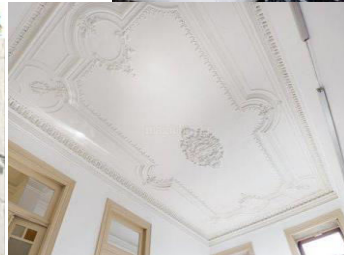
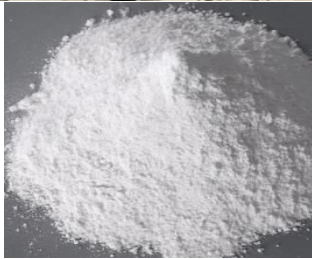


PLASTER OF PARIS



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Title of Project Profile: PLASTER OF PARIS

Plaster of Paris (popular name is POP), quick-setting gypsum plaster consisting of a fine white powder (calcium sulfate hemihydrate), which hardens when moistened and allowed to dry. Known since ancient times, plaster of paris is so called because of its preparation from the abundant gypsum found near Paris. The another name through POP is calcined gypsum / plaster, popularly known in industry is Gypsum. POP is used mainly as building plaster, for ceramic moulds, pottery and as surgical plaster.

Nomenclature of the product (as per the nomenclature mentioned in the national or international standards):

Plaster of Paris for Ceramic Industry, Gypsum building Plaster excluding premixed (light weight plaster), Dental Laboratory Plaster & Dental Impression Plaster.

(A) Commercial details

1. HSN codes of the product:

25202010: Calcined Plasters/POP for Ceramic Industry,

The subject products are classified under Chapter Heading 25 “Mineral products: Salt; Sulphur; earths and stone; plastering materials, lime and cement” of the Customs Tariff Act. The classification at the 8-digit level is 25202010. However, goods are coming under other heads of 25 also.

2. NIC code of the product:

23945: Manufacturing of Plasters of Calcined Gypsum or Calcium Sulphate

32501: Manufacturing of Dental Fillings & Cements (except denture adhesive or cement), dent wax and other Dental Plaster Preparations, Bone reconstruction cement

NIC Codes of the items made by using POP and other related codes:

23951: Manufacturing of plaster statues and other plaster products

23992: Manufacture of gypsum boards

26949: Manufacturing of other plaster, not elsewhere classified and other plaster products

3. Clusters already existing on the Plaster of Paris:

Gypsum mineral is the only raw material used in POP manufacturing. By States, Rajasthan alone accounts for 81% natural Gypsum deposition as mineral where as Jammu & Kashmir 14% and Tamil Nadu 2%. The remaining 3% is contributed by Gujarat, Himachal Pradesh, Karnataka, Andhra Pradesh and Madhya Pradesh (Ref: Indian Minerals Year book 2016, Part- III : Mineral Reviews, 55th Edition Gypsum ,Govt. of India, Ministry of Mines, Indian Bureau of Mines, Nagpur – 440 001 -published in Feb. 2018). The majority of POP industry clusters are near the Gypsum mines in India. The number of POP units are more in Rajasthan on account of POP grade Gypsum availability. Rajasthan, with the existence of about 700 POP units, located in the districts of Bikaner, Badmer, Churu, Hanumangarh, Nagaur, Jalore , Sri Ganganagar & Jaisalmer is the largest POP producing state in

country. The Rajapalayam of Tamilnadu, Trichur of Kerla, New Jalpaiguri district of West Bengal and the U.T. of Jammu also have small POP industries clusters.

Majority of the units in these clusters are in micro and small enterprises (MSE) category and the units are varies in terms of turnover, machinery used in processing and it is based on location of industry and end use of POP.

In India, there are about 900 POP industries in located all over India. The rationale for this seems to be because of low value addition in MSEs, the skills requirement is less and processing near the source of raw material, reduces transportation cost in terms of reduced material for transportation as moisture weight is reduced in making POP due to removal of moisture (physical and bound) from raw material. The MSEs are located in clusters with informal structures and owned by family entrepreneurs.

The present total production of POP in India is estimated to be approx. 3,00,000 ton per month with Rajasthan producing about 80 % of POP and the rest by other clusters.

In these clusters, the average production capacities of MSEs vary from 300 tons per month and in Medium/ large scale industries the capacity is ranging between 2500 to 7000 tons per month.

3.1: POP Cluster Profiles

In India, there are number of POP units in Rajasthan, U.T. of Jammu and Kashmir, West Bengal, Kerla, Mahastra, Gujrat, Telangana, Andra Pradesh and Tamil Nadu of which Rajasthan has the largest number of units. The state of Rajasthan is rich in gypsum mines. Most of the mines are located in Bikaner, Hanumangarh, Churu, Jaisalmer, Nagaur districts of Rajasthan. Plaster of Paris (POP) is manufactured from gypsum. The units in states of Maharastra, Gujrat, A.P. T. N. Kerla & Odisha are located near the coastal areas. As such most of the POP units are located in and around the districts where gypsum is easily available. Typically each unit employs one or two Calciner and depending on this size of Gypsum crusher. The clusters in Jammu, Kerla , Tamil Nadu are very small in comparison with 10-30 units in each cluster. The key features of few of the clusters is briefly described inthe following sections.

3.1.1: Bikaner cluster

Bikaner is one of the desert districts situated in the North-West of Rajasthan. Good quality thick Gypsum bed are available in the area. This Cluster is having about 550 Nos of units and is the largest POP producing cluster in India and accounts for more than 70% of total POP production of country. Driver for this Cluster Formation are easy access to key raw material, indigenus and local technology that is easy to adopt, quality of gypsum suitable to market needs and major consuming markets is in the vicinity (Delhi, Jaipur markets for building grade POP, Gujarat for ceramics etc). The POP units are mainly located in Khara industrial area, which is about 15 kilometers north-east from Bikaner. Dantor, Khari, Jaimlsar, tanwarwala, Shobhasar are the other places in Bikaner district having presence of POP units. The cluster generates direct employment for more than 1500 people. Primary market is domestic in different states of India. POP produced from this cluster is mainly used for the protective and/ or decorative coating of walls and ceilings (real estate field), moulding and casting decorative elements (manufacturing

industries), setting broken or fractured bones and surgical instruments (medical field) with more than 95% of POP is sold outside the state.

The Bikaner cluster units and other units of Rajasthan are supplies the building grade POP to nearby construction industry in Delhi, Jaipur and other cities, the ceramic grade POP to ceramic clusters in Gujarat and to large scale ceramic industries in North and Western India besides supplying the medical plaster to surgical plaster molds preparation units.

Reasons for growth of the cluster:

- Adequate gypsum availability.
- Encouragement of state governments for setting up of industries.
- Indigenous and local technology that is easy to adopt.
- Major consuming markets is in the vicinity (Delhi, Punjab, Haryana, Gujrat, etc).

Problems faced:

- Old and obsolete technology.
- Low-end scale of operation.
- Low value addition in products.
- Failure of technology development institutions to provide customized support for automation or product development or technology upgradation.

3.1.2: Jammu Cluster

The Jammu province is another area where gypsum (rock type) is available, though the quantity is very meager as compare to that in Rajasthan area. The gypsum in Jammu reportedly accounts to 3-4 % of total quantity available in India. The rock gypsum mines located around Jammu area are source of raw material supply to about 25 micro and small POP manufacturing units, scattered in different industrial areas in and around Jammu as Bari Brahmna, Sambha, Kaluchak, Udampur & Kathua. In contrast to Rajasthan, units in Jammu may not form a cluster, however the region is widely known for its POP manufacturing. The variation in POP is based on end use. The Jammu cluster supplies the POP to ceramic industry and construction industry in northern region.

Problems faced:

- Fast setting time of the POP produced in this cluster makes less demand in market.
- Old and obsolete technology.
- Low-end scale of operation.
- High cost of raw material & finished product transportation and poor road connectivity from mines to POP plants.
- Low value addition in products.

3.1.3: New Jalpaigudi Cluster

The New Jalpaigudi region cater the POP requirements of eastern & north-eastern part of country as West Bengal, Orissa, Assam, Bihar etc. Raw material used here is rock gypsum, which is attained (imported) from neighboring country Bhutan. Similar to Jammu region, there are about 30

Micro & small POP manufacturing units, scattered in different industrial areas in and around New Jalpaigudi. The rock gypsum is whitish in color and has high purity. This gypsum doesn't

require any beneficiation and is used as such. The variation in POP is based on end use and this variation is brought about by grinding to varying mesh sizes and calcining time and temperature variation, in this cluster. This POP is used for producing ceramic moulds, pottery, surgical and dental grade POP, apart from building grade.

The Jalpaiguri cluster supplies only to construction industry in eastern region mainly cities like Calcutta including some amount of export to Nepal.

Problems faced:

The rock gypsum used in this area is imported from Bhutan and therefore transportation cost of gypsum is crucial factor that decides profitability of the units.

3.1.4: Rajapalayam Mini Cluster

In Rajapalayam, Virudhunagar district Tamil Nadu there are about 8-10 small POP manufacturing units with production capacity about 300 TPM. The cluster units, primarily manufacturing building and ceramic grade POP. The main raw material used is marine gypsum which is acquired from the coastal areas, which have sedimented on the fields during salt manufacturing. Units have closed pan/vertical type calciners. Firewood is the main fuel used in the furnaces. In these areas, only raw material is grinded to required sizes, the product grinding after calcination is not practiced. The Rajapalayam cluster supplies to ceramic, construction and chalk industry in southern India.

Problems faced: Further growth of this cluster is restricted because raw materials availability is dependent on salt manufacturing from sea water which itself is restrained in expanding capacity.

4. Possibility to create /establish clusters on the Plaster of Paris:

Following districts have potential to create clusters:

- I. **Srinagar:** The availability of Gypsum in sufficient quantity in Uri mines and with the existence of about 10-12 POP units in and around Srinagar, there is the ample opportunity for establishing new units with policy support of UT administration. Once sufficient mass of MSEs is available cluster development activity can be undertaken.
- II. **Nagaur:** State-of-the-art-technology needs to be adopted for the exploitation of deep-seated gypsum. Once gypsum is available units of POP will come in existence and ample scope for cluster of POP manufacturing and support industries.

5. Probable areas or districts where the Plaster of Paris manufacturing or project can be established:

S. No	State	District	Factors affecting
a	Rajasthan	Nagaur	50-200 feet Gypsum bed reserve of good quality in ample quantity is available. Extraction is yet to be initiated. steps would be necessary to find out suitable mining technology to exploit, deep-seated gypsum resources in Bhadvasi deposit, Nagaur district
	Rajasthan		
b		Bikaner	Near Pakistan border ample Gypsum reserves is available. Availability of trained labour in the area and presence of local equipments manufacturers.
c	Gujrat	Surat	Availability of Marin Gypsum and By Product Gypsum in Gujrat. Proximity with Kandla Port makes the easy access of imported Natural Gypsum from Oman and Iran at affordable priced.
d	Gujrat	Morbi	POP is required to Morbi ceramic cluster unit for moulds making and to cater the construction grade POP requirement of nearby areas
e	W.B.	Siligudi	Good Quality Raw Material (Gypsum) requirement could be met easily from Bhutan and Coal could be easily supplied from Meghalaya
f	Jammu U.T.	Jammu	Easy availability of natural Gypsum stock in Samba region is a key attraction.
g	Aasam	Jalpaiguri	In the gypsum availability is governed by the POP industrial scenario and gypsum market in Bhutan.

6. Number of industries registered as MSME is available in the manufacturing of the Plaster of Paris (Data division/NIC Division of HQ)

6.1: State wise total number of MSMEs having Udyam Registration for manufacturing of plasters of calcined gypsum or calcined sulphate (5- digits NIC code: 23945)

S.No.	State Name	Micro	Small	Medium	Total
1	ANDHRA PRADESH	10	0	0	10
2	ARUNACHAL PRADESH	0	0	0	0
3	ASSAM	0	0	0	0
4	BIHAR	5	0	0	5
5	CHHATTISGARH	1	0	0	1
6	GOA	0	0	0	0
7	GUJARAT	22	6	1	29
8	HARYANA	4	2	0	6
9	HIMACHAL PRADESH	0	0	0	0
10	JHARKHAND	4	1	0	5
11	KARNATAKA	3	0	0	3
12	KERALA	2	0	0	2
13	MADHYA PRADESH	2	0	0	2
14	MAHARASHTRA	50	14	1	65
15	MANIPUR	0	0	0	0
16	MEGHALAYA	0	0	0	0
17	MIZORAM	0	0	0	0
18	NAGALAND	0	0	0	0
19	ODISHA	2	0	0	2
20	PUNJAB	1	0	0	1
21	RAJASTHAN	88	2	0	90
22	SIKKIM	0	0	0	0
23	TAMIL NADU	15	3	1	19
24	TELANGANA	6	0	0	6
25	TRIPURA	0	0	0	0
26	UTTAR PRADESH	5	0	0	5
27	UTTARAKHAND	0	0	0	0
28	WEST BENGAL	2	0	0	2
29	ANDAMAN AND NICOBAR ISLANDS	0	0	0	0
30	CHANDIGARH	0	0	0	0
31	DADAR AND NAGAR HAVELI	0	0	0	0

32	DAMAN AND DIU	0	0	0	0
33	DELHI	3	0	0	3
34	JAMMU AND KASHMIR	14	1	0	15
35	LADAKH	1	0	0	1
36	LAKSHADWEEP	0	0	0	0
37	PUDUCHERRY	0	0	0	0
Total		240	29	3	272

6.1.1: District wise breakup of the MSMEs of Gujarat, Rajasthan, Kerla U.T. of Jammu and Kashmir having Udyam Registration for manufacturing of plasters of calcined gypsum or calcined sulphate (5- digits NIC code: 23945)

State/U.T.	District	No.of Enterprises			
		Micro	Small	Medium	Total Nos.
Gujarat	Ahmedabad				4
	Anand				1
	Bharuch				2
	Devbhumi Dwarka				2
	Gandhi nagar				1
	Jamnagar				1
	Junagadh				1
	Kachchh				7
	Rajkot				6
	Surat				1
	Surendranagar				3
	Vadodara				3
Valsad				3	
Rajasthan	Badmer				1
	Bikaner				73
	Churu				2
	Hanumanghar				5
	Jaipur				5
	Jhodpur				6
	Nagaur				4
	Udaipur				1
	Sri Ganganagar				2
Kerla	Kollam				1
	Triruvanathapuram				1
Jammu U.T. and Kashmir U.T.	Jammu				5
	Bandipora				1
	Baramula				1
	Kathua				1
	Pulwama				2
	Samba				3
	Srinagar				1
	Udhampur				

**6.2: State wise total number of MSMEs having Udyam Registration for manufacturing of dental fillings and cements (except denture adhesive or cement), dental wax and other dental plaster preparations; manufacture of dental laboratory furnaces, dental instruments, artificial teeth, bridges, etc., made in dental labs)
(5- digits NIC code: 32501)**

S.No.	State Name	Micro	Small	Medium	Total
1	ANDHRA PRADESH	6	0	0	6
2	ARUNACHAL PRADESH	0	0	0	0
3	ASSAM	0	0	0	0
4	BIHAR	7	1	0	8
5	CHHATTISGARH	3	0	0	3
6	GOA	0	0	0	0
7	GUJARAT	42	2	0	44
8	HARYANA	7	5	0	12
9	HIMACHAL PRADESH	1	0	0	1
10	JHARKHAND	7	0	0	7
11	KARNATAKA	28	0	0	28
12	KERALA	21	2	1	24
13	MADHYA PRADESH	14	2	0	16
14	MAHARASHTRA	96	4	0	100
15	MANIPUR	1	0	0	1
16	MEGHALAYA	0	0	0	0
17	MIZORAM	0	0	0	0
18	NAGALAND	0	0	0	0
19	ODISHA	2	0	0	2
20	PUNJAB	12	0	0	12
21	RAJASTHAN	21	0	0	21
22	SIKKIM	0	0	0	0
23	TAMIL NADU	48	6	0	54
24	TELANGANA	7	1	0	8
25	TRIPURA	0	0	0	0
26	UTTAR PRADESH	24	0	1	25
27	UTTARAKHAND	4	1	0	5
28	WEST BENGAL	2	2	0	4
29	ANDAMAN AND NICOBAR ISLANDS	0	0	0	0
30	CHANDIGARH	2	0	0	2
31	DADAR AND NAGAR HAVELI	0	0	0	0

32	DAMAN AND DIU	1	0	0	1
33	DELHI	19	5	0	24
34	JAMMU AND KASHMIR	4	2	0	6
35	LADAKH	0	0	0	0
36	LAKSHADWEEP	0	0	0	0
37	PUDUCHERRY	0	0	0	0
Total		379	33	2	414

Note: The data given above in the table No. 6.2 also includes the data pertaining to the MSMEs engaged in manufacturing of dental wax and manufacture of dental laboratory furnaces, dental instruments, artificial teeth, bridges, etc., made in dental labs, which are not the part of study.

7. Major Players of the sector: Following are the major players and famous brands engaged in manufacturing of POP and related products:

1. M/s.Sakarni Plaster INDIA Pvt Ltd ,New Delhi. Sakrani is a famous brand having their units in Bikaner and Jammu Area. Apart from the regular production of POP from the their owned units, Sakrani Plaster India used to procure the POP from many MSMEs and sale under their own brand name.
2. M/s.Walplalst Pvt. Ltd., Mumbai- under the brand name of Buildwell
3. M/s. JK Lakshmi Cement Limited, Sirohi- under the brand name of JK Laxmi Plast POP
4. M/s JK Plast, New Delhi- under the brand name of JK Super Plast POP
5. M/s.Birla Cement Chetak – under the brand name of Birla POP
6. M/s Saint Gobian India Pvt Ltd. – Gyproc Business, Mumbai
7. M/s.Boral Gypsum India Pvt Ltd-under the brand name of USP Boral Plasto POP
8. M/s.FACT-RCF Building Products Ltd (FRBL) ,Rapidwall, Ambalamedu, Earnakulam (Kerla). It is a joint venture of Fertilizers & Chemicals Travancore and Rastriya Chemicals & Fertilizers Mumbai.

These brands are having their own manufacturing units and/or having contract manufacturing from other MSEs engaged in manufacturing of POP and situated in various clusters/areas of country.

8. Data about the imports of Plaster of Paris for the past three years (As per Dc office website)

FY 2017-18 (Value- Rs. In Crore)	FY 2018-19(Value- Rs. In Crore)	FY 2019-20(Value- Rs. In Crore)
128.051308	135.963601	118.447292

The imports of POP is mainly from Iran, Oman, UAE, Thailand, US, Germany, South Korea and China. The POP imported from Oman and Iran is having better whiteness but having poor

quality in terms of setting time while use of POP, which is less as compared to Rajasthan POP quality and thus requires to add certain chemicals/ additives to retard the setting time. The imported POP has become viable in the areas near ports, mainly in Gujarat and Maharashtra, in comparison with the POP being manufactured supplied from Rajasthan, Jammu & Kashmir mainly because of the transportation cost for carrying the POP from clusters to these areas is becoming costlier day by day. The low price of imported POP is also a major reason for import.

9. Data available for the exports well against this product for the past two years (as per DC office website):

FY 2017-(Value- Rs. In Crore)	FY 2018-19 (Value- Rs. In Crore)	FY 2019-(Value- Rs. In Crore)
9.213701	9.8334534	-

10. Scope for the number of units couldn be established further

Year	In Rajasthan	In Telangana	In Gujrat	In Kashmir U.T.	In Maharashtra
2021-22	10	4	5	5	3
2022-23	12	4	7	5	2
2023-24	12	4	8	7	4

11. The demand in the domestic market:

The demand is assessed in the following sectors for POP consumption:

- I. Sanitary ware, Electrical insulators, Crockery items including ceramic art ware, table wares and allied items are requiring POP in large quantity.
There is a growing industrial activity in the field of whiteware, such as pottery, sanitaryware, chemical and electrical porcelains, requiring large quantities of plaster of paris for making moulds and preparation of moulds. The demand for these product are ever increasing.
- II. Construction industry use POP mainly for plastering and with increase of per capita income along with increase in population the construction field will develop further, will increase the demand of POP / calcined gypsum.
- III. Surgical bandages and dental impressions. As there are large number of hospitals and Dental clinics spread in country and large quantities of superior grade plaster of Paris is used in there.
- IV. Miscellaneous such as chalk crayons, sculptures, jewellery statues and toys, paint, in moulding & casting process of nonferrous alloys Plaster boards. There is also considerable demand for the POP arising from a large number of shops and establishments engaged in making statues 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.

POP consumption is directly linked with construction activity and increases during summer and winter seasons and reduces during rainy season as the construction activity is not undertaken during this season and also the production in ceramic MSEs, sculpting activities where atmospheric drying is practiced will be less than normal and energy required for calcination increases due to wet gypsum. With renewed focus on improving the economy and upscaling industrial developments, India lays greater emphasis on creation of Infrastructure. The augmentation of infrastructural activities will endanger further growth of the Construction Industry which concomitantly will raise the consumption of POP.

12 Future Growth Prospectus:

The growth prospectus of the industry is intertwined with the and POP industry cumulatively is expected to grow at 10-12% in line with ceramic and cement industry however, the onset of the COVID-19 pandemic is expected to have a some impact on the POP products market in 2021-22. But the market for moulds making, chalk, medical and other grades is not likely to change as much as chalk boards is being increasingly replaced by white boards. Dental and surgical molds are designed to make them lighter by changes in molds making process and value additions. Also the volume of POP used for these purposes is relatively insignificant. In these grades while usage of POP may remain stagnant the possibility of value addition and increasing turnover is high and the requirements being low, MSEs can benefit by technology and know-how adoption.

The constraint for growth is reported to be based on easy availability of gypsum. The entire gypsum supply source is governed by State Mining Development Corporation in Jammu & Kashmir. In Bikaner cluster also, there is a problem to get the good quality Gypsum at reasonable price as state government has given free hold to the land owners/farmers for mining in their Gypsum bearing land for which they do not have expertise in mining and also the economy of scale is also a matter of concern. Steps would be necessary to find out suitable mining technology to exploit, deep-seated gypsum resources in Bhadvasi deposit, Nagaur district Rajasthan. State-of-the-art-technology needs to be adopted for the exploitation of deep-seated gypsum to make available the, uninterrupted affordable and good quality raw material to the POP industry.

In Jalpaiguri, the gypsum availability is governed by the POP industrial scenario and gypsum market in Bhutan. However, the increasing usage of special retarders and the introduction of new chemical combinations by several key players operating in the current Construction grade plaster market are likely to fuel some growth of the market. In addition, surge in demand for lightweight construction materials and focus on minimizing the structural load of buildings may provide an impetus for the growth of the global gypsum plaster market in the upcoming years.

It can be concluded that future growth of POP industry in short term over a period of 5 years will depend upon the growth in real estate industries. In the long term the growth is not expected in volume terms but will depend on the industries own efforts in moving into value added products by collaborations and know how absorption.

13. Global Demand

The onset of the COVID-19 pandemic is expected to have a strong impact on the global POP products market in 2021-22. As the construction sector gradually recovers from the sluggish first two quarters of 2020 & the ongoing second quarter of 2021, due to stringent lockdown measures, restrictions on transportation, etc., the demand for gypsum plaster is projected to grow at a consistent pace in the upcoming months. The decline in the number of construction projects or delays and postponement of several existing projects is a major factor projected to have some adverse impact on the gypsum plaster market. Factors that could hinder the growth of the convenience, POP products market in the future include COVID-19 pandemic and geopolitical tensions. However, the technological advancements in new product development is expected to compensate these challenges and will support to drive the market to some extent. In the opinion of industry persons, the global growth rate in demand of POP is expected in next 2-3 years is around 1 to 2% per annum.

Based on raw material, the global POP products market can be bifurcated into natural gypsum and synthetic gypsum. The natural gypsum segment is expected to dominate the global gypsum plaster market in coming years. The synthetic gypsum segment is anticipated to offer lucrative opportunities by the end of the forecast period.

The growth of the construction sector is expected to have a direct impact on the overall growth of the global Construction grade plaster (gypsum plaster) market in the upcoming decade. Moreover, benefits offered by Construction grade plaster over conventional water curing processes is one of the key factors expected to drive the Construction grade plaster market in coming years. Another key factor that is expected to play an influential role in driving the adoption of this product is the environment-friendliness of the product. Construction grade plaster has emerged as a popular plastering choice among construction companies, and is increasingly being used to plaster internal surfaces. In addition, it offers exceptional acoustic and thermal properties due to which, the demand is expected to witness steady growth during the forecast period. It is free from shrinkage cracks, fast tracks construction, and is nearly **50%** lighter in weight compared to traditional sand-cement plaster. These factors are likely to propel the Construction grade plaster market in the upcoming years. The entry of new and advanced machinery for the production of gypsum plaster is expected to play an essential role in driving the gypsum plaster market during the assessment period.

14. Demand of the export market

POP is traded all around the world. There are number of countries and territories like China, UAE, USA, Hong Kong, Singapore, Nepal, Bangladesh, South Africa, Fiji, which are actively importing POP from India.

At the back of these factors, along with increasing focus on research and development and in the opinion of POP industry persons, the global POP market is projected to reach US\$ 600 Mn by the end of 2030. A surge in the number of residential and non-residential construction projects, increasing foreign direct investments, and encouraging government initiatives are anticipated to play an imperative role in fueling the demand for gypsum plaster, especially in the Asia Pacific region.

15. Suggestive steps to curb the Import of POP to make India Atmnirbhar

- The constraint for growth of POP industry is reported to be easy availability of gypsum. Active and entrepreneur friendly policies of government, state and GoI and Mining Development Corporations matters a lot for easy access of raw material to the industry.
- Steps would be necessary to find out suitable mining technology to exploit, deep-seated gypsum resources. In Utlai area of Nagaur District of Rajasthan, a huge reserve of good quality Natural Gypsum is available below the 50 feet of ground level. The deployment of suitable technology for deep seated mining is a need for sustainability of units in Bikaner and surrounding districts as the assessable reserves in surrounding are exhausting fast.
- Presently the gypsum dig out from mines is not being segregated as per quality. Therefore, the POP manufacturers are using the available gypsum for the intended product, which varies in the quality, not able to either standardize the production parameters nor product quality assurance.
- Moving into manufacturing of value added products by collaborations and know how absorption by the POP manufacturers of the country.
- Focusing on the ways for increase the demand for lightweight construction materials and focus on minimizing the structural load of buildings may provide an impetus for the growth of the gypsum plaster market in the upcoming years.
- Poor road connectivity from mines to POP plants/clusters is also a matter of great concern, which needs to be addressed.
- Development of the low cost transportation means for raw material and finished products to make the product competitive with imported material.
- Fast setting time of the POP produced in the some of the clusters/areas makes less demand in market. This issue could be sorted out by making the thorough chemical analysis of the Gypsum sources and based on R & D, the area wise/R.M. composition wise solution should be developed to enhance the POP setting time while use , in the form of suitable additives/ Chemicals.

- Low-end scale of operation. Common needs of units to be identified and though the Clustering/CFC their needs may be addressed to enhance the capacity building of Units, individually as well as collectively. Setting up of common testing centers and common raw material buying centre could be some of the ways to enhance their competitiveness.
- Failure of technology development institutions to provide customized support for automation or product development or technology upgradation.
- Availability of coal or Wood at competitive prices for the POP units is also a matter of big concern as the average fuel cost is about Rs. 900/- for manufacturing of 1 Ton POP. In Bikaner cluster imported coal is being used as the Coal India Limited & other Indian coal companies are not able to supply the desired calorific value coal at competitive price to the units, thus enhancing the burden on foreign reserves.
- Adoption of energy efficient technologies and adoption of standard operating procedures are the essential things to be taken care by all units.
- About 40 of the units possess the BIS licenses shows that the poor customer awareness coupled with the 'Sab chalata hai' mindset of entrepreneurs has made the market where product quality differentiation has no value and thus poorly process controlled products are dominating the market. The expert organizations like NPC, TERI, BEE, PCRA should be engaged for cluster level intervention to address these issues.
- Higher royalty applicable rates in few states for Gypsum mining also makes burden on POP units and thus compels them to cut their profit margins. This makes business unprofitable and becomes the main cause for closure of units.
- Access to finance/ subsidy for replacement of old and obsolete machinery with advanced machinery is the dire need of industry for their sustainability and growth and to make products globally competitive.
- Technological barriers: The present technology employed in production of POP is locally developed, is conventional & obsolete. The out-put from the present technology employed is not efficient: on quality parameter achievement which can meet the Indian Standard or international standard, the productivity is also very low. Therefore, technological intervention in order to improve product quality at par with quality standard and improving productivity to reduce cost of the production is the need of hour.
- The price difference between the Indian POP and imported POP is one of the factor for import of POP. The imported POP is quit cheaper then the indigenious. The production of POP on large scale, utilization of installed capacity to the possible extent, improving in productivity, deploying LEAN and MFCA in production unit and developing cost effective technology etc are the suggested measure to counter the cost difference. Moving into manufacturing of value added products by collaborations and know how absorption by

the POP manufacturers of the country to widen the market base within country as well as export market. Development of the low cost transportation means for raw material and finished products to make the product competitive with imported material.

- Development of new products/ application based on POP: By developing new product / application based on POP will expand the market base , indigenous as well as export, will attract the new units with modern technology and this will fuel the modernization on technological front, which will ultimately bring the Indian POP at par with imported one in terms of quality and cost. As a result the import of POP may reduce.

(B). Technical details

1. Sector in which the product is falling: Ceramic Industry

2. End users of the products/sectors:

- Used in making casts and patterns for molds and statues for pressing and jiggering shapes in plastic clay.
- Used in 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.
- Used by the ceramic industry in the production of dishes, sanitary ware, art ware, stone ware and related products.
- Used in the manufacture of electrical insulators and low tension porcelain insulators in the manufacture of sanitary wares, Making decorative moulding and building interior features,
- imitate wood or stone mostly found in ancient buildings and monuments.
- Used as a fireproofing material and for making chinks. Many fireproofing products and fire protection systems make use of plaster of Paris. The plaster coating discharges water vapors when the building catches fire and thus helping to retard the spread of the fire. It also gives some protection to slow down the heat circulation into steel and concrete components, that would lose their strength and breakdown in a fire.
- Used in hospitals for immobilizing the affected part in case of bone fracture or sprain. These Orthopedic plasters are used by hospitals and clinics for all types of orthopedic cast work such as surgical caste, orthopedic bandages etc.
- Used in dentistry for mounting casts or models of oral tissues. False teeth (dentures) are made by first taking a dental impression utilizing a delicate, malleable material that can be expelled from around the teeth and gums with full replication and utilizing the impression to making a wax model of the teeth and gums. The model is utilized to make a plaster form (which is heated so the wax melts and streams out) and the dental replacement materials are infused into the shape. After some time, the mould is opened and the false teeth are finished.
- Different kinds of moulds and prototypes are made with the help of plaster of Paris. Plaster of Paris is also utilized in radiotherapy for manufacturing individualized immobilization shells for patients. The bandages of plaster are utilized to develop an impression of a patient's head and neck, and then the paste of plaster is utilized to fill the impression and produce a plaster dummy
- Used to fill small gaps on walls & roofs. This material is also used for False Ceiling in buildings.
- Used in chemistry laboratory for sealing air-gaps in apparatus when air-tight arrangement is required.

- Used 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 crayon: Chalk crayons are round and tapereshape sticks of different colors made of plaster of Paris. They are extensively used for writing on black boards and markings on any colored surface.
- Used is utilized by numerous morticians and executives of funeral houses to remake the damaged tissue, rejoin cut off parts of dead bodies, and to fill wounds occurred.
- Gypsum plaster is also used in 3D printing nowadays, where the water is specifically applied by the inkjet head. Powder bed and inkjet head 3D printing is commonly based on the reaction of gypsum plaster with water, where the water is selectively applied by the inkjet head.

3. Governing Indian specification:

The Bureau of Indian Standards has formulated and published the following specifications for maintaining quality of the product and testing purpose.

BIS Standard No.	Item Nomenclature & Description	No. of License Holding Companies in India (as on 21.05.2021)
IS 2333 (1992)	Plaster of Paris for Ceramic Industry	Nil
IS 2547-Part 1 (1976)	Gypsum building Plaster excluding premixed light weight plaster Class/ Type <ul style="list-style-type: none"> • Plaster of Paris β Hemihydrate (Type A) • Retarded Hemihydrate Gypsum Plaster (Type B) Type I - Under Coat - Browning Plaster Metal Lathing Plaster Type II - Final Coat Plaster - Finish Plaster Board Finish Plaster <ul style="list-style-type: none"> • c) Anhydrous Gypsum Plaster • d) Keene's Plaster 	33
IS 6555 (1972)	Dental Laboratory	Nil
IS 6556 (1972)	Dental Impression Plaster	Nil
BIS Specification for Other Related Item		
IS 4738:1993	Bandage, Plaster of Paris	Nil
IS 2095-Part 1(2011)	Gypsum Plaster Board	6
IS 2547-Part 2 (1976)	Gypsum building plaster including premixed lightweight plaster	Nil

BIS Specifications for Testing Methods

IS 1288:1982	Methods of tests for mineral gypsum	-
IS 2542 (Part-01): 1978 (RA: 2017) Amd-03	<p>Methods of test for Gypsum Plasters, Concrete and Products Concrete (First Revision) (Soundness, Compressive Strength, N/mm², anverse Strength. Kg/cm² 5.54 Min 5.0 Min4.0# -- -- REMARK)</p> <ul style="list-style-type: none"> • Determination of setting time by potentiometer, determination of bulk density, and determination of dry set density, have been introduced. • Determining the normal consistency of gypsum plaster : APPARATUS : Modified Vicat Apparatus & Consistometer for determining the setting time of plaster a Vicat apparatus including Vicatmould, needle and other attachments - Potentiomete Sample Containers • Method for Stablizing POP and Undercoat Plaster – Plaster shall be stabilized before use in the tests for compressive strength, transverse strength, mechanical resistance and expansion on setting. • Compressive Strength and Dry Set Density of Gypsum Plaster- APPARATUS Cube Moulds • Soundness of Gypsum Plaster • Mechanical Resistance of Gypsum Plaster by Dropping Ball Test • Damp-Closet, Tube • Retarded Hemihydrate Plaster (Final Coat Plaster) • Anhydrous Gypsum Plaster and Keene's Plaster • reedom from Coarse Particles • Expansion of Plaster, APPARATUS 3.1 Extensometer — • Sand in Set Plaster • Percentage of Insoluble Matter in Plaster, 	-

	<p>Percentage of Insoluble Matter in Sand, Percentage of Insoluble Matter in Gypsum Neat Plaster</p> <ul style="list-style-type: none"> • Wood Fibre Content in Wood Fibre Gypsum Plaster • Dry Bulk Density 	
<p>IS 1290 (1973) (Second Revision; reaffirmed 2011)</p>	<p>Mineral Gypsum :It is used as a raw material for manufacturing of POP.</p> <p>The quality of mineral gypsum available in India is very inconsistent and the percentage of calcium sulphate varies even in one and the same deposit. The ratio between the high grade gypsum of above 80 percent calcium sulphate content and the rest is generally 1 : 3. Consequently, a huge amount of low grade gypsum for which economical beneficiation arrangements are not available at present, remains untapped causing considerable difficulty to the mining industry. To offset the national wastage involved, it is essential that a particular industry should derive its supply of the necessary quality of gypsum and not of a higher or a lower quality. This standard is intended to guide the trade in using the right quality of gypsum for use in the manufacture of surgical plaster, ammonium sulphate, pottery and cement.</p> <p>Acidity and Alkalinity Test for surgical plaster industry:</p> <p>TEST FOR ACIDITY AND ALKALINITYA:Methyl Orange Indicator Solution - Dissolve 0.1 g of methyl orange in 100 ml of water. A-1.2 Phenolphthalein Indicator Solution — Dissolve 0.01 g of phenolphthalein in 100 ml of 60 percent rectified spirit. A-2. PROCEDURE A-2.1 Shake 5 g of the prepared sample (see 5 of IS : 1288-1973*) with 20 ml of water. Warm the mixture to about 40°C and then filter. Test the clear filtrate with methyl orange and phenolphthalein indicator solutions. A-2.2 The material shall be considered as having passed the test if the filtrate is neither acidic to methyl orange nor alkaline to phenolphthalein.</p> <ul style="list-style-type: none"> • Free water, percent by mass, Max 1.0 	<p>-</p>

	<ul style="list-style-type: none"> • Carbon dioxide (as Co₂), percent by mass, Max 1.0 • Silica and other insoluble matter, percent by mass, Max0.7 • Iron and aluminium (as oxides), percent by mass, Max 0.1 • Magnesium oxide (as MgO), percent by mass, Max 0.5 • Calcium sulphate (as CaSO₄.2H₂O), percent by mass Min 96.0 • Chlorides (as NaCl), percent by mass, Max 0.01 	
IS:10170-1982, (reaffirmed 2008)	<p>BIS specification for by-product gypsum.</p> <p>Specification lays down a minimum 70% content of CaSO₄ .2H₂O and maximum limit of 0.75% Na, 1.0% F and 15% free moisture on dry basis. The material should pass through 2 mm sieve, but 50% of material should also pass through 0.25 mm (60 mesh) sieve.</p>	-
IS:12679-1989 (reaffirmed 2010)	<p>Specifications of by-product gypsum for use in plaster, blocks and boards,</p>	-

Note-1: Sub-contracting is permitted to a laboratory recognized by the BIS or Government laboratories empanelled by the BIS.

4. Governing international specification:

4.1 American Society for Testing and Materials (ASTM):

These standards govern the manufacture of products and set strict criteria for strength, water resistance, and other characteristics. Below are some of the standards followed in the industry:

- ASTM C 28, Specification for Gypsum Plasters. This specification covers four gypsum plasters; gypsum mill-mixed plaster, gypsum neat plaster, gypsum wood fibered plaster, and gypsum gauging plaster. The plasters shall contain a volume of aggregate not more than requirements prescribed. Compressive strength test and Vicat test shall be performed to meet the requirements.
- ASTM C1324 (ASTM International, 2005b). petrographic examination would normally be performed. Once a sample is received in the laboratory, an initial visual and low-power microscopical examination is conducted to determine the number of material types or layers, layer thickness, colour, and the relative hardness, relative bond strength, and coherence of the material. High-power examination of thin section specimens is then used to determine the nature of the gypsum plaster matrix, the quantity of impurities and additions, bond surface characteristics, and outer surface features, and to screen the material for evidence of distress or deterioration.

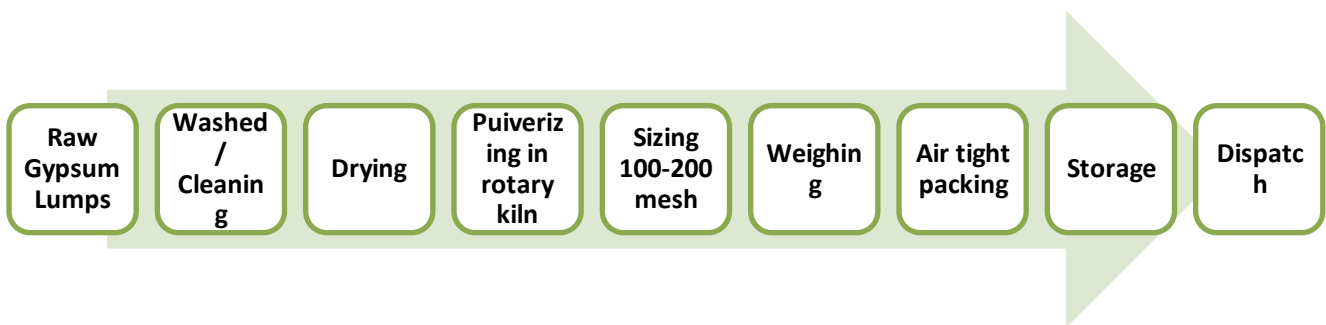
4.2 Other related International standards:

- ASTM C 35, Specification for Inorganic Aggregates for Use in Gypsum Plaster.
- ASTM C 37, Specification for Gypsum Lath.
- ASTM C 59, Specification for Gypsum Casting and Molding Plaster.
- ASTM C 842, Specification for Application of Interior Gypsum Plaster.
- ASTM C 587, Specification for Gypsum Veneer Plaster.
- ASTM C 1396, Specification for Gypsum Board (Gypsum Base for Veneer Plaster)
- ASTM C1264-19, Specification for Sampling, Inspection, Rejection, Certification, Packaging, Marking, Shipping, Handling, and Storage of Gypsum Panel Products
- ASTM C1766- 15(2019), Standard Specification for Factory-Laminated Gypsum Panel Products
- ASTM C1658 ,Specification for Glass Mat Gypsum Panels
- ASTM international standard test methods for chemical analysis Plaster of Paris as per (471M-61).
- EN 13279-1 Gypsum binders and gypsum plasters — Part 1: Powder products based on gypsum binder for building purposes. This includes premixed gypsum building plasters for plastering of walls and ceilings inside buildings where they are applied as a finishing material which can be decorated.

For occupational Health the following standard is also followed internationally.

- **Occupational Safety and Health Administration (OSHA):** People can be exposed to plaster of Paris in the workplace by breathing it in, swallowing it, skin contact, and eye contact. The Occupational Safety and Health Administration (OSHA) has set the legal limit (permissible exposure limit) for plaster of Paris exposure in the workplace as 15 mg/m³ total exposure and 5 mg/m³ respiratory exposure over an 8-hour workday. The National Institute for Occupational Safety and Health (NIOSH) has set a Recommended exposure limit (REL) of 10 mg/m³ total exposure and 5 mg/m³ respiratory exposure over an 8-hour workday.

5. Flow process chart of the manufacturing:



Plaster of Paris is made up from gypsum. Plaster of Paris contains the calcium sulfate hemihydrates ($\text{CaSO}_4 \cdot 0.5 \text{H}_2\text{O}$). This is prepared by heating the gypsum which contains calcium sulfate dihydrate ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) to a temperature about 150°C (120-180°C). Certain additives are added when heating. Plaster of Paris is a fine, white powder. When it is hydrated it can be used to mould things, and when allowed to dry, it hardens and retains the shape it is set to before drying.

The primary difference between gypsum and Plaster of Paris is that calcium sulphate dihydrate is found in the gypsum, whereas calcium sulphate hemihydrates are contained in the Plaster of Paris. A naturally occurring mineral is gypsum. This is thus Gypsum shapes the POP when heated to such a temperature.

The gypsum doesn't require any beneficiation and is used as such while manufacturing POP. The variation in POP is based on end use. The variation is brought about by grinding to varying mesh sizes and calcining time and temperature variation.

6: Qualitative parameters of the product

Plaster of Paris is usually a white dry plaster powder. It can be effectively worked with metal apparatuses or even abrasive sheets and can be shaped as per the requirements. The strength of plaster of Paris is not as strong as other compounds and it often requires external support when a large amount is used. It is often applied in the form of a quick-setting paste with water.

Appearance of plaster of Paris powder should be Fine, odorless, tasteless. It is available in two grades, i.e. Grades Alpha and Beta. The variation in POP quality for various uses is brought about by grinding to varying mesh sizes and calcining time and temperature variation.

6.1: 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 re-crystallization.

6.2: 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.

Its Molecular formula is $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$, Melting point $163(-\frac{1}{2}\text{H}_2\text{O})^\circ\text{C}$ 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.

The Qualitative parameters for plaster of Paris is as under:

- 1: Fineness: Material retained on 150 microns IS: sieve
- 2: Normal consistency 45 to 65
- 3: Setting time 8 to 25 minutes,
- 4: Temperature rise during setting 12°C
- 5: Expansion after setting 0.2 to 0.4%
- 6: Modules of rupture 4.0 to 7.0 MPA/minutes
- 7: Dry compressive strength 9 to 20 MPA/minutes
- 8: Water absorption 12 to 25%
- 9: Calcium sulphate(CaSO_4) 85 to 90%
- 10: Carbonate (CaCO_3) 1 to 3%
- 11: Compound water 5.8 to 6.4%

6.3: Physical properties of gypsum and POP

S. No	Property	Parameter for Gypsum	Parameter for POP
1	Molecular Weight	172.17	145.15
2	Density /cm	2.31	2.62-2.64
3	Hardness, Mohs	1.5	
4	Water of crystallization, wt%	20.92	6.21
5	Water solubility @ 20°C /l 100g of solution	0.21	0.88

6.4: Requirement of By-product Gypsum for Use in Plaster, Blocks and Boards (IS:12679 - 1989, Reaffirmed 2010)

Sl. No.	Characteristic Requirement	Requirement Phospho-	Fluoro-gypsum	Marine-gypsum
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		gypsum		
1	P2O5 % by mass (max)	0.40	-	-
2	F % by mass (max)	0.40	1.00	-
3	Na2O % by mass (max)	0.10	-	-
4	K2O % by mass (max)	0.20	-	-
5	Organic matter % by mass (max)	0.15	-	-
6	CaSO4 .2H2O % by mass (max)	85.00	90.00*	85.00
7	Cl as NaCl % by mass (max)	0.10	-	0.10
8	pH of 10% aqueous suspension of gypsum (min)	5.00	5.00	6.00

Note: *Fluoro-gypsum shall be in anhydrous form (as CaSO4).

7: Details of the product Licenses to obtained product:

For establishment of manufacturing unit of plaster of paris in the state of Gujarat following STATUTORY / GOVERNMENT APPROVALS are required:

- Goods and Services Tax (GST) registration
- Shop and establishment registration (GUMASTA license)
- Professional tax registration
- Factory act license 1948
- Employee State Insurance Act (ESIC)
- Import Export Code registration-IECcode,(for exporter/importer)
- Fire safety license
- NOC from pollution control board (GPCB)
- Approved building plan from competent authority

7.1: To obtain the above license/ permission following basic documents are required:

- Udyam Registration Certificate
- Pan card
- Address proof
- Details of Bank account
- Registration of Partnership deed/ Proprietorship/ Company

7.2: Equipment required for the manufacturing:

- Hot filtration and crushing unit (Attrition/ Jaw /Hammer) with pump Fluid Control Equipment
- Screw conveyor
- Dryer
- Storage tanks
- Trolleys
- Weighing scale
- Calciner (Rotary Drum type/ Pan type/Kettle type Calciner)
- Disc pulveriser (Attrition type) 1 MT/hour with motor and other accessories
- Dust Collector
- Packaging unit/ Bag Stitching Machine
- Burner
- Testing equipments

8: Test facilities required for the products

S. No.	Tests used in with Clause Reference	Major test equipment/ Chemicals required to test as per the Indian Standard
1	Chemical analysis (Clause 4.1)	Ammonium Chloride Ammonia Solution Ammonium Nitrate Barium Chloride Citric Acid Calcium Carbonate Calcium Chloride Di-hydrate Calcium Sulphate Extra Pure Di- ammonium hydrogen phosphate Di - Ammonium Oxalate E D T A Solution N 50 Erio-chrom Black T Filter paper ordinary Filter Paper (Whattman) 40 Filter Paper (Whattman) 41 Filter Paper (Whattman) 42 Gypsum Extra Pure Grease Hydro Chloride Acid Litmus Paper Blue , Litmus Paper Red Methyl Red Indicator Nitric Acid Oxalic Acid Propan - 2- ol

		Potassium Hydroxide Potassium Permanganate Phenolphthalein Potassium Chloride P.H. Paper Patton and Reeder's Indicator Petroleum Jelly Rectified Spirit Sulphuric Acid Sodium Oxalate Sodium Chloride Sodium Carbonate Silver Nitrate Tri-Sodium Citrate
2	Loss on Ignition (Clause 4.1) (should be >4 and <9)	Muffle Furnace
3	Consistency and Setting time (Clause 5.2)	Vicat Apparatus (with moulds and needles) Apparatus for Checking Consistency
4	Transverse Strength (Clause 5.2) Hollow Corrosion resistant metal cylinder	Transverse Strength testing machine With Load Indicator Moulds
5	Residue on 150 µm sieve (Clause 5.2)	Test Sieves
6	Soundness test (Clause 5.2)	Moulds Steamer Water Bath Steel Scale
7	Mechanical resistance of set neat plaster (Clause 5.2)	Moulds Tube Ball
8	Expansion on setting (Clause 5.2)	Extensometer Bar Moulds Stop watch Room Thermometer Spatula
9	Other common lab equipments	Hot Air Oven Humidity Chamber S.S. Chamber Digital Flame photometer LPG Cylinder with regulator Balance Hot Plate Desiccators Weighing Balance Standard sand

The above list is indicative only and may not be treated as exhaustive.

8.2: For the testing of Medical grade POP following facilities is required:

- For Atmospheric condition-An A/C hall is essential
- For fineness –Series of sieves.
- For Dry compressive strength, Modules of rupture
- For water absorption, Auto-clave is required.
- Tensile machine for crushing strength.
- Chemical testing equipments like, Container, Glass beaker, porcelain basin, stirrer, Hard rubber ring, Flat glass sheet stop watch, Thermometer, Dish, Spoon knife, Air-oven and the Chemicals such as: Dilute hydrochloric acid, Soda ash, Magnesium perchlorate are required for testing.

8.3: Test Details

Requirement	BIS Standard Clause	BIS Standard Reference
(a). Chemical Requirements		
SO ₃ percentage by mass	4.1	Min 35% as per IS 2547 (Part 1) & IS 1288
CaO percentage by mass,	4.1	Min 2/3 of SO ₃ as per IS 2547 (Part 1) & IS 1288
Soluble magnesium salts expressed as percentage of MgO	Appendix A	Min 0.3% as per IS 2547 (Part 1)
Soluble sodium salts expressed as percentage of Na ₂ O	Appendix A	Max 0.3% as per IS 2547 (Part 1)
Loss of ignition percent by mass	Appendix B	IS 2547 (Part 1)
Free lime percent	Appendix C	IS 2547 (Part 1)
(b). Physical Requirements		
Purity	5.1	IS 2547 (Part 1)
Setting time	5.2	IS 2547 (Part 1)
a) Plaster sand mixture		

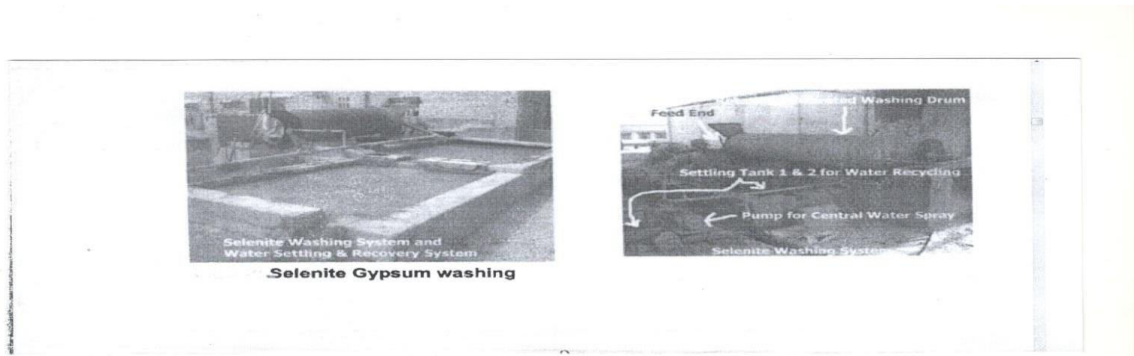
b) Neat plaster

Transverse Strength	5.2	I S 2 5 47(Part 1)
Soundness	5.2	I S 2 5 47(Part 1)
Mechanical Resistance	5.2	I S 2 5 47(Part 1)
Of set neat plaster		
Residue on 150 µm	5.2	I S 2 5 47(Part 1)
sieve percentage		
Expansion on setting	5.2	I S 2 5 47(Part 1)
Percentage		

9: The technology existing the manufacturing of the product

9.1: Raw Material Cleaning:

The gypsum transported from mine to manufacturing sites may required to beneficiated depending on presence of impurities. The lump and rock type gypsum are processed directly, the selenite and marine gypsum are washed with water before being processed further. During washing, the gypsum is loaded into a inclined rotating cylindrical screen from one end and the water is continuously sprayed over the material through a perforated tube. The salt, fine silt and other impurities are dissolved or carried away with water and clean material is collected from other end. Water carrying impurities is collected in the sedimentation tank where the silt gets settled and overflowing clean water is collected in other tank from where it is recycled back. The collected silt is removed periodically and make-up water is added when required. The sludge generated from cleaning of gypsum is sold to cement manufacturers or disposed of in low lying areas.



9.2: Raw Material Crushing

Raw or cleaned Gypsum is crushed to 25-100 mesh size. Raw gypsum obtained from mines in lumps form is broken to smaller pieces manually in the varying sizes of upto 150 mm. These lumps are crushed to uniform sizes in the range of 25- 100 mesh in the crushers. The crushing may be carried out in a hammer mill or attrition mill or jaw crusher depending on type of raw material and desired product. The various types of crusher in use in POP industry are briefly described.

9.2.1: Attrition Mills

Attrition mills (like used for flour milling) are widely used for raw material crushing in small scale units at Rajasthan. This mill works on the principal of shearing force. The raw gypsum of 100-150 mm size is grounded to 20-50 mesh.

9.2.2: Jaw Crusher

Jaw crushers are the most commonly used crushers in all clusters and large scale industry except in clusters of Rajasthan. In Jaw Crusher the feed is compressed between a stationary and a movable surface. These crushers are made with jaw widths varying from about 2" to 48" and the running speed varies from about 100 to 400 RPM.

9.2.3: Hammer Mill

Hammer Mill is also widely used for gypsum crushing, sometimes as stand alone or after pre-crushing in jaw crusher. In these mills hammers are attached to the rotor via pivots so that they are deflected when they hit strong and particularly large stones. The grinding action results from impact and attrition between the lumps or particles of the material being ground. The

fineness of product can be regulated by changing rotor speed, feed rate, or clearance between hammers & grinding plates as well as by changing the number & type of hammers used & the size of discharge opening. In most cases the crushing zone is surrounded by grate bars so that fragments which are larger than the openings of the grating are retained in the crushing zone.

9.3: Calcination

The crushed gypsum is conveyed near the calciner from where it is fed into calciner, manually (in small/medium scale units). The Gypsum is heated in the furnace at a temperature of 120-200°C for 1 to 4 hrs to remove physical moisture and $\frac{3}{4}$ chemically bound moisture in gypsum 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 ($\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$). This is the most advanced system of POP manufacturing as on day.

The variation in calcining temperature is due to raw material quality variance, product quality that is being produced (some units produce low quality POP).

The variation in calcining time is due to low quality product being produced and also due to moisture variations in raw material.

Firewood and coal are the most commonly used fuel in calciner furnace in small scale industries while diesel or furnace oil is the preferred fuel in large scale industry. Calcined POP is taken out manually from calciner and spreaded in an open space inside the shed to cool in small scale industry and in large scale industry heat recovery through heat exchanger is practiced.

The process of calcination is a batch process and batch cycle depends on capacity and operating practices. Around $1\frac{1}{2}$ hour is needed to complete a batch operation including loading and unloading operations. In calcination process, $1\frac{1}{2}$ molecule of water from hydrated gypsum is removed to obtain the required properties of POP. After cooling, the calcined powder is passed through 150 mesh and packed in airtight polythene lined gunny bags.

Firewood is the most commonly used fuel in calciner furnace in MSEs while diesel or furnace oil is the preferred fuel in medium & large scale industry. Calcined POP is taken out manually from calciner and spreaded in an open space inside the shed to cool in MSEs and in medium & large scale industry heat recovery through heat exchanger is practiced. The major source of dust emission is the drum vent pipe besides combustion gas emissions from furnace. Coal is the main fuel used in the POP units of Rajasthan whereas Wood is the fuel commonly used barring few units in Siliguri where coal and FO is used. The usage varies from 100 -150 Kg of coal and 200-350 Kg wood per ton of POP produced.

The various types of calciners used in India are described below:

9.3.1: Rotary Drum calciner

The Rotary Drum calciners are horizontal / vertical drums, made up of mild steel, rotating along the horizontal shaft at slow speed of around 10-12 rpm. The batch capacity of drum is in the tune of 1 ton and the batch time varies from 1.5 hrs to 4 hrs, depending on desired quality & end use of product. This type of calciner is predominantly used in clusters of Rajasthan and is gaining in popularity in Jammu and Jalpaiguri clusters. The drum is heated so that gypsum (inside drum) temperature rises to 160-200 °C.

Traditionally, POP industries in MSE sector use locally fabricated furnace for heating of gypsum using drum with 1 or 2 tonne capacity. The typical dimensions of the furnaces are 72 X 102 X 100 inch in P.O.P. clusters of MSE. The drums are made up of mild steel of 3 feet diameter and 6 feet length. The loading of the gypsum into the drum is generally done manually. There is no instrumentation used for monitoring and controlling of process parameter. A low pressure burner is used to reach the calcinations temperature. Furnace temperature is subjectively maintained at around 1000°C. Some of the important features of the traditional furnaces used in the cluster include the following:

- High temperature of flue gases (more than 700°C).
- Manual judgments are used to monitor furnace operation and no instrumentation is used.
- Use of improper refractories for wall construction.
- Poor insulation on the furnace wall.
- There is no external fin on drum surface. Burner used is of crude type.

9.3.2: Pan type Calciner

The Pan type calciners are stationary calciners wherein the material is gently agitated through chain agitator inside the pan. Here the material is heated in two stages; pre-heat chamber (where it is heated upto 80-100°C through flue gases of main chamber), and in main chamber where it is heated upto desired temp of 180°C for 3-4 hrs. Batch capacity of these calciners is 600-800 kg.

9.3.3: Kettle Calciner

These are the continuous type of calciners used in large scale units, producing POP at the rate of 10-12 T/hr. In India Kettle type continuous calciner with combined drier and grinder is used in large scale industry with a capacity of 10-12 T/hr. The temperature of calcining is about 158°C and time of calcinations is around 4-5 hours. The specific fuel oil reported to be used is 28-32 liters per ton of POP. Since the kettle is enclosed loading and unloading of calciner is done automatically through enclosed system and emissions are directed to ESP or bag filter to control emissions and recover material.

9.4: Pulverisation

The calcined POP after cooling is manually fed in the pulveriser and grounded further to about 200-mesh size. Air is blown through grinder, which lifts the ground calcined POP. Silica particles (impurity in gypsum) get collected at side outlet of hammer mill due to density difference between silica and POP particles from where they are removed manually and disposed. The POP particles are airlifted into cyclone, where particles of size 200-250 mesh are collected from the bottom of cyclone and finer particles get carried away from cyclone into a bag filter or recycled back to the end of pulveriser. Furthermore, additive and retarders are added to gypsum plaster to delay the setting. The POP collected from cyclones and bag filter is mixed as per the product specification and packed in bags as final product. The finer particles are passed into an open type bag filter and collected from the bag filter hopper. The POP particles collected from bag filter are combined with particles from cyclone and sold off or disposed of in low lying areas.

Furnace with plant yard fabrication



Burner and drum under



10: Technology Advancement

Rapid growth in technology is expected to drive market growth during the coming years. To take advantage of the opportunities, the business research company recommends the convenience, POP manufacturing companies to adopt new technologies, focus on providing more go other options and focus on target audience. Technological advancements coupled with increasing investments in research and development have paved the way for innovative and cutting-edge engineering and construction techniques due to which, the demand for environment-friendly products, such as gypsum plaster has steadily grown.

With the integration of modern technology based system for POP manufacturing, such as mechanical, hydraulic, electric automated and intelligent controlling technology, which grant it with advantages, the existing serious problems such as low production, poor efficiency, difficult installation & maintenance of manufacturing etc, could be solved.

Technology Upgradation requirements of POP industry

1. In large scale units flue gas heat recovery, heat recovery from product cooling helps improve thermal energy efficiency, however in MSEs heat recovery is not practiced. The study of TERI shows that by improving insulation and controlling draft path, a saving of 15% of fuel is possible.
2. Based on the evaluation of POP Cluster by TERI, it is found that fabric filters are not economically viable. Among the techno-economically viable alternatives considering the high dust loading it is recommended that a Baffle Settling Chamber, Cyclone will be a appropriate control system considering particle cut diameter ($d_c < 10\text{microns}$) and average dust loading in the range of 3000- 4000 mg/m³.

11: Suggested modern technology for implementation or available in the market for manufacturing of plaster of Paris

- **Fluidized Bed Technique of Producing POP**

The main principle of drying system using fluidized technique is to fluidize the powdered gypsum (POP) by a root blower blowing hot air from bottom of the boiling furnace body. The chamber is heated by delicate and intensive net work of steel pipes. A heat conductive oil/steam is circulated in these coils; this circulating fluid releases the heat into the inside of furnace. There is a roots blower under the bottom of boiling furnace, and it blows hot air in to the furnace, until powder is in boiling status. Under a certain temperature, the dried and dehydrated powder becomes lighter, and gets carried away with hot air automatically. The quality of this kind of gypsum powder is stable, because the equipment adopts dried electrostatic dust remover, so the dust-removing efficiency is above 95%. It appears that this technique is very efficient technique. The fluidized bed technique there are no moving parts and both thermic fluid and steam can be used to heat the charge to required temperature. The systems using steam are comparatively less efficient in comparison to the thermic fluid.

- **Advanced modern technologies based Jaw crusher**

The advanced modern technologies based Jaw crusher along with conveyor belt and screening system structure plant are available in market for production of POP. This modern technology is a new type intelligent coarse crusher with big capacity system and high efficiency which Reducing the maintenance time.

- **Automated Vertical grinding mill**

Where the Fully is also a modern technology for manufacturing of POP, Raw material falls down in to feed hopper and then enters rotor through central entrance hole. It is accelerated in high speed rotor and then is thrown out at speed of 60-75 m/s when hitting anvil it is crushed this system is global most advanced dry-process pop making system It integrates the functions of high-efficiency particle shape optimization. Fully Automatic Vertical grinding mill integrates crushing, drying, grinding, separating and transporting.

- **Solar Parabolic System**

The POP units mainly use wood or coal to calcine gypsum. The electrical energy constitutes only 5% while rest is thermal energy. Most of POP units in India are situated in western Rajasthan. This region has about 300-320 days of clear sunshine. Since thermal energy has major contribution in energy mix, it makes sense to supplement the same with concentrated solar technology. A commercial parabolic concentrator could be used for calcinations process to producing POP. The pay back period is observed to be of the order of 4 years.

Whereas the Dual Axis Tracked Parabolic Dish Concentrators systems employ dual axis sun tracking. In India at present two options are available as ARUN dishes in 100 and 169 sqm while Megawatt dishes in 90 sqm could be used for this purpose for delivering of the required 40000 kcal/hour. Considering some government incentives and accelerated benefits as in case of Scheffler dishes, the economics work out is similar with payback period of around 2-3 years with financial. To minimize the capital cost of solar concentrating, the most efficient method of calcination could be tied up with such systems.

- **Green technique that can convert Plaster of Paris waste into useful products**

POP waste is a hazardous waste generated from hospitals and other medical centres. It is mainly used for setting broken or fractured bones or for making casts in dentistry. The waste is loaded with bacteria and needs disinfection. It affects not only the environment but also people who collect, segregate and dispose it.

Typically such waste from hospitals is collected by municipal waste collectors and incinerated. Incineration generates toxic gases and heavy metals, resulting in air and soil pollution.

A team of scientists has developed a technique that promises to help recycle Plaster of Paris waste from hospitals and other medical centres in a simple, eco-friendly and economical way. It has been developed by Pune-based National Chemical Laboratory (CSIR-NCL) and Jalna campus of Mumbai-based Institute of Chemical Technology.

The new technique is non-toxic. It disinfects waste and converts it into useful products like ammonium sulphate and calcium bicarbonate. It can be used as a green alternative to currently used method of incineration. The technique can also be used to disintegrate POP waste from idols immersed in water bodies.

The new technique involves treatment with ammonium bicarbonate (ABC) solution with a concentration of 20 per cent. The solution was found to disintegrate the waste into high value and non-toxic chemicals such as ammonium sulphate and calcium bicarbonate in the form of sludge in 24 hours to 36 hours at room temperature.

Ammonium sulphate can be utilized as nitrogen fertilizer, fire-extinguishing powder, and in industries like pharmaceutical, textile and wood pulp. Calcium carbonate can be used in metallurgy industry, mainly in steel manufacturing.

"The 20% solution of ammonium bicarbonate also exhibits antibacterial and antifungal property. It could kill 99.9% microbes present in POP waste samples within three hours. The solution also degrades bio-films formed on plaster, especially in orthopedic wastes. This method can prove helpful in villages and remote areas where biomedical waste disposal facilities are not available.

The technique was also found useful to disintegrate idols made of Plaster of Paris. The Municipal Corporations in various cities may show their interest in using it for tackling the problem of pollution because of immersion of idols in rivers and other water bodies.

12: Raw Material required to Manufacture POP

Plaster of Paris Industry requires high purity gypsum. Different grades of plaster of Paris are manufactured depending upon the period for setting. For surgical plaster, a minimum 96% $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ grade gypsum is required. Calcined gypsum finds use in manufacturing plaster of Paris.

Types of Gypsum used in POP Manufacturing:

Gypsum is chemically termed as Calcium Sulphate dihydrate ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$). There are three broad kinds of gypsum which are found across the world. Consumption of Marine Gypsum and Synthetic Gypsum in Plaster of Paris manufacturing is not much but their use is keep on increasing in the nearby areas of sources.

1. Naturally gypsum
1. Marine Gypsum
2. Synthetic gypsum

12.1: Natural Gypsum

Generally two types of natural gypsum are used in India. The major type of gypsum is considered to be amorphous in nature and contain impurities like clay and is used for building grade and

low quality ceramic moulds. Mostly mine production clay type gypsum possess purity ranging between 70 to 95%. The second type of gypsum is crystalline in nature called as selenitic gypsum, which contains selenite. This is transparent, imparts whiteness to the POP, and gives longer cycle time to the mould used for producing ceramic and surgical grade POP. Different grades of plaster of Paris are manufactured depending upon the period for setting. For surgical plaster, a minimum 96% $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ grade gypsum is required.

Selenite is a colourless, transparent, naturally occurring crystalline variety of gypsum. On drying, it sets into a hard rock-like form. Gypsum deposits Gypsum deposits Plaster of paris Industry requires high purity gypsum.



12.2: Marin Gypsum

Gypsum is formed as a by-product of the common salt manufacturing process and this gypsum is called Marine gypsum. In India marine gypsum is found in Tuticorin and Gujarat where the salt pans exist.

12.3: By-product gypsum / Synthetic gypsum

With the robust infrastructural growth, India's gypsum consumption is on the rise. To meet the growing demand, Indian POP makers are moving towards utilizing synthetic gypsum. It is often used as a substitute to natural gypsum. Furthermore, its low cost of manufacturing is helping it replace natural gypsum in the production of gypsum plaster. It is primarily produced as a by-product of industrial processing and offers same characteristics as that of natural gypsum. Furthermore, it is environment-friendly. These factors have boosted the consumption of synthetic gypsum across the globe.

The gypsum is also formed as a by-product of industrial manufacturing processes like fertilizers, copper and power. The gypsum thus formed is called synthetic gypsum. Synthetic gypsum includes materials such as phospho-gypsum, titano-gypsum, fluoro-gypsum and citro-gypsum. FGD Gypsum is a unique synthetic product derived from flue gas desulphurisation (FGD) systems at electric power plants.

As per the industry experts, this variety of gypsum consumption in India would grow steadily.

12.3.1: Phospho-gypsum

Phospho-gypsum is produced as a by-product during the manufacture of phosphoric acid by wet process. The purity of phospho-gypsum ranges from 77 to 98%. Presently, most phosphoric acid plants dispose the phospho-gypsum generated, by way of stacking it within the plant premises. These stacks are subsequently sold off when demand arises for them. Phospho-gypsum generated from phosphoric acid plants contains three types of impurities such as residual acid, fluorine compounds and trace elements, including those that are radioactive that are considered to be potentially harmful. Principal Producers of Phospho-gypsum are:

- State Unit of Andhra Pradesh Coromandel International Ltd, Visakhapatnam.
- Gujarat State Fertilizers and Chemicals Ltd, Fertilizernagar, Vadodara district.
- Hindalco Industries Ltd, P.O. - Dahej. Gujarat
- Fertilizers & Chemicals Travancore Ltd, Udyogamandal, Ernakulam district.Kerla
- Fertilizers & Chemicals Travancore Ltd, Ambalamedu, Ernakulam district.Kerala
- Maharashtra Rashtriya Chemicals & Fertilizers, Chembur, Mumbai.
- Paradeep Phosphates Ltd.,Odisha
- IFFCO, Paradeep, district Jagatsinghpur. Tamil Nadu
- Southern Petrochemical Industries Corporation Ltd, Thoothukudi.
- Coromandel International Ltd, Ennore, Thiruvallur. Tamil Nadu
- Sterlite Industries (India) Ltd, Thoothukudi. Tamil Nadu
- West Bengal Tata Chemicals Ltd, Haldia.W.B.

12.3.2: Fluoro-gypsum

Phosphogypsum is a by-product in the wet process for manufacturing phosphoric acid (ammonium phosphate fertilizer) by the action of sulphur acid on the rock phosphate. The other sources of phosphogypsum are by-products of the hydrofluoric acid and boric acid industries.

Fluoro-gypsum is obtained as a by-product during the manufacture of aluminium fluoride and hydrofluoric acid using fluorite. Some of units that produces aluminium fluoride are:

- Navin Fluorine International Ltd, Udhana-Navsari Road, Surat district, Gujarat.
- Tanfac Industries Ltd SIPCOT Industrial Complex, Cuddalore, Tamil Nadu.
- Maya Rasayan Ltd, Mumbai; Aegies Chemical Ltd Dombivali, Thane, Maharashtra, etc

12.3.3: Boro-gypsum

By-product boro-gypsum is obtained at a plant which refines calcium borates (colemanite and ulexite) to produce borax and boric acid. Borax Morarjee Ltd, Ambarnath, Thane district, Maharashtra is one of the main Company.

Other Raw Materials/additives used for producing POP

In producing POP different types/forms of gypsum are used, and depending on end use and quality requirements process parameters are altered. Major raw materials require are the Gypsum and maleic anhydride & Sodium hydroxide. The setting of plaster of Paris is known for a long time. Gypsum plaster sets quickly due to its natural process of crystallisation. This crystallisation of gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) from a suspension of Ca sulfate hemihydrate is known as the setting of plaster. For commercial applications, the retardation of plaster to a desired level is

required to add the maleic anhydride & sodium hydroxide for producing hard plaster of paris having very short setting times and high strength values.

13: Raw Material and availability

Gypsum is a naturally occurring mineral produced in many parts of the India and the world. It is a hydrated sulphate of calcium which occurs as white opaque or transparent mineral in beds in India. The Natural gypsum is mined and extracted below the earth's surface using conventional means. It is laid down in beds and ranges in thickness from a few centimetres to several metres. Gypsum deposits are known to exist in several parts of India and is found largely in Rajasthan. Except this it also occurs in bands in sedimentary formations such as limestones, sandstones and shales. In some cases it occurs as transparent crystals associated with clays.

The deposits are mined out by opencast method and usually by manual mining except a few semi-mechanised mines in Rajasthan. In semi mechanised mines, gypsum is excavated by backhoe excavator and directly loaded into trucks/ dumpers. The trucks and dumpers loaded with gypsum are despatched directly to the user industry or are taken to railway siding for further loading into railway wagons for dispatch to far living user industry. In some mines of Rajasthan, the excavated gypsum is ground before despatching to the user or party. Based on the use of gypsum, the production is classified into different grades like Fertilizer grade, Cement grade, plaster of Paris grade, Surgical grade, etc.

Of the total reserves/resources, Fertilizer/ Pottery grade accounts for major chunk and only two percent of resources is shared by Surgical / Ceramic grade Plasters. By States, Rajasthan alone accounts for 81% resources of gypsum in the country . The State is continued to be the leading producer, contributing major output. The entire production of Selenite is from Rajasthan State. Gypsum is found in the districts of Bikaner, Nagaur, Barmer, Hanumangarh, Jaisalmer, Shri Ganganagar, and Jalore. (Source: www.mines.rajasthan.gov.in). The other areas of the country i.e. Jammu U.T. and Kashmir U.T. accounts for about 14% and Tamil Nadu about 2% resources. The remaining resources are in Gujarat, Himachal Pradesh, Karnataka, Uttarakhand, Andhra Pradesh and Madhya Pradesh.

Tin Rajasthan, the mining of Gypsum of purity of +70% $\text{CaSO}_4, 2\text{H}_2\text{O}$ is a co-operative effort between the land owners and RSMML. The farmers give up his gypsum bearing land to RSMML in return for an assured share of profits. After mining, the Company improves the land condition and returns back to the farmer for cultivation. As demand is increasing so there is need for prospecting new promising areas of Gypsum/Gypsite . There is an increasing demand of natural Gypsum with the search of new deposits in Bikaner Distt.

A sizeable quantity of gypsum from mines in Barmer, Bikaner, Jaisalmer, Hanumangarh, Sri Ganganagar and Nagaur districts of Rajasthan is also supplied to the plaster of Paris units in Rajasthan, Uttar Pradesh, Haryana, Maharashtra, West Bengal, Delhi, etc.

In Jammu U.T. and Kashmir U.T., the entire gypsum supply source is governed by Mining Development Corporations. The quality produced from the Gypsum mined in parlanika area of Samba having fast setting time while using the POP which may be delayed with increasing amount of water, the powder size and other factors.

In Gujrat, as per the report published by commissioner of Geology and mining Govt. of Gujrat, the estimated reserves of raw gypsum is about 33 lakh Mt. Ballar, Bhavnagar, Porbandar whereas in Aasam, the gypsum availability is governed by the POP industrial scenario and gypsum market in Bhutan. (Ref: Indian Minerals Yearbook 2016 (Part-III: Mineral Reviews) 55th Edition GYPSUM)

14: Import of Raw Materials

The world reserves of natural gypsum are large. Commercial quantities of gypsum are found in many countries such as- China (largest producer of world), Iran (world's second largest producer), Thailand, Iraq, Oman, India, UK, USA. Italy, Canada, Brazil, Australia, Turkey, Spain, Mexico, & Japan, etc.

The Indian industry met their gypsum requirement predominantly from natural gypsum sources in India and the by-product gypsum from industrial sources. However, such sources for gypsum peaked and stagnated and the incremental requirement was met by imports, mainly from Oman, and Iran. Other reserves that India could use are in the distant countries such as Australia, Mexico and Morocco.

POP purity depends on the SO₃ content. Higher the SO₃ content greater the purity. Usually Imported **gypsum natural have higher SO₃ content**. This is mainly because of the source material (gypsum crystal/ore). The quality produced from the Gypsum imported from Oman & Iran having fast setting time while using the POP and the same could be delayed with increasing amount of water, the powder size and mixing some chemicals to retard the POP setting process and thus increasing the setting time. Iran has become a source of gypsum, but trade barriers will continue to obstruct the import of gypsum from there to India.

POP manufacturing units established in Gujrat, Maharashtra, Tamilnadu which are nearer to sea and ports are using the Marine Gypsum and Imported Gypsum by mixing with mined Gypsum (Imported as well as Indegenous) for their manufacturing. Both of the varieties of Gypsum are good in whiteness. Marine Gypsum is costlier in comparison with other varieties and produces the some inferior quality in terms of quick setting time. Marine Gypsum and By-product Gypsum requires to be washed thoroughly before use in making POP.

15: Trade Policy

As per 'Export-Import Policy, 2015-2020, gypsum, anhydrite, plasters (consisting of calcined gypsum or calcium sulphate) whether or not coloured, with or without small quantities of accelerators or retarders are free under import policy under heading 2520.

16: Present gypsum sources in India

- Rajasthan State Mines & Minerals Ltd (RSMML): RSMML is the country's leading producer of natural Gypsum and Selenite producing about 3.0 million tonnes per year. These are mined in the heart of the Thar desert areas where the working conditions are very harsh.

The deposits are shallow and scattered over large areas. Most of the land is owned by private cultivators.

16.1: Other Major Natural Gypsum Producers

- FCI Aravali Gypsum & Minerals India Ltd (FAGMIL)
- Indian Farmers Fertilizer Cooperative Limited (IFFCO)
- Paradeep Phosphates Limited (PPL)
- Coromandel International
- Hindalco Industries Limited (HIL)

Earlier in Rajasthan, gypsum mining is controlled by FCI Aravali Gypsum & Minerals India Ltd and Rajasthan State Mines & Minerals Limited

17: Fuel Availability

In Rajasthan, large deposits of Lignite occur in tertiary formation of middle Eocene age spread over 70,000 sq.km. area in the Barmer-Sachore, Jaisalmer and Nagaur basins falling in Barmer, Jaisalmer, Palsana (Bikaner), Nagaur and Jalore districts. A total of about 5720 million tonnes resources of Lignite have been estimated in 78 localities in Barmer, Bikaner, Nagaur, Jaisalmer and Jalore districts of western and north-western parts of the State. Lignite is being exploited at Giral (distt. Barmer), Kapurdi-Jalipa (distt. Barmer), Palana-Barsinghsar (distt. Bikaner) and Mata Sukh-Kasnau-Igiyar (distt. Nagaur) for Lignite based power plants and captive use. Lignite based power plants are operating at Kapurdi-Jalipa (distt. Barmer), Giral (distt. Barmer), Palana-Barsinghsar (distt. Bikaner) and Gurha (distt. Bikaner). This coal is having low calorific value and low ignition temperature is being considered as poor quality in comparison to the imported Indonesian quality coal and thus not much used now. The imported Indonesian coal costing about Rs. 8500/- per tonne. Considering the average coal requirement of 100 Kg. of imported coal to manufacture 1 ton of POP, the average fuel (coal) cost comes to Rs. 850/- per ton of POP manufacturing.

18: Covering Raw material standards Indian International standards

IS 1290 (1973) Mineral Gypsum

19: The famous Magazine or Journals associated with P.O.P. and other Gypsum products manufacturing Industry are:

- Global Gypsum
- Walls & Ceilings
- Cement and Concrete Research
- Gypsum as a Construction Material- A Review of Recent Developments

(C). PROJECT PROFILE:

- 1. NAME OF THE PROJECT PROFILE : PLASTER OF PARIS**
- 2. PRODUCT CODE : 25202010**
- 3. NIC CODE : 26945 & 32501**
- 4. PRODUCTION CAPACITY : Qty. : 3000 MT
Value : Rs. 240 Lakhs**
- QUALITY STANDARD & SPECIFICATION : IS 2333 (1992), IS 2547 (1976)- Pt.-1,
IS 6555(1972) & IS 6556(1972)**
- 6. MONTH & YEAR OF PREPARATION : April, 2021**

1. INTRODUCTION:

Plaster of paris which is calcium sulphate with half molecule of water of crystallisation ($\text{CaSO}_4 \frac{1}{2} \text{H}_2\text{O}$) possess outstanding property of setting and subsequent hardening when mixed with water. Plaster of paris medical grade is made from Gypsum generally known as POP. The super medical grade white PoP with distinguish property is used for medical purpose. The PoP is widely used all over the world today, this POP is available in 100 mesh to 200 mesh fineness with light ivory to white colour. As per the properties and fineness of the POP it is classified in several groups such as ceramic grade, Medical grade and construction grade. Plaster of Paris is extensively used in ceramic industry for the preparation of models, moulds and plaster of toys. It is also used as a main raw material in the manufacture of toys and statues, chalk crayons, gypsum plaster boards, decorative picture frames, walls & ceiling plastering besides a wide range of applications in the interior decoration of buildings and other establishments.

2. MARKET POTENTIAL:

As there are large number of hospitals and clinics spread in country and large quantities of these super grade plaster of paris is used in this clinic and hospitals. There is a growing industrial activity in the field of whiteware, such as pottery, sanitaryware, chemical and electrical porcelains, requiring large quantities of plaster of paris for making moulds and preparation of moulds. The demand for the product is ever increasing. There is also considerable demand for the plaster of paris arising from a large number of shops and establishments engaged in making statues 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.

3. BASIS & PRESUMPTIONS:

- It has been taken into consideration that the unit will work on single shift basis for 300 working days in a year.
- Labour and wages mentioned as per the prescribed minimum wages.
- Interest rate at @ 12% is considered in the project profile for recurring and non-recurring investment.
- Margin money will vary from 10- 25% depending upon the location and scheme adopted by the entrepreneur, i.e. self-employment or commercial scheme.
- The costs of machinery and equipment, raw materials and consumables, other contingent expenses etc., indicated in the profile are based on those prevailing at the time of preparation. Therefore, there are subject to necessary changes from time to time based on the local conditions.
- The break-even point is calculated on full capacity utilisation basis.
- The unit requires 1 to 2 months trial production to achieve full capacity.

4. IMPLEMENTATION SCHEDULE: (PRESUMPTION)

The Time requirement for preparation of Project report	:	1 Months
Time requirement for selection of Site	:	1 Month
Time required for registration as Small Scale Unit	and	
Availability of finance	:	1/2 Month
Time required for Machinery procurement, Erection and commissioning	:	2 Months
Recruitment of labourer etc.	:	1 Month
Trial runs	:	1 Month

5. TECHNICAL ASPECTS:

5.1 MANUFACTURING PROCESS:

The method of producing POP includes collection, selection, washing, drying, crushing, screening, calcination and storing.

The raw material gypsum is sorted and washed with water for removal of sand and other impurities. The lumps thus obtained are then dried and powdered in Crusher. The dried gypsum powder is calcined in a rotary drum calciner using light diesel oil as fuel. The low pressure burner is used for calcination at a temperature of 160°C to 180°C. The process of calcination is done over a period of about 1.5-2 hours, 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 pulverised to a fineness of 100-200 mesh and packed in air tight polythene lined gunny bags to avoid the plaster of paris from absorption of moisture. For manufacture of medical grade plaster of paris, a mineral silinite which is considered to be a purer variety of gypsum is used.

5.2: Production Capacity (per annum)

Quantity	: 3000 MT
Value	: Rs. 2,40,00,000
Motive Power	20 H.P.

5.3: Pollution Control

To avoid health hazard to workers due to air borne, Plaster of paris, it is recommended to install dust collecting system and adopt safe work practice.

The following are the simple recommendations to control dust in this industry:

- a) It is recommended to prohibit smoking inside the working place.
- b) The floor should be well built. The clearing of floors at various places is recommended by water mopping
- c) A centralized dust collecting system of suitable capacity should be provided with extension of ducts fitted with control valves
- d) Workmen working in the area with potential to release pop dust should wear mask while working.
- e) The used bags should be reversed in wet condition in a water tank and rinsed. The water can be used in mixer with the help of pump at frequent intervals.

5.4: Energy Conservation

General precautions saving energy particularly, the electricity and fuel are required to be followed by adopting energy conservation techniques not only to conserve the power and fuel but also to save considerable expenditure on their consumption in own interest.

Modern rotary kiln furnace is recommended using furnace oil as LDO or gas firing systems. Combustion systems, for example, burners, blowers, preheating of fuel will depend on the fuel selected. Care should be taken in selecting the type and design of the furnace, refractories to be used for construction of the furnace, proper thermal insulation of the furnace walls and crown. All these factors have a bearing on the thermal efficiency of the furnace and energy conservation achieved in the calcination operation. Calcination operation constitutes a significant cost factor in production of Plaster of paris.

5.5: Quality Control and Standards

The Bureau of Indian Standards has formulated and published the following specifications for maintaining quality of the product and testing purpose.

BIS Standard No.	Item Nomenclature & Description
IS 2333 (1992)	Pop for Ceramic Industry
IS 2547 (1976) - Part 1	Gypsum building Plaster of Paris including Premixed light weight plaster
IS 6555 (1972)	Dental Laboratory Plaster
IS 6556 (1972)	Dental Impression Plaster
IS 1288:1982	Methods of tests for mineral gypsum
IS 1290 (1973)	Mineral Gypsum: It is used as a raw material for manufacturing of POP.

6: Financial Aspects:

Fixed Capital

6.1: Land and Building

Description	(Rs.)
Land :4000 sq,mtrs @500/-	20,000,00
Description	(Rs.)
Land :4000 sq,mtrs @500/-	20,000,00
Covered area: Production shed,.2000 sq.mtrs @ Rs2000. provision for stores, office etc.250 sq.mtrs@Rs.3000, with equal open area	40,000,00 7,50,000
Borwell overhead tank(compound wall, security cabin etc)	2,50,000
Total	70,00,000

6.2: Machinery and Equipments

Description	Qty. (Nos.)	Amount (Rs.)
Hot filtration and crushing unit with pump Fluid Control Equipment	1	5,00,000
Screw conveyer 3 HP motor	1	5,00,000
Dryer	1	2,00,000
Storage tanks	2	2,00,000
Trolleys	5	2,00,000
Weighing scale	1	50,000
Rotary cylindrical drum calciner capacity 2 MT (Locally fabricated)	2 No.	12,000,00
Attrition type disc pulveriser 2 MT/hour with motor and other accessories	1 No.	3,00,000
Computer system, office furniture and equipment	-	5,00,000
Burner and other equipment	-	2,00,000
Dust Collector	1	1,50,000
Installation and electrification charges @ 10%	-	4,00,000
Total		44,00,000
(iii) Pre-operative expenses such as project cost, electricity, deposits etc.		2,00,000
Total Fixed capital		
Land & Building +Machinery + pre-operative expenses 70,00,000+ 46,00,000 =		1,16,00,000

6.3: Working Capital (Per Month)

6.3.1: Staff and Labour (per month)

Designation	No.	Salary month (Rs.)	Total (Rs.)
Manager	1	100000	1,00,000
Computer operator/typist	1	40000	40,000
Technologist/Chemist	2	50000	1,00,000
Skilled workers	3	30000	90,000
Un-skilled workers	5	20000	1,00,000
Peon/Watchman	2	20000	40,000
Total			4,70,000
+ 15% perquisites			70,500
Total			5,40,000

6.3.2: Raw Materials (per month)

Particulars	Qty.	Rate (Rs.)	Value (Rs.)
Gypsum(Selenite)	420 MTs	1000/MT	4,20,000
Woven bags polythene cover lined for packing	6000	10/bag	60,000
Total			4,80,000

6.3.3: Utilities (per month)

	(Rs.)
Power 4000 units @ Rs.6/unit	24,000
Water	2,000
Light diesel oil -3000 litres @ Rs .50/litre	1,50,000
Total	1,76,000

6.3.4: Other Contingent Expenses (per month)

	(Rs.)
Postage, stationery and telephone	5,000
Repairs and maintenance	10,000
Transport charges	10,000
Other misc. Expenses	5,000
Total	30,000

6.3.5: Working Capital (per month)

	(Rs.)
Staff and labour	5,40,000
Raw materials	4,80,000
Utilities	1,76,000
Other contingent expenses	30,000
Total	12,26,000

(vi) Working Capital (for 2 months)	24,52,000
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7: Total Capital Investment:

Fixed Capital	1,16,00,000
Working capital for 2 months	24,52,000
Total	1,40,52,000

8: Financial Analysis

8.1: Cost of Production (per annum)

	(Rs.)
Total recurring expenses	1,47,12,000
Depreciation on machinery and equipment @ 10%	3,90,000
Depreciation on building@5%	5,00,000
Depreciation on computer system and office furniture @ 20%	1,00,000
Interest on total capital investment @ 12%	16,86,240
Total	1,73,88,240 (Say Rupees 1,74,00,000)

8.2: Turnover (per annum):

	(Rs.)
Sale of 3000 MT. of plaster of paris @ Rs .8000/MT	2,40,00,000

8.3: Net Profit (per year) (Before Income tax)

Turnover	Cost of Production	Profit
Rs. 2,40,00,000	1,74,00,000	66,00,000

8.4: Net Profit Ratio:

	$\frac{\text{Net profit per year} \times 100}{\text{Turn over per year}}$
	$\frac{66,00,000 \times 100}{2,40,00,000}$ <p>27.5%</p>

8.5: Rate of Return:

	$\frac{\text{Net Profit per year} \times 100}{\text{Total capital investment}}$
	$66,00,000 \times 100$

	----- 1,40,52,000 46.96%
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8.6: Break-even Point:

Fixed Cost	(Rs)
Depreciation on machinery and equipment	3,90,000
Depreciation on computer system and office furniture	1,00,000
Depreciation on building	5,00,000
Interest on total capital investment@12%	16,86,240
40% of salary and wages	25,92,000
40% of other contingent expenses	1,44,000
Total	54,12,240

8.7: Net profit (per year)	
B.E.P.	Fixed Cost x 100 ----- Fixed cost + Profit
	54,12,240 x 100 ----- 54,12,240+66,00,000
	45.05%

9: Details of the Machinery and Equipment Suppliers

1	Narotapulverizer Machine Manufacturer, 37/59-GIDC Industrial Phase 4, Vatva, Ahmedabad 382445	2	PVS Engineers, 68/01/p GIDC Industrial Estate near Water Tank Phase 1, Vatva Ahmedabad 382445
3	Kesav Industries, 96/b/1, Jagdishbhuvan, Opp. Shakti Nagarshahpur, Darwajadhudheswar Road, Ahmedabad 380004	4	H.R Engineering, Plot No.10, Shreeji Industrial Estate ,Opposite Sagat Industrial Park Kujad Indoor Highway Nikol, Ahmedabad 382210
5	M/s. Sharma Kiln Technology, Kothawala Flat, Harekrishna Complex, Nr. Paldi, Ahmedabad-380 007	6	M/s. Modern Engg. & Fabrication Works, Behind Kubeshwar Mahadev, Saijpur (Ambavadi), Naroda Road, Ahmedabad
7	M/s. Amic Industries 10, BT Road, Kolkata-36.	8	M/s. Wes man Engineers Co. (P) Ltd. 1/2, Allerby Road, Kolkata-20.
9	M/s. Durgapur Engineering Co. Ltd. Marshal House, 33/1, Netaji Subhash Road, Kolkata-700001.	10	M/s. Continental Thermal Engineers 806, II Stage, 4th Main, A Block, Rajajinagar, Bangalore-10.
11	M/sPUZZOLANA Machinery fabricators, P.O,7222, 63/6,Rashomoni Sadan,18th road, Chembur, MUMBAI-71.	12	M/S. Utkal agencies, RajgurupurDist..SUNDERGARH, ORISSA.
13	The Global PharmaEquipments Star, IndustrialEstate, D-32, Naik Pada, Near Hanuman Mandir, Opposite Dwarka Industrial Estate, Vasai, East, Vasai - 401208, Maharashtra, India	14	Future Industries Pvt. Limited, Shed No. 15, Ambica Estate, Corporation Municipal, Opposite Sadvichar Hospital, Naroda, Opposite Sadvichar Hospital, Naroda, Ahmedabad - 382330, Gujarat

All the machines and equipment are available from Indigineous manufacturers. The entrepreneur needs to ensure proper selection of product mix and proper type of machines and tooling to have modern and flexible designs. Some of the machinery and dies and tooling suppliers are listed here below:

10: Details of Raw materials suppliers

1	M/S Ecomatrix gypsum Pvt. Ltd. Shop 9/1, Hariom Estate Survey No357, Near AudawatertankGota Ahmedabad 382481	2	M/S Deviranch Enterprise B/9 Parulnagar, Gate no 4 bhuyangdev Cross Road, Sola Road, Ghatlodia Ahmedabad 380061
3	M/S Shree Ganesh Enterprise B/s Shell Petrol Pump, Avadh Residency Police Station,b/a/g 132 feet Ring Road, Opp. Jivaraj park Ahmedabad 380051	4	M/S BrahmaniEnterprise, 141/8 Baroda Mosaic and Marble Compound Dharma Singh Desai, Marg, Opposite watertankchhani, Vadodara 390002
5	M/s. Mysore Minerals 39, MG Road, Bangalore-1.	6	M/s. TAMIN 9, Anderson, Habibulla Avenue, Chennai-4.
7	M/s. Shri Venkateswara Products VadakuVenganallur, Opp. Raju's College, Mudangiar Road, Rajapalyam, (Tamil Nadu)	8	M/s. Andhra Pradesh Mining Corporation 6-3-672, Punjagutta, Hyderabad-82.
9	M/s. Madras Mineral Suppliers No.2/10, Toovipuram, Tuticorin-3, Tamil Nadu.	10	M/S.RAJA MINIING WORKS, Ariyalore, Trichi,T.N

Addresses of Woven bags (polythene cover lined for packing)Suppliers

1	M/s. Indian Petrochemicals Corpn. Ltd. P.O. Petrochemicals, Distt. Vadodara Gujarat - 391346	2	M/s. Tamilnadu Petro Products Ltd. Manali, Tamilnadu
3	M/s. Reliance Industries Ltd. Patalganga, Maharashtra	4	M/s. Dharamsi Morarji Chemical Limited 317/21, Dr. D. N. Road, Fort, Mumbai-1

(D): Schemes and consultancy services

1: Existing schemes available and their details:

(A). Credit Guarantee Fund Trust Scheme for MSEs and New Entrepreneurs

Objective: Credit Support

Eligible Condition: Existing Micro, small & service entrepreneur all are eligible.

Nature of Scheme: The scheme is implemented by Credit Gurantee Trust for MSE (CGTMSE);

Detailed Information:

- Credit guarantee for loans upto 200 lakh for loan up to R. 2.00 Crore without collateral and third party guarantee:
- Guarantee coverage ranges from 85% (Micro Enterprise up to Rs. 5 lakh) to 75% (others);
- Recently, guarantee coverage made eligible to select NBFCs and small Finance banks;
- The extent of guarantee cover is 50% of the sanctioned amount of the credit facility for credit from Rs. 10 lakh to Rs. 100 Lakh per MSE borrower for retail trade activity.
- The extent of guarantee cover is 50% of the sanctioned amount of the credit facility for credit from Rs. 10 Lakh to Rs. 100 Lakh per MSE borrower for retail trade activity.
- The extent of guarantee cover is 80% for (i) micro and small enterprises operated and / or owned by women; and (ii) all credit /loans in North East Region for credit facilities up to Rs. 50 Lakh.
- In case default, CGTMSE settles the claim with the leading institute.
- Apply through Member landing Institute (MLIs- Banks and NBFCs).
- List of MLIs are available at www.cgtmse.in

(B). Interest Subvention Scheme for MSMEs

Objective : Credit support

Key Benefits: 2% interest subvention for incremental credit to MSMEs.

Scheme applicable for: Existing Entrepreneurs & Aspiring Entrepreneurs

Detailed Information

- Interest Subvention Scheme for Incremental credit to MSMEs 2018 offers 2 % interest subvention on fresh or incremental loans maximum up to Rs. 1 crore to MSMEs. Small Industries Development Bank of India (SIDBI) is the Nodal Agency for implementation of the Scheme.
- The Scheme aims at encouraging both manufacturing and service enterprises (including trading activities) to increase their productivity. Incremental/fresh term loan or incremental/fresh working capital extended from 2nd November 2018 by any Scheduled Commercial Banks, NBFCs, RRBs, UCBs (Scheduled & Non-scheduled) and DCCBs would be covered under the scheme.
- MSMEs already availing interest subvention under any of the Schemes of the State /

(C). Credit Linked Capital Subsidy Component (CLCS & TU Scheme)

Objective: Technology support/ Credit Support

Key Benefits: Induction of established and improved technologies.

15% Subsidy on institutional credit upto Rs 1.00 crore with a subsidy cap of Rs.15.00 lakh.

Scheme applicable for: Existing Entrepreneurs & Aspiring Entrepreneurs

Detailed Information

The objective of CLCS component of CLC-TUS is to facilitate technology to MSEs through institutional finance for induction well established and proven technologies in the specific sub-sector/products approved under the scheme:

- Upfront subsidy of 15% on institutional credit up to Rs. 1.0 crore (i.e. a subsidy cap of Rs. 15.00 lakh) for identified sectors/subsectors/ technologies.
- Flexibility for review of the identified technologies/ subsectors also exists.
- Presently scheme is being implemented through 11 nodal banks/agencies, however, almost all Commercial Banks, Pvt. Banks & RRBs are acting as PLI through these 11 nodal banks/agencies {SIDBI, NABARD, SBI, Andhra Bank, PNB, BoB, Canara Bank, Corporation Bank, Indian Bank, Bank of India, & TIICL}.
- In order to ensure fair inclusion of SC/ST category, women entrepreneurs and entrepreneurs from NER, Hill States (Jammu & Kashmir, Himachal Pradesh & Uttarakhand) Island Territories (Andaman & Nicobar and Lakshadweep) and the identifies Aspirational Districts/LWE Districts, the subsidy has also been proposed to be admissible also for investment in acquisition/replacement of plant & machinery/equipment & technology up-gradation of any kind.

(D). Procurement and Marketing Support (PMS) scheme

Objective: Marketing Support

Key Benefits: Participation of Individual MSEs in domestic Trade Fair/ Exhibition

Capacity building of MSMEs in Modern Packaging Technique / Development of Marketing Haats.

Organizing Domestic Trade Fair& Exhibition/ Vendor Development Programs/ National & International Workshops & Seminars/ Awareness programs

Scheme applicable for: Existing Entrepreneurs

Detailed Information

- Participation of individual MSEs in domestic trade fairs/ exhibitions across the country: Maximum Budgetary support (space rent and contingency) upto Rs.1.5 Lakhs max.for Metro & A class cities. Rs 1.0 lakhs max. for Class B cities / NER/J&K/ Hilly States and for other cities Rs.0.80 lakhs max.
- Organizing Domestic Trade Fairs/ Exhibition and participation in trade fairs/exhibitions by the Ministry/Office of DC (MSME)/Government organizations: Maximum Budgetary support for space rent and advt. & publicity for the event is as follows,
 - Regional :(State/District): Rs.30.00 Lakh max.
 - National: Rs.40.00 Lakh .max.

- International: As decided by Empowered Committee subject to approval of Deptt. Of Expenditure.
- Capacity building of MSMEs in modern packaging technique: Maximum Budgetary support of Rs.1.0 lakh max. for ordinary packaging consultancy and Rs.1.5 lakh max. for green packaging consultancy for MSME unit.
- Development of Marketing Haats. Maximum Budgetary support: For Development of new MSME Haats, upper limit of GIA will not exceed Rs. 50 lakh max.
- For Renovation/up-gradation of existing Marketing Haats, upper limit of GIA will not exceed Rs.20 lakhs max.
- Vendor Development Programmes: Maximum Budgetary support is as follows; State Level Vendor Development Programme (SLVDP): Rs. 1 Lakh max. (One day)
National Level Vendor Development Programme (NLVDP): Rs. 10 lakhs max. for A class city and Rs.7.0 lakh max. for other cities. (2-3 days)
- International/National Workshops/Seminars.: Maximum Budgetary Support would be Rs 5.0 lakh maximum or actual whichever is less and for National Workshop/Seminar and Rs 7.5 Lakh maximum or actual whichever is less for International Workshop/Seminar
- Awareness Programs: Maximum Budgetary support of Rs. 70,000/- max. per program (One day)

(E). International Cooperation (IC) Scheme

Objective: Marketing Support

Key Benefits: Reimbursement for participation/visit in international exhibitions/fairs
Reimbursement for holding international conferences and seminars by industry associations/Govt. organizations.

Scheme applicable for: Existing Entrepreneurs

Detailed Information

Assistance provided under the scheme:

- For Participation in International Exhibition/Fair:
Economy class Air fare fair (maximum of Rs. 1 Lakh).
Stall charges (maximum Rs. 1.25 Lakh).
Freight Charges (maximum Rs. 25,000/-)
Entry/Registration fee up to Rs. 5000/-
- For Organizing International Conference in India
Cost for organizing the event subject to a maximum of Rs. 4.50 Lakh.
Airfare for foreign speakers (minimum 03) up to a maximum of Rs. 2.50 lakh.

For more detailed information refer to Scheme guidelines, on the following link:
<https://msme.gov.in/sites/default/files/IC-Scheme-Guidelines-June-2018.pdf>

(F). Micro & Small Enterprises Cluster Development Programme (MSE – CDP)

Objective: Technology support/Skill development

Key Benefits: Creation of Common Facility Centers including Plug & Play Facilities
Thematic Interventions- Activities such as Training Programmes, Exposure Visits

Scheme applicable for: Existing Entrepreneurs (in form of a SPV)

Detailed Information

- Common Facility Centers: Creation of “tangible assets” such as Common Production/Processing Centre, Design Centers, Testing Facilities including Plug & Play Facilities.
- GoI Assistance: upto 90% of the maximum Project cost of Rs. 20 crore
- Infrastructure Development: Development of land, roads, drainage, power distribution etc. in new / existing industrial (multi-product) areas / estates / Flatted Factory Complex.
GoI Assistance: upto 80% of the maximum Project cost of Rs. 15 crore
- Marketing Hubs / Exhibition Centres by Associations: Establishing Marketing Hubs/Exhibition Centres at central places for display and sale of products.
GoI Assistance: upto 80% of the maximum Project cost of Rs. 10 crore
- Thematic Interventions: Activities such as Training Programmes, Exposure Visits, BDS provisioning etc. for approved/ completed CFCs.
GoI Assistance: Rs.2.00 lakh for each activity, maximum Rs.10 lakh per CFC
- State Innovative Cluster Development Programme: Co-funding of the CFC projects of State Cluster Development Programme on matching share basis.
GoI Assistance: GoI fund would be limited to State Government share or Rs.5.00 crore whichever is lower For details please contact nearby MSME-Development Institute/ District Industry Centre.

(G). ZED Certification Scheme

Objective: Technology support

Key Benefits

- Promote adaptation of Quality tools/systems and Energy Efficient manufacturing.
- Financial assistance will be provided to the MSMEs in obtaining a ZED certification.
- Reimbursement of Certification fees/Consultancy charges on successful certification, subject to an upper ceiling as per the scheme guideline. This can be claimed only once each for National and International Standards.
- For MSMEs supplying for Defence, reimbursement shall be admissible additionally on Defence related certificates/Standards only once.

Scheme applicable for: Existing Entrepreneurs

Detailed Information: The scheme envisages promotion of Zero Defect and Zero Effect (ZED) manufacturing amongst MSMEs and ZED Assessment for their certification so as to:

- Encourage and Enable MSMEs for manufacturing of quality products using latest technology tools & to constantly upgrade their processes for achievement of high productivity and high quality with the least effect on the environment.
- Develop an Ecosystem for Zero Defect Zero Effect Manufacturing in MSMEs, for enhancing competitiveness and enabling exports.
- Promote adoption of Quality and recognizing the efforts of successful MSMEs.
- Increase public awareness on demanding Zero Defect and Zero Effect Products through the ZED Rating and Grievance Redressal Portal.

(H). Lean Manufacturing Competitiveness for MSMEs

Objective:Technology support

Key Benefits:Financial assistance is provided for implementation of lean manufacturing techniques, primarily the cost of lean manufacturing consultant (80% by GoI and 20% by beneficiaries).

Scheme applicable for:Existing Entrepreneurs

Detailed Information

The objectives of the Scheme are to enhance the manufacturing competitiveness of MSMEs through the application of various Lean Manufacturing (LM) techniques by;

- Reducing waste;
- Increasing productivity;
- Introducing innovative practices for improving overall competitiveness;
- Inculcating good management systems; and
- Imbibing a culture of continuous improvement.

(I). Awareness on Intellectual Property Rights (IPR)

Objective:Technology support

Key Benefits

- Reimbursement of Patent/Trademark/GI:
- Patent:
 - A. Indian Patent upto Rs.1.00 Lakh
 - B. Foreign Patent upto Rs. 5.00 Lakh
- Trademark upto Rs. 0.10 Lakh
- GI Registration Rs. 2.00 Lakh
- Assistance for setting up IP Facilitation Centre upto Rs. 1.00 cr. for period of 5 years

Scheme applicable for: Existing Entrepreneurs

Detailed Information

- To enhance the awareness of Intellectual Property Rights (IPRs) amongst the MSMEs to encourage creative intellectual endeavor in Indian economy;
- To take suitable measures for the protection of ideas, technological innovation and knowledge-driven business strategies developed by the MSMEs for;
- To provide appropriate facilities and support for protection and commercialization of Intellectual Property (IP) for the benefit of MSME sector;
- To assist SMEs in effective Utilization of IPR Tools for technology up-gradation, market and business promotion and competitiveness. enhancement.

(J). Standup India Scheme

Features of Scheme

- To develop large number of entrepreneurs. 1.25 lakh bank branches to assist at least 2 entrepreneur.
- Loans under the scheme is available for only Green field Projects of manufacturing, services or the trading sector.
- Composite bank loans between Rs 10 lakh and Rs 1 Crore to at least one Scheduled Caste (SC) or Scheduled Tribe (ST) and one woman borrower per bank branch
- Composite loan of 75% of the project cost inclusive of term loan and working capital.
- Margin money of 25% can be provided in convergence with eligible Central / State schemes. In all cases, the borrower's own is minimum of 10% of the project.
- Besides primary security, the loan may be secured by collateral security or guarantee of Credit Guarantee Fund Scheme for Stand-Up India Loans (CGFSIL), nodal agency National Credit Guarantee Trustee Company, as decided by the banks.
- The Stand Up India portal (www.standupmitra.in) provides information to a potential borrower on types of handholding supports as well as guidance to get in touch with Banks for availing loans.

2: Proposed scheme (if existing is not suitable)

The new schemes may be derived covering following aspects:

- Incentivisation of new product development either through tax credit / deferment equivalent to the cost of new product development.
- Technology acquisition support up to 50 % cost of technology acquired from R & D institution of international repute and financial support for acquiring patented technology .(max. limit can be fixed in consultation with CGCRI & industry leaders) .

3: Details of agencies who can provide guidance

3.1: The **Central Building Research Institute (CBRI)** at Roorkee, Uttarakhand, India, is a constituent establishment of Council of Scientific and Industrial Research, India and has been vested with the responsibility of generating, cultivating and promoting building science and technology in the service of the country.

Since its inception in 1947, the Institute has been assisting the building construction and building material industries in finding timely, appropriate and economical solutions to the problems of building materials, health monitoring and rehabilitation of structures, disaster mitigation, fire safety, energy-efficient rural and urban housing. The Institute is committed to

servicing the people through R&D in the development process and maintains linkages at international and national level.

At the national level of India, the Institute has close interaction with BMTPC, HUDCO, DST, Ministry of Urban Development, Ministry of Rural Areas, Housing Boards and Societies of the State Governments, engineering and academic institutions, construction and building

Website www.cbri.res.in

3.2: CSIR-Central Glass & Ceramic Research Institute (CGCRI) is a Kolkata based National research institute under Council of Scientific and Industrial Research, India. Established in 1950 it focuses on the area of glass, ceramics, mica, refractories etc.

Address:

Ph: +91-33-24735829/24839241/23223001/23223380 (Secretariat)

Fax: +91-33-24730957

E-mail: dir_office@cgcri.res.in; director@cgcri.res.in

Email: sjana@cgcri.res.in, www.Cgcri.res.in

3.3: CSIR-CGCRI Khurja Centre :The centre is actively involved in Research & Development in traditional ceramics, Product/Process improvement, Testing and Training activities for the growth of ceramic industries in U.P. state and surrounding region since 1977.

Address:

G T Road, Khurja 203131 (Uttar Pradesh)

Ph: +91 5738245433 / 232501, T-fax: 245081

<https://www.cgcri.res.in/campus/khurja/>

3.4: CSIR-CGCRI Ahmedabad Centre :The centre is actively involved in Research & Development in traditional ceramics, Product/Process improvement, Testing and Training activities for the growth of ceramic industries in Gujrat state and surrounding region.

Address:

CSIR-CGCRI, Naroda Centre 168-169, Naroda Industrial Estate Naroda, Ahmedabad - 382 330

, Mobile : (0) 9427624352 E-mail: siccgcrinc@gmail.com, drmisra2005@yahoo.com,

snmisra@cgcri.res.in

3.5: CDGI, Firozabad: Centre for the Development of Glass Industry was established at Firozabad in India in the year 1992 as a joint venture project of Government of India, State Government of Uttar Pradesh and United Nations Development Program/United Nations Industries Development Organization.

CDGI thus focuses on providing Developmental and Technological Support services to the micro & small scale industries. Its plans and policies are guided by Ministry of MSME, Government of India.

Address:

Centre for the Development of Glass Industry (CDGI)

A1/1, Industrial Area, Jalesar Road, Firozabad 283203, Uttar Pradesh

cdgifzbd@gmail.com, 9897021838

3.6: CAPEXIL a non-profit making organization, was setup in March 1958 by the Ministry of Commerce, Government of India to promote export of Chemical and Allied Products from India. And since then has been the voice of Indian business community. With the headquarter at Kolkata, and regional offices at New Delhi, Mumbai, Kolkata and Chennai, CAPEXIL has more than 3500 members across the country. One of the fascinating aspects of CAPEXIL is the overwhelming variety of products it deals with.

Address:

"Vanijya Bhavan", International Trade Facilitation Center, 3rd Floor,
1/1 Wood Street, Kolkata-700016
Tel: 91-33-22891721/22/23/25, Fax: 91-33-22891724
E-mail: capexil@capexil.in

3.7: Indian Ceramic Society, a non-profit making organization, was setup in March 1928. It has members including students, professionals, researchers, manufacturers, etc. of ceramic related field.

Address:

Anandapally, Bidhanpally, Jadavpur, Kolkata, West Bengal 700032,
Phone: 033 2473 3469

3.8: (EDII) :Entrepreneurship program helps to run business successfully is also available from Institutes like Entrepreneurship Development Institute of India (EDII), Gandhinagar, Gujrat.

Address: Gandhinagar - Ahmedabad Rd, Village, next to Apollo Hospital, Bhat, Ahmedabad, Gujarat 382428

Phone: 079 2396 9151

4: Major trade Industry Associations

Following major industry associations related to the POP industry in Bikaner district of Rajasthan:

- Khara Udyog Sangh has 225 number of primary registered member, out of which around 150 members are engaged in manufacturing POP. The association actively promotes business interests of POP industries in general and mining & procurement of gypsum within the Rajasthan in particular.
- Dhantor POP Sangh, Dhantor, Distt. Bikaner has about 100 members engaged in manufacturing of POP.

Apart from above industry associations of Bikaner, there is no other prominent association has been reported in the other parts of country, having prominence of POP manufacturers. However, the chambers/industry associations like Chamber of Commerce and Industry, Jammu are the representative associations for their respective area POP manufacturers.

(E): References

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3. Peltier L.F. Norman Publishing; San Francisco: 1993. Orthopedics: A History and Iconography; pp. 195–222. Scoliosis. [Google Scholar]
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