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MINOR MINERALS

30.2 BENTONITE

(ADVANCE RELEASE)

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 derives 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 has 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 of 501 million tonnes (86%) of the total resources are placed under Unclassified and Not-known categories while 60 million tonnes (10%) under Foundry grade and 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 covered in the Review on "Exploration & Development" under "General Reviews".

PRODUCTION

As defined in Clause (e) of the Section-3 of MM(DR) Act 1957, 'bentonite' has been declared as 'Minor Mineral', hence the producers report the production data directly to the respective States and not to IBM. However, efforts were made to collect this information through correspondence with the State Directorates of Mining and Geology of individual states or by visiting their websites. All possible information/data that could be gathered has been presented in this Review.

Statewise production of bentonite during 2017-18 to 2019-20 is furnished in Table-2.

Table-2: Statewise Production of Bentonite

(In tonnes)

State	Year		
	2017-18	2018-19	2019-20
Gujarat	3313358	3385450	-
Rajasthan	174906	276000	305000

Source: *As received from State DGMs and their websites.*
Note : *" - " NA*

USES & SPECIFICATIONS

Bentonite has high swelling properties along with good viscosity and liquid limit. These properties are highly valued in most of the industrial

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		Total A	Feasibility STD211	Pre-feasibility		Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334	Total B	
		STD121	STD122			STD221	STD222						
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.

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 have 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).

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.

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 accounts 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 as demand in the international market. More and more Indian companies are entering into joint ventures with multinationals in order to meet the challenge of the strong global competition.