

PROJECT PROFILE
ON
CALCIUM SULPHATE

MONTH & YEAR
JULY 2011

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This publication is supported by

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STIFTUNG **FÜR DIE FREIHEIT**

CALCIUM SULPHATE

(PLASTER OF PARIS)

A. INTRODUCTION

Calcium sulphate finds useful applications in various industrial and commercial products. Well known as Plaster of Paris it is used in ceramics, mouldings, dental and pharmaceutical industries.

B. PRODUCT USES & SPECIFICATIONS

Calcium Sulphate appears in fine, odourless and tasteless powder. The alternate name for calcium sulphate is Dried Calcium Sulphate, Dried Gypsum and Calcium Sulphate hemihydrate. It has two grades Alpha and Beta. The Molecular Formula for Calcium Sulphate is $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ and the weight is considered to be 145.15. The Melting Point is $163(-\frac{1}{2} \text{H}_2\text{O})$ Deg.C.

Alternate name	Dried Calcium Sulphate, Dried Gypsum, Calcium Sulphate hemihydrate
Appearance	Fine, odourless, tasteless powder.
Grades	Alpha and Beta
Molecular formula	$\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$
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.

Physical and Chemical Properties

Molecular formula	CaSO ₄ 0.5 H ₂ O
Composition	Lime (CaO) 38.6 Sulphur trioxide (SO ₃) 55.2 Combined water (H ₂ O) 6.2
Molecular weight	145.15
Melting point, deg.C	163
Solubility in 100g water at 25 deg.C, g	0.30
Residue on 120 mesh	1.0% max
Hemihydrate content	More than 97%
Water: Plaster ratio (g/100g)	40:100 to 50:100
Blending time	About 2 minutes
Water consistency	33 to 38 water per 100 gm product
Setting time	
(I) initial	6 to 15 mts
(II) Final	16 to 40 mts.
Compressive strength	350 to 466 kg/cm ²
Tensile strength	27 to 36 kg/cm ²
Bulk density	1.36 to 1.52 kg/cm ²
Modulus of rupture	97 to 150 kg/cm ²

Application Sector

- Ceramic industry
- Making decorative mouldings and building interior features

□□Hospitals and Dental laboratories-Pharmaceutical grade

Ceramic industry

It 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 favoured 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:-

Decorative mouldings and building interior features:-

In decorative mouldings: Art plasters are essentially moulding plasters used in making decorative mouldings 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 colours made of plaster of paris. They are extensively used for writing on black boards and markings on any coloured 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.

C.MARKET POTENTIAL

There are several small and medium scale industries manufacturing calcium sulphate. The total capacity is estimated at around 250000 tonnes per annum.

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 mouldings and casting process of non ferrous alloys.

Consolidated Statement of Demand can be estimated as given below.

Sector	Demand In tonnes per annum
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Sanitary ware	18000
Electrical insulators	9000
Surgical bandages	1500
Ceramic art ware & toys	5000
Plaster boards	225000
Miscellaneous applications	25000
TOTAL	283500

Growth rate in demand

The growth in demand for Plaster of Paris in various sector would be largely in tune with the industrial and economic growth rate in the country

Application	Estimated Annual growth rate in percentage
Sanitary ware	12
Electrical insulators	7
Surgical bandages	10
Ceramic art ware & toys	10
Plaster boards	12
Miscellaneous applications	7

As the demand is growing in the usage sectors the demand for the calcium sulphate is increasing every year.

D. TECHNICAL ASPECTS

1. INSTALLED CAPACITY

The production capacity of Calcium Sulphate is estimated as 0.4 Tonnes per day on 3 shift basis and the capacity per annum works out to 120 tonnes.

2. PLANT & MACHINERY

Machine name
Screw conveyer
Micro pulveriser
Reactor
Hot filtration and crushing unit with pump
Drier
Boiler

The total value of the machinery is estimated at Rs.60.00 lakhs on a turnkey basis.

3. MANUFACTURING PROCESS

Washed marine gypsum is pulverised to 200 I.S. mesh. The pulverised 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.

4. RAW MATERIAL REQUIREMENTS AND AVAILABILITY

Raw material requirements

Basis: One tonne of Plaster of paris

Gypsum 14 00 kgs

Maleic anhydride 1.35 kgs

Sodium hydroxide 1.5 kgs

Production-MTs

per annum 120

Raw material required

	Per MT	Qty MTs	Rate Rs	Value Rs lakhs
Gypsum	1.40	168	1100.00	1.85
Maleic Anhydride	0.00135	0.162	250000.00	0.41
Sodium Hydroxide	0.00150	0.180	45000.00	0.08
				2.33

5. LAND & BUILDING

Land required 0.5 acre cost Rs.7.50 lakhs

Building area required 2000 sq.ft Cost Rs.16.00 lakhs

6. Utility

Power:

The total power requirement of the unit will be 40 HP.

Fuel 120 litres per day

Water:

For process 5000 litres per day.

Man Power Requirement:

Category	Nos.	Monthly	Total monthly
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		Salary	Salary
Supervisor	1	9000	9000
Skilled	2	7000	14000
Helpers	3	5000	15000
Office			
assistants	2	6000	12000
			50000
Add : Benefits	20%		10000
Total			60000

Total wages per annum

[Rs.lakhs]

Rs.7.20 lakhs

7. IMPLEMENTATION SCHEDULE:

After arranging the finance required for the project, the project can be implemented in six months period.

8. ASSUMPTIONS

Installed capacity per annum	Calcium Sulphate -120 MTs per annum
Capacity utilization-Year -1	60%
Year-2	70%
Year-3	80%
Selling price per unit	Rs.70000 per MT
Raw material cost	Rs.2.33 lakhs at 100%
Consumables /Packing materials	Rs.2200 per MT
Power and Fuel-100% (Rs.lakhs)	Rs.18.11 lakhs per annum
Wages & salaries -100% (Rs.lakhs)	Rs.7.20 lakhs per annum
Repairs & Maintenance	Rs.20000 Per Month

Depreciation	Written down value method
General & administration Expenses per month	Rs.40000.
Selling expenses	3% on sales value
Interest on term loan and Working capital finance	14% per annum
Income tax provision	34% on taxable income

Source of technology

National Research Development Corporation

(A Government of India Enterprise)

20-22, Zamroodhpur Community Center

Kailash Colony Extension

New Delhi 110 048. India

LIST OF MACHINERY SUPPLIERS

Name of the equipment	Name of the supplier
Screw conveyor	Chem Eng. Consultant Shalin, Near Sanjivani Hospital New Sharda Mandir Road, Paldi, Ahmedabad-380 007 Deccan Mechanical and Chemical Inds. Ltd., Flat No.4, A-Wing, 7th Floor, Parsn Manere 602, Mound Road,

	Chennai-600 006
Micro pulveriser	ACE Pack Machines 23, V.N. Industrial Estate Bharathi Colony, Near Athiparasakthi Temple Peelamedu, Coimbatore-641 004 Frigmaires Engineers PO Box 16353, 8, Janata Industrial Estate Senapati Bapat Marg Opp Phoenix Mill, Lower Parel (W) Mumbai-400 013
Reactor	Chemitherm Plants & Systems P.Ltd., 30, Anandha Street Alwarpet, Chennai-600 018 Texel Fabricators Pvt. Ltd., 335, Sidco Industrial Estate, Ambattur, Chennai-600 098, Tamil Nadu
Hot filtration and crushing unit with pump	Fluid Control Equipment Teynampet Chennai
Dryer	Richard Engineering (Bombay) Pvt. Ltd. 42, IIF, Veerabadran Street Near Valluvar Kottam Nungambakkam, Chennai-600 034 Ganson Ltd. 645, Anna Salai, Chennai-600 006

Boiler	<p>Sri Ranga Industries SF, 739, Ramraj Nagar, Goldwins, Coimbatore-641 014</p> <p>Firetech Boilers Pvt. Ltd. No.211, 2nd Cross, 38th Main, B.T.M. Layout 2nd Stage, Bangalore-68</p>
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LIST OF RAW MATERIALS SUPPLIERS

Local suppliers

FINANCIAL ASPECTS

1. COST OF PROJECT

	[Rs.lakhs]
Land	7.50
Building	16.00
Plant & Machinery	60.00
Technical know how fees	2.00
Other Misc. assets	5.00
Pre-Operative expenses	15.00
Margin for WC	1.16
	<u>106.66</u>

2. MEANS OF FINANCE

Capital	43.66
Term Loan	63.00
	<u>106.66</u>

3. COST OF PRODUCTION & PROFITABILITY STATEMENT

	[Rs.lakhs]		
Years	1	2	3
Installed Capacity (MT)	120	120	120
Utilisation	60%	70%	80%
Production/Sales (MT)	72	84	96
Selling Price per MT	Rs.70,000		
Sales Value (Rs.lakhs)	50.40	58.80	67.20
Raw Materials	2.61	3.05	3.48
Packing materials	1.58	1.85	2.11
Power & fuel	10.87	12.68	14.49
Wages & Salaries	7.20	7.56	7.94
Repairs & Maintenance	2.40	2.64	2.90
Depreciation	9.80	8.36	7.13
Cost of			
Production	34.46	36.14	38.05
Admin. & General expenses	4.80	5.04	5.29

Selling expenses	1.51	1.76	2.02
Interest on Term Loan	8.82	7.72	5.51
Interest on Working Capital	0.63	0.63	0.63
Total	50.22	51.29	51.50
Profit Before Tax	0.18	7.51	15.70
Provision for tax	0.00	2.55	5.34
Profit After Tax	0.18	4.96	10.36
Add: Depreciation	9.80	8.36	7.13
Cash Accruals	9.98	13.32	17.49

4. WORKING CAPITAL:

	Months	Values	%	Margin	Bank
	Consumptions			Amount	Finance
Raw Materials	1.00	0.22	25%	0.06	0.16
Finished goods	0.25	0.72	25%	0.18	0.54
Debtors	1.00	4.20	10%	0.42	3.78
Expenses	1.00	0.50	100%	0.50	0.00
		5.64		1.16	4.48

5. PROFITABILITY RATIOS BASED ON 80% UTILISATION

<u>Profit after Tax</u>	=	<u>10.36</u>	15%
Sales		67.20	
<u>Profit before Interest and Tax</u>	=	<u>21.84</u>	20%
Total Investment		111.14	
<u>Profit after Tax</u>	=	<u>10.36</u>	24%
Promoters Capital		43.66	

6. BREAK EVEN LEVEL

Fixed Cost (FC):

	[Rs.lakhs]
Wages & Salaries	7.94
Repairs & Maintenance	2.90
Depreciation	7.13
Admin. & General expenses	5.29
Interest on TL	5.51
	<hr/>
	28.77
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Profit Before Tax (P)	15.70

$$\text{BEL} = \frac{\text{FC} \times 100}{\text{FC} + \text{P}} = \frac{28.77}{44.47} \times \frac{80}{100} \times 100$$

52% of installed capacity