

DIATOMITE



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DIATOMITE

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**GOVERNMENT OF INDIA
MINISTRY OF MINES
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10 Diatomite

Diatomite is a siliceous sedimentary rock that is white and yellowish in colour. It is composed of fossilised remains of unicellular aquatic algae-like plants called diatoms which are both marine & lacustrine in origin. Diatomite has the ability to absorb soluble silica to form a highly porous skeletal framework. The dead remains of these diatoms over the ages have fossilised and formed the deep-bedded deposits in ocean & lake floors. The special properties of diatomite i.e. light weight, high porosity & high absorptivity have facilitated its application as filter medium and absorbents. It is chemically inert & highly stable. The diatomite consists of approximately 90 percent silica and the remainder consists of compounds, such as, aluminium and iron oxides. It is also called 'Kieselguhr'.

Siliceous earth is an inorganic material which has chemical composition of more than 80% of amorphous silica. This amorphous phase is very rare and used widely in industrial scale because

of its high porosity, fine particle size, very low density and its high surface area. Its chemical and physical features are same as diatomites which is also amorphous silica consists of fossilised remains of diatoms, a type of hard-shelled algae. Siliceous earth differs from diatoms in its origin and seems to be formed from volcanic ash. Due to these similarities in both materials, siliceous earth finds similar uses as diatomites and has been included in this review.

RESERVES/RESOURCES

The occurrences of diatomite are reported from Gujarat, Rajasthan, Tamil Nadu, Andhra Pradesh and Camorta & Trincat Islands in Andaman and Nicobar archipelago. As per NMI database, based on UNFC system, the total resources of diatomite as on 1.4.2015 have been estimated at 2.89 million tonnes, all of which fall under remaining resources. The resources are distributed in Rajasthan (72%) and Gujarat (28%) (Table - 1).

Table – 1: Reserves/Resources of Diatomite as on 1.4.2015 (By Grades/States)

(In '000 tonnes)

Grades/State	Reserves Total (A)	Remaining Resources			Total Resources (A+B)
		Feasibility STD211	Inferred STD333	Total (B)	
All India: Total	–	634	2251	2885	2885
By Grade					
Unclassified	–	634	2251	2885	2885
By States					
Gujarat	–	–	811	811	811
Rajasthan	–	634	1440	2074	2074

Figures rounded off.

PRODUCTION

Production of diatomite has not been reported since 1991-92. Pandava and Khadriliya areas in Bhavnagar district, Gujarat were the producing areas prior to 1991-92.

Siliceous Earth

The production of Siliceous earth was 69

thousand tonnes during 2016-17 as against 47 thousand tonne in 2015-16.

There were thirteen reporting mines in the year 2016-17 as well as in 2015-16.

The production of siliceous earth was reported only from Rajasthan during the year.

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Mine-head closing stocks of siliceous earth in the year 2016-17 were 57,905 tonnes (Tables-2 to 5).

The average daily employment of labour in 2016-17 was 73.

Table – 2 : Principal Producers of Siliceous Earth

Name & address of producer	Location of mine		Name & address of producer	Location of mine	
	State	District		State	District
			Jai Shriram Minerals, C/o Surya Prakash Parmar, Swamiyo ka Vas, Shiv, Barmer – 344 701, Rajasthan.	Rajasthan	Jaisalmer
J.B. Mines & Chemicals, Indewar, Tehsil-Merta Nagaur-341 510, Rajasthan.	Rajasthan	Jaisalmer	Parmeshwar Khatri, Shastri Nagar, Barmer, Barmer -334 001, Rajasthan.	Rajasthan	Jaisalmer
Bhom Singh Rathore, 297, Hanwant-ABJS Colony, Jodhpur-342 001, Rajasthan.	Rajasthan	Barmer	Priyanka Kanwar, 2, Madhuban Colony, Behind Panchyat Samiti,, Barmer-334 001, Rajasthan.	Rajasthan	Barmer

**Table – 3 : Production of Siliceous Earth, 2014-15 to 2016-17
(By States)**

(Qty in tonnes; Value in `'000)

State	2014-15		2015-16		2016-17 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	NA	NA	47386	20735	69379	63722
Rajasthan	NA	NA	47386	20735	69379	63722

**Table – 4 : Production of Siliceous Earth, 2015-16 and 2016-17
(By Sectors/States/Districts)**

(Qty in tonnes; Value in `'000)

State/District	2015-16			2016-17 (P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
India	13	47386	20735	13	69379	63722
Private Sector	13	47386	20735	13	69379	63722
Rajasthan	13	47386	20735	13	69379	63722
Barmer	6	20159	10286	6	21687	20692
Jaisalmer	7	27227	10449	7	47692	43030

Table – 5 : Mine-head Closing Stocks of Siliceous Earth 2015-16 & 2016-17 (By States)

(In tonnes)		
State	2015-16	2016-17 (P)
India	45029	57905

USES

Diatomite is commonly used after calcination in plate and frame filter units. Processed diatomite finds a wide range of applications due to its properties like porosity, low bulk density, soluble impurities, high absorptive capacity for liquids, large surface area, low thermal conductivity, mild abrasive nature and chemical inertness.

Diatomite is an excellent filtering material for many liquids especially beverages, fruit juices, soft drinks, beer and wine. It is used in chemicals like sodium hydroxide, sulphuric acid and gold salts. Filtration of cooking oils (vegetable and animal) and sugar (cane, beet and corn) is an application where diatomite is predominantly used. It is also used as an absorbent of vegetable oil, polyethylene, rayon liquors and as a flattening agent in paint, plastic, rubber, drugs, toothpaste, polishes and chemicals. Diatomite is utilised for safe handling and storage of hazardous chemicals like sulphuric acid. Besides, diatomite is also used as an abrasive in metal polishing in automobiles and toothpastes; as pozzolanic admixtures in Cement Industry; as animal feed stuff conditioners; and in explosives. It is also used as a coating material in the manufacture of ammonium nitrate fertilizer which is hygroscopic. Diatomite clay is the new revolution in hydroponics. In pharmaceuticals, it is used to filter syrups and other bulk drugs in liquid form. It is used as a facial exfoliator to promote skin health. Research has also shown that food-grade diatomaceous earth may offer positive benefits for controlling cholesterol levels which in turn would improve heart health. In Oil Industry, before packing, it is used for filtering oil which not only gives it a shine but also helps in removing any suspended impurity. Wine and Beer is filtered through diatomite filters before packing to remove molasses. Filter candles are made from diatomite filter aids for drinking water purification. Processed diatomite granules 15 to 50 mm,

are used in denim wash (commonly known as stonewash) to give it shine and design.

Diatomite is also used as caking agent in fertilizers, plastics and as a natural insecticide for organic pest control. Potable water treatment and biological filtration are areas of expansion in diatomite consumption. Siliceous earth is mainly used as filler and filter, heat and sound resistant material and in ceramic industry. Filtration and cleaning of vegetable oils and animal fats and manufacturing of medicines are other uses. In advance applications, it is used as carrier for catalyst in chemical processes and for mineral fertilizers and herbicides, pesticides and fungicides in agriculture as well as raw material for refination and filtration as well as constituent of synthetic molding mass. Siliceous earth is used in powder form which may vary from 80 mesh to 500 mesh powder. It is also used in granule form in some specific operations and in paint, filler, rubber, catalyst, fertilizer, pesticides, agriculture and many other industries.

SUBSTITUTION

Many materials are used as substitutes for diatomite. However, the unique properties of diatomite assure its continuance in many applications. Expanded perlite and silica sand are considered as viable substitutes of diatomite for filtration purposes. Filters made from manufactured materials, notably ceramic, polymeric or carbon membrane filters and filters made with cellulose fibres are becoming competitive as filter media. Alternate filler materials include talc, ground silica sand, ground mica, clay, perlite, vermiculite and ground limestone. For thermal insulation materials, such as, various clays & special brick, mineral wool, expanded perlite and exfoliated vermiculite can be used.

TRADE POLICY

As per the Foreign Trade Policy 2015-2020, imports are permitted free and no policy restrictions on the exports of siliceous fossil meals (kieselguhr, tripolite, diatomite) and similar siliceous earth, whether or not calcined under HS code 251200 (25121010, 25120020, 25120030 and 25120090).

WORLD REVIEW

World resources of crude diatomite are adequate for the foreseeable future. The USA has the largest reserves at 250 million tonnes followed by China with 110 million tonnes and Turkey with 44 million tonnes. World's largest producing district in terms of volume is near Lompoc, CA in USA (Table- 6).

The total world diatomite production was 2.39 million tonnes in 2016 which remained same as in the previous year. The USA dominated the world production by accounting for 36% output which was followed by China (18%), Argentina (8%), Denmark (5%), Peru (4%), Japan, France, Mexico & Turkey (4% each) and Russia (2%). Production in Denmark was mostly of molar, an impure diatomite containing a large proportion of clay (Table- 7).

**Table – 6: World Reserves of Diatomite
(By Principal Countries)**

(In '000 tonnes)	
Country	Reserves
World: Total (rounded)	Large
Argentina	NA
China	110000
Denmark (processed)	NA
France	NA
Japan	NA
Mexico	NA
Peru	NA
Russia	NA
Spain	NA
Turkey	44000
USA	250000
Other countries	NA

Source: Mineral Commodity Summaries, 2018.

**Table – 7: World Production of Diatomite
(By Principal Countries)**

(In '000 tonnes)			
Country	2014	2015	2016
World : Total	2536	2391	2389
Argentina ^e	200	200	200
China ^e	420	420	420
Denmark (Molar)*	119	128	114
France ^e	90	90	90
Japan ^e	90	100	100
Mexico	88	90	97
Peru	151	121	107
Russia	72	66	47
Turkey	62	87	90 ^e
USA	901	832	850 ^e
Other countries	343	258	273

Source: World Mineral Production, 2012-2016.

* Molar is an impure diatomite containing a large proportion of clay.

FOREIGN TRADE

Exports of diatomite increased to 38,427 tonnes in 2016-17 from 30,597 tonnes in the previous year. Exports were mainly to Saudi Arabia (94%) and Chinese Taipei/Taiwan (4%) (Table-8).

Exports of kieselguhr decreased drastically to 39 tonnes in 2016-17 from 90 tonnes in the previous year. Exports were mainly to China (90%) and Bangladesh (8%). There were no exports of tripoli earth in both the years, i.e. 2015-16 and 2016-17 (Table-9).

Imports of diatomite increased to 3,142 tonnes in 2016-17 from 2,023 tonnes in the previous year. Imports were mainly from Mexico (39%) which was followed by China (37%) and USA (22%) (Table-10).

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Imports of kieselguhr were negligible in 2016-17 as well as in the previous year. Imports of kieselguhr were mainly from UK, USA and China (Table-11).

Imports of tripoli earth were 19 tonnes in 2016-17 as against 20 tonnes in the previous year. (Table-12).

Table – 8: Exports of Diatomite (By Countries)

Country	2015-16 (R)		2016-17 (P)	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	30597	328268	38427	362900
Saudi Arabia	28891	300724	36075	320144
Chinese Taipei Taiwan	1382	16374	1587	19153
USA	3	1771	19	10798
Equador	-	-	208	3558
Senegal	-	-	307	2831
France	15	1873	41	1846
UK	52	775	59	1244
Malaysia	37	1411	20	734
Oman	45	1380	19	672
UAE	10	318	25	665
Other countries	162	3642	67	1255

Table – 9: Exports of Kieselguhr (By Countries)

Country	2015-16 (R)		2016-17 (P)	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	90	1900	39	931
China	35	514	35	540
Bangladesh	2	107	3	322
Israel	-	-	1	65
Sri Lanka	-	-	++	2
Vietnam	-	-	++	2
France	26	713	-	-
Netherlands	16	278	-	-
Algeria	10	162	-	-
Nepal	1	119	-	-
Germany	++	4	-	-
Other countries	++	3	-	-

Table – 10 : Imports of Diatomite (By Countries)

Country	2015-16 (R)		2016-17 (P)	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	2023	87086	3142	113035
Mexico	300	13063	1213	41502
USA	1101	52755	677	34443
China	609	19873	1160	33323
Spain	1	327	72	3077
Australia	6	166	20	640
Japan	6	836	++	31
France	-	-	++	10
Germany	++	66	++	9

Table – 11: Imports of Kieselguhr (By Countries)

Country	2015-16 (R)		2016-17 (P)	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	++	73	++	139
UK	++	67	++	73
USA	-	-	++	51
China	++	6	++	15

Table – 12 : Imports of Tripoli Earth (By Countries)

Country	2015-16 (R)		2016-17 (P)	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	20	825	19	817
USA	20	825	19	817

FUTURE OUTLOOK

The economic stability of diatomite was largely on account of its use as a viable filtration medium. Despite challenging market condition for many industrial commodities, world diatomite production remained stable. The demand for diatomite as filtration medium still remains

strong particularly in the filtration of spirit as well as human blood plasma and in other biotechnical applications.

The large world reserves and near stability in demand are certain to keep the viability of diatomite steady in the foreseeable future, especially in the filler and absorbent markets.

