

# **PLASTER OF PARIS**

## **1. INTRODUCTION:**

Plaster of Paris is also known as Dried Calcium Sulphate, Dried Gypsum, Calcium Sulphate dehydrate. Appearance of plaster of Paris is Fine, odorless, tasteless powder. It is available in two grades, i.e. Grades Alpha and Beta. Its Molecular formula is  $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ , having Molecular weight 145.15, Melting point  $163(-\frac{1}{2}\text{H}_2\text{O})$  Deg.C Solubility in 100 g water at 25 Deg.C, g 0.30. When the product is mixed with water, it sets to a hard mass. Upon setting, it expands slightly and this property is used to reproduce the finest details size reduction up to 1 mm is done in certain dental and jewellery castings.

Characteristics of Alpha type

Alpha type is distinguishable from Beta in that its particles disintegrate very little when mixed with water. It requires far less mixing water to form workable slurry. Consequently, Alpha has the ability to produce denser and higher compressive strength casts with less excess water, beyond that required for recrystallization.

Characteristics of Beta type

Beta type without additives is not suitable for plastering because the initial setting occurs too late and the final setting too early. Also, its particle size distribution is not suitable for plaster.

## **2. PRODUCT & ITS APPLICATION:**

Ceramic industry: Used by the ceramic industry in the production of dishes, sanitary ware, art ware, stone ware and related products. Mixture of Alpha and Beta plaster is the favored moulding plaster especially for ceramics. Plaster of Paris is used in the ceramic industry for three related purposes. Model making:

This requires a dense uniform plaster of Paris which can be readily carved. Making moulds for pressing and jiggering shapes in plastic clay. Making moulds for slip casting ware, in the manufacture of chemical porcelain, Chemical porcelain is a white vitrified dense transparent, body with or without glaze. In the manufacture of electrical insulators and low tension porcelain insulators in the manufacture of sanitary wares, Making decorative moulding and building interior features, Hospitals and Dental laboratories-Pharmaceutical Grade. In decorative moulding, Art plasters are essentially moulding plasters used in making decorative moulding modified to increase surface hardness, chip resistance and reduce paint absorption of casts made from this material. In building interior features, Moulding plasters are used to form columns and other building interior features. In manufacturer of chalk crayons, Chalk crayons are round and tapered shape sticks of different colors made of plaster of Paris. They are extensively used for writing on black boards and markings on any colored surface. Hospitals and Dental laboratories-pharmaceutical grade, Orthopedic plasters are used by hospitals and clinics for all types of orthopedic cast work such as surgical caste, orthopedic bandages etc. Both Alpha and Beta plasters are used in dental laboratories.

### **3. DESIRED QUALIFICATIONS FOR PROMOTER:**

Promoter must have basic knowledge of chemical process and operation and quality of gypsum. It is desirable to have Graduate in any Science.

### **4. INDUSTRY LOOK OUT AND TRENDS**

As there is growing building construction activity thus requiring large quantities of Plaster of Paris; Demand for the product is also increasing in making mould & models There is also considerable demand for the plaster of Paris arising from a

large number of studies and establishments engaged in making statutes and interior decoration as well as decorative plaster boards for false ceiling etc... which is in turn creating a good scope for setting up new units in this line of manufacture.

## **5. MARKET POTENTIAL AND MARKETING ISSUES, IF ANY:**

There are reported to be around 400 producers of Plaster of Paris in the country. Most of the units are in the un-organized and cottage sector, producing low grade product, essentially meeting the local requirements. Estimated Indian Installed Capacity is 2, 50,000 tons per annum.

### **INDIAN DEMAND:**

The demand is assessed in the following sector, Sanitary ware, Electrical insulators, Crockery items including ceramic art ware, table wares and allied items, Surgical bandages, Plaster boards, Miscellaneous such as chalk crayons, sculptures, jewellery and dental impressions, statues and toys, paint, in moulding and casting process of nonferrous alloys. Total world production of gypsum: 120 million tons per annum. Total estimated production of Plaster of Paris for various grades Around 50 million tons per annum. Global growth rate in demand around 1 to 2% per annum Consolidated Statement of Demand.

## **6. RAW MATERIAL REQUIREMENTS:**

Major raw materials require are the Gypsum, maleic anhydride, and Sodium hydroxide.

Gypsum available in form of NATURAL GYPSUM, MARINE GYPSUM, DRIED GYPSUM and PHOSPHO GYPSUM.

## **7. MANUFACTURING PROCESS:**

Washed marine gypsum is pulverized to 200 I.S. mesh. The pulverized gypsum is fed to reactor where water is added to make slurry. Sodium maleate is added as a crystal modifier. The reaction is carried out under pressure at 40 psig for one hour under agitation. The slurry is filtered hot using vacuum filtration. The cake is washed with boiling hot water. The hot cake is transferred to dryer immediately in hot trays and dried at 120-130 deg.C. The dried product is sieved through 100 I.S. mesh and packed in bags.

## 8. MANPOWER REQUIREMENT:

The enterprise requires 16 employees as detailed below:

Sr. No.	Designation of Employees	Monthly Salary ₹	Number of employees required				
			Year-1	Year-2	Year-3	Year-4	Year-5
1	Machine Operators	12,000	2	2	2	3	3
2	Helpers	8,000	6	6	8	8	10
3	Sales/ Purchase man	10,000	2	2	2	1	1
4	Accounts/Stores Asst	12,500	1	1	1	1	1
5s	Office Boy	9,500	1	1	1	1	1
	<b>Total</b>		12	12	14	14	16

## 9. IMPLEMENTATION SCHEDULE:

The project can be implemented in 3 months' time as detailed below:

Sr. No.	Activity	Time Required (in months)
1	Acquisition of premises	1.00
2	Construction (if applicable)	2.00
3	Procurement & installation of Plant & Machinery	1.00
4	Arrangement of Finance	2.00
5	Recruitment of required manpower	1.00
	Total time required <i>(some activities shall run</i>	3.00

	concurrently)	
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## 10. COST OF PROJECT:

Sr. No.	Particulars	₹ in Lacs
1	Land	3.00
2	Building	7.50
3	Plant & Machinery	30.00
4	Furniture, Electrical Installations	2.00
5	Other Assets including Preliminary / Pre-operative expenses	1.00
6	Working Capital	11.00
	<b>Total</b>	<b>51.00</b>

## 11. MEANS OF FINANCE:

Bank term loans are assumed @ 75 % of fixed assets.

Sr. No.	Particulars	₹ in Lacs
1	Promoter's contribution	11.00
2	Bank Finance	40.00
	<b>Total</b>	<b>51.00</b>

## 12. WORKING CAPITAL CALCULATION:

The project requires working capital of ₹ 11.00 lacs as detailed below:

Sr. No.	Particulars	Gross Amt	Margin %	Margin Amt	Bank Finance
1	Inventories	8.00	25.00	2.00	6.00

2	Receivables	3.00	25.00	0.75	2.25
3	Overheads	0.00	100%	0.00	-
4	Creditors	-	40%	-	-
	<b>Total</b>	11.00		2.75	8.25

### 13. LIST OF MACHINERY REQUIRED:

A detail of important machinery is given below:

Sr. No.	Particulars	UO M	Qty	Rate (₹)	Value (₹ in Lacs)
	<b>Plant &amp; Machinery / equipments</b>				
<b>a)</b>	<b>Main Machinery</b>				
i.	Screw conveyor 3 HP motor	Nos	1.00	500000	5.00
ii.	Micro pulveriser With 2 HP motors	Nos	1.0	50000	0.50
iii.	Reactor	Nos	1.0	300000	3.00
	Hot filtration and crushing unit with pump Fluid Control Equipment	Nos.	1.0	1000000	10.00
	Dryer	NOS	1.0	400000	4.00
	Weiging scale	Nos.	1.0	50000	0.50
<b>b)</b>	<b>Ancilliary machinery</b>				
i.	Boiler and	Nos	1	3.000	3.00
	Storage tanks	Nos.	4	0.25	1.00
ii.	Trolleys	Nos.	5	10000	0.50
	<i>sub-total Plant &amp; Machinery</i>				<b>27.50</b>
	<b>Furniture / Electrical installations</b>				
a)	Office furniture	LS	1.00	50,000	0.50
b)	Stores & Spares	LS	1.00	30,000	0.30
c)	Computer & Printer	Nos	1.00	1,00,000	1.00
	<i>sub total</i>				<b>1.80</b>
	<b>Other Assets</b>				
a)	Licenses and other fees		2.00	50,000	1.00
	<i>sub-total Other Assets</i>				<b>1.00</b>
	<b>Total</b>				<b>30.30</b>

All the machines and equipment are available from local manufacturers. The entrepreneur needs to ensure proper selection of product mix and proper type of machines and tooling to have modern and flexible designs. It may be worthwhile to look at reconditioned imported machines, dies and tooling. Some of the machinery and dies and tooling suppliers are listed here below:

- Kamdhenu Agro Machinery  
Plot No. 6, Near Power House,  
Wathoda Road, Wathoda  
Nagpur - 440035  
Maharashtra, India
  
- Future Industries Private Limited  
Shed No. 15, Ambica Estate,  
Corporation Municipal Plot,  
Opposite Sadvichar Hospital,  
Naroda, Ahmedabad - 382330,  
Gujarat, India
  
- The Global Pharma Equipments  
Star Industrial Estate,  
D-32, Naik Pada,  
Near Hanuman Mandir,  
Opposite Dwarka Industrial Estate,  
Vasai East, Vasai - 401208,  
Maharashtra, India

#### **14. PROFITABILITY CALCULATIONS:**

Sr. No.	Particulars	UOM	Year-1	Year-2	Year-3	Year-4	Year-5
1	Capacity Utilization	%	60%	70%	80%	90%	100%

2	Sales	₹. In Lacs	25.20	29.40	33.60	37.80	42.00
3	Raw Materials & Other direct inputs	₹. In Lacs	12.00	14.00	16.00	18.00	20.00
4	Gross Margin	₹. In Lacs	13.20	15.40	17.60	19.20	22.00
5	Overheads except interest	₹. In Lacs	5.00	5.50	6.00	6.50	6.50
6	Interest @ 10 %	₹. In Lacs	4.80	4.80	3.50	2.25	1.50
7	Depreciation	₹. In Lacs	10.00	6.00	3.00	2.40	1.8
8	<b>Net Profit before tax</b>	₹. In Lacs	<b>-6.60</b>	<b>-0.90</b>	<b>5.10</b>	<b>8.05</b>	<b>12.20</b>

## 15. BREAKEVEN ANALYSIS:

The project shall reach cash break-even at 29.54 % of projected capacity as detailed below:

Sr. No.	Particulars	UOM	Value
1	Sales at full capacity	₹. In Lacs	42.00
2	Variable costs	₹. In Lacs	20.00
3	Fixed costs incl. interest	₹. In Lacs	06.50
4	$BEP = FC/(SR-VC) \times 100 =$	% of capacity	29.54

## 16. STATUTORY / GOVERNMENT APPROVALS

As per the allocation of business rules under the Constitution, labour is in the concurrent list of subjects. It is dealt with by the MOLE at the Central and Departments of Labour under State Governments in respective States / UTs. The MOLE has enacted workplace safety and health statutes concerning workers in the manufacturing sector, mines, ports and docks and in construction sectors.



Further, other Ministries of the Government of India have also enacted certain statutes relating to safety aspects of substances, equipment, operations etc. Some of the statutes applicable in the manufacturing sector are discussed below:

### **The Static and Mobile Pressure Vessels (Unfired) Rules, 1981**

These (SMPV) Rules are notified under the Explosives Act, 1884. These rules regulate storage, handling and transport of compressed gases. These rules stipulate requirements regarding construction and fitments, periodic testing, location, fire protection, loading and unloading facilities, transfer operations etc. in respect of pressure vessels whose water capacity exceeds one thousand litres. These rules are enforced by the Chief Controller of Explosives under the Ministry of Industry and Commerce, Govt. of India (PESO).

### **The Manufacture, Storage and Import of Hazardous Chemicals Rules (MSIHC), 1989**

These MSIHC Rules are notified under the Environment (Protection) Act, 1986. These rules are aimed at regulating and handling of certain specified hazardous chemicals. The rules stipulate requirements regarding notification of site, identification of major hazards, taking necessary steps to control major accident, notification of major accident, preparation of safety report and on-site emergency plan; prevention and control of major accident, dissemination of information etc. These rules are notified by the Ministry of Environment and Forests (MOEF) but enforced by the Inspectorates of Factories of respective States / UTs in the manufacturing sector.

### **The Factories Act, 1948 and State Factories Rules**

The Factories Act, 1948 is very comprehensive legislation dealing with the matters of safety, health and welfare of workers in factories. The Act places

duties on the occupier to ensure safety, health and welfare of workers at work. Some of the salient provisions of the Act include:

- Guarding of machinery
- Hoists and Lifts; Lifting Machines and Appliances
- Revolving Machinery
- Pressure Plant
- Excessive Weight
- Protection of Eyes
- Precautions against dangerous fumes, gases etc.
- Explosive or inflammable dust, gas etc.
- Precautions in case of fire
- Safety of buildings and machinery
- Permissible limits of exposure of chemical and toxic substances
- Entrepreneur may contact State Pollution Control Board where ever it is applicable.

## **17. BACKWARD AND FORWARD INTEGRATIONS**

Chemical companies often become integrated and undergo other activities outside the chemical industry. Increased competition prompts many companies to reduce supply chain costs by looking outside the chemical sector at suppliers and customers. While most companies within the chemicals sector primarily produce chemicals, some companies also conduct other manufacturing activities. The exact proportion of chemicals sector companies that are integrated with other sector activities is unknown, but many companies actively seek vertical integration. Many manufacturers pursue vertical integration to secure suppliers and customers for their products.

Mergers and acquisitions are a common way for companies to undertake new chemical ventures. By purchasing their chemical suppliers, some manufacturers secure future chemical feedstock for their products or other chemicals that they use in manufacturing. The company making the purchase obtains valuable expertise and equipment. Some mining and petrochemical production is more cost-effective when integrated within a chemical company.

Energy and feedstock costs are often a significant expense for chemical companies. Integrating chemical production with activities that secure supplies of chemical feedstock and energy is relatively common as chemical companies grow. Chemical companies are located near mines, oil fields, ammonia factories and water supplies. This reduces transportation costs and increases the reliability of supplies by reducing the distance between feedstock and the factory.

Some companies, such as Sino-Coking Coal and Coke Chemical Industries Incorporated, own their mines. BHP Billiton operates a broad range of mines and is primarily a mining company. It does, however, also produce petrochemical feedstock for the chemical industry and therefore operates within the chemical industry as well. These companies technically operate within both the chemical and mining industries in their normal business operations.

Integrating a chemical company with other activities provides several direct benefits for the company and is becoming increasingly common. High energy costs necessitate greater control of energy resources and minimal reliance on expensive transportation. Chemical companies experience volatile profitability due to fluctuations in feedstock and energy expenses. Some companies control this volatility through careful supply chain management and by charging supply surcharges. Actively researching and developing alternative feedstock and energy supplies helps the company reduce costs.

Vertical integration supports these activities by eliminating redundant activities at multiple companies and increasing efficiency. By consolidating activity among multiple, similar operations, chemical companies achieve cost savings that contribute to higher profitability. End products are often very profitable, and some chemical companies purchase their former customers to take advantage of the marked-up prices of products further along in the supply chain.

Integration may become more common for many chemical companies as competition strengthens and traditional feedstock becomes more expensive. Market demand for chemical feedstock increases as emerging market economies grow and result in increased consumer spending around the world.

## **18. TRAINING CENTERS AND COURSES**

There is no such training required to start this business but, basic chemical bachelor's degree is plus point for enterpriser. Promoter may train their employees in such specialized institutions to grow up the business. There are few specialised Institutes provide degree certification in chemical Technology, few most famous and authenticate Institutions are as follows:

1. Department of chemical LD college of engineering  
No.120, Circular Road, University Area, Navrangpura,  
Opposite Gujarat University, Ahmedabad, Gujarat 380015

2. MIT College of chemical Engineering, Pune  
Gate.No.140, Raj Baugh Educational Complex,  
Pune Solapur Highway,  
Loni Kalbhor, Pune - 412201  
Maharashtra, India

Udyamimitra portal ( link : [www.udyamimitra.in](http://www.udyamimitra.in) ) can also be accessed for handholding services viz. application filling / project report preparation, EDP, financial Training, Skill Development, mentoring etc.

Entrepreneurship program helps to run business successfully is also available from Institutes like Entrepreneurship Development Institute of India (EDII) and its affiliates all over India.

**Disclaimer:**

Only few machine manufacturers are mentioned in the profile, although many machine manufacturers are available in the market. The addresses given for machinery manufacturers have been taken from reliable sources, to the best of knowledge and contacts. However, no responsibility is admitted, in case any inadvertent error or incorrectness is noticed therein. Further the same have been given by way of information only and do not carry any recommendation.

Source:- Udyami Mitra/Sidbi