

GYPSUM BASED BUILDING MATERIALS

Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) is available naturally and as a by-product from chemical and fertilizer industries. Its main uses, in the dihydrate form are in the cement industry and as soil conditioner.

On heating gypsum loses water and gives the hemihydrate ($\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$) or the anhydrite. The hemihydrate known as Calcined gypsum/ Plaster of Paris / stucco is an important building material. Main uses of plaster of Paris are:

- *Plaster boards* - a layer of plaster sandwiched between two sheets of cardboard.
- *Fibrous plaster* - plaster with fibers (often made of glass fibers but natural fibers are also used) mixed into it to increase its strength. Fibrous plaster is usually cast into a mould then used in slabs. Ceiling boards for false ceiling and partition boards)
- *Plaster cornices* - the decorative plaster projections used under the eaves and above doorways and windows in buildings, making statues, film settings
- *Plaster mouldings* – ceramic industry and engineering industry
- *Chalk plaster*
Plaster of paris is also used for manufacturing building plasters

Proposal

It is recommended to set up a unit to process 30 tons per day gypsum to produce

1. Plaster of Paris for sale	2000 tons/yr
2. Gypsum fiber boards	3000 tons/yr
3. Gypsum wall plasters	2000 tons/yr

Market

Market for Calcined gypsum is growing rapidly. New houses in cities are now invariably built with false ceilings, and interiors are plastered with gypsum based plasters. About one ton of calcined gypsum goes into building a 1000 sft house with false ceiling. The other consumer industries like ceramics and industrial castings are also growing.

Manufacturing process

Calcined Gypsum:

The raw material gypsum (natural / phospho gypsum of fertilizer industry) is sorted and washed with water for removal of sand and other impurities. The lumps thus obtained are then dried and powdered in pulverizer. The dried gypsum powder is calcined in a rotary drum calciner at a temperature of 160°C to 180°C . The process of calcination is done over a period of about 2 hours, by

carefully controlling the temperature so that one and half molecules of water is removed to convert the gypsum ($\text{CaSO}_4 \cdot 2 \text{H}_2\text{O}$) into plaster of Paris ($\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$). After cooling the product (plaster of Paris) is further pulverized to a fineness of 150 mesh and packed in air tight polythene lined gunny bags to avoid the plaster of Paris from absorption of moisture.

Gypsum plaster board: The following steps convert calcined gypsum to commercial gypsum plaster boards:

1. Proportioning and mixing of gypsum plaster with water. Set controller and filler is-added to this slurry with a small quantity of glass fiber / natural fiber as reinforcement;
2. Casting of board with the board forming machine.
3. Carrying the 'green' board on a belt conveyor until the core sets and edges are stuck.
4. Cutting boards with a rotary knife into lengths of 1m to 6m before the 'green' board reaches the end of the machine belt.
5. Drying of boards by passing them through a tunnel kiln. Hot-air/steam allows recirculation of air. Natural drying is possible for small production. Drying is a very sensitive operation requiring careful attention.
6. Transferring of dry boards on to portable platform and transportation to the warehouse.

Gypsum plasters:

Gypsum plasters are dry mixture of gypsum, mineral fillers and modifying additives. The plasters are produced by blending the ingredients in proper proportion and then packing in moisture proof bags.

Technology:

Technology for manufacture of calcined gypsum, gypsum fiber boards and gypsum based wall plasters is available from a number of sources including CSIR laboratories

Plant and machinery:

The main plant and machinery consists of, Calciner, pulverizers, slab casting machine, tunnel dryer, mixers and blenders and bagging machinery. The plant and machinery is available indigenously.

Raw material:

The main raw material is gypsum. Natural (mined) gypsum and by-product gypsum are available.

Utilities:

Fuel for Calcination is the main utility. Water is required for washing and rehydration. Power needs are moderate.

Project cost:

Proposed unit may cost about Rs. 3 Crores.

Turnover and profitability:

Turnover will be Rs. 7 to 8 Crores per year with net profit margin of about 10 %.

Suggested location:

The target markets are, Hyderabad, Vizag, Vijayawada in A.P. Other metros like Bangalore, Pune are potential markets. The site is to be chosen on the basis of transport costs of rawmaterial and product and also availability of low cost fuel.

Entrepreneur profile:

This is a marketing intensive activity.

Entrepreneurs associated with the construction industry may fare better in marketing the products. High technical skills are not needed.

APITCO is well placed to carry out detailed feasibility study and arrange for technology tie-up for the project.

Reference for Detailed feasibility study:

1. Detailed market assessment based on location chosen
2. Raw material availability
3. Technology tie-up
4. Selection of plant and machinery
5. Choosing proper fuel

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