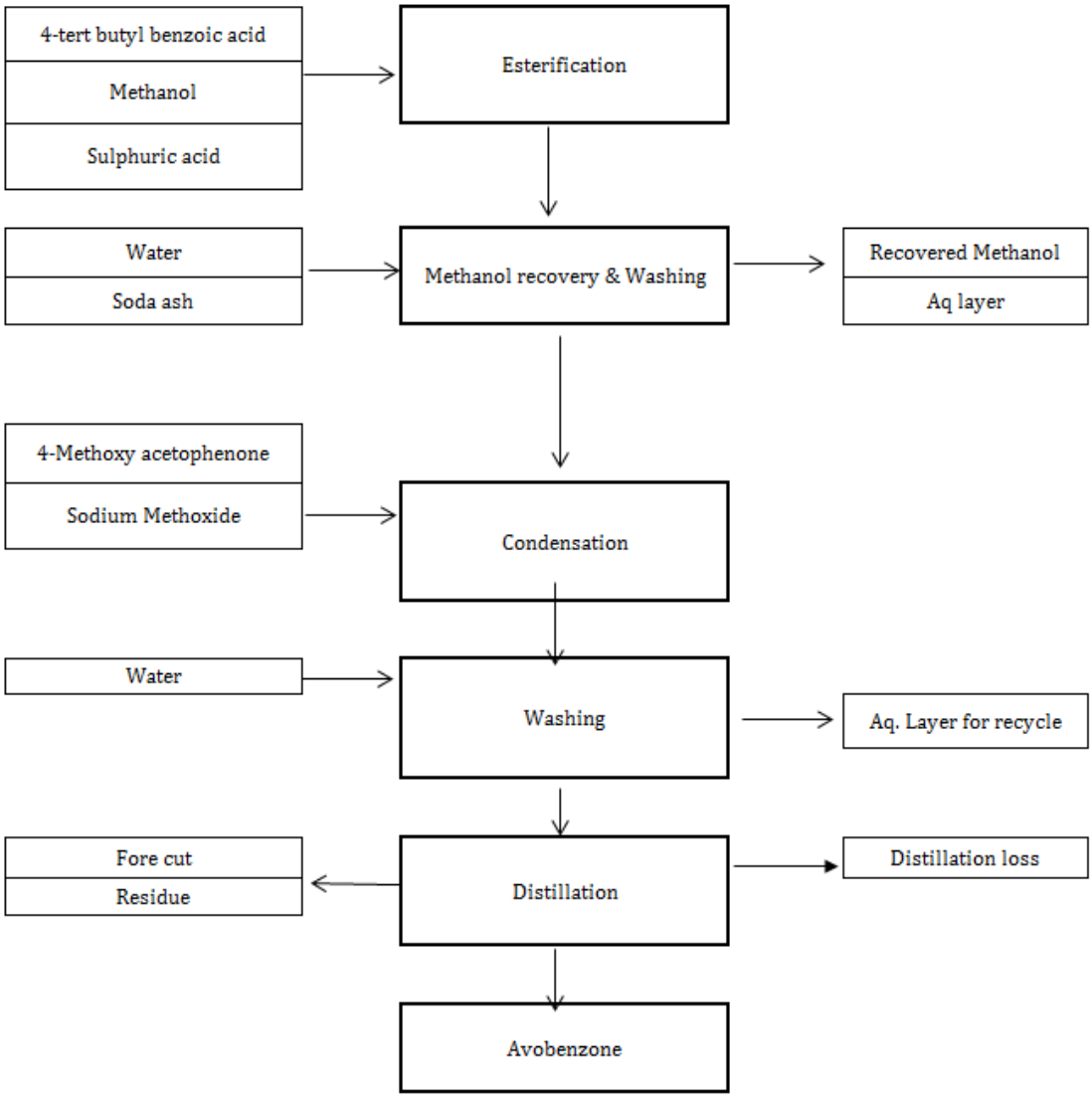
$C_9H_{10}O_2$
150.2
4-MAP

$C_{20}H_{22}O_3$
310.39
Avobenzone

C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
4-tert butyl benzoic acid	0.59	Avobenzone	1	Product for sale
Methanol	1.50	Recovered Methanol	1.455	Reuse in process
Sulphuric acid	0.1	Aq. Layer	0.46	Reuse in process
Water	0.50	Aq. Layer to ETP	0.80	to ETP (ZLD)
Soda ash	0.10	Distillation loss	0.002	
4-Methoxy acetophenone	0.5	Fore cut	0.09	Recycle in distillation
Sodium Methoxide	0.05	Process Residue	0.03	CHWIF
Water	0.5			
Total	3.84		3.84	

D. Process Flow Diagram

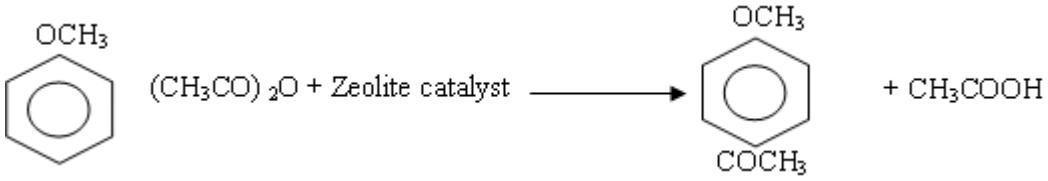


1.1.10 4-Methoxy Acetophenone

A. Manufacturing Process

Acylation of anisole is carried out by using acetic anhydride as an acetylating agent in the presence of zeolite catalyst. After filtration, followed by fractional distillation to get pure 4-Methoxy acetophenone.

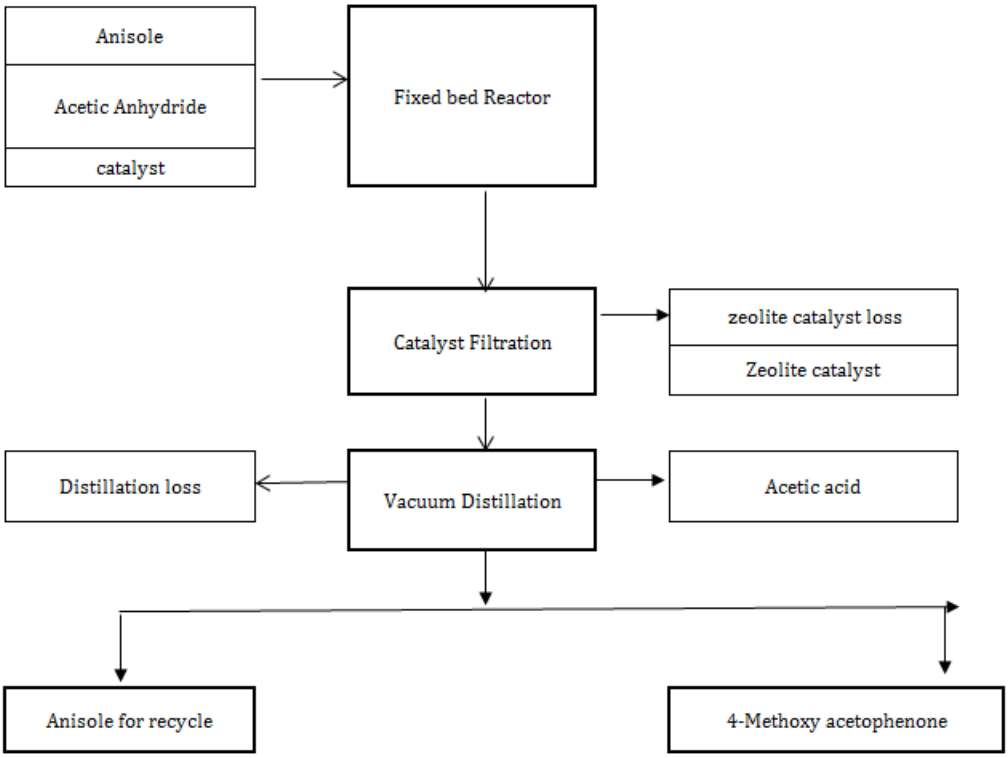
B. Chemical Reaction



C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
Anisole	4.6	4- Methoxy Acetophenone	1	product for sale
Acetic Anhydride	0.88	Anisole	4.177	To recycle in process
Catalyst	0.01	Acetic acid	0.3	
		Distillation Loss	0.005	
		Zeolite Catalyst Losses	0.005	
		Zeolite Catalyst	0.005	
Total	5.492	Total	5.492	

D. Process Flow Diagram



1.1.11 Sodium Sulphite (from Cresol plant)

A. Manufacturing Process

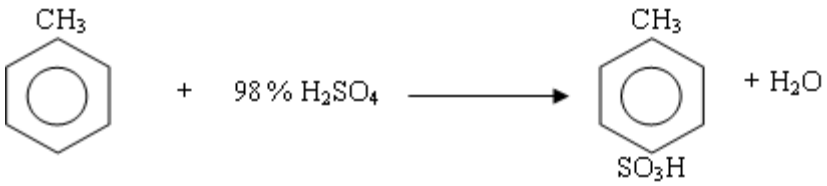
Fusion quenched mass in cresol manufacturing is neutralized/ acidified with Sulphur dioxide and Sulphuric acid to yield Crude Cresol and Sodium Sulphite is separated by centrifuging and dried in closed continuous dryer. The product is washed and purified to make it an exportable grade product which is exported. This is aRs 100 cr business product where Atul is one of the reputed global players.

1.1.12 Para Toluene Sulphonic Acid

A. Manufacturing Process

Sulphonation of toluene is carried out by using con. H_2SO_4. Azeotropically water is removed from reaction mass. After reaction completion toluene is distilled off. The sulphomass crystallized by using water as a solvent to get pure p-toluene sulphonic acid.

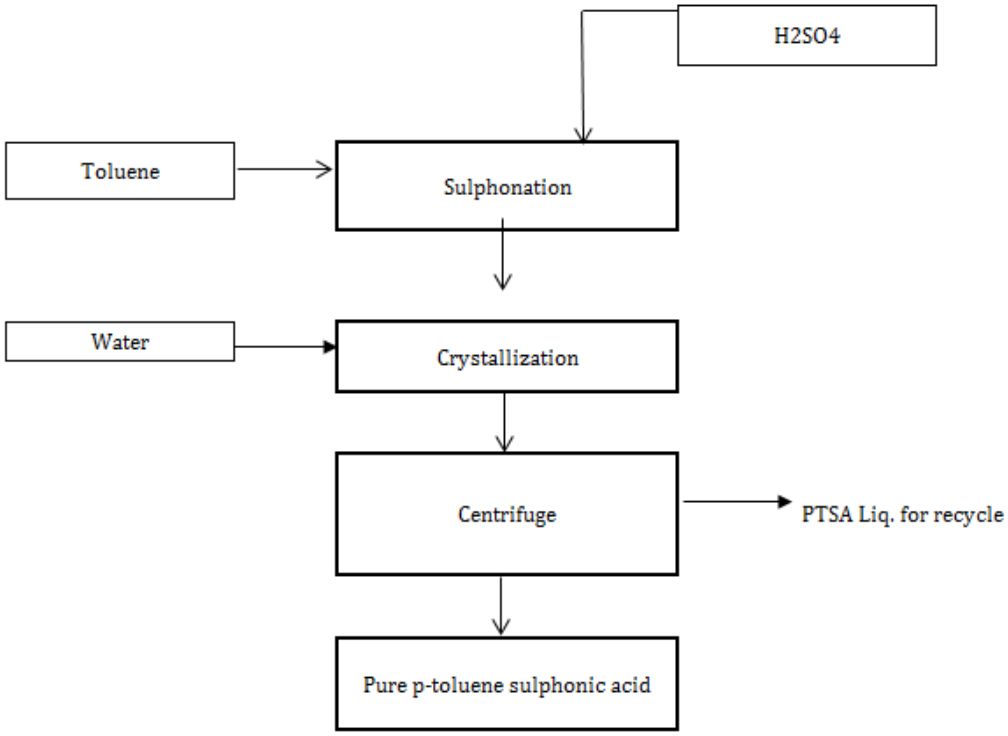
B. Chemical Reaction



C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
Toluene	1.5	P-Toluene sulphonic acid	1	Product for sale
Sulphuric Acid	1.02	PTSA liq for recycle	1.82	Recycle in cresols
Water	0.3			
Total	2.82	Total	2.82	

D. Process Flow Diagram

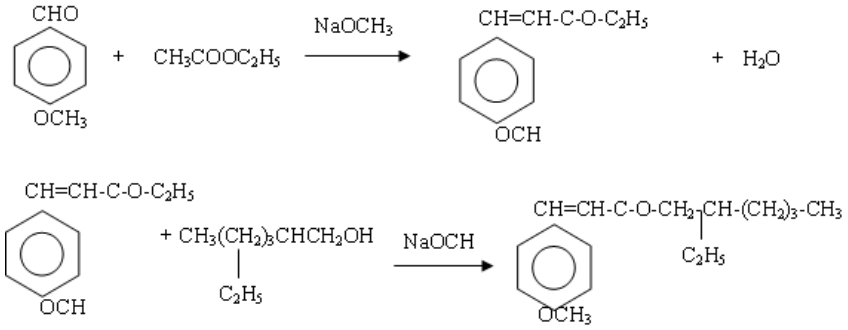


1.1.13 Octyl Methoxy Cinnamate

A. Manufacturing Process

- Para Anisaldehyde is reacted with Ethyl acetate in presence of sodium methoxide to give Ethyl Methoxy cinnamate & water.
- Ethyl Methoxy cinnamate reacts with 2-Ethyl Hexanol to give Octyl Methoxy cinnamate.

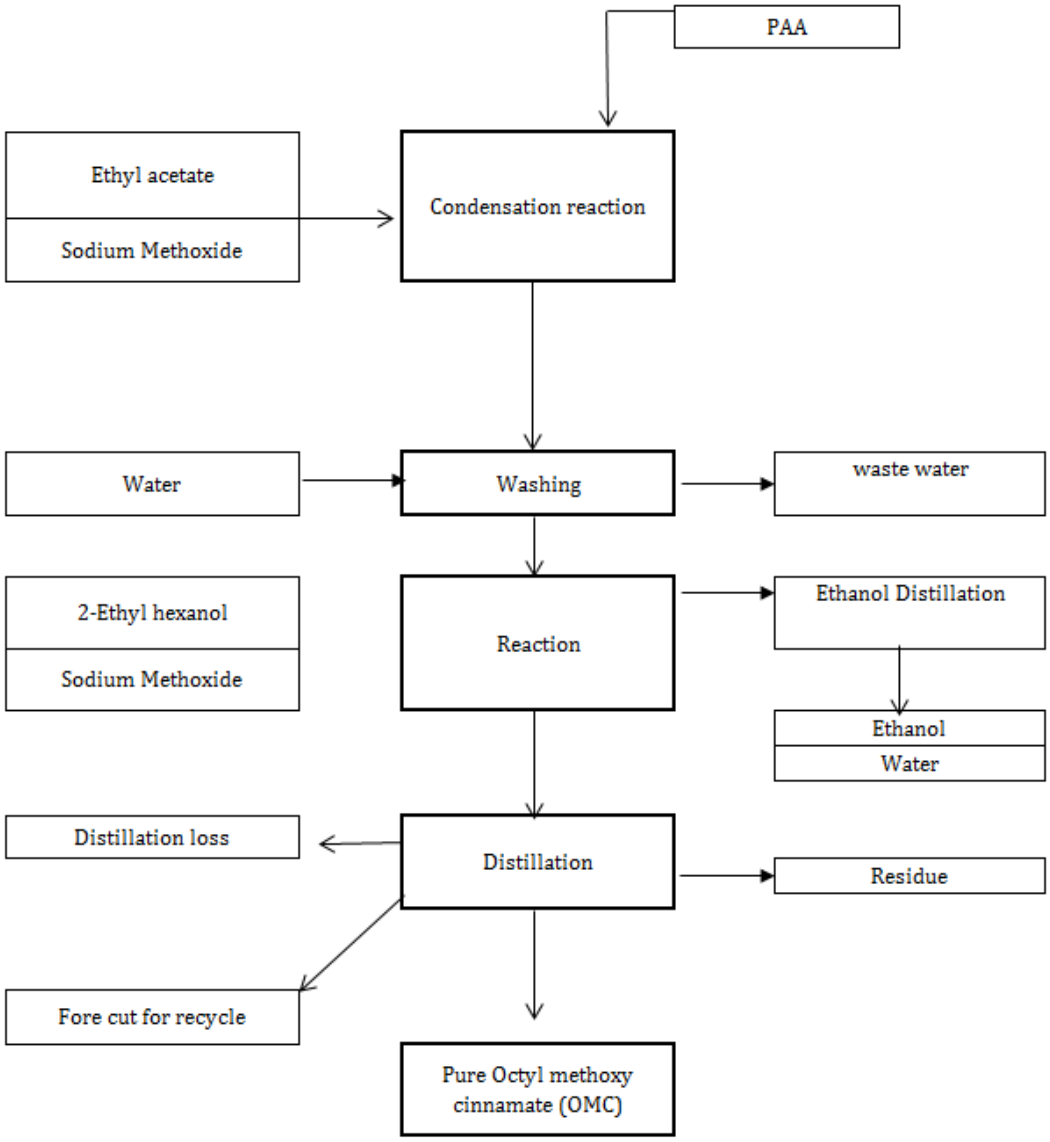
B. Chemical Reaction



C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
P-Anisaldehyde	0.766	Octyl Methoxy Cinnamate	1	Product for sale
Ethyl Acetate	0.34	Ethanol	0.062	Byproduct for sell to authorized recycler under rule-9
Sodium Methoxide	0.02	water	0.096	Reuse in process
Water	2.8	Distillation losses	0.01	
2-Ethyl Hexanol	0.38	Process residue	0.031	To CHIWF
		Fore cut	0.157	Reuse in process
		Water	2.95	To ETP
Total	4.31	Total	4.31	

D. Process Flow Diagram

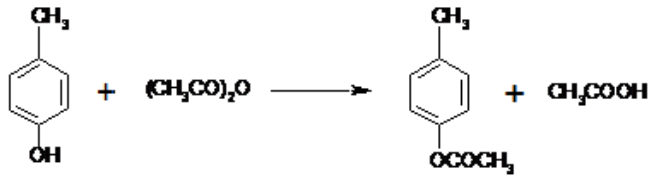


1.1.14 Para Cresyl Acetate

A. Manufacturing Process

Para Cresol and acetic anhydride are mixed under agitated condition. After reaction is completed, cool the reaction mass. Extract the product with toluene. Wash toluene layer with water and sodium carbonate solution. Organic layer is taken for distillation

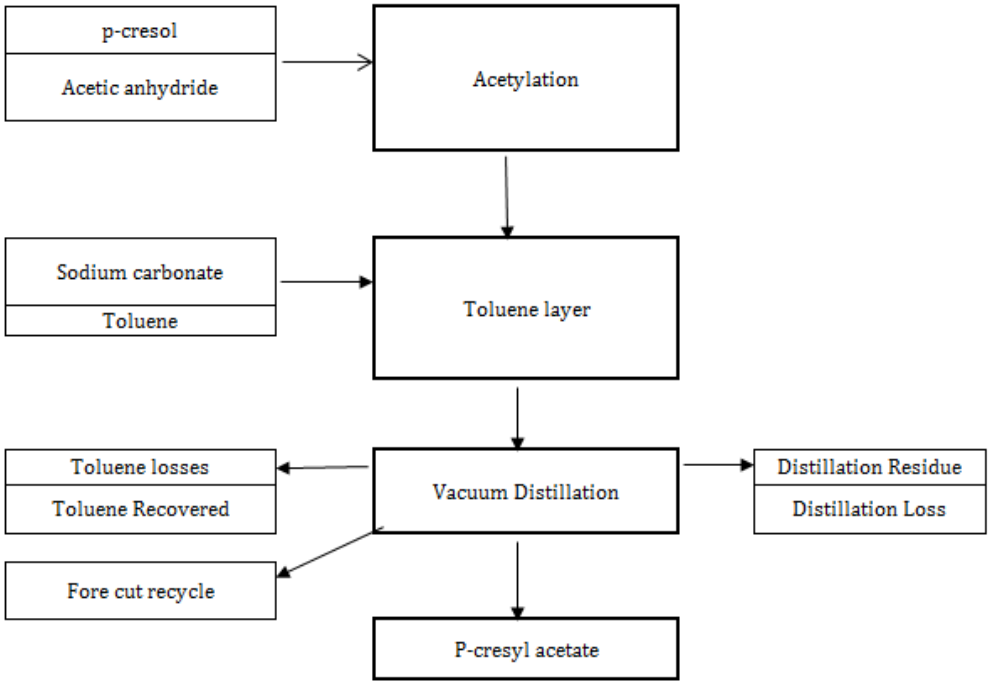
B. Chemical Reaction



C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
p-cresol	0.77	Para Cresyl Acetate	1	Product for sale
Acetic anhydride	0.8	Recovered Toluene	0.97	Reuse in Process
Toluene	1	Toluene Losses	0.001	
Sodium Carbonate	0.04	Distillation Losses	0.01	
		Distillation residue	0.02	CHWIF
		Fore cut	0.607	Reuse in process
Total	2.61		2.61	

D. Process Flow Diagram

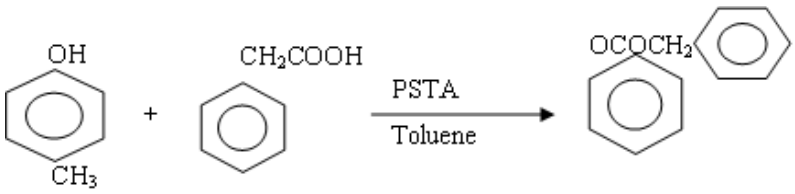


1.1.15 Para Cresyl Phenyl Acetae

A. Manufacturing Process

Para cresol is esterified with phenyl acetic acid using catalyst and toluene as solvent. After esterification the product is washed with sodium carbonate followed by water. The crude product is distilled and then crystallized.

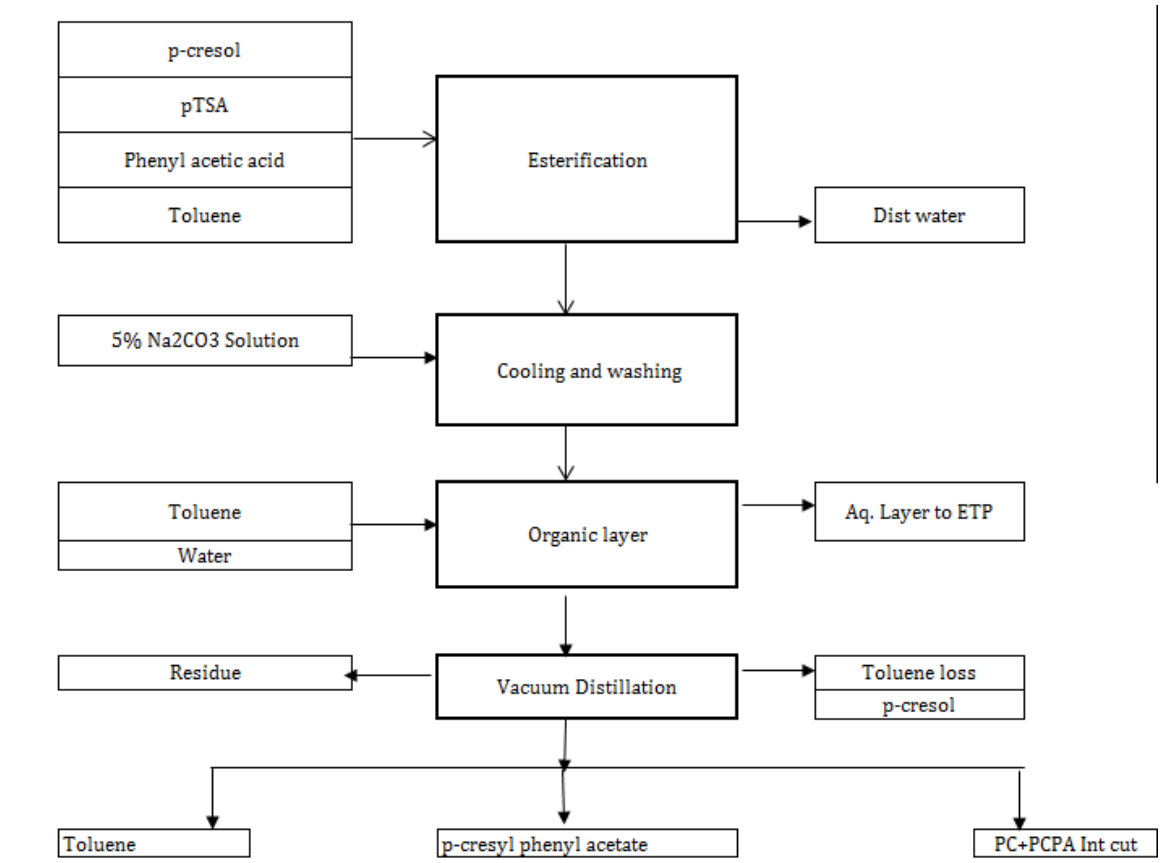
B. Chemical Reaction

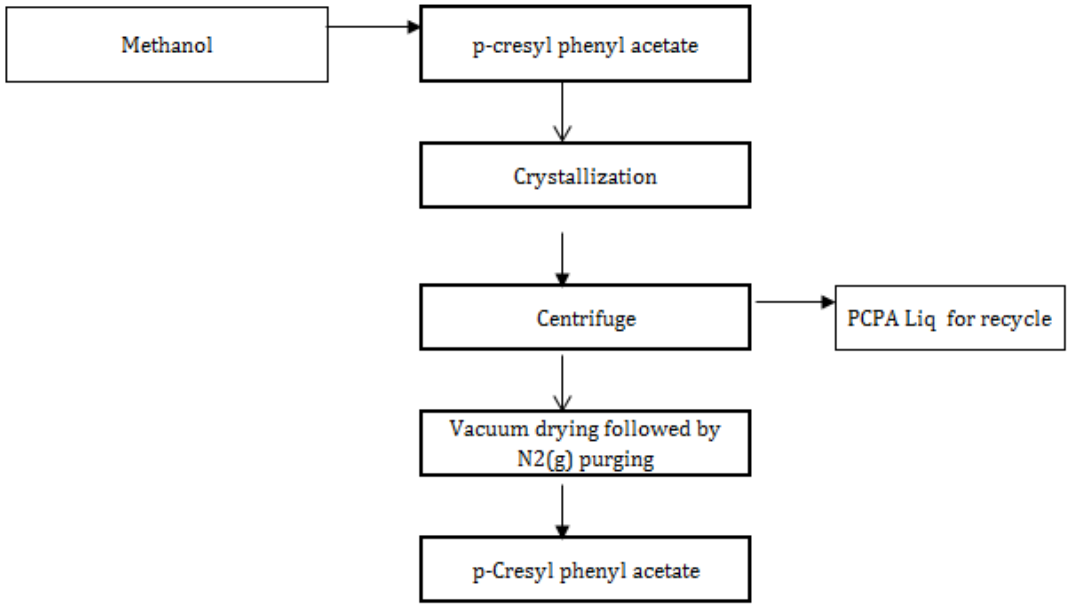


C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
p-cresol	1.11	Para Cresyl Phenyl Acetae	1	Product for sale
p-Toluenesulphonic acid (PTSA)	0.09	Dist water	0.19	Reuse in process
Phenyl acetic acid	0.89	p-cresol	0.515	Reuse in process
Toluene	2.25	Toluene loss	0.028	
		Toluene recovered	2.185	Reuse in process
		Distillation Residue	0.037	Reuse in process
Sodium carbonate (5%)	0.07	PC+PCPA int cut	0.187	Reuse in process
Water	0.6	Para Cresyl Phenyl Acetae liq	1.978	To recycle in crystallisation
methanol	1.89	Lower aqueous layer	0.78	To ETP
Total	6.90	Total	6.9	

D. Process Flow Diagram





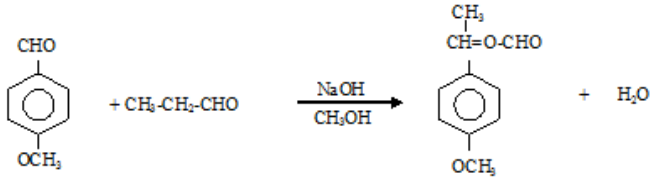
1.1.16 Para Anisyl Propanal

A. Manufacturing Process

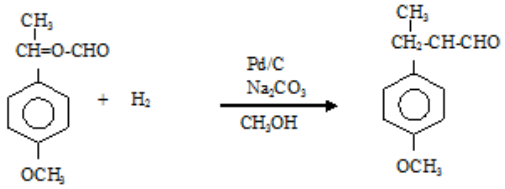
Para Anisaldehyde is condensed with propanaldehyde in presence of sodium hydroxide solution. Methanol is recovered and the condensed product is extracted with toluene. Toluene layer is washed with sodium carbonate and water. The organic layer is taken for distillation. The condensed product is selectively hydrogenated to form crude Para anisyl propanal. The Crude product is vacuum distilled to get pure Para anisyl propanal.

B. Chemical Reaction

STEP: 1



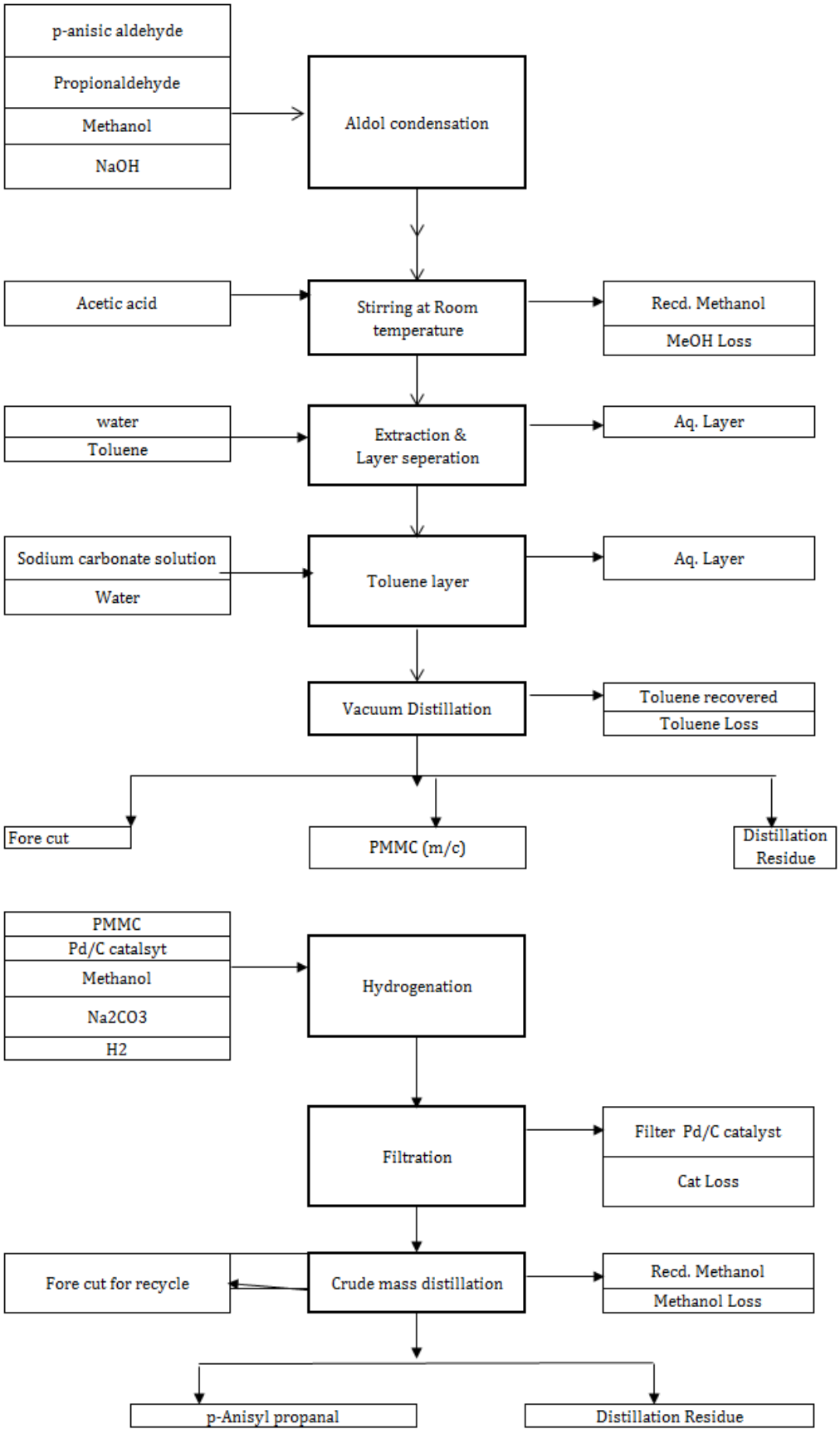
STEP: 2



C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
p-Anisaldehyde	1.2	P-Anisyl Propanal	1	Product
Propanaldehyde	0.53	Recovered Methanol	4.316	Reuse in process
Sodium hydroxide	0.016	Methanol Losses	0.09	
Sodium carbonate	0.072	Recovered Toluene	3.882	Reuse in process
Methanol	4.443	Toluene Losses	0.03	
Acetic acid	0.023	Forecut (PAA + PMMC)	0.401	Reuse in process
Toluene	4	dislitation residue	0.037	To CHWIF
		distillation residue	0.088	To CHWIF
Pd/C	0.022	Propanal fore cut	0.346	Reuse in process
Hydrogen	0.016	waste water	0.91	To ETP
Water	0.8	Recovered Pd/c catalyst	0.019	Reuse in process
		Pd/c catalyst Losses	0.003	
Total	11.122	Total	11.122	

D. Process Flow Diagram

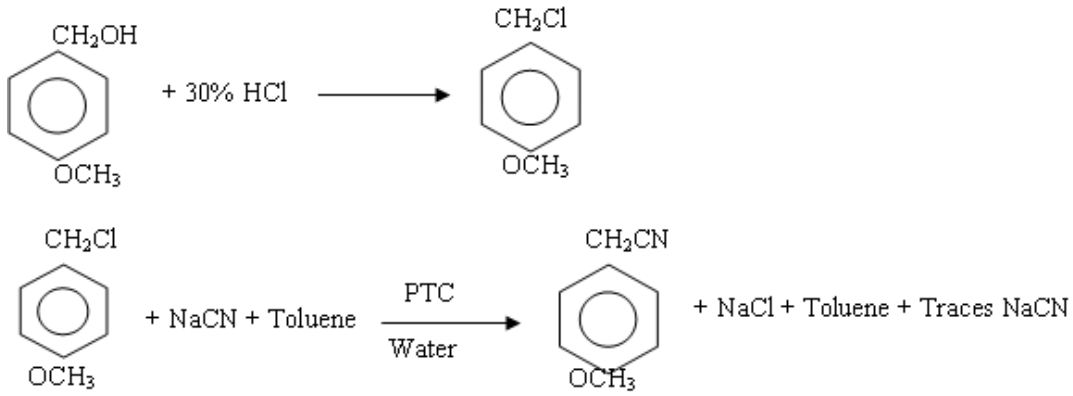


1.1.17 4-Methoxy phenyl Acetonitrile

A. Manufacturing Process

Paraanisyl alcohol is reacted with dilute hydrochloric acid under agitation. The reaction mass is allowed to settle and the organic layer of para anisyl chloride, after addition of a stabilizer is reacted with sodium Cyanide in presence of a catalyst, water & toluene. This reaction mixture is then phase separated whereby the aqueous layer is generated. The organic layer is given further washes. The washed organic layer is taken for distillation. The combined aqueous layers after cynation containing traces of NaCN are treated with dilute sodium hypochlorite solution to bring the free cyanide content within the permissible limits

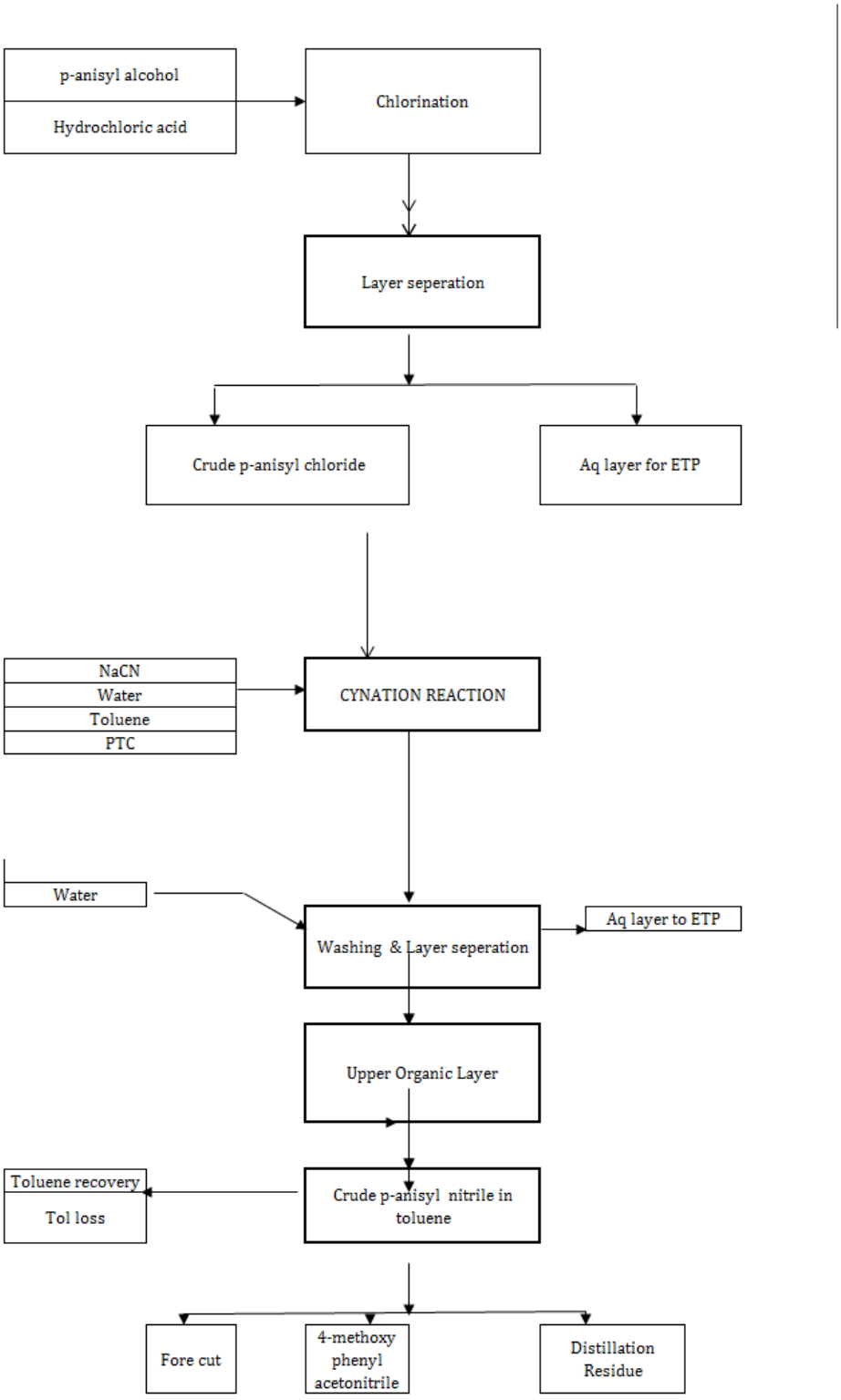
B. Chemical Reaction



C. Material Balance

Input	Qty (MT)	Output	Qty (MT)	Remark
p-Anisyl alcohol	1	4-Methoxy phenyl Acetonitrile	1	Product
Hydrochloric acid	1.1	Toluene recovered	1.487	Reuse in process
Sodium Cyanide	0.42	Fore cut	0.08	Reuse in process
Water	1.5	Distllation residue	0.033	To CHWIF
Toluene	1.53	waste water	2.95	To ETP
Phase Transfer Catalyst (PTC)	0.01	Toluene loss	0.01	
Total	5.56	Total	5.56	

D. Process Flow Diagram

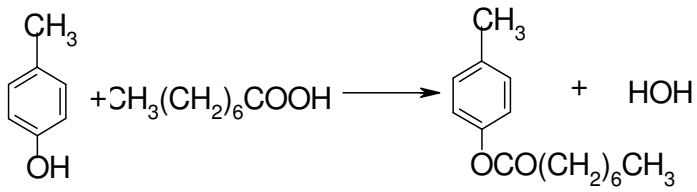


1.1.18 Para Cresyl Caprylate

A. Manufacturing Process

P-cresol is reacted with Caprylic acid and refluxed to remove water azeotropicaly. After completion of the reaction cool the reaction mass, wash toluene layer with sodium bicarbonate solution & water. Organic layer is taken for distillation.

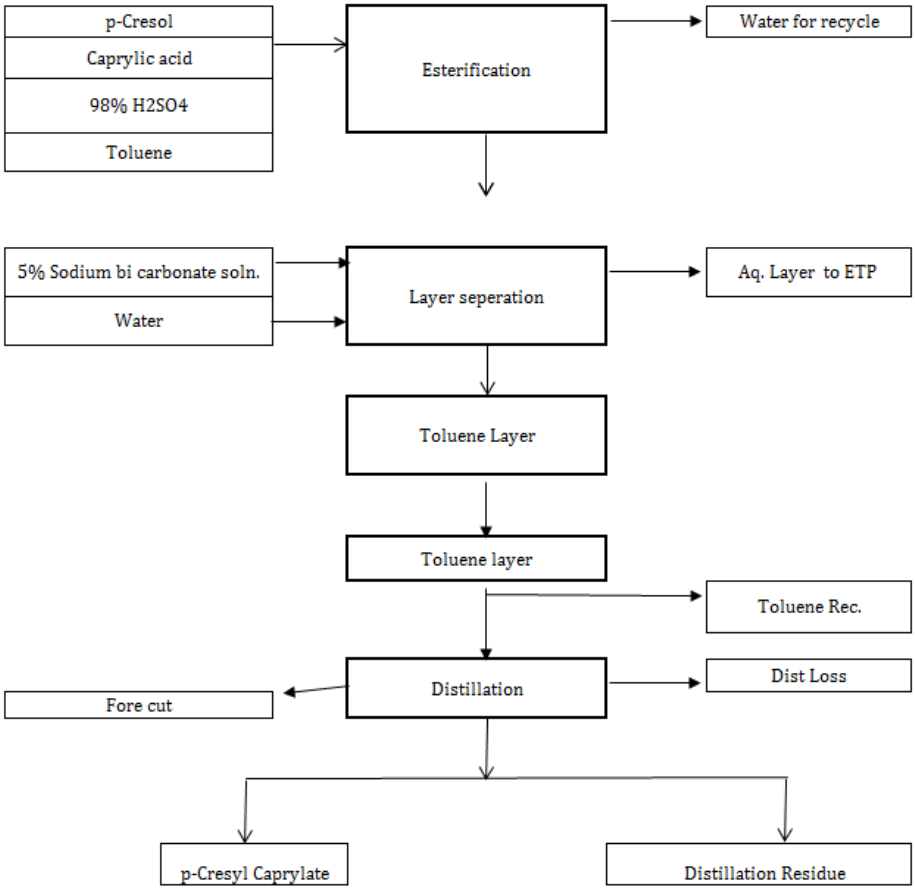
B. Chemical Reaction



C. Material Balance

Input	Qty (MT)	Input	Qty (MT)	Remark
p-cresol	0.5	p-Cresyl Caprylate	1	Product
Caprylic acid	0.8	Fore cut for recycle	0.24	Reuse in process
Toluene	1.78	Recovered Toluene	1.74	Reuse in process
Sodium bicarbonate Solution (5%)	0.15	Disitillation loss	0.015	
Water	2.4	Distillation Residue	0.025	To CHWIF
Sulphuric Acid	0.02	Water from esterification	0.15	Reuse in process
		Waste water	2.48	to ETP
Total	5.65	Total	5.65	

D. Process Flow Diagram

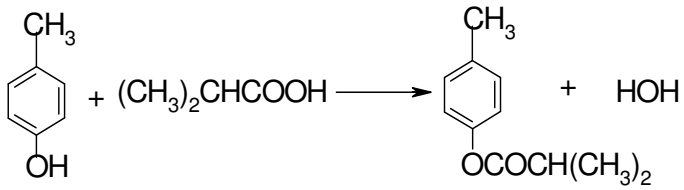


1.1.19 Para Cresyl Isoebutyrate

A. Manufacturing Process

P-cresol is reacted with Isobutyric acid and refluxed to remove water azeotropicaly. After completion of the reaction cool the reaction mass, wash toluene layer with sodium bicarbonate solution & Water. Organic layer is taken for distillation.

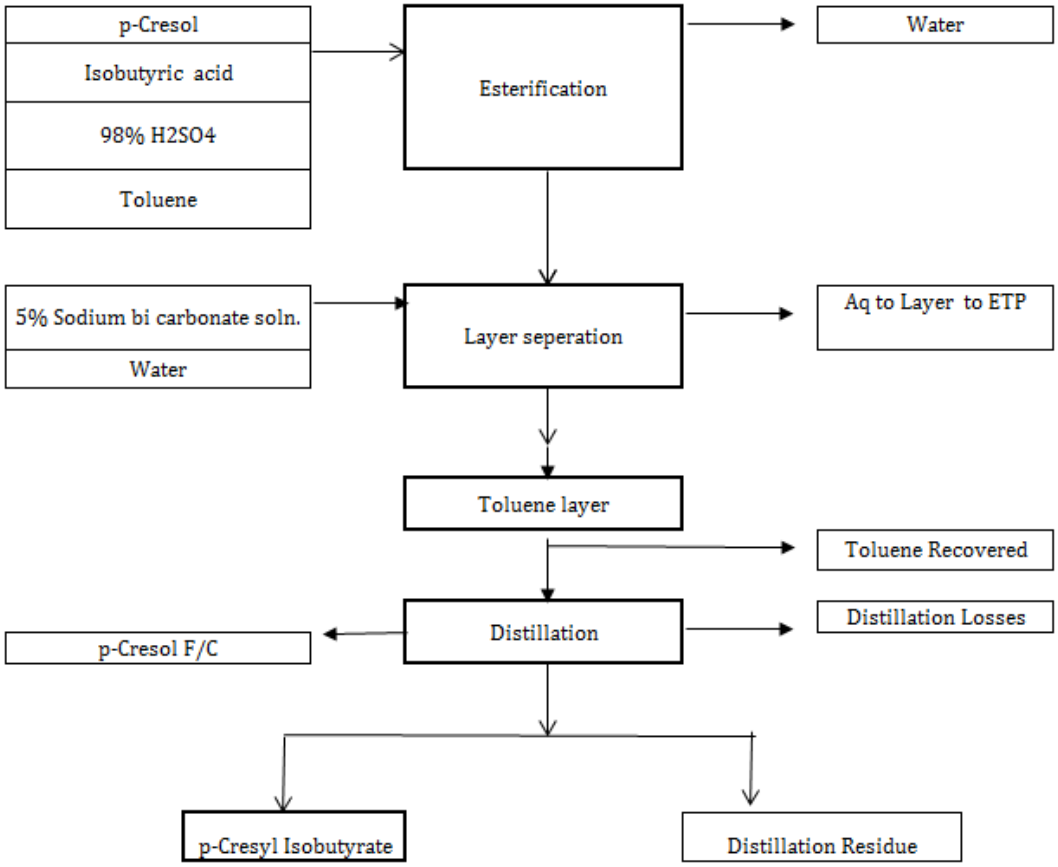
B. Chemical Reaction



C. Material Balance

Input	Qty (MT)	Input	Qty (MT)	Remark
p-cresol	0.65	p-Cresyl Isobutyrate	1	Product
Isobutyric acid	0.7	p-cresol F/C	0.2	Reuse in process
Toluene	2.4	Recovered Toluene	2.33	Reuse in process
Sodium bicarbonate Solution (5%)	0.39	Distillation loss	0.02	
Water	2.5	Distillation Residue	0.05	To CHWIF
Sulphuric Acid	0.02	Waste water	3.06	To ETP
Total	6.660	Total	6.66	

D. Process Flow Diagram



1.1.20 Para Cresyl Formate

A. Manufacturing Process

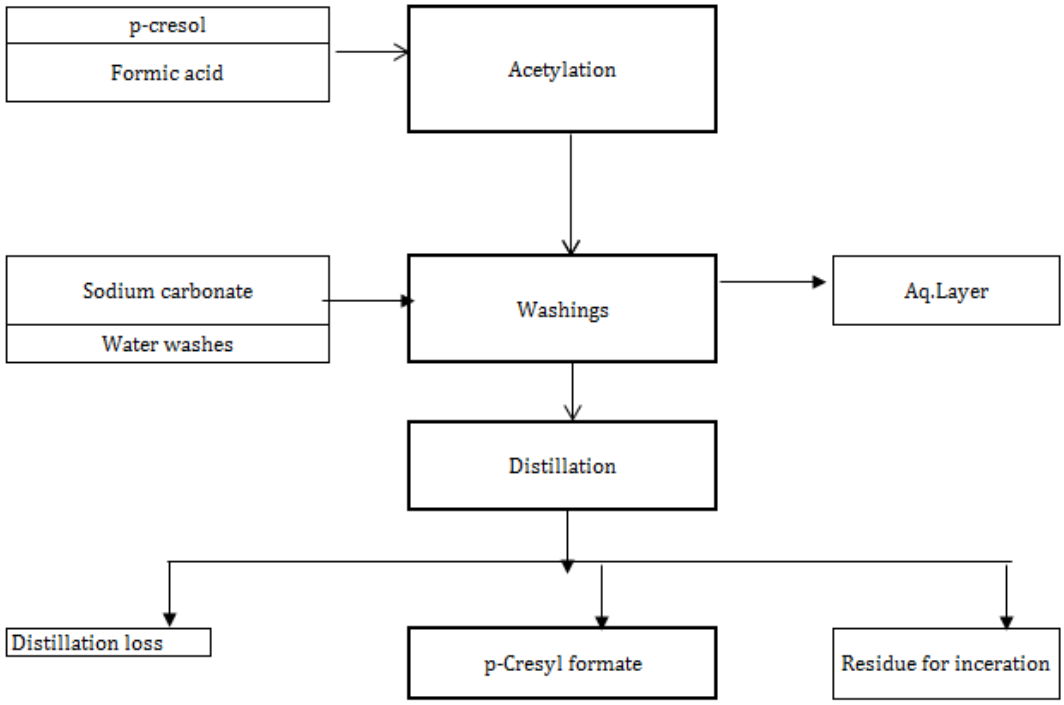
P-Cresol is reacted with formic acid to produce Para Cresyl formate

B. Chemical Reaction

C. Material Balance

Input	Qty (kg)	Input	Qty (kg)	Remark
P-Cresol	0.86	P-Cresyl formate	1	Product
Formic acid	0.37	Effluent	0.64	To ETP
Sodium Carbonate	0.086	Distillation Losses	0.02	
Water	0.374	Process Residue	0.03	To CHWIF
Total	1.69	Total	1.69	

D. Process Flow Diagram

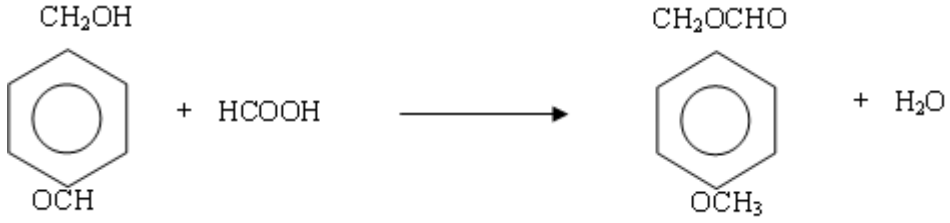


1.1.21 Para Anisyl Formate

A. Manufacturing Process

Para Anisyl Alcohol is reacted with formic acid to produce Para Anisyl formate

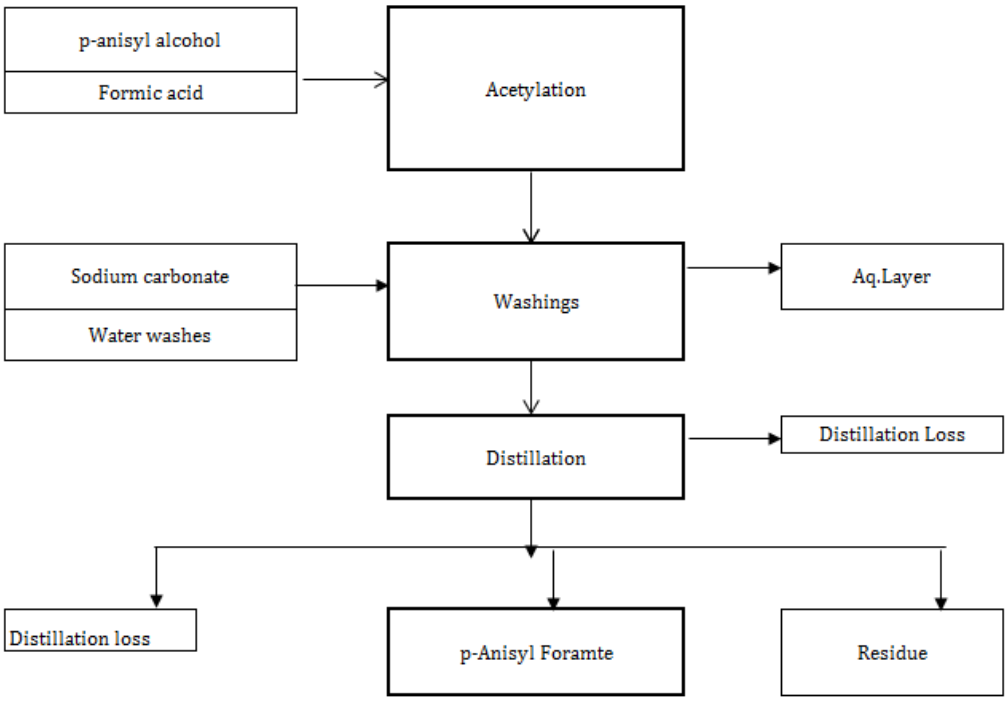
B. Chemical Reaction



C. Material Balance

Input	Qty (MT)	Input	Qty (MT)	Remark
P-Anisyl Alcohol	0.908	P-Anisyl Formate	1	Product
Formic acid	0.3	Effluent	1.068	To ETP
Sodium Carbonate	0.091	Distillation Losses	0.02	
Water	0.817	Process Residue	0.028	CHWIF
Total	2.116	Total	2.116	

D. Process Flow Diagram

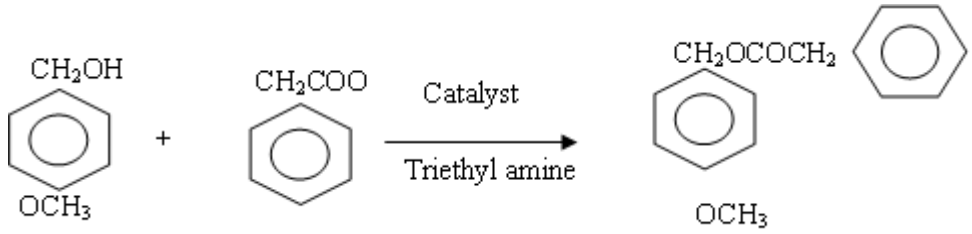


1.1.22 Para Anisyl Phenyl Acetate

A. Manufacturing Process

Esterification of p-anisyl alcohol is carried out with phenyl acetic acid by using a catalyst, triethylamine and toluene as a solvent. After esterification reaction mass is washed with 5% sodium bicarbonate solution followed by water. Finally the organic layer is distilled and to get pure p-Anisyl phenyl acetate.

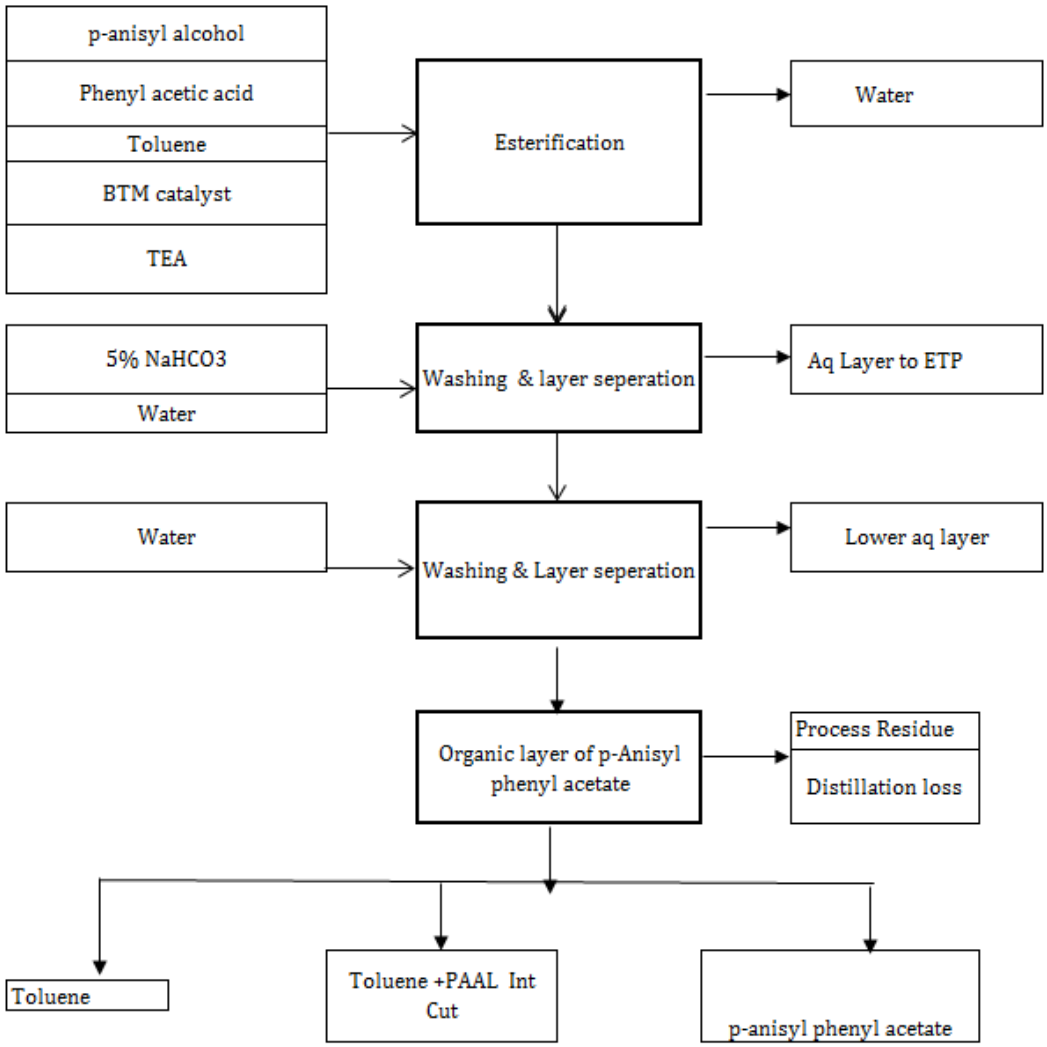
B. Chemical Reaction



C. Material Balance

Input	Qty (MT)	Input	Qty (MT)	Remark
p-anisyl alcohol	0.696	P-Anisyl phenyl acetate	1	Product
Phenyl acetic acid	0.958	Water from esterification	0.0804	reuse in process
BTM catalyst	0.036	Toluene	2.847	reuse in process
Triethyl amine (TEA)	0.201	Fore cut (Toluene+product+PAAL)	0.14	reuse in process
Toluene	2.88	Process Residue	0.013	CHWIF
Sodium bicarbonate	0.234	Distillation Loss	0.02	
Water	9.38	waste water	10.2846	To ETP
Total	14.385	Total	14.385	

D. Process Flow Diagram

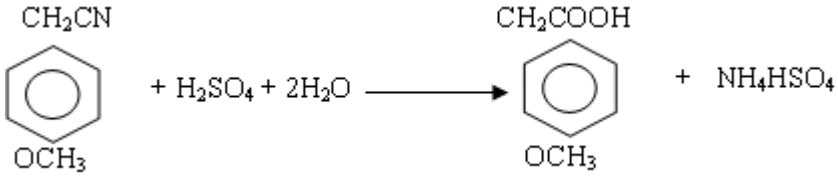


1.1.23 4-Methoxy Phenyl Acetic Acid

A. Manufacturing Process

The process involves Hydrolysis of p-anisyl nitrile with NaOH solution. The reaction mass diluted with water and acidified with HCl to give p-methoxy phenyl acetic acid.

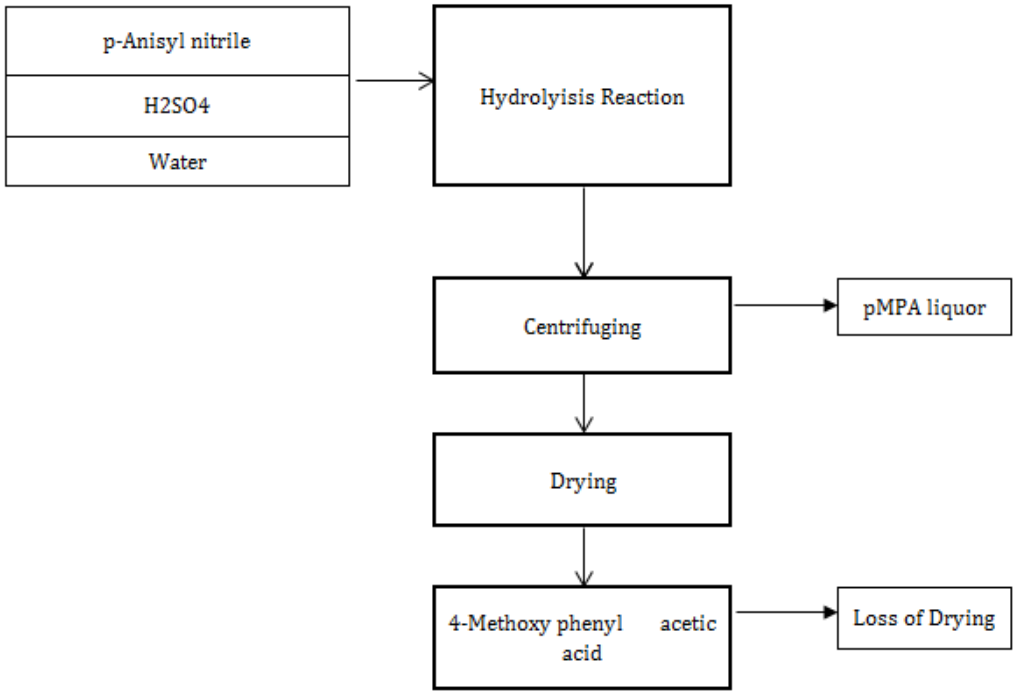
B. Chemical Reaction



C. Material Balance

Input	Qty (MT)	Input	Qty (MT)	Remark
P-Anisyl Nitrile	0.9200	4-Methoxy phenyl acetic acid	1.00	Product
H2SO4	0.5000	pMPA Liquid	1.870	To recycle in crystallisation
Water	1.5000	Loss of drying	0.050	
Total	2.9200	Total	2.920	

D. Process Flow Diagram

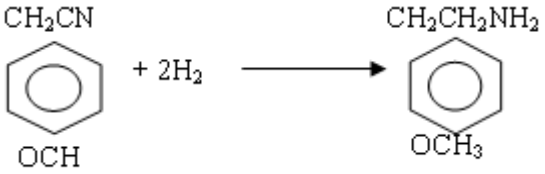


1.1.24 4-Methoxy Phenyl Ethyl Amine

A. Manufacturing Process

Hydrogenation of P-Anisylnitrile in presence of Ruthenium catalyst gives 4-Methoxy Phenyl Ethyl Amine.

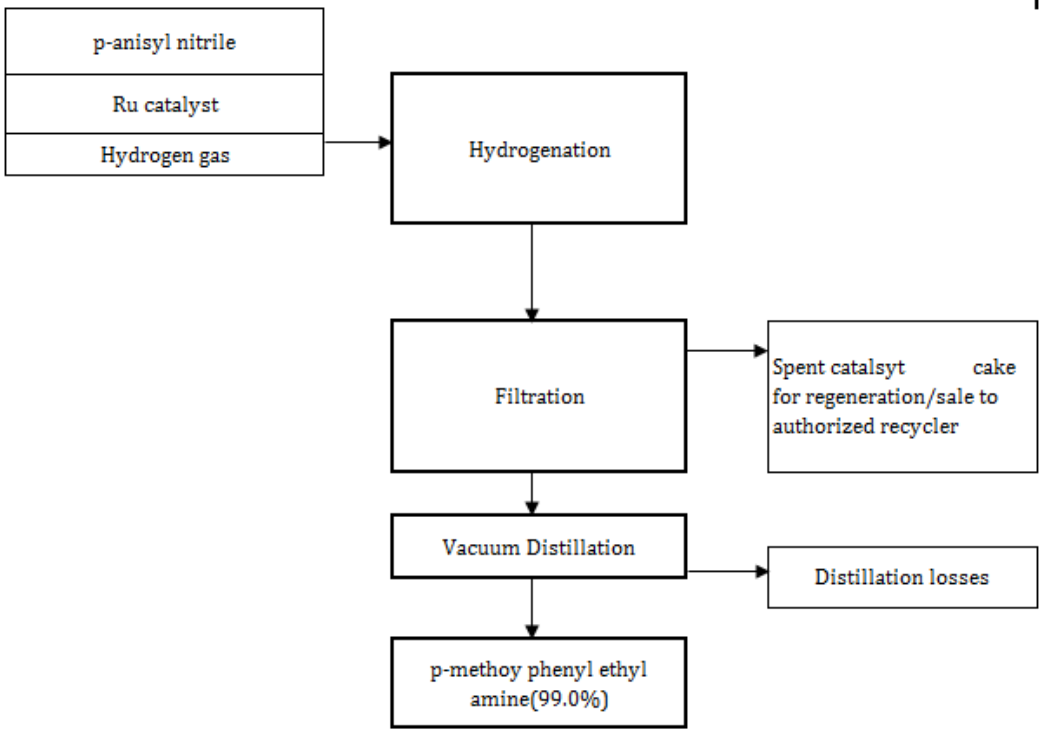
B. Chemical Reaction



C. Material Balance

Input	Qty (MT)	Input	Qty (MT)	Remark
P-Anisyl Nitrile	1.010	4-Methoxy phenyl ethyl amine	1.000	Product
Hydrogen	0.030	Ruthenium Catalyst Recovered	0.007	Recycler
Ruthenium Catalyst	0.0100	Dist loss	0.043	
Total	1.050	Total	1.050	

D. Process Flow Diagram

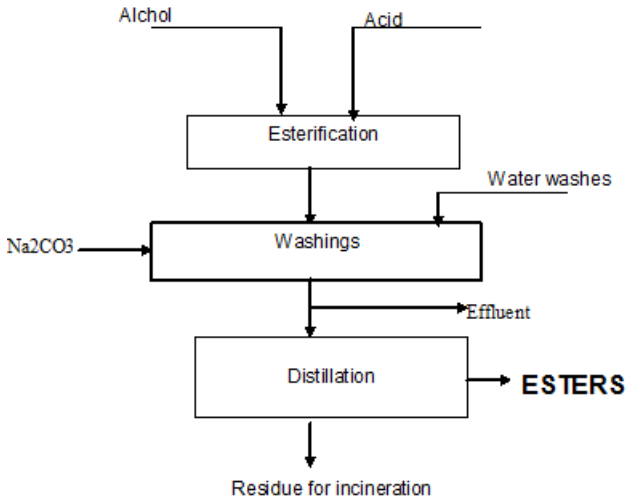


1.1.25 Perfumery Ingredients

A. Manufacturing Process

Ester manufacture is carried out by heating the alcohol and an acid are heated together in the presence of a sulfuric acid catalyst, and the reaction is driven to completion by removing the products as formed.

B. Process Flow Diagram



ANNEXURE – III

LIST OF RAW MATERIALS

Name of the products	Raw Materials	CAS No.	Quantity (MT/Month)		
			Existing	Proposed	Total after Expansion
Cresols	Toluene	108-88-3	1395	1302	2697
	Catalyst	64-90-7	30	28	58
	Sulphur Trioxide	7446.-11-9	1350	1260	2610
	Sulphur Dioxide	7446.-09-5	135	126	261
	Sulphuric acid	7664-93-9	900	840	1740
	Sodium Hydroxide (48%)	Mixture	2700	2520	5220
P-Anisaldehyde	p-Cresol	1319-77-3	735	0	735
	Sodium Hydroxide	1310-73-2	371	0	371
	Dimethyl Suphate	77-78-1	581	0	581
	Maganese dioxide	1313-13-9	1995	0	1995
	Sulphuric Acid	7664-93-9	1948.8	0	1948.8
	Toluene	108-88-3	1343.3	0	1343.3
	CaCO3	471-34-1	245	0	245
P-Anisyl Alcohol	Para Anisaldehyde (PAA)	123-11-5	204	51	255
	Nickel Catalyst	Mixture	0.6	0.15	0.75
	Hydrogen	1333-74-0	4	1	5
P-Cresidine	P-Cresol	1319-77-3	45	27	72
	Nitric Acid	7697-37-2	60.2	36.12	96.32
	Sodium Hydroxide (48%)	Mixture	38.5	23.1	61.6
	Di methyl sulphate	77-78-1	90	54	144
	Tartaric acid	87-69-4	0.7	0.42	1.12
	Nickel catalyst	Mixture	0.82	0.492	1.312
	Toluene	108-88-3	125	75	200
	Hydrogen gas	1333-74-0	1	0.6	1.6
P-Anisic Acid	Sulphuric acid	7664-93-9	20.25	-	20.25
P-Anisyl Acetate	P-anisyl alcohol	105-13-5	7	-	7
	Acetic anhydride	108-24-7	6	-	6
	Sodium bicarbonate	144-55-8	0.5	-	0.5
Manganese Sulphate	Manganese Oxide	1313-13-9	220	200	420
Anethole	Anisole	100-66-3	-	46.5	46.5
	Propionic anhydride	123-62-6	-	1	1
	Catalyst	6192-52-5	-	45	45
	Methanol	67-56-1	-	4.5	4.5
	Hydrogen	1333-74-0	-	30	30
	Nickel Cat.	Mixture	-	90	90
	KHSO4	7646-93-7	-	80	80
Avobenzone	4-tert butyl benzoic acid	98-73-7	-	8.85	8.85
	Methanol	67-56-1	-	22.5	22.5

Name of the products	Raw Materials	CAS No.	Quantity (MT/Month)		
			Existing	Proposed	Total after Expansion
	Sulphuric acid	7664-93-9	-	1.5	1.5
	Soda ash	497-19-8	-	1.5	1.5
	4-Methoxy acetophenone	100-06-1	-	7.5	7.5
	Sodium Methoxide	124-41-4	-	0.75	0.75
4-Methoxy Acetophenone	Anisole	100-66-3	230	-	230
	Acetic Anhydride	108-24-7	44.1	-	44.1
	Zeolite Catalyst	1318-02-1 or 68989-22-0	0.5	-	0.5
P-Toluene Sulphonic Acid	Toluene	108-88-3	900	-450	450
	Sulphuric Acid	7664-93-9	612	-306	306
Octyl Methoxy Cinnamate	P-Anisaldehyde	123-11-5	191.5	-76.6	114.9
	Ethyl Acetate	141-78-6	85	-34	51
	Sodium Methoxide	124-41-4	5	-2	3
	2-Ethyl Hexanol	104-76-7	95	-38	57
P-Cresyl Acetate	p-cresol	1319-77-3	1.2782	-	1.2782
	Acetic anhydride	108-24-7	1.328	-	1.328
	Toluene	108-88-3	1.66	-	1.66
	Sodium Carbonate	497-19-8	0.0664	-	0.0664
P-Cresyl Phenyl Acetate	p-cresol	1319-77-3	3.33	-	3.33
	p-Toluenesulphonic acid	6192-52-5	0.267	-	0.267
	Phenyl acetic acid	103-82-2	2.667	-	2.667
	Toluene	108-88-3	6.75	-	6.75
	Sodium carbonate (5%)	Mixture	0.213	-	0.213
	methanol	67-56-1	5.67	-	5.67
P-Anisyl Propanal	p-Anisaldehyde	123-11-5	4.8	-	4.8
	Propanaldehyde	123-38-6	2.12	-	2.12
	Sodium hydroxide	1310-73-2	0.064	-	0.064
	Sodium carbonate	497-19-8	0.288	-	0.288
	Methanol	67-56-1	17.772	-	17.772
	Acetic acid	64-19-7	0.092	-	0.092
	Toluene	108-88-3	16	-	16
	Pd/C	Mixture	0.088	-	0.088
	Hydrogen	1333-74-0	0.064	-	0.064
4-Methoxy Phenyl Acetonitrile	p-Anisyl alcohol	105-13-5	25	10	35
	Hydrochloric acid	Mixture	27.5[3]	11	38.5
	Sodium Cyanide	143-33-9	10.5	4.2	14.7
	Toluene	108-88-3	38.25	15.3	53.55
	p-Toluenesulphonic acid (PTSA)	6192-52-5	0.25	0.1	0.35
	methanol	67-56-1	47.25	18.9	66.15
P-Cresyl Caprylate	p-cresol	1319-77-3	0.5	-	0.5
	Caprylic acid	124-07-2	0.8	-	0.8
	Toluene	108-88-3	1.78	-	1.78
	Sodium bicarbonate	Mixture	0.15	-	0.15

[3] By product of 4-Methoxy Phenyl Acetonitrile

Name of the products	Raw Materials	CAS No.	Quantity (MT/Month)		
			Existing	Proposed	Total after Expansion
	Solution (5%)				
	Sulphuric Acid	7664-93-9	0.02	-	0.02
P-Cresyl Isobutyrate	p-cresol	1319-77-3	0.65	-	0.65
	Isobutyric acid	79-31-2	0.7	-	0.7
	Toluene	108-88-3	2.4	-	2.4
	Sodium bicarbonate Solution (5%)	Mixture	0.39	-	0.39
	Sulphuric Acid	7664-93-9	0.02	-	0.02
P-Cresyl Formate	P-Cresol	1319-77-3	0.86	-	0.86
	Formic acid	Mixture	0.37	-	0.37
	Sodium Carbonate	497-19-8	0.086	-	0.086
P-Anisyl Formate	P-Anisyl Alcohol	105-13-5	1.135	-	1.135
	Formic acid	Mixture	0.375	-	0.375
	Sodium Carbonate	497-19-8	0.11375	-	0.11375
P-Anisyl Phenyl Acetate	p-anisyl alcohol	105-13-5	1.15536	-	1.15536
	Phenyl acetic acid	103-82-2	1.59028	-	1.59028
	BTM catalyst	885051-07-0	0.05976	-	0.05976
	Triethyl amine (TEA)	121-44-8	0.33366	-	0.33366
	Toluene	108-88-3	4.7808	-	4.7808
	Sodium bicarbonate	144-55-8	0.38844	-	0.38844
4-Methoxy Phenyl Acetic Acid	P-Anisyl Nitrile	874-90-8	2.76	11.04	13.8
	Sulphuric Acid	7664-93-9	1.5	6	7.5
4-Methoxy Phenyl Ethyl Amine	P-Anisyl Nitrile	874-90-8	5.555	-	5.555
	Hydrogen	1333-74-0	0.165	-	0.165
	Ruthenium Catalyst	7440-18-8	0.055	-	0.055

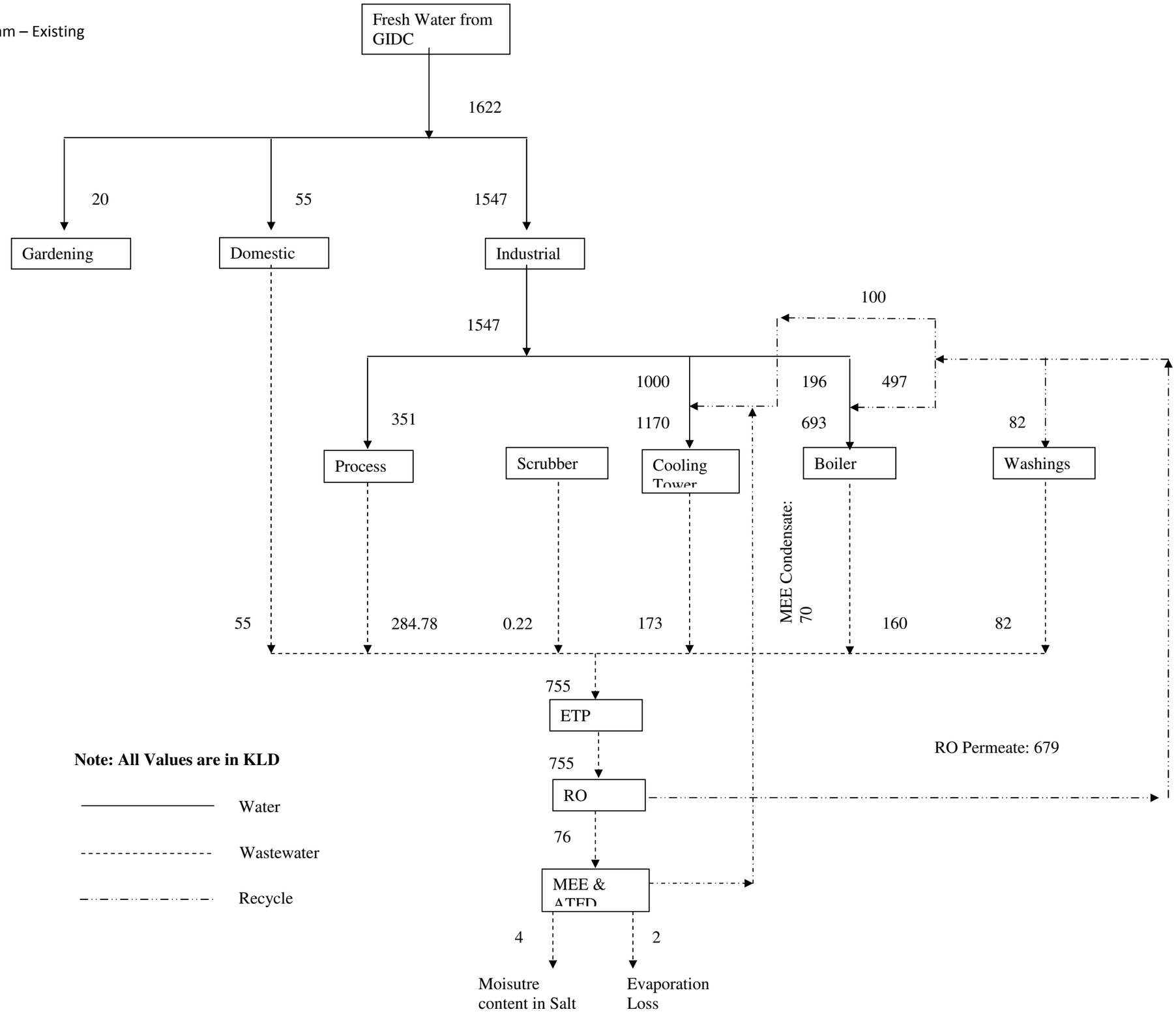
ANNEXURE –IV

WATER REQUIREMENT AND WASTEWATER GENERATION

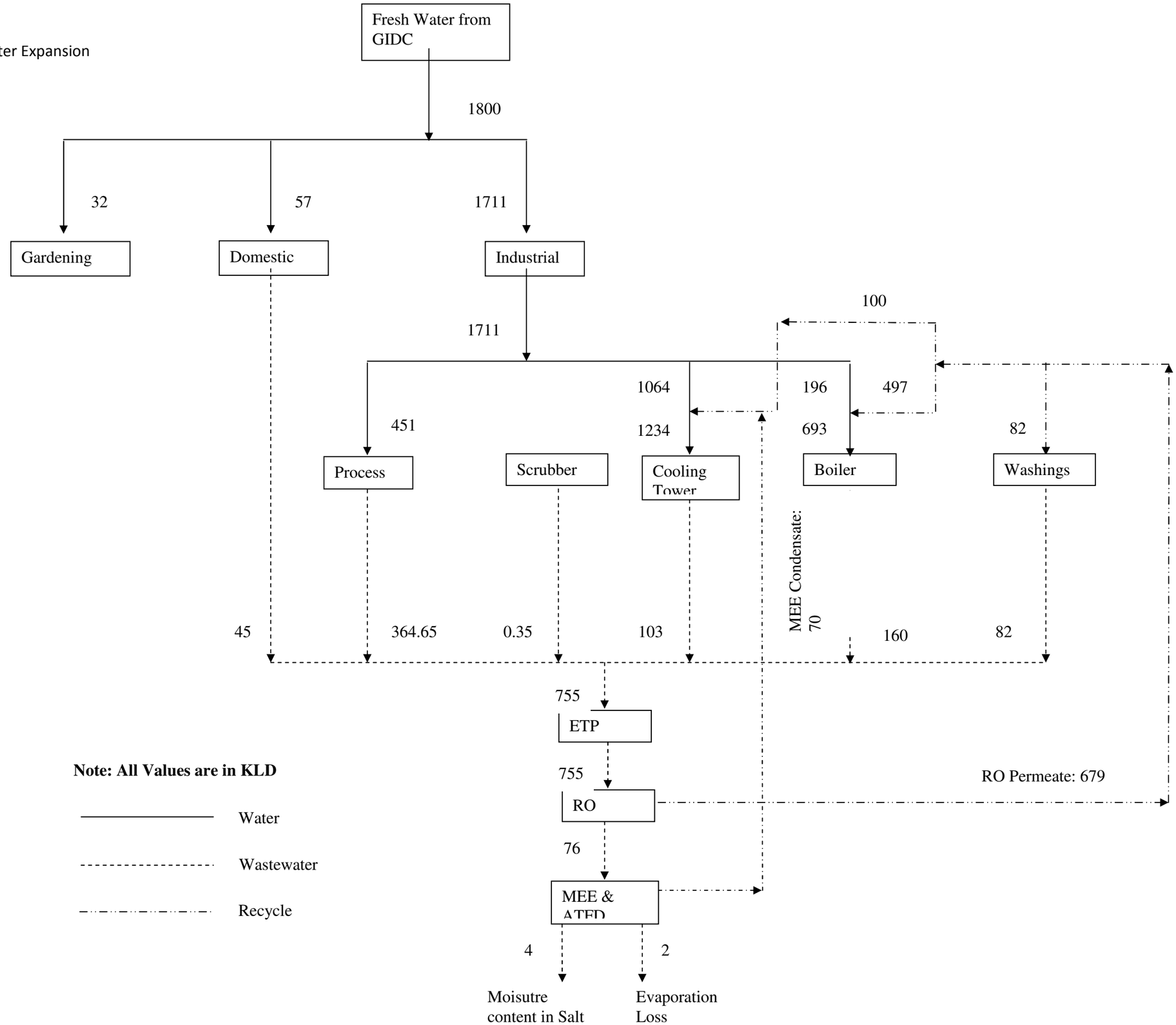
Sr. No.	Area of Consumption	Water Requirement (KL/d)		
		Existing	Proposed	Total after Expansion
1	Domestic activities	55	2	57
2	Greenbelt development	20	12	32
3	Industrial activities			
a.	Process	351	100	451
b.	Boiler	693 (196 Fresh + 497 recycled)	0	693 (196 Fresh + 497 recycled)
c.	Cooling Tower	1170 (1000 Fresh + 170 recycled)	64	1234 (1064 Fresh + 170 recycled)
d.	Washing	82 (82 recycled)	0	82 (82 recycled)
e.	Scrubber	0	0	0
Total Water Required		2371	178	2549
Total Fresh Water Required		1622	178	1800

Sr. No.	Area of Generation	Wastewater Generation (KL/d)		
		Existing	Proposed	Total after Expansion
1	Domestic activities	55	-10	45
2	Process	284.78	79.87	364.65
3	Boiler	160	0	160
4	Cooling Tower	173	-70	103
5	Washing	82	0	82
6	Scrubber	0.22	0.13	0.35
Total (domestic + industrial)		755	0	755

Water Balance Diagram – Existing



Water Balance Diagram – After Expansion



ANNEXURE –V

DETAILS OF SOLID & HAZARDOUS WASTE GENERATION DURING OPERATION

Schedule & Category	Type	Source	Quantity (MT/Annum)			Disposal Facility
			Existing	Proposed	Total	
Sch-I 35.3	ETP Sludge	ETP	240	0	240	Collection, Storage within factory premises and transportation and final disposal at common TSDF of BEIL /SEPPL for landfilling
Sch-I 37.3	Salt	MEE & ATFD	24000	-16800	7200	Collection, Storage within factory premises and transportation and final disposal at common TSDF of BEIL /SEPPL for landfilling
Sch-I 1.2	Tarry residues & still bottoms from distillation	Production of Para Anisaldehyde, Para Cresidene, Para Cresyl Acetate, Para Cresyl Phenyl Acetate, Para AnisylPropanal, 4-Methoxy phenyl Acetonitrile, p-CresylCaprylate, p-CresylIsobutyrate, P-Anisyl phenyl acetate, Anethole, Avobenzone	600	240	840	Collection, Storage within factory premises and transportation and final disposal at common incineration at common incinerator of BEIL /SEPPL for incineration
Sch-I 26.1	Gypsum Sludge	Para Anisaldehyde	10200	-1800	8400	Collection, Storage within factory premises and transportation and final disposal at common TSDF of BEIL /SEPPL for landfilling
Sch-I 26.1	Process residue	Production of P-Cresyl Formate, , P-Anisyl Formate, P-Anisyl phenyl acetate, Avobenzone	1.08	5.4	6.48	Collection, Storage within factory premises and transportation and final disposal at common incineration at common incinerator of BEIL /SEPPL for

Schedule & Category	Type	Source	Quantity (MT/Annum)			Disposal Facility
			Existing	Proposed	Total	
						incineration
Sch-I 26.1	Process waste	Production of Manganese Sulphate	1320	1200	2520	Collection, Storage within factory premises and transportation and final disposal at common TSDF of BEIL /SEPPL for landfilling
Sch-IV Sr. No. 10	Spent Catalyst	Production of P-Anisyl Alcohol, Para Cresidene, 4-Methoxy Acetophenone, Para Anisyl Propanal, 4-Methoxy phenyl ethyl amine, Anethole	30	0	30	Collection, Storage within factory premises and sold to Registered recycler
Sch-I 5.1	Used/Spent Oil	Plant	9.6	0	9.6	Collection, Storage within factory premises and sell to Registered re-refiners
Sch-I 33.1	Discarded Containers/ Liners/barrels/glass wool packing material	Raw material storage area	120	60	180	Collection, Storage within factory premises and sold to Registered recycler
Sch-I 36.2	Spent Carbon	Carbon filter of ETP	4.8	55.2	60	Collection, Storage within factory premises and transportation and final disposal at common incineration at common incinerator of BEIL /SEPPL for incineration
Sch-I 36.2	Filter & Filter material	RO plant	0.3	0	0.3	Collection, Storage within factory premises and transportation and final disposal at common incineration at common incinerator of BEIL /SEPPL for incineration
Sch-I 3.3	Sludge & Filter	RO plant	0.48	0	0.48	Collection, Storage within factory

Schedule & Category	Type	Source	Quantity (MT/Annum)			Disposal Facility
			Existing	Proposed	Total	
	contaminated with oil					premises and transportation and final disposal at common incineration at common incinerator of BEIL /SEPPL for incineration
Sch-I 35.2	Spent Ion Exchange resin	DM Plant	0.3	0	0.3	Collection, Storage within factory premises and transportation and final disposal at common incineration at common incinerator of BEIL /SEPPL for incineration
Sch-I 35.4	Oil & grease skimming residue	ETP	0.6	0	0.6	Collection, Storage within factory premises and transportation and final disposal at common incineration at common incinerator of BEIL /SEPPL for incineration
-	Evaporated Mother Liquor generated from MEE	From MEE (MEE concentrate)	1440	0	1440	To inhouse ATFD
-	Wastewater containing $NaNO_2$ & $NaNO_3$	NO_x Scrubber attached with Para Cresidine plant	79.2	46.8	126	To inhouse ETP
-	Wastewater containing Na_2SO_3	SO_2 Scrubber attached with Cresols plant	5220	4870	10090.8	Reuse in neutralization process of cresol plant
-	Ethanol	By-product from OMC plant	186	-74	112	Sell to authorized recycler under Rule-9
-	19-20% HCl	By-product from 4-Methoxy phenyl acetonitrile	330	-330	0	Existing: Reuse in production of 4-Methoxy phenyl acetonitrile Total after expansion: Due to change in process generation of HCl is as by-product is

Schedule & Category	Type	Source	Quantity (MT/Annum)			Disposal Facility
			Existing	Proposed	Total	
						terminated
			255	-255	0	Existing: Sell to authorized recycler Total after expansion: Due to change in process generation of HCl is as by-product is terminated

ANNEXURE – VI

EMISSIONS FROM COMBUSTION OF FOSSIL FUELS FROM STATIONARY OR MOBILE SOURCES

FLUE GAS EMISSION

S. No.	Particular	Capacity and Quantity			Nos. of Stack and Stack Height (m)			Expected Pollutant
		E	P	T	E	P	T	
1.	Boiler	12 TPH x 2 Nos.	-	12 TPH x 2 Nos.	33 m Common Stack	-	33 m Common Stack	SPM ≤ 150 mg/Nm^3 SO_2≤ 100 ppm NO_x ≤ 50 ppm
		16 TPH x 4 Nos.	-	16 TPH x 4 Nos.	33 m Common Stack	-	33 m Common Stack	
2.	Cogen	0.9 MW x 4 Nos.	-	0.9 x 1 No. Working + 0.9 x 3 Nos. Standby	22 m x 4 Nos.	-	22 m x 1 No. Working + 22 m x 3 Nos. Standby	
3.	Cresol plant fusion pot	-	-	-	16 m x 14 Nos.	-	16 m x 14 Nos.	
4.	Cresol Fusion Furnace	-	-	-	16 m x 6 Nos.	16 m x 10 Nos.	16 m x 16 Nos.	
5.	D. G. Set	1250 KVA	-	1250 KVA	17 m x 1 No.	-	17 m x 1 No.	

Note:

- E: Existing
- P: Proposed
- T: Total after Expansion

PROCESS GAS EMISSION (EXISTING)

Sr. No.	Stack attached to	Stack Height (m)	Expected Pollutant	APC System
1.	Nitration (PCD Plant)	15	$NO_x \leq 25$ mg/Nm^3	Caustic scrubber
2.	Sulphonation reactor of Cresol Plant	15	$SO_2 \leq 40$ mg/Nm^3	Caustic scrubber

ANNEXURE – VII

PROPOSED TERMS OF REFERENCE FOR EIA STUDIES

A. PROJECT DESCRIPTION

1. Justification of project.
2. Promoters and their back ground.
3. Project cost.
4. Project location and Plant area with site details of 10 km area along with site map.
5. Product spectrum along with production Capacity and production process with mass balance.
6. Water source and utilization (Water Balance)
7. Pollution potential from the products
8. Complete Scheme for water treatment process.

B. DESCRIPTION OF THE ENVIRONMENT AND BASELINE DATA COLLECTION

The Baseline data may be collected within 10 km radius of the project site for one season except Monsoon. The following may be included for baseline data collection-

1. Micrometeorological data for wind speed, direction, temperature, humidity and rainfall.
2. Topography, Local area hydrology and storm water drainage.
3. Details of the water source available in the impact area (Depth of ground water table, data from the available secondary sources). Base line data for ground and surface water quality monitoring in and around the area. The monitoring may be carried out as per the CPCB guidelines.
4. Existing environmental status of air quality for PM, SO_2 and NOx Monitoring of these will be carried out as per CPCB Guidelines.
5. Monitoring of noise in and around the site as per CPCB guidelines.
6. Soil characteristics of in and around the site.
7. Other industries in the impact zone area
8. Prevailing environment quality standards

C. SOCIO ECONOMIC DATA

1. Existing socio-economic status, land use pattern and infrastructure facilities available in the study area were surveyed.
2. Change in the status due to the expansion project.

D. IMPACTS IDENTIFICATION AND MITIGATORY MEASURES

1. Identification of impacting activities from the proposed project during construction and operational phase.
2. Impact on air (Organic and inorganic pollutants) and mitigation measures including green belt.
3. Surface water abstraction and its impact on water sources.
4. Waste water generation, its treatment and final disposal. Details of ETP design may also be given.

5. Impacts of waste water and its mitigation measures.
6. Soil pollution source and mitigation measures.
7. Noise generation and control.
8. Solid waste generation, its characteristics, quantification and disposal methods.
9. Sources of fugitive emissions and its control.

E. ENVIRONMENTAL MANAGEMENT PLAN

1. Details of proposed pollution control measures
2. Environment management team
3. Proposed schedule for environmental monitoring for air, water, soil and noise.

F. RISK ASSESSMENT

1. Objectives and methodology of risk assessment
2. Details on storage facilities
3. Process safety, transportation, fire fighting systems, safety features and
4. Emergency measures to be adopted.
5. Identification of hazards
6. Risk assessment and consequence analysis.
7. Vulnerability Distances superimposed on the site map.
8. Recommendations on the basis of risk assessment. Safety precautions for the storage of Chemicals and process.
9. Disaster Management Plan.

G. PROJECT BENEFITS

H. OCCUPATIONAL HEALTH AND SAFETY PROGRAM FOR THE PROJECT.