

# ENVIRONMENT MANAGEMENT PLAN FOR A SYNTHETIC RESIN INDUSTRY-A CASE STUDY OF MACRO POLYMER PVT LTD.

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## ABSTRACT

*In this paper, an Environmental Management Plan anticipate Resin producing substance in an chemical industry has been exhibited. Industrialization alludes to a procedure of progress in the innovation used to deliver products and administration. It is as often as possible considered as the substitution of cultivating and asset extraction by assembling and administration action. This change takes distinctive structures in better places at various circumstances. Topographies of industrialization and financial advancement are imperative in understanding future development designs in the business. In the comparative way, the opposite side is ecological contamination. The contamination in air, soil, noise and water influence the living framework and our biodiversity. The compound businesses like pitch creation, pharmaceutical ventures, dye and dye intermediates and chemical producing industries, and so forth are the significant contamination creating enterprises and are at high hazard. The methodical and powerful Environmental Management Plan can overcome the hazard and diverse sort of Environmental contaminations.*

**Keyword:** Economic development; EMP; Pharmaceutical industries; Resin production.

## 1. INTRODUCTION

Industrial development is associated with both positive and negative impacts on the environment [1][2]. The negative impacts should not hinder industrial development but they should be properly mitigated. The strong Environmental Management Plan (EMP) should be prepared for the proposed activity to minimize negative impacts and is formed on the basis of prevailing environmental conditions and likely impacts of proposed activity on various environmental parameters. EMP will also facilitate monitoring of environmental parameters (Environmental Management Plan [3]). EMP ought to incorporate plans for appropriate and logical treatment and transfer instrument for air, fluid and strong risky contaminations. Aside from this, green belt advancement, security part of the laborers, clamor control, fire insurance and so forth ought to likewise incorporate into it. Satisfactory budgetary arrangements ought to be made by advocate. A basic component of this procedure is to create measures to kill, counterbalance or decrease effects to satisfactory levels amid execution and operation of tasks. The reconciliation of such measures into venture usage and operation is upheld by plainly characterizing the ecological prerequisites inside an Environmental Management Plan (EMP), one might say that the proposed venture of M/s. Macro Polymers Pvt. Ltd. has altogether less contamination potential.

## 1.1 OBJECTIVES OF EMP

The objectives of the Environmental Management Plan are summarized below,

- To limit/minimize the degree, extent, magnitude or duration of adverse impacts.
- To treat all the pollutants i.e. liquid effluent, air emissions and hazardous waste with adoption of adequate and efficient technology.
- To comply with all the norms and standards stipulated by Gujarat Pollution Control Board/Central Pollution Control Board.
- To reduce any risk hazards and design the disaster management plan.
- Continuous development and search for new innovative technologies for a cleaner and better environment.
- Implement of cleaner production. Optimum use of natural resources.
- To promote green belt design in the industry.

## 2. STUDY AREA

M/s. Macro Polymers Pvt. Ltd. falls under 5(f) category- Synthetic organic chemicals industry Hence, unit requires Environmental Clearance from Central (MoEF) as per capacity defined for Category 'A'. M/s. Macro Polymers Pvt. Ltd. is proposed to start chemical resins manufacturing unit at Plot No. D-01 to D-06 A, Village: Chancharwadi, Tal: Sanand, Dist.: Ahmedabad, Gujarat. Total Land area: 26244.37 sqm. The estimated cost of the project for the proposed unit is estimated around Rs. 28 Crores.

Following are the manufactured products by the industries:-

**Table -1:** Name of the Product

Sr. No.	Name of Product	Production Capacity In MT/Month
	Resins	15000
1	Alkyd Resins	5000
2	Amino Resin	2000

### 2.1.1 MANUFACTURING PROCESS

The manufacturing process followed by the industry is as follows:-

#### A) Alkyd Resin

Fatty Acid/Oil + Polyols 250<sup>0</sup>C (Mono Glyceride formation – if oil is used) + Dibasic Acid + Catalyst – Esterification process at 200<sup>0</sup>-240<sup>0</sup>C – Solvent dilution.

**Table -2: Mass balance of Alkyd Resin**

Input	MT		Output	MT	
Vegetable Fatty Acids/oils	2000	→	<b>REACTOR</b>		
Pthalic anhydride or di/polyacid	665	→		<b>Alkyd Resin</b>	5000
Benzoic or mono acid	235	→		<b>Water Effluent (Distillation)</b>	250
Glycerine/penta or polyol	600	→		<b>No Process Emissions</b>	
Toluene/xylene/mto	1750	→			
<b>TOTAL</b>	<b>5250</b>			<b>5250</b>	

**B) Amino Resin**

Formaldehyde 37% + 20% Caustic solution + Butanol + Urea + Melamine + Catalyst – Maximum working temperature 120°C.

**Table -3: Mass balance of Amino Resin**

Input	MT		Output	MT	
Urea / Melamine	1000	<b>REACTOR</b>			
Formalin	1700		→	<b>Amino Resin</b>	2000
N-butanol/ Sabutanol/Iso- butanol/ any other grade of butanol	1200		→	<b>Water Effluent (Distillation)</b>	2000
Phenol	100		→	<b>No Process Emissions</b>	
<b>TOTAL</b>	<b>4000</b>				<b>4000</b>

**Effluent Load Generation**

This is the proposed load calculation for the above manufactured products and C.O.D load generation for the same to estimate the capacity of the Effluent treatment plant.

**Table -4: Effluent Load Generation**

Product Name	Effluent Generation Lit/MT	Effluent Generation KL/day
Alkyd Resin	250	10
Amino Resin	2000	80

Total amount of effluent generated from the above process is 90 KL/day.

**C.O.D Load****Table -5: C.O.D Load Generation**

Product Name	COD Product Assumption mg/MT	C.O.D mg/MT
Alkyd Resin	40000	10
Amino Resin	250000	500

As per the above calculation the generated C.O.D load generated shows that because of the presence of the solvent present in the effluent, we obtain high amount of C.O.D in Amino Resin.

### 3. ENVIRONMENT MANAGEMENT PLAN

Environment Management Plan and implementation of this plan is the technical heart of prevention and control of pollution. An essential element of this process is to develop measures to eliminate, offset or reduce impacts to acceptable levels during implementation and operation of projects.

#### 3.1 E.M.P during Construction Phase

The natural perspectives amid venture development stage might include: 1) Water contamination control, 2) Air contamination control, 3) Solid waste Management, 4) Noise contamination control, 5) Soil protection and 6) House-keeping.

- Water contamination should be for the most part because of water utilization for residential utilize and sewage created .Sewage should be dealt with and arranged by septic tank and drench pit to anticipate/take out the water contamination.
- Air contamination should be mostly because of criminal outflows from development exercises and development of vehicles. There should not be any material squashing or structure obliteration exercises at the venture site. General sprinkling of the water will be done to limit criminal discharges from vehicle development.
- The fundamental wellspring of strong waste might be trash created because of development exercises. The waste can be used for filling plinth and roads.
- The wellspring of commotion contamination might be primarily development exercises, operations of development apparatuses and vehicles. There should not be any high clamor producing exercises like impacting, smashing and pummeling. All development hardware might produce commotion level beneath CPCB standards. Vehicle transmission is less in the area.
- Top soil level should be evacuated and saved before beginning the development exercises. It might be utilized for improvement of garden/green belt inside processing plant premises.
- Adequate housekeeping hones might be embraced to maintain a strategic distance from any irritation because of development exercises.

#### 3.2 E.M.P during Operation Phase

##### 3.2.1 Air Environment

###### ❖ Stack emission

Coal/Lignite/bio-coal/ agro-residue will be used for boiler and TFH. The major point source is boiler and TFH. The unit will install cyclone separator and centrifugal scrubber to achieve flue gas emission standards. In order to reduce the air pollution, the factory will develop green belt in and around its premises. The green belt area will be developed considering the following guidelines,

- i) Green cover should be created at all the available open spaces.
- ii) To make green belt dense maximum possible trees will be planted at all possible patches.
- iii) Strict surveillance will made to increase the survival rate of the trees.
- iv) Plants with higher height, medium and low height will be planted to ensure thick belt for attenuation of fugitive emission. This activity demands expert advice and guidance.

###### ❖ Process emissions

There will be no process emission from manufacturing activity.

###### ❖ Fugitive emissions

Most of the raw materials/products shall

be in liquid/semi liquid phase and there will not be any fugitive emissions of PM. All powder/solid materials will be handled in closed system to prevent any fugitive emissions of PM. All solvents shall be also handled by closed system to prevent fugitive emissions of VOC. Pakka road will be made to control the fugitive emission. Water sprinkler will be provided to reduce the dusting from road transportation. Timely inspection and maintenance of valves, pipes etc. shall be carried out. Regular periodic monitoring of work place for identified contaminant to check the fugitive emission.

### 3.2.2 Water Environment

There shall not be any water required as a medium for chemical reaction, for product washing / purification, equipment cleaning and floor washing. Water will be used only for utilities and domestic consumption. Hence, water demand of the industry shall be very low with respect to production capacity. The unit will require 45 KLD fresh water. This fresh water requirement will be satisfied through bore well. The unit has total 28,166 m<sup>2</sup> of area. With considering average 75 cm per year rain fall, total rain water will be approx. 21,000 m<sup>3</sup> per year. With considering maximum 45 m<sup>3</sup> per day fresh water requirement, total maximum 16,500 m<sup>3</sup> per year fresh water will required. As harvested/ recharged rain water is more than total water requirement, the unit will have positive water balance and there shall not be any stress on ground water due to proposed project.

The industry shall install state-of-the-art effluent treatment plant to treat industrial effluent and domestic sewage. The effluent treatment plant shall comprise two stage bio-chemical treatment (i.e. Anaerobic + Aerobic), tertiary treatment and Nano-filtration. The reclaimed water shall be reused for meeting water demand of utilities and rejected stream from Nano-filtration, which shall meet the statutory norms, shall be reused for scrubbing flue gases and irrigation of green belt. The industry shall adopt the practice of maintaining the records for the total water withdrawal, consumption at various sources, effluent generation, reclaimed water generation / reuse and NF reject reused for flue gas scrubbing and green belt irrigation.

**Table -6: Results of water analysis**

Sr. no	Parameter Analysis	Analysis Value	Unit
1	P.H	7.32	
2	Odor	Agreeable	
3	T.D.S	3130.00	Mg/l
4	Total Hardness	232	Mg/l as CaCO <sub>3</sub>
5	Chlorides	400	Mg/l
6	Sulphates	239	Mg/l
7	Total Alkanity	136	Mg/l as CaCO <sub>3</sub>

Raw water analysis was done to check is the quality of water for domestic as well as industrial Requirement.

As per the water quality analysis done, the ground water available at the site has high amount of chlorides and Total dissolved solids which is not as per the permissible limits of Drinking Water (IS: 10500 – 1991). R.O has to be installed at the site for drinking and other Domestic purpose and even in the construction activities like concrete making, sprinkling, curing etc. at the site. Following test have been performed in the lab of p.H, T.D.S, Total hardness, Chlorides, Sulphates, Total alkanity



Fig -1: Water balance Diagram

\*There shall not be any water required in process / reaction. Wastewater will be generated from the manufacturing process due to presence of moisture contents in the raw materials (i.e. glycerine, alcohols etc.) and as a by-product of esterification reaction.

\*\*126 KL/d wastewater will be generated which will be treated in ETP and finally passed through Nano-filtration (NF) along with 12 KL/d fresh water.

NF Permeate will be around 100 KL/d and used as feed water for utilities.

Estimated NF reject will be around 38 KL/d which will be utilized for on campus irrigation / wet scrubbing of boiler and thermic heater flue gases.

### 3.2.3 Hazardous/Solid Waste Management

Hazardous waste is hurtful for regular habitat and produces long haul and here and now unfavorable effects. So it is important to appropriately oversee and arrange dangerous waste for contamination aversion. There should not be any era of dangerous waste from the center mechanical exercises like material taking care of, off detail materials/items, by items shaped amid assembling process, gushing treatment and air contamination control frameworks.

The main perilous waste produced from center modern exercises should be off determination tar in a low amount. It will be reconditioned and reused in house in assembling process.

Alternate risky waste might incorporate 1) disposed of liners/holders and 2) Spent oil. This perilous waste might be gathered and put away at the site. The unit will likewise give secluded range to the capacity of unsafe waste with rooftop cover and impenetrable floor. Both the risky squanders should be at long last sold to the enrolled recyclers.

There will be no era of concoction muck from gushing treatment plant as there is no physico-synthetic treatment. The overabundance biomass from gushing treatment plant will be dewatered and utilized as soil conditioner in cultivating. The waste buildup from the wet scrubber might be blended with heater fiery remains. This fly cinder created because of utilization of strong fuel will pitch to nearby block producer

### 3.2.4 Noise Control Technique

- The Factory might not do any high commotion producing operations/exercises like pounding, processing, grinding, pulverizing and so forth.
- The mil wellspring of commotion will pivot apparatuses like pumps, compressors, fans and so on. Every one of these machines will produce commotion level underneath CPCB standards at source.
- Higher commotion producing machines/types of gear like DG set, might be introduced in acoustic walled in areas to guarantee clamor level underneath reasonable points of confinement.
- Sufficient preventive support measures like grease, disposal/diminishment in vibrations and so on, should be done to guarantee clamor level to least conceivable level.
- Checking of clamor levels is fundamental to survey the adequacy of upkeep timetables embraced to lessen commotion levels and clamor security measures

### 3.2.5 Health & Safety

Health Hazard related with occupation are called word related risk. The accompanying registration might be done routinely to keep away from word related danger:

- Pre-medicinal registration of the workers are fundamental at the season of work in unit.
- Provision of occasional therapeutic examination for every one of the workers is fundamental medical aid offices.
- The emergency treatment preparing should likewise be given to the workers. Checking of word related dangers like commotion, ventilation should be completed at successive interims.
- The unit will choose the medicinal officer for the customary therapeutic examination and treatment of the representative.
- The accompanying precautionary measures might be taken to maintain a strategic distance from predictable mishap like spillage, fire and blast risks and to limit the impact of any such mischance and to battle the crisis at site level in the event of crisis.
- Various crisis spots in plant range will be recognized and kept in sharp and ready watch.
- Protective types of gear will be consistently checked and will be kept effectively available and effortlessly workable amid crisis.
- Safety establishments like accessible amount of running water will be frequently observed.
- Fire pail and hose reels will be given to withstand the fire or blast conditions.
- Various sorts of flame quenchers, for example, (Foam sort, water CO2 type, CO2 type) will be given inside the production line premises and basic area.

## 4. CONCLUSIONS

- The synthetic industries ventures are effluent producing industries. In Gujarat, numerous industries are on terminations because of contamination load and no legitimate relief measures to control the contamination.
- Zero liquid release is the plan to reestablish the industries. The ecological contamination is significant worry in creating nations.
- Appropriate natural administration arrange make it maintain. Green belt advancement can alleviate 90% of fugitive emanation and bad smell annoyance. Along these lines, an appropriate EMP ought to be proposed and executed in the compound industries.
- Water environment: - Effluent treatment plan with Nano filtration should be provided to achieve the Cod and Bod values. Even provide fantom process to reduce the amount of COD from the raw effluent generated.
- Air environment: - Centrifugal + Bag Filter should be provided in the stack.
- Impacts generated in the construction phase can be mitigated by better housekeeping.
- In the further step, will even gone through the permissible limit of each aspect of GPCB/CPCB for the preparation of EMP
- To provide Rain water harvesting in the industry to meet the water balance.

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