

BENTONITE



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MINOR MINERALS 30.2 BENTONITE

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**GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES**

Indira Bhavan, Civil Lines,
NAGPUR – 440 001

PHONE/FAX NO. (0712) 2565471
PBX : (0712) 2562649, 2560544, 2560648
E-MAIL : cme@ibm.gov.in
Website: www.ibm.gov.in

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30-2 Bentonite

Bentonite is essentially a highly plastic clay containing not less than 85% clay mineral, montmorillonite. It gets its name from the place where its presence and usages were first discovered, Fort Benton, America. Bentonite's commercial importance is due to its inherent bleaching properties similar to that of fuller's earth, hence, it is also known as bleaching clay. There are two types of bentonites, namely, swelling-type or sodium bentonite and non-swelling-type or calcium bentonite. Sodium bentonite is usually referred to as bentonite, whereas calcium bentonite is called fuller's earth. The commercial importance of bentonite depends more on its physico-chemical properties rather than its chemical composition. Excellent plasticity & lubricity, high dry-bonding strength, high shear & compressive strength, low permeability and low compressibility make bentonite commercially viable. Bentonite is valued in applications, such as, foundry sand binding, drilling mud, iron ore pelletisation and as a waterproofing & sealing agent in civil engineering works. Processing is a prerequisite for bentonite marketing. Bhavnagar and Kachchh districts of Gujarat and Barmer district of Rajasthan are the major producing areas of bentonite. The sodium bentonite mined in Rajasthan tends to be of lower quality and is used as foundry sand. Both activated and granular bentonite are produced in the country. Bentonite is exported both as unprocessed (crude) and processed (including activated) forms.

RESERVES/RESOURCES

The total reserves/resources of bentonite in the country as per NMI data based on UNFC system as on 1.4.2015 have been estimated at 583 million tonnes out of which 15 million tonnes are categorised as reserves. The bulk of the resources, i.e. 428 million tonnes (73%) are in Rajasthan, 144 million tonnes (25%) in Gujarat and the remaining in Tamil Nadu, Jharkhand and Jammu & Kashmir. Substantial quantity 501 million tonnes (86%) of total resources are placed under Unclassified and Not-known categories; 60 million tonnes (10%) under Foundry grade, 19 million tonnes (3%) under Poor/Blendable grades. About 3 million tonnes resources are placed under Drilling Fluid grade, The reserves/resources of bentonite as per the UNFC system as on 1.4.2015 are furnished in Table - 1.

EXPLORATION & DEVELOPMENT

The exploration & development details, if any, are given in the review on "Exploration & Development" in "General Reviews".

PRODUCTION

As per Govt. of India Notification S.O. 423(E), dated 10th February 2015 'bentonite' has been declared as 'Minor Mineral' hence the production data is not available with IBM.

MINING & PROCESSING

Bentonite is exploited mainly by manual and at places, by semi-mechanised methods by deploying shovels and dumpers for mining, haulage, etc. Generally, bentonite deposits are very close to the surface and mined to a depth of 25 metres. Most of the working mines are located in Kachchh & Bhavnagar districts of Gujarat and Badmer, Bikaner & Jhalawar districts in Rajasthan. Working of bentonite often involves selective mining, blending and processing to achieve the required grade.

The processing involves drying, grinding, sizing and at times use of additive for cation exchange. The mined material is first graded and sun-dried before pulverisation. Raw bentonite when delivered to the processing plant contains 25 to 40% moisture. It is, therefore, dried in dryers and the dried clay is ground in roll and hammer mills or other pulverisers and screened. Bentonite is processed generally by simple milling techniques that involve removal of water and volatile matter like carbon dioxide, if present, and grinding it to the appropriate sizes. Small amount of chemicals like soda ash are added sometimes before grinding, to control the properties of bentonite. Most of the bentonite is ground to approximately 90% finer than 200 mesh. For insecticide purpose, bentonite is made in the form of granules. Ashapura Minchem Ltd has extensive reserves of both types of Sodium & Calcium based bentonite in Kachchh, Gujarat, India. However, predominantly, most of its reserves are high quality, high montmorillonite based Sodium grades which gives Ashapura the opportunity to produce various quality bentonite products for diverse industry sectors.

BENTONITE

**Table – 1 : Reserves/Resources of Bentonite as on 1.04.2015
(By Grades/States)**

(In tonnes)

State/Grade	Reserves				Remaining Resources						Total Resources (A+B)		
	Proved STD111	Probable STD121	STD122	Total A	Feasibility STD211	Pre-feasibility STD221	Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334		Total B	
All India :Total	13926227	50000	609406	14585633	6838864	2721697	68632472	26519818	225744237	212115692	25730000	568302781	582888414
By Grades													
Drilling Fluid	69109	-	-	69109	-	-	-	-	-	3009437	-	3009437	3078546
Foundry	4705000	50000	-	4755000	-	592570	3565120	420000	-	50468524	-	55046214	59801214
Poor/blendable	-	-	-	-	-	-	-	-	-	18530969	-	18530969	18530969
Unclassified	9152118	-	609406	9761524	6838864	2129127	-	13583818	5302333	52583197	-	80437339	90198863
Not-known	-	-	-	-	-	-	65067352	12516000	220441904	87523565	25730000	411278821	411278821
By States													
Gujarat	9221227	-	-	9221227	6838864	-	12460170	2163813	1904	113259150	-	134723901	143945128
Jammu & Kashmir	-	-	-	-	-	-	-	-	-	147400	-	147400	147400
Jharkhand	-	-	609406	609406	-	3067	-	-	-	367527	-	370594	980000
Rajasthan	4705000	50000	-	4755000	-	2718630	56172302	24356005	222017000	92523096	25730000	423517033	428272033
Tamil Nadu	-	-	-	-	-	-	-	-	3725333	5818519	-	9543852	9543852

Figures rounded off

USES & SPECIFICATIONS

Bentonite has high swelling properties along with good viscosity and liquid limit. These properties are highly valued in most of the industrial applications. Sodium bentonite is well suited as a binder in the preparation of pellets and in foundry and as oil-well drilling mud. Bentonite also acts as a suspending agent in oil-well drilling fluids and is abundantly used in horizontal drilling for shale production. Bentonite exhibits good green strength along with high hot and dry strength which helps in preventing moulds from breaking or cracking during the pouring or cooling process in the foundry industry. Owing to high green strength resulting from its property to absorb and then release moisture, bentonite is used in iron ore pelletisation. Sodium-based bentonite of 75 micron size finds suitability in iron ore pelletisation for bonding by user industries. Bentonite clay is also used in pyrotechnics to make end plugs and rocket engine nozzles. Bentonite has remarkable colloidal and waterproofing properties. Bentonite gels are used as a carrier for a number of cosmetic preparations, toothpastes, creams, etc. Bentonite is also used in Chemical, Rubber, Insecticide & Pesticide Industries and in civil construction works. Bentonite in the form of fine powder free from dirt and other foreign matter and of least swelling property is used in Ceramic Industry. Bentonite which is the active mineral in clays with medicinal properties is also prescribed as a bulk laxative and it is also used as a base for many dermatological formulations. Bentonite is also used to prepare sulphur bentonite fertilizer (90:10) which is useful to impart better productivity.

The specifications of bentonite for Chemical & Rubber and Oil-well drilling Industries have been published vide BIS Specification IS:6186-1986 (Second Revision Reaffirmed 2010). The specifications for Ceramic Industry has been published vide IS: 12621-1988 (Reaffirmed 2011). BIS has revised the specifications of bentonite for use in Foundries, the new specifications are prescribed vide IS : 12446 - 2007 (First Revision, Reaffirmed 2012).

INDUSTRY

There were about 30 pulverising units in Gujarat and 27 in Rajasthan. The processing plants of bentonite owned by Neelkanth Chemical Work at Akli, Barmer and Jodhpur in Rajasthan produce about

25,000 tpy sodium bentonite.

The Ashapura Minechem Pvt. Ltd, Kachchh, Gujarat has a bentonite pulverising plant with a capacity of 3,50,000 tpy near Bhuj, Kachchh district. The plant can produce 90% 200-mesh powder. The Company also has a new Pellet Strength Test (PST) grade bentonite plant with a capacity of 1,00,000 tpy near Bhuj. It produces 90% minus 63-micron powder which is supplied to the Iron Ore Pelletisation Industry. Its main processing facility is close to Mundra port which is a deep water, all weather port, and can berth even up to capsized vessels. It also has mining and mineral processing facilities in the States of Karnataka, Kerala, Andhra Pradesh and Odisha. Today Ashapura is the 3rd largest producer of bentonite in the world. It has extensive resources of both sodium and calcium bentonite which is mined and processed into several grades such as dried & crushed lumps, granules and powder to micronised powder as per the requirement of diverse needs of the clients. The Ashapura group possesses requisite ISO Certifications and its products are used by a wide range of industries such as Iron ore Pelletisation, Drilling, Metal casting (foundry), construction, cat litter etc. Its value added products are also extensively used in Paper Industry, Detergents, Pharmaceutical Industries, Animal Feeds etc.

Ashapura Volclay is a joint venture between Ashapura Group, India's leading bentonite exporter, and Illinois-based Amcol International Corp., one of the USA's top bentonite producers. The company produces bleaching clays from its plant in Bhuj in Kachchh district, Gujarat since 2001 with the installed capacity of 50,000 tpy. The blended clay is in demand particularly in the domestic market for bleaching of light-coloured vegetable oils, such as sunflower, groundnut and cotton seed oils. The Company is in the process of expanding its production capacity of acid activated bleaching clay.

Following the success of the plant at Bhuj, Ashapura Group has set up another plant for manufacturing bleaching earth at Dharur, Andhra Pradesh, with installed capacity of 30,000 tpy. This plant not only has access to the primary raw mineral attapulgitite but also has a logical edge for exports to the palm oil producing and refining countries in South-East Asia. The brand 'Clearflow' has within a short

span established itself as a cost-effective brand in major oil refiners in India and overseas. Given the importance of Europe as a market, the Ashapura Minechem has set up a mineral processing complex at Antwerp, Belgium as a joint venture with AMCOL International Corp. with installed capacity of 20,000 tpy. The facility has the capability of processing bleaching earth which would be exported from India in a semi-processed form. The Antwerp facility today serves all the major oil refineries of Europe by making available cost-effective and quality product at their doorstep. All the Bleaching Earth grades from Ashapura are available at Antwerp facility. Malaysia being a strategic manufacturing hub in South-East Asia for edible oils, has prompted Ashapura to invest in Hudson MPA Snd. Bhd., a reputed Bleaching Earth manufacturer of Malaysia. The Selangor facility imports attapulgit and bleaching earth from Ashapura in India and processes it for marketing in Malaysia and neighbouring countries. The Selangor plant has an installed capacity of 20,000 tpy.

Gimpex Imerys India Pvt. Ltd has a processing plant with capacity of 60,000 tpy in Kachchh region of Gujarat producing sodium and calcium bentonite. It is reported that in addition to Gimpex Imerys India Pvt. Ltd, Jumbo Mining, Star Bentonite Group, Fonadwell Minechem and Gexmin Co. also produce processed bentonite.

WORLD SCENARIO

World resources of clays including bentonite are quite large, hence country-specific data is not available. USA, China and Turkey are the major producers of bentonite. Other major producers are India, Greece, Mexico, Iran, Russia, Brazil, Japan and Germany.

FUTURE OUTLOOK

The biggest market for bentonite in both North America and European countries are foundry, cat litter, iron ore pelletising and drilling. Civil engineering and environmental applications, such as, land fills require bentonite for use as a sealant and lubricant.

The global market of bentonite and fuller's earth is likely to witness a healthy growth owing to strong demand expected in foundry and Iron Ore Pelletisation Industry. This is mainly due to strong growth in the automotive production (>100 M vehicles) as well as increase in iron & steel production. Increase in civil construction activity in Asian countries and traditional edible oil refining in Asia will also boost bentonite consumption in near future. The slump in global crude oil prices since 2015 may result in lower demand of future exploration activity for oil and gas. Bentonite consumption in Drilling Mud Industry is also expected to remain on lower side till global oil market again picks up.

Global Bleaching clay market exceeds \$700 million in 2015. This product is widely used in processing and refining of edible oils as well as for decolorising mineral oils, waxes and lubricants. Asia Pacific Bleaching clay market may witness significant growth owing to increasing edible oil production in China, India, Malaysia and Indonesia.

Ashapura Group of Companies, an Indian company features among the global key operators in the Bleaching Clay Industry which include BASF SE, Clariant International, AMCOL Speciality Minerals etc.

Bentonite is among the exportable mineral commodities in India. Since Indian resources of Bentonite are of high grades, India has excellent opportunity to cater to diverse industries worldwide. Bentonite is exported both in unprocessed (crude) and processed (including activated) forms. Though, export of crude bentonite account for a higher quantity, the exports of processed bentonite fetch higher value than the crude bentonite. There is a pressing need to develop different processing techniques that suit our available resources, in order to make our products match the international standards. There is scope to establish bentonite processing, granulation and paint grade processed bentonite units in the country to meet the indigenous demand as well demand in the international market. More and more Indian companies are entering in joint ventures with multinationals in order to meet the challenge of the strong global competition.