CLUSTER PROFILE

GYPSUM, KOHAT

Turn Potential into Profit

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1 Description of the Cluster

1.1 History and Background of the Cluster

The Gypsum reserves of Pakistan are estimated to be about 6 billion tons with existence in all the provinces[1]. The current production of Gypsum is around 0.7 to 0.8 million tons per annum. The KP province leads in terms of quantity and quality of reserves. The total estimated reserves of province are about 5.5 Billion Tons with an annual production of about 0.67 Million Tons (Year 2012). In terms of percentage the gypsum content is 90% and above.

Though the Hazara and DI Khan regions posses gypsum reserves but the dominant area of KP is the Kohat region with around 4.9 Billion Tons' reserves. The bulk orders of gypsum for agriculture, cement, and plaster of Paris attracted investment in the region. The Gypsum mining activities started during early 1980s, leading to Gypsum crushing and plaster plants. Currently, there are about 105 firms engaged in the mining, processing, and trading operations.

1.2 Description of Products

Being a soft sulfate mineral composed of calcium sulfate dehydrate, with the chemical formula $CaSO_4 \cdot 2H_2O$.[3], the Gypsum is used a fertilizer, , filler in paper and textiles, gypsum boards, plaster of Paris, and in cement.

The gypsum products of Kohat cluster are categorized as, the Gypsum Lumps, Gypsum Powder, and Plaster of Paris.

1.2.1 Gypsum Lumps

These are the handpick boulders weighing between 2 Kg to 10 Kg. The mine owners with jack hammer machines or manual labor convert the large boulders into such pieces. The lumps stock traders also perform these operations at their stocking sites with the help of manual labor. The average price (ex factory) is about Rs. 325 to 350 per ton.

[1] Board of Investment, and Industry Survey

1.2.2 Gypsum Crush and Powder

The normal size of the Gypsum crush from Kohat Region is 3.5 Inches with an ex factory price of about Rs. 450/Ton. The prices of gypsum powder (packaging in recycled bags) are between Rs. 700 to 800 per Ton. Few of the gypsum powder suppliers with new/fresh bags and own brand offering the crush mesh size from 1 to 2 inches at prices of Rs. 1,000 to 11,00 per ton. Normal packaging size is 50 to 52 kg bags.


1.2.3 Gypsum Plaster

The common quality of this product available in the product is the white cementing material obtained by dehydration of the gypsum powder. The ex-factory prices range between Rs. 4,000 to 5,000 per ton. The product is offered in bags of 50 Kg packing.


1.3 Core Cluster Actors

1.3.1 Detail of Manufacturing Units in Terms of Scale of Business

1.3.1.1 Medium Scale Organizations

With a total of 40 operational mines, few of the mine owners are medium scale with investment ranging between 10 Million to 25 Million. Similarly, all of the Gypsum Plaster plants with an average investment of Rs. 7 million are of medium scale.

1.3.1.2 Small Scale Organizations

Majority of the mine owners is operating on small scale with investment below 3.5 million rupees. The average investment size of Gypsum crushing units is from Rs. 0.7 Million to 1.5 Million.

1.3.2 Detail of Manufacturing Units by Nature of Business

1.3.2.1 Gypsum Miners and Wholesalers

Gypsum Miners

The only method of gypsum mining in Kohat regions is that of blasting. As a result, the boulders are obtained and then broken either manually or by machinery into hand pick lumps. There are around 40 mine leases with an average of 40 quarries per mine.

Gypsum lumps wholesalers

There are about 10 lumps wholesalers in the Kohat region.

1.3.2.2 Gypsum Crush Processors

About 26 crush processing units (out of them 89% are located in the district Karak) procure the gypsum lumps and crush these into smaller sizes and powder. With a single crusher (syndicator) set the installed and operational capacities are 40 Tons and 32 Tons per day respectively. The fixed cost for these products is low because of the open area operations even without boundary walls and rooms for labor. That is, just install a syndicator with conveyor belt and start crushing operations.

1.3.2.3 Gypsum Plaster (Plaster of Paris)

The number of these processing plants is about 72, mainly spread along the old Bannu road, Karak. These plants can be operated on dual fuel, i.e., both natural gas and coal operated plants.

1.3.3 Total Employment Generation

Business	Number of Units	Average Employment	Total Employment
Quarries	1,600	6	9,600
Gypsum Crush/Powder	26	09	234
Gypsum Crush, Powder, Plaster	72	15	1,080
Lumps Wholesalers	10	08	80
Total Employment in Cluster			**10,994**

1.3.4 Total Production

The total production from the gypsum mines of Kohat Region is about 0.64 Million Tons per annum.[2]

1.3.5 Capacity Utilization

1.3.5.1 Mines

The average operational capacity of a labor intensive mine is 20 Tons/ Day (40 tons installed capacity) whereas the mines with compressed air machinery have operational capacity of 210 tons per day as compared to the installed capacity of 525 tons per day.

1.3.5.2 Gypsum Wholesalers/Lumps Traders

The installed (stocking) capacity of the load traders is about 132 tons per day whereas the daily loading is about 44 tons per day.

1.3.5.3 Gypsum Crush/Powder Processors

All of these units have their own syndicators for crushing lumps whereas majority of them have a set of 02 furnaces with 02 grinding machines. With this combination the installed and operational capacities are 18 Tons and 06 Tons plaster per day.

[2] Source: Directorate of Mines and Minerals, KP

1.4 Other Cluster Actors

Prominent among these are the local machinery manufacturers based in Punjab. Transporters such as loading trucks, dumpers, and tractor trolleys are used for transportation from mines to processing units. Transportation to customers in other cities is done by trucks, dumpers, and containers.

1.5 Geographical Location

The Gypsum Mines are located at Shakardara Road, and the Krapa. The Gypsum lumps traders and powder producers can be seen in the district Karak along the main Indus Highway, and Old Bannu Road. The location of the crush units and plasters producing factories is as under:

Area	Number of Units	Plant/Machinery
Gypsum Crush Processors		
Khoshal Garh (Kohat)	01	Local
Speena	08	Local
Choongi	15	Local
Shakardara	02	Local
Gypsum Powder and Plaster		
Jhatta Ismail Khel	30	Local Gas Operated: 07 Coal Operated: 23
Karak	20	Local: Gas Operated
Sanda Khurram	06	Local: Gas Operated
Kohat	08	Local: Gas Operated
Gorgori/Teri	08	Local: Gas/Coal Operated

1.6 Current Cluster Scenario

The mining activities depict somewhat stagnant activities because of the costly option of manual labor. With the advent of machinery, though the bigger mine owners are getting increased production but with the majority comprising of small mine owners the production remains limited to only 22 Tons per day. The hindrance in mine access is poor due to the unavailability of proper roads.

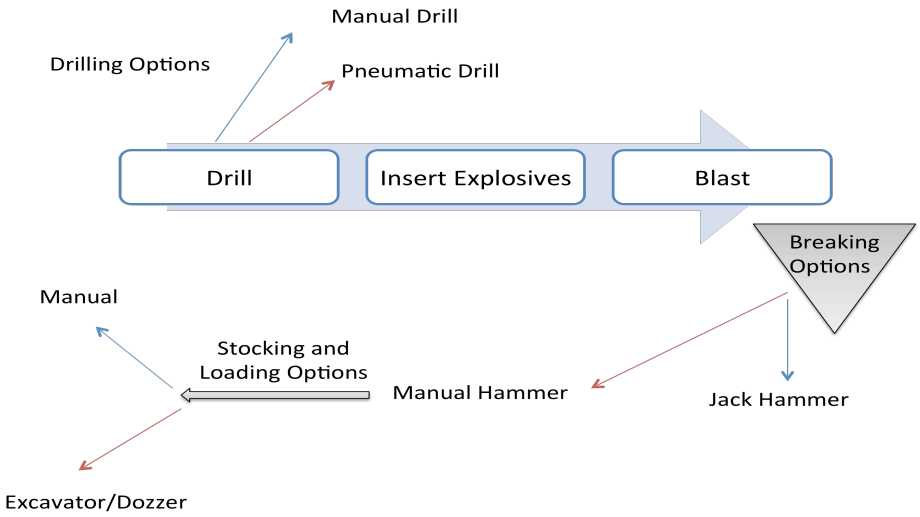
With the exploration of oil and gas at Terri and Shakardara, the gypsum processing cluster flourished fast at an ideal location half way between both of the exploration sites. Amidst electricity shortage, and after the ban on the gas connections even, the cluster is growing. The new investors are commencing

with the coal operated factories. However the trends in products' variety are still that of the limited conventional crush, powder, and plaster.

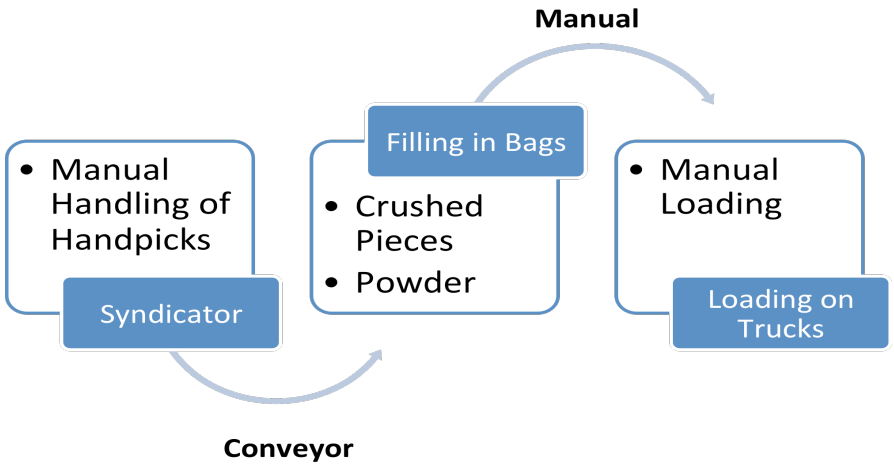
2 Analysis of Business Operation

2.1 Production Operation- Process Flow

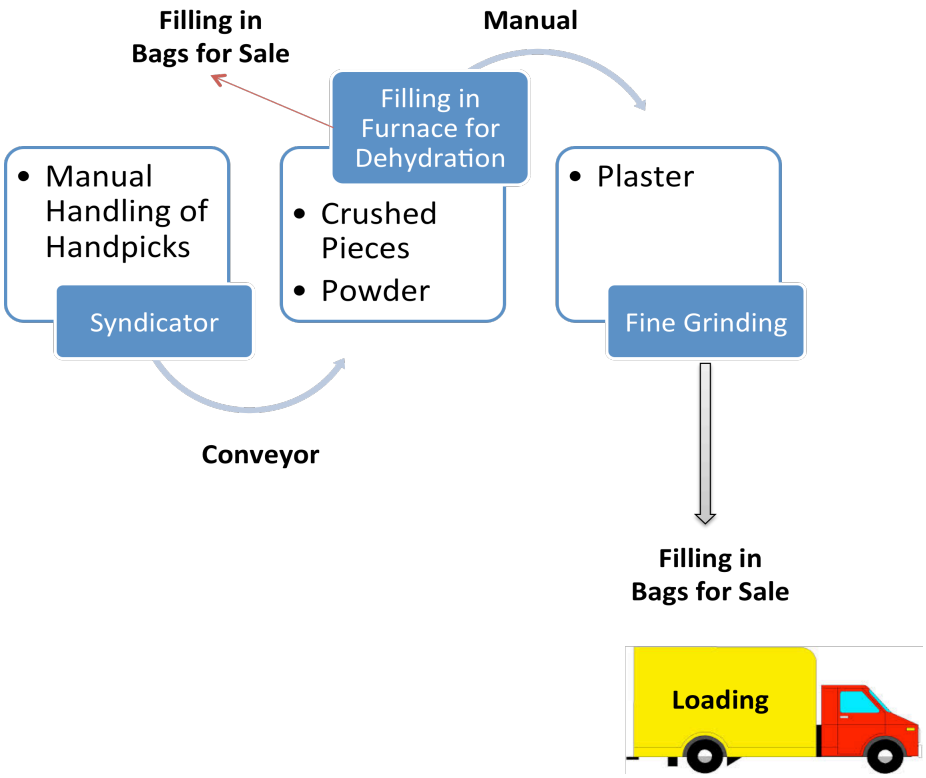
2.1.1 Gypsum Mining



2.1.2 Gypsum Crush and Powder



2.1.3 Gypsum Crush and Plaster



2.2 Raw Materials Availability

The raw material is totally indigenous extracted from the mines of the Kohat Region and the prices start from Rs. 325 per Ton.

2.3 Technology Status

As the mining rely upon the blasting, so limited second hand equipments, like drills and air compressors are used. Though the crushing is done manually but due to the higher costs and lower production the trend of using second hand hammer machinery has also gained popularity.

In case of the gypsum powder the local crushing machinery and conveyor belts are used. Normally, these machines are placed in open without any shed or boundary wall resulting in air pollution with around 150 Kg of powder per ton of gypsum crushed. For the gypsum plaster, though the furnaces are installed in sheds but these furnaces are procured from local manufacturers, and are resulting in waste of electric and gas energy. Furthermore, due to the manual loading in open environment, the wastage is 250 Kg per 30 tons.

Collectively, the cluster needs upgraded technology with energy efficient and environment friendly machinery and equipments.

2.4 Quality Assurance

The Gypsum Lumps and crush are tested as per the existence of Gypsum content in the sedimentary rock. Normally it ranges between 80 to 95%, against which the gypsum of Kohat region have proven to be of best quality, i.e., above 90%.

In case of the gypsum powder and plaster the standard practice is to sieve the small crush for impurity and then grind it to powder so that to obtain fine quality powder and plaster. As compared to this, only a handful of the progressive mine owners practice this, otherwise the majority of processors simply crush the lumps into powder without any sieving. This type of conventional practice renders the quality deteriorated. The performance of the powder depends upon its crystals' sizes and shapes.

As per the description of the "Dongfeng Board" for its plaster, the following standard can be considered for Pakistan.

Properties	Plaster of Paris
Chemical Composition	Calcium Sulphate Hemihydrates CaSO4. ½ H20
Fineness	4 to 6% only remaining on sieve 200u
Initial Setting Time	From 3 minutes for speedo plaster to 10 minutes as per requirement
Final Setting Time	From 12 minutes for speedo plaster to 30 minutes as per requirement
Compressive Strength	Greater than 10.5 MN/m2 or 1525 psi (pure plaster)
Density	1100 kg/meter cube
Thermal Conductivity	0.22 W/m. K (i.e. gypsum plaster's insulation is about five times better than cement-sand plaster

In contrast to this, the processing side of Kohat region remains silent about the properties of its plaster products.

2.5 Marketing and Sales

Activity	Products	Marketing and Sales		
		Target Market	Packaging	Price/Unit (Rs.)
Gypsum Mining	Hand Picks	Cement Manufacturers/Lumps Traders	Open/ Loaded into Truck without Packing	325-350/Ton
Gypsum Mining Cum Crushing	Hand Picks	Cement Manufacturers/Lumps Traders	Open/ Loaded into Truck without Packing	325-350/Ton
	Crush	Exporters to Mini Cement Plants of India	Recycled Bags:50 Kg New Bags: 52 Kg	450/Bag
	Powder	Agriculture Farms	Recycled Bags:50 Kg New Bags: 52 Kg	600/Bag 1,000/Bag
Gypsum Crushing Units	Crush	Exporters to Mini Cement Plants of India	Recycled Bags:50 Kg	450/Bag
	Powder	Agriculture Farms	Recycled Bags:50 Kg	600/Bag
Gypsum Plaster	Powder	Exporters to Mini Cement Plants of India	Recycled Bags:50 Kg	600/Bag
	Plaster	Surgical Uses/House Building Uses	Recycled Bags:50 Kg	3,200/Bag

2.6 Financing

Like other mining activities, the mine owners of gypsum face the problem of financing through banks and financial institutions. The reason is that the banks do not consider the mining lease as collateral. The finance availability to processing units is also very limited and dependent upon the strong collateral conditions. The entire sector rely upon either own funds or investment generation from friends and relatives.

2.7 Human Resources

The value chain components of mining and processing rely upon the contract labor system. The labor in mining and processing both is with no or less formal education. As compared to this, the larger mines engage mining engineers for mine supervision and simple graduates for accounts and administration. Similarly, the processing sector manages their factories through simple graduates.

The contractor is responsible for managing labor on the basis of rupees charged per day in mining and per bag in processing. This on one hand is encouraging for the business owner but the implementation of labor laws is nonexistent in the cluster. The labor from Punjab is normally trusted upon and this contractual nature possesses a weakness for miners and processors as well. During the crops harvesting seasons the shortage of labor becomes an issue.

3 Institutional Setup

3.1 Entrepreneurs Associations

The absence of Gypsum specific association makes the mine owners to unite under the umbrella of the Frontier Mine Owners Association which is based at Nowshehra.

3.2 Government & Semi-government Organizations

The Directorate of Mines and Minerals is responsible for the allotment of mining leases and implementation of provincial mineral policy. The issuance of explosive license is the responsibility of the district administration. In addition to these, the NOC from Environment Regulatory Authority is mandatory to be obtained. The SMEDA mainly acts as a facilitator and stimulating agent for the capacity building through individual and group interactions. Recently one of the mines was facilitated through Economic Revitalization Project of KP/FATA for the up gradation of mining machinery. The export market access services of the TDAP can also be considered by the investors.

4 SWOT Analysis

The following analysis is presented from the cluster point of view. In case of industry analysis on the Porter Five Model, the situation will be different.

4.1 Strengths

- Local reserves of Raw Material (Gypsum).
- Easy and economical logistics of Gypsum.
- Easy availability of labor on contract system.
- Simple processing operations mean minimum reliance upon the skilled labor.
- Very low costs of land purchase.
- Availability of locally fabricated machinery.
- The business can be started with small investment, depending upon the nature of operations.

- On the substitute side, though there is no cheaper substitute* to gypsum for soil and water improvement.

4.2 Weaknesses

- Focus upon conventional operational techniques.
- Lack of innovation in new products and reliance upon very narrow product mix.
- Obsolete machinery resulting in loss of energy, especially the gas.
- Poor quality of processed powder in terms of mesh sizes.
- The bargaining power of the suppliers remain low for unprocessed gypsum as there are already a large number of suppliers in the market and for agricultural purpose, the gypsum need not to be of high quality
- The bargaining power of the buyers is high.
- Problems and delays in obtaining the explosives license.
- The gas theft factor makes the plaster processing to be a costly option where the honest organizations are unable to compete over the prices. This has also rendered the gypsum plaster to be a very low priced commodity in the country.
- The local machinery is not energy efficient and causes over use of gas whereas the coal is also expensive because of being procured from Tarnol and Hyderabad.

4.3 Opportunities

- The huge demands of gypsum crush domestically as well as in the neighboring country of India.
- Absence of innovative products and energy efficient technology may be an encouraging factor for the quality oriented investors.
- The economic corridor of Kashgar to Gawadar may reduce the transportation costs for exports via sea.
- The use of recycled bags for packing of crush and powder offers the opportunity of branded products with own label and new material of packaging.

4.4 Threats

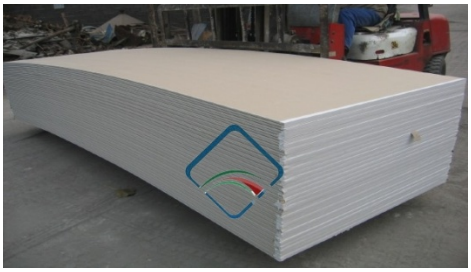
- Low level of required investment makes it easy for new comers and thus increased competition.

* Substitute is available to gypsum e.g. farm yard manure but this is needed in large quantity and is usually used to cover small areas.

- Law and order situation. On one hand the issue of explosives license is becoming more strict while on the other hand the transporters are now reluctant to take carriage to Wahga border due to delays in unloading.
- The ban on gas connections for processing industry.

5 Investment Opportunities

- Innovative Products like Gypsum Board.



- Gypsum Tiles Processing

- Energy efficient processing plants of gypsum plaster.
- Small scale labor intensive production units for plaster products used in house false ceilings.
- The investment opportunity in allied businesses is that of coal washing and briquetting plants while focusing upon the up gradation and marketing of local impure coal.