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Research Paper

Case Study: Environment Impact assessment report of Resin Manufacturing unit.

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A B S T R A C T

This Environmental Impact Assessment (EIA) Study Report is prepared for M/s. ABC Limited which is the existing unit located at Village: Ajapar, Taluka: Anjar, Kutch, Gujarat - 370110.

M/s. ABC Limited has an existing unit involved in the manufacturing of plywood with a capacity of 1250 m^3/ month. The proposed expansion for manufacturing of `different types of` Resin such as Urea Formaldehyde, Melamine Urea Formaldehyde, and Phenol-Formaldehyde with the capacity of 100 MT/ month, 50 MT/ month, and 50 MT/ Month respectively [i.e. Plywood: 1250 m^3/month existing and Resin: 200 MT/month proposed] at their existing land.

The proposal by M/s. ABC Limited need prior Environment Clearance because it falls under project activity 5(f), Category B1 as per EIA Notification 2006 and its amendment dated 25 June 2014 as the site is located outside the notified industrial estate,

1. Water consumption is less than 25 m^3/day;
2. Fuel consumption less than 25 TPD;
3. Materials and storage quantity do not cover in the category of MAH units as per the Management, Storage, and Import of Hazardous Chemical Rules.

The Environmental Impact Assessment (EIA) is to provide information on the potential positive and negative environmental and social impact of the project.

EIA also helps to identify externalities associated with the project related to environmental and social issues, quantify them and internalize the cost of such externalities in the project cost during the design stage itself. This would help the project proponent to make informed economic decisions during the design as well as operation stage.

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1 Introduction

Resin is used predominantly in the wood-based product manufacturing industry as an adhesive. The growth of the resin market is strongly correlated to construction/remodeling activity (which accounts for over 50% of consumption), and to a lesser degree, to the automotive industry. The products like resin (Urea Formaldehyde, Melamine Urea Formaldehyde, and Phenol-Formaldehyde resins) are mainly used to manufacture plywoods, blockboards, and laminated sheets. These sheets have good market demand to develop the home and office furniture.

The Indian plywood and laminates industry manufactures various engineered woods like plywood, laminates, MDF, and veneers. Plywood is the most demanded product of this industry followed by laminates. Good quality raw materials are available at cheaper rates in India, enabling manufacturing at a low cost. This increases the profit margin as compared to other players in the world. To meet the current and future market demand, the project proponent intends to expand the existing unit.

The market for plywood and laminates is mainly driven by increasing demand from the housing market. The demand has increased due to the growing significance of the new construction industry. Plywood and laminates have become an indispensable part of big and evolving markets like the real estate market, furniture market, and modular kitchen market as well as the flooring market. The increased demand in these markets triggers the demand in the plywood and laminates market.

The proposed project will contribute revenue to the central and state exchequer in the form of applicable taxes. Indirect contribution to the central and state exchequer will be there due to income by way of registration of trucks, payment of road tax, income tax from the individual as well as taxes from associated units. Thus, the proposed project expansion will help the government by paying different taxes from time to time, which is a part of revenue and thus, will help in the development of the economy as well as local physical infrastructure for further boosting of industrial development with the sustainable approach as the industries need to maintain good environment and safe condition to get the better market place.

The existing unit is involved in the manufacturing of plywood with a capacity of 1250 m^3/ month. The proposed expansion is a different type of Resin [200 MT/month] for captive as well as trading/selling purposes at their existing manufacturing unit. The details of existing and proposed products are given in **Table 1.1** The proposed activity falls under 5(f) Synthetic Organic Chemicals as EIA Notification 2006, amended to date, and will be treated as a category B1 project. A public Hearing is applicable as it is located outside the notified industrial area.

Table: 1.1 Details of Product

Sr. no.	Name of the Products	CAS / CI no.	Quantity			End-use of the products
			Existing	Proposed	Total	
1	Plywood	--	1250 m^3/Month	0.0	1250 m^3/Month	Furniture
2	Urea Formaldehyde Resin	9011-05-6	0.0	100 MT/M	100 MT/M	Bonding of plywood, particleboard, and other structured wood products
3	Melamine Urea Formaldehyde Resin	25036-13-9	0.0	50 MT/M	50 MT/M	Bonding of plywood and wood products
4	Phenol-Formaldehyde Resin	9003-35-4	0.0	50 MT/M	50 MT/M	Bonding of plywood and wood products
Total			**1250 m^3/Month**	**200 MT/Month**	**1250 m^3/Month& 200 MT/M**	

Applicable Environmental Regulations and standards

For prevention and control of environmental pollution, the following Acts and Rules of government the proposed project activity:

- The Water (Prevention & Control of Pollution) Act, 1974 was amended in 1988.
- The Air (Prevention & Control of Pollution) Act, 1981.
- The Environment (Protection) Act, 1986and its amendments from time to time
- The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.
- The Solid Waste (Management and Handling) Rules, 2016.
- Construction and Demolition Waste Management Rules, 2016
- The Noise Pollution (Regulation and Control) Rules, 2000 and its Amendments.
- The Batteries (Management and Handling) Rules, 2001
- The Energy Conservation Act, 2001.
- The National Environment Appellate Authority Act, 1997.
- The Public Liability Insurance Rules, 1991.
- The Factories Act, 1948.
- The Petroleum Act, 1934 and the Petroleum Rules, 2002.
- Chemical Accidents (Emergency Planning, Preparedness, and Response) Rules, 1996
- The Motor Vehicle Act, 1988 and The Central Motor Vehicle Rules, 1989
- Environment Impact Assessment Notification S. O. No. 1533 (E) dated 14th September 2006 and subsequent Amendments.

2. Plant Layout & Land Distribution of the site

The proposed expansion will be carried out in the existing premises. The existing plot area of 26585 m^2. The plot allotment letters are enclosed as Annexure 2**.** The detailed plant layout is provided as f**.** The total area of 9929 m^2 (@ 37.3 % of 26585 m^2) will be developed as a greenbelt. The project proponent will continue to be part of the common greenbelt development program promoted by the industrial association.

Table: 2.1 Plant Layout Details

Sr. No.	Description	Area, sq. m.			Percentage %
		Existing	Proposed	Total	
1	Shed 1	5600	-	5600	21.1
2	Shed 2	2500	-	2500	9.4
3	Shed 3	2000	-	2000	7.5
4	Wood logging Tank	300	-	300	1.1
5	Workers Colony	790.7	-	790.7	2.97
6	Staff Room	150	-	150	0.6
7	Green Belt	9929	-	9929	37.3
8	Office Area	150	-	150	0.6
9	Road	1800	-	1800	6.8
10	Open Area	3350	-1200	2150	8.10
11	Resin Manufacturing Area	-	1200	1200	4.51
12	OHC	15.30	--	15.30	0.03
	Total	**26585**	**0**	**26585**	**100**

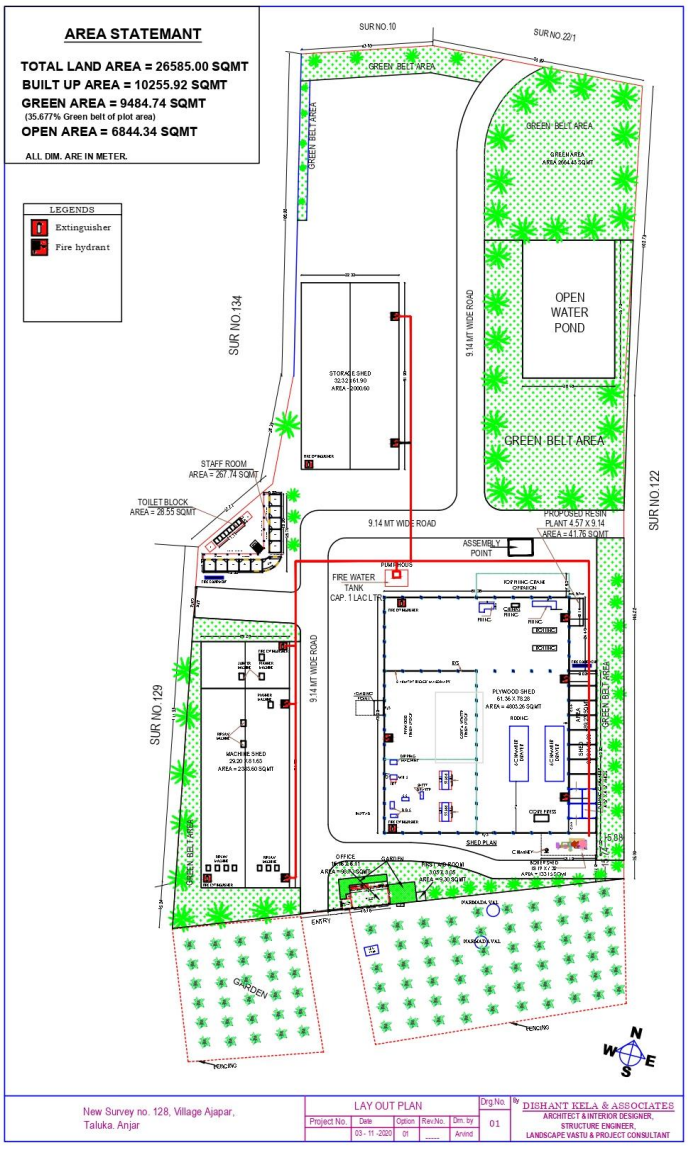


Figure: 1 Plant Layout of the site.

3. Raw Material Details

Table 3.1 Quantity of Raw Material for proposed projects.

Sr. no.	Name of the Products	Name of the Raw Materials	CAS no. / CI no. of raw materials.	Quantity MT/Month		
				Existing	Proposed	Total
		Logs	--			
		Veneer	--			
		Face	--			
		Glue	--	75MT/M	0	75MT/M
		Formaldehyde	50-00-0	0	72	72
		Sodium Hydroxide	1310-73-2	0	0.1	0.1
		Acetic Acid	64-19-7	0	0.1	0.1
		Urea	57-13-6	0	28.8	28.8
		Formaldehyde	50-00-0	0	36	36
		Sodium Hydroxide	1310-73-2	0	0.1	0.1
		Acetic Acid	64-19-7	0	0.1	0.1
		Melamine	108-78-1	0	6	6
		Urea	57-13-6	0	9	9

Sr. no.	Name of the Products	Name of the Raw Materials	CAS no. / CI no. of raw materials.	Quantity MT/Month		
				Existing	Proposed	Total
4	Phenol Formaldehyde Resin	Phenol	108-95-2	0	13.75	13.75
		Formaldehyde	50-00-0	0	34.25	34.25
		Sodium Hydroxide	1310-73-2	0	0.83	0.83

Table 3.2 Storage Details of Raw Material

Sr. No.	Name of Raw Material	Maximum Storage (kg or lit)	Physical State	MOC	Size of Packing (kg or lit)	No. of Bags/ Barrel/ Tanks	Transport By
1	Phenol	3.0	Liquid	MS Tank	3 MT	1	Road
2	Formaldehyde	4.0	Liquid	SS Tank	4 MT	1	Road
3	Sodium Hydroxide	0.3	solid	HDPE Bag	25 Kg	12	Road
4	Acetic Acid	0.2	Liquid	HDPE Drum	200 Liter	1	Road
5	Melamine	1.5	Solid	HDPE Bag	50 Kg	30	Road
6	Industrial Urea	9.5	Solid	HDPE Bag	50 Kg	100	Road

4. Manufacturing Process

Urea – Formaldehyde Resin

i. 1 part of Formaldehyde (37%) by weight is charged into the resin kettle pH of the formaldehyde is raised to 7.0 to 7.5, by the addition of sodium hydroxide solution in water (30 to 35%).

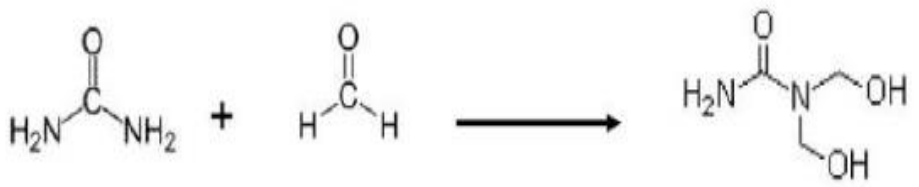
ii. Now 0.36 part of urea by weight is added and mixing is carried out to get a clear solution.

iii. The solution is refluxed at 90 to 95˚C for about one hour to complete the formation of Dimethylol – urea.

iv. In the next stage, solution pH is maintained at 4.5 to 5.0 by the addition of glacial Acetic Acid diluted with water to 50% concentration by volume.

v. Refluxing is continued at a temperature of 90 to 95 °C till the water tolerance of the resin is about three to four times in hot conditions and the flow time of resin is around 17 to 18 seconds in a B-4 ford cup.

vi. At this stage reaction is arrested by raising the pH of the resin to about 7.0 to 8.0 by adding Sodium Hydroxide and the residual second part 0.04 part by weight of Urea is added to the resin and cooled to ambient temperature by circulating water in coils/ jacket and discharged from the kettle

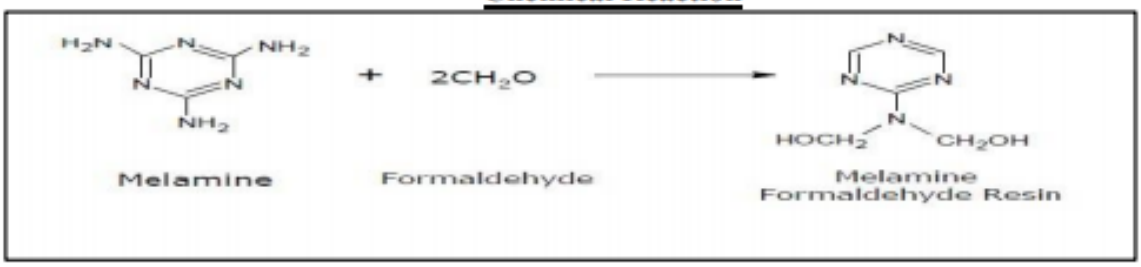


Urea Formaldehyde Urea Formaldehyde Resin

Melamine Urea Formaldehyde Resin

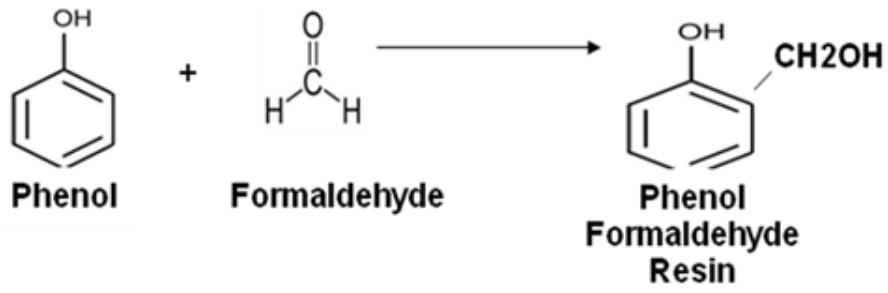
- 1 part by weight of formaldehyde of 37 % is charged into the kettle. the pH of the formaldehyde is raised from 8.0 to 8.5 by adding 30 to 35 % solution of Sodium Hydroxide in water.
- Now 0.25 parts by weight of urea and 0.15 parts by weight of melamine are charged in the resin kettle.
- Now the mixture is heated at about 70 °C, Now the solution becomes transparent. Heating is continued and the solution is heated up to 90 to 95 °C for about two hours to complete the formation of methyl urea and methylolmelamine.
- In the next stage, the solution is mixed with a small quantity of Acetic Acid of 50% concentration in water to lower the pH from 7.0 to 7.5, and the heating is continued further till desired properties.
- At this stage, condensation is continuously checked till flow time in the B4 cup is 17 to 18 seconds, and tolerance is three times of water.
- Now condensation reaction is arrested by raising the pH of the solution to 8.0 to 8.5 by adding sodium hydroxide. This will be a closed condensation to remove the emission of VOCs
- The resultant solution is cooled to ambient temperature by circulating water in jacket/ coils now 0.025 part of urea is added as second urea and is stirred into resin to obtain transparent resin solution. Now resin is discharged from a kettle.

Chemical Reaction



Phenol Formaldehyde Resin

- Phenol (as per % of purity) is charged into the kettle followed by Formaldehyde (37%) in the ratio of 1:1.3 to 1:2.5.
- Stirring is continued throughout the cycle, 50% solution of sodium hydroxide in water is added.
- Steam is sent through the reactor coils/ jacket to raise the temperature to about 60 0C until the exothermic reaction becomes strong enough to cause the batch to heat up without further steam.
- The temperature is maintained at about 60 0C by circulating cold water in the coil/jacket.
- After the vigorous exothermic reaction, the condensation reaction is continued in the temperature range of 85 to 90 0C. This will be a closed condensation to remove the emission of VOCs
- When the viscosity of the resin is 17 to 18 seconds in B 4 ford cup and water tolerance is about 5 times resin is cooled to room temperature by circulating water and discharged from the kettle.



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Mitigation Measures for Air Pollution

- Install appropriate, effective equipment for complete combustion.
- Unit would be using imported coal / briquetteas a fuel in thermic fluid heater, hence multi cyclone separator + scrubber has been installed as Air Pollution Control Equipments with TFH.
- Wind breaking walls provided to ensure that the fugitive emissions are not travelling beyond the premises.
- The source of air pollution is TFH and DG Set, which consumes imported coal/ briquette and diesel/HSD respectively. Other source of pollution is process gas.
- Adequate Stack Height as air pollution control equipment for TFH and dust collector shall be provided as APCM for process gas emission.
- Plant area has well ventilated, cross air flow and exhaust fans have been provided for extra air flow.
- Green belt will be developed along the periphery

Mitigation Measures for Water Pollution

- Water requirement for the project will be met from Gujarat Water Infrastructure Limited.
- No process wastewater would be discharged to any surface waters.
- Domestic wastewater shall be sent to STP and treated sewage will be used in gardening purpose.
- 2 KLD from washing will be treated within premised and will be evaporated. Hence, Zero Liquid Discharge will be maintained.

Pollution Control measures for hazardous waste/chemicals

- ETP Sludge will be sent to active TSDF site and approved by the Board
- The unit will provide the dedicated area for hazardous waste storage within premises having impervious flooring, roof cover and leachate collection system.
- The tightly closed HDPE bags/drums will be labelled “ETP sludge / Hazardous waste” and shall be transferred to storage area by trolleys.
- The hazardous waste shall be disposed off to TSDF site according to their respective disposal methods.
- Discarded containers / bags shall be reused again in plant or sold to vendors after decontamination. The detailed decontamination procedure is given in Chapter-7.
- Suitable PPE shall be provided to all the workers handling hazardous waste.

Pollution Control measures for Soil & Noise

Soil

- As the unit is already working since more than 10 years; and have occupied land there is nonegative impact envisaged on soil & Geology of the study area. There would be only the installation of machineries for the proposed expansion and construction of the building which would be within premises.

Noise

- The following proposed activity will generate noise.
    - Operation of utilities
    - Operation of plants and machineries
- However, same would be localized within the factory premises.

Activity	Aspects	Impact	Impact Characteristics			
			Nature	Duration	Reversibility	Significance, Mitigative Measures
During Construction Phase						
Excavation	Fugitive and dusting due to site preparation activities	Increase in air pollutant levels as PM	Direct Negative	Short Term	Reversible	Low, Temporary only during construction phase Construction site will be fenced with physical barrier
Transportation of construction material	Emissions Due to Vehicular Movement	Increase in air pollutant levels as PM, CO, NOx	Direct Negative	Short Term	Reversible	Low, The vehicles used for transport shall follow the applicable guidelines given in The Motor Vehicles Act. PUC shall be obtained and renewed at regular intervals of time and management to ensure the same.
Storage of construction material on site	Fugitive emission due to storage of sand, cement and other material	Increase in air pollutant levels as PM	Direct Negative	Short Term	Reversible	Low, Temporary only during construction phase, Storage of material will be provided with cover on TOP.
Generation of Construction Waste	Construction material left over material, cutting and scrap metals etc	Low, Temporary only during construction phase, Soil Contamination	Direct Negative	Short Term	Reversible	Low, Consturiction waste will be used as filling material during foundation work, scrap matel will be stored at proper storage area and sent to recyclers.
Sewage	Generation of sewage due to lobours residing	Contamination on land / soil.-Increase in pollutant level of water if mixed with storm water.-Bad odours	Direct Negative	Short Term	Reversible	Low, STP will be installed and treated sewage will be used in gardening purpose.
During Operation Phase						
Transportation of Raw Material / Product	Air Emissions Due to Vehicular Movement used for transportation of raw material and product	Increase in air pollutant levels as PM, CO, NOx	Direct Negative	Short Term	Reversible	Low, The vehicles used for transporting raw materials / products shall follow the applicable guidelines given in The Motor Vehicles Act. PUC shall be obtained and renewed at regular intervals of time and management to ensure the same.
	Spillages of liquid raw material during Transportation	Contamination of Land / soil due to leakage / spillages if any. Contamination of ground water due to spillages	Direct Negative	Short Term	Reversible	Low, Trained transporters to be engaged for transport of raw materials / products, spill control & other emergency actions.Closed vehicles shall be used for transport of raw material and product. Any spillages / leakages to be attended immediately.
	Noise Generation during Transportation	-Increase in ambient noise levels	Direct Negative	Short Term	Reversible	Regular maintenance of vehicles. Avoiding of horn when not necessary.Transportation during day time would be done.

Activity	Aspects	Impact	Impact Characteristics			
			Nature	Duration	Reversibility	Significance, Mitigative Measures
	Health risk due to vehicular emission during transportation chances of accidents.	Health risk for humans, flora-fauna	Direct Negative	Long Term	Irreversible	Regular maintenance of vehicles. Licenced driver shall be engaged. Trained drivers to be engaged for the work.
Handling & Charging of Raw Materials/Products	Spillages of liquid or solid raw materials during handling and charging. Leakage due to improper flanges connection.	-Increase in pollutant levels of water if mixed with storm during rainy season. -Land / soil contamination due to spillages. -Increase in pollutant level of ground water if the liquid or solid material on mixing with water percolates the ground.	Indirect Negative	Long Term	Reversible	Low, management to ensure proper handling of the spillages during transfer, charging operation. Training to be imparted to workers.Storm water at the site to be managed properly by providing proper storm water management system. Manufacturing activity is going to be carried in closed building so there would less chances of mixing of storm water with any spilled raw material.The spillage to be cleaned immediately. Preventive maintenance of flange connections and glands of pumps. Besides, the management will also ensure proper usage of the Personnel Protective Equipments by the workers.Regular Work Place Monitoring, Leakages if any shall be attended immediately.
	Fugitive dust /vapour emissions during loading, unloading and transfer of raw materials	-Increase in ambient air pollutant levels as SPM, SO2, NOx, VOCs	Direct Negative	Long Term	Reversible	Proper handling of the spillages during transfer, charging operation and provision of a Dust Collection System for collection of the air borne materials wherever applicable. Closed containers shall be used. While loading and unloading of raw material workers shall be provided with personal protective equipments.
	-Generation of noise due to handling and charging of raw material	-Increase in ambient noise levels	Direct Negative	Short Term	Reversible	Low, Personal protective equipments to be provided to workers.
Storage of Liquid Raw Materials / Products	-spillages & Leakages of raw material during storage. -Disposal of drums / containers	Contamination on land / soil.-Increase in pollutant level of water if mixed with storm water.-Bad odours due to storage of raw material	Direct Negative	Long Term	Reversible	Liquid raw materials are stored in drums / barrels. Chemicals shall be stored, by taking necessary measures to avoid contamination of Land & water during monsoon. Proper ventilation to be provided in process area/ product storage area to prevent the bad odours and fugitive emissions. The storage area shall be closed with impervious flooring to avoid any leakage / spillage to

Activity	Aspects	Impact	Impact Characteristics			
			Nature	Duration	Reversibility	Significance, Mitigative Measures
						percolate in soil or land. The empty containers / drums shall be decontaminated and then disposed to registered / approved recyclers.
Storage of Solid Raw Materials / Products	Disposal of used bags and drums.	-Aesthetic environment -Increase in water pollutant level during washing and decontamination of bags / drums	Direct Negative	Long Term	Reversible	The empty bags after being decontaminated shall be sold to registered/approved recyclers. Relevant records to be maintained.The wastewater generated during decontamination of bags shall be treated into ETP.
Manufacturing Process	-Wastewater generation due to manufacturing activities. -Water consumption for manufacturing activity.	-Increase in water pollutant levels. -Decrease in natural resources.	Direct Negative	Long Term	Irreversible	Water required for manufacturing activity shall be provided by GWIL and hence Borewell water shall not be used. Generated industrial wastewater from manufacturing of products is treated in in-house Zero liquid Discharge System.
	Fugitive emissions/ VOCs	-Increase in air pollutant levels as SPM & VOCs. -Odour issues.	Direct Negative	Long Term	Reversible	The manufacturing activity is carried within industrial sheds/building and hence, fugitive emissions would not be impacting outside environment.Management to ensure proper handling of the spillages during transfer, charging operation and provision of a Dust Collection System for collection of the air borne materials wherever applicable. Proper ventilation system shall be provided.
	-Operation of equipments and machineries	-Increase in ambient noise levels.	Direct Negative	Long Term	Reversible	Personal protective equipments shall be provided to the workers within operating areas. Wherever, possible sound acoustic shall be provided to minimize the noise. Wherever possible plantation shall be done within premises to absorb the noise levels.
	Generation of hazardous and other wastes	Increase in health risk of humans.Leachate generation which may contaminate the ground water and land/soil	Direct Negative	Long Term	Reversible	Proper handling, storage and transportation of hazardous waste and disposal at approved TSDF / CHWIF site..
Operation of Utilities as TFH	Emission of pollutants (PM, SO2, NOx) along with flue gas	-Increase in ambient air pollutant levels as	Direct Negative	Long Term	Reversible	Imported coal/briquetteshall be utilized as a fuel for the TFH. Multi Cyclone Separator with scrubber shall be

5. Conclusion

The salient features of the impact on the environment due to the proposed expansion project can be summarized as follows:

- The construction phase will not impart significant impact as no major construction activities are envisaged. However, proposed mitigation measures will be followed.
- Land used is located within industrial land and hence no change in existing land use pattern. There would not be any resettlement and rehabilitation due to the proposed project.
- No adverse impacts will occur on the water environment
- The economic status of the local population will be improved due to the increased business opportunities. The industry will generate employment.
- No ecological sensitive areas are located within the study area. Various other environmental parameters like Forest/ National Park/ Sanctuary and Religious/Historical Places will not be affected.
- An Environmental Management Plan has been formulated to control all the pollution control measures and Environmental Management Cell has been set up to follow the formulated environmental plan.

Thus, the proposed expansion will have overall minor negative impacts on the environment and these impacts will be encountered with proper mitigate measures.

Overall, direct and indirect employment opportunities, improvement in basic infrastructures by the development of industry, etc. will be observed with negligible impact on the environment. It can be concluded that on positive implementation of mitigation measures and environmental management plan during the construction and operational phase, there will be negligible impact on the environment.

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