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MAGNESITE

(FINAL RELEASE)

GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES

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19 Magnesite

Magnesite ($MgCO_3$) is a carbonate of magnesium. It is usually found as secondary deposits formed due to alteration of ultrabasic rocks (mostly serpentinite) and other magnesium-rich rock types formed by replacement of dolomite and dolomitic limestone, as bedded deposits and as irregular veins. Magnesite deposits in India, generally occur as crystalline mass, amorphous and massive. Calcium and silica are the most common impurities found in magnesite along with Fe_2O_3 and Al_2O_3. It is a very important mineral for the manufacture of basic refractories, which could be largely used in the Steel Industry. In commerce, the term 'magnesite' refers not only to the mineral, but also to many products, obtained by calcining the natural carbonate, e.g., caustic magnesite (magnesia obtained by calcining crude magnesite at comparatively low temperatures, 700 to 1,000 °C, and retaining 2 to 7% CO_2 as carbonate) and dead-burnt or refractory magnesite (magnesia obtained by calcining magnesite at high temperatures, 1,500 to 1,800 °C, usually containing less than 0.5% CO_2). Pure magnesite calcined at still higher temperatures (1,600-1,800 °C) to expel carbon dioxide completely is termed as 'periclase' (MgO) in the trade. The dead burnt magnesite and fused magnesia are used in Refractory Industry to manufacture various refractory products. The caustic magnesia or low calcined magnesite is used as animal feed stuff and in the manufacture of oxichloride cement.

The Refractory Industry is the major consumer of magnesite.

RESERVES/RESOURCES

The total reserves/resources of magnesite as per NMI database, based on UNFC system, as on 1.4.2015 are about 394 million tonnes of which Reserves and Remaining Resources are 82 million tonnes and 312 million tonnes, respectively. Substantial quantities of resources are established in Uttarakhand (59%), followed by Tamil Nadu (25%) and Rajasthan (14%). Resources are also located in Andhra Pradesh, Himachal Pradesh, Jammu & Kashmir, Karnataka and Kerala.

Occurrences of magnesite in Tamil Nadu are low in lime and high in silica, whereas those of Uttarakhand are high in lime and low in silica. The gradewise and statewise reserves and resources of magnesite are furnished in Table - 1.

EXPLORATION & DEVELOPMENT

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

PRODUCTION

Production of magnesite in 2017-18 at 195 thousand tonnes decreased by 35% as compared to that in the previous year. There were 9 reporting mines in 2017-18 as against 19 reporting mines in 2016-17. Five principal producers accounted for about 90% of the total output during the year 2017-18. About 60% of the total production of magnesite was contributed by public sector during 2017-18.

Tamil Nadu continued to be the major producing state with maximum contribution of 63% to the total output during 2017-18 followed by Uttarakhand and Karnataka.

Mine-head closing stocks of magnesite for the year 2017-18 were 78 thousand tonnes as against 83 thousand tonnes in the previous year.

The average daily employment of labour in magnesite mines during the year was 893 as against 1331 in the previous year (Tables- 2 to 5).

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

(In '000 tonnes)

	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	**77867**	**165**	**4244**	**82276**	**6210**	**9345**	**45574**	**59010**	**59652**	**131707**	**213**	**311711**	**393988**
By Grades													
High Grade	-	-	-	-	3217	-	3	2	-	26	-	3249	3249
Medium Grade	75021	40	4113	79174	1223	6463	11506	64	109	7954	-	27318	106492
Beneficiable/Low	2701	125	122	2949	595	540	673	648	31558	117667	168	151850	154799
High & Medium Mixed	-	-	-	-	6	173	2059	-	-	100	-	2339	2339
Medium & Low Mixed	-	-	-	-	-	429	29237	58271	27766	207	-	115910	115910
Others	146	-	-	146	1168	1698	2090	24	-	2501	-	7480	7626
Unclassified	-	-	-	-	-	-	-	-	-	83	-	83	83
Not-known	-	-	8	8	-	43	7	-	219	3170	45	3482	3491
By States													
Andhra Pradesh	-	-	-	-	-	-	-	-	-	80	-	80	80
Himachal Pradesh	-	-	-	-	-	-	-	-	-	298	-	298	298
Jammu & Kashmir	-	-	-	-	3210	740	-	-	-	150	45	4145	4145
Karnataka	1264	125	-	1389	566	190	391	88	10	3179	168	4592	5981
Kerala	-	-	-	-	-	-	-	2	-	38	-	40	40
Rajasthan	-	-	-	-	912	1589	2121	-	149	49033	-	53804	53804
Tamil Nadu	73499	40	38	73577	499	6224	11529	17	737	5643	-	24649	98226
Uttarakhand	3104	-	4206	7310	1023	602	31534	58902	58756	73287	-	224103	231413

Figures rounded off

Table-2: Principal Producers of Magnesite, 2017-18

Name & address of producer	Location of mine	
	State	District
Tamil Nadu Magnesite Ltd, 5/53, Omalur Main Road, Jagirammapalayam, Distt. Salem-636 302, Tamil Nadu.	Tamil Nadu	Salem
Almora Magnesite Ltd, Village Matela, P.O. Billori, Distt. Bageshwar-263 630, Uttarakhand.	Uttarakhand	Bageshwar
S. Sundararajan, 5/22-A, Periyakollapatti Kannankuruchi, Post – Gorimedu, Distt. Salem -636 008, Tamil Nadu.	Tamil Nadu	Salem
N. B. Minerals Corporation, 6/575 Nawabi Road, Haldwani, Distt. Nainital – 263 139, Uttarakhand.	Uttarakhand	Pithoragarh
India Magnesia Product Limited, No. 11/239, Ramakrishna Road, Balaji Towers, 3rd floor, Distt, Salem – 636 007, Tamil Nadu.	Tamil Nadu	Salem

Table – 3: Production of Magnesite, 2015-16 to 2017-18
(By States)

(Qty in tonnes; Value in ``'000)

State	2015-16		2016-17		2017-18	
	Quantity	Value	Quantity	Value	Quantity	Value
India	**327663**	**827072**	**299149**	**749297**	**195033**	**503919**
Karnataka	8161	39962	8391	34997	8419	43120
Tamil Nadu	264913	705318	223406	623084	122408	362627
Uttarakhand	54589	81792	67352	91216	64206	98172

Table – 4: Production of Magnesite, 2016-17 and 2017-18
(By Sectors/States/Districts)

(Qty in tonnes; Value in `'000)

State/District	2016-17			2017-18		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
India	**19**	**299149**	**749297**	**9**	**195033**	**503919**
Public Sector	4	162883	388590	3	117310	266828
Private Sector	15	136266	360707	6	77723	237091
Karnataka	**2**	**8391**	**34997**	**2**	**8419**	**43120**
Mysore	2	8391	34997	2	8419	43120
Tamil Nadu	**14**	**223406**	**623084**	**4**	**122408**	**362627**
Karur	1	811	1217	-	-	-
Namakkal	1	2555	3322	-	-	-
Salem	10	219862	618085	4	122408	362627
Tiruppur	2	178	460	-	-	-
Uttarakhand	**3**	**67352**	**91216**	**3**	**64206**	**98172**
Bageshwar	1	31632	54502	1	36602	62561
Pithoragarh	2	35720	36714	2	27604	35611

Table-5: Mine-head closing stocks of Magnesite, 2016-17 and 2017-18
(By States)

(In tonnes)

State	2016-17	2017-18
India	**83130**	**78149**
Jharkhand	1012	1012
Karnataka	11719	4619
Rajasthan	-	30
Tamil Nadu	68092	71694
Uttarakhand	2307	794

MINING AND MARKETING

Magnesite is being worked by opencast method by developing benches. In Salem area (Tamil Nadu), magnesite is found chiefly as encrustations, veins and stringers in ultrabasic rocks like dunite and peridotite. Stringers and veins occur irregularly in fractures of rocks giving rise to different patterns. Veins are broken and magnesite is sorted out manually. Major magnesite producing mines in Salem area belong to Tamil Nadu Magnesite Ltd (TANMAG a State Government Undertaking), Ponkumar Magnesite Mines, Mysore Minerals, Dalmia Magnesite Corporation (a Private Sector Enterprise) and SAIL Refractory Co. Ltd (a Central Government Undertaking). These mines are semi-mechanised as well as mechanised and uses compressors, wagon drills, jackhammers, power shovels, loaders, dumpers, dozers and pumps. Normally, Ammonium Nitrate Fuel Oil (ANFO) Mixture with high explosives as booster is used for blasting. The powder factor may go up to 10.The blasted rock or run-of-mine material containing 25 to 30% magnesite is subjected to manual sorting.

The hand-picked crude magnesite is further subjected to sorting and dressing in the dressing yard. Magnesite lumps which are not considered fit for dressing (containing 10 to 20% silica) constitute 2 to 6% of the run-of-mine. These lumps are hand-picked and stacked separately as rejects. The remaining material is further dressed to obtain usable magnesite containing less than 3% silica. The usable magnesite hardly constitutes 4 to 8% of blasted rocks even though run-of-mine contains 20 to 30% magnesite. In Uttarakhand, Almora Magnesite Ltd and N.B. Minerals Corporation are the important producers having mines in Bageshwar and Nainital districts, respectively.

Magnesite is marketed generally after calcination, that is, after converting it into lightly calcined or caustic magnesite and dead-burnt variety.

At TANMAG, the recovery of magnesite from blasted earth is about one in fourteen. After picking the magnesite, the remaining reject material is removed by mechanical operation using HEMM. TANMAG's annual crude magnesite production capacity is in the range of 75,000 to 1,00,000 tonnes.

USES AND SPECIFICATIONS

The major proportion (about 98%) of magnesite mined is used for conversion into calcined form which finds many applications. The other industries where raw magnestite is used are mosaic tiles, electrodes, chemicals and manufacture of magnesium metal. Magnesite is also used in fertilizers and by Food Processing Industry. As per the Industries Department, Govt. of Tamil Nadu, Policy Note 2016-17, about 2.7 tonnes of raw magnesite and 220 litres of furnace oil is required to produce one tonne of Dead Burnt Magnesite (DBM). Raw magnesite is dead-burnt for making basic refractory bricks, basic refractory mortars, ramming mass, tar/pitch impregnated magnesite, magnesia-carbon bricks, slide-gate plates and other refractories. As per the Industries Department, Govt. of Tamil Nadu, Policy Note 2016-17, about 2.7 tonnes of raw magnesite and 140 litres of furnace oil are required to produce one tonne of Caustic Calcined Magnesite (CCM). Caustic Calcined Magnesite is used in manufacturing sorel cement (magnesium oxychloride), castable refractories and extraction of magnesium metal. It is also the source material for manufacture of magnesium compounds like magnesium sulphate (Epsom salt) and other salts used in Paper and Pharmaceutical Industries. In Paper Industry, magnesium bisulphate produced from magnesite is used as cooking liquor for preparing pulp. It is also used in Textile, Rubber, Glass, Ceramic Industries and as animal feed stuff. Fused magnesia finds application as insulating material in tubular heating elements in Electrical Industry and refractory brick linings in steel furnaces.

Refractory Industry

Refractory Industry is one of the major consumers of magnesite in India. In the manufacture of refractories, deleterious constituents are SiO_2, CaO, Fe_2O_3 and Al_2O_3. The permissible limits for these constituents are governed by its end-use. The refractory bricks are made from Dead Burnt Magnesite by judicious blending of different types of raw magnesite before dead-burning or of different qualities of Dead Burnt Magnesite prior to brick making.

Indian steel plants use domestic DBM bricks containing up to 5% silica and 2.5% maximum CaO. By and large, Indian refractory makers prefer magnesite for making high-grade DBM containing MgO 45.5% (min.), SiO_2 2.5% (max.) and CaO 1.5% (max.).

The BIS has prescribed the IS specification (14303-1995, Reaffirmed 2011) for magnesite for use in Refractory Industry. The said specification has laid down five grades of magnesite as follows:

Sl. No.	Constituent	Requirements, Percent				
		Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
i)	MgO min.	45.00	43.00	42.50	45.00	43.00
ii)	CaO max.	0.75	0.75	0.75	2.00	2.00
iii)	Al_2O_3 max.	0.50	0.50	0.50	0.50	0.50
iv)	Fe_2O_3 max.	0.50	0.50	0.50	2.50	2.00
v)	SiO_2 max.	2.00	3.00	4.00	1.00	2.00
vi)	Size*	25-75 mm	25-75 mm	25-75 mm	50-100 mm	50-100 mm

** Unless and otherwise agreed to.*

Chemical Industry

The BIS specification (IS : 3607-1979, First Revision, Reaffirmed 2010) has prescribed the following specifications for magnesite for use in Chemical Industry:

Sl.No.	Characteristic	Requirement
i)	Loss on ignition, percent by mass, min.	48.0
ii)	Silica (as SiO_2), percent by mass, max.	2.0
iii)	Alumina (as Al_2O_3), percent by mass, max.	0.3
iv)	Iron Oxide (Fe_2O_3), percent by mass, max.	0.4
v)	Magnesium (as MgO), percent by mass, min.	45.0
vi)	Calcium (as CaO), percent by mass, max.	1.0

Table – 6: Consumption* of Magnesite 2015-16 to 2017-18 (By Industries)

(In tonnes)

Industry	2015-16	2016-17	2017-18
All Industries	**265000**	**230000**	**200000#**
Calcination	155100	148300	31000
Chemicals	3000	2500	800
Ferroalloys	14500	18700	6200
Refractories	69000	60500	137000
Others (foundry, iron & steel, paper,etc.)	23400	-	25000

** Includes actual reported consumption and/or estimates made wherever required and due to paucity of data, coverage may not be complete.*

 # Consumption estimated from the despatches, as reported in Form-H under Rule-45 of MCDR,2017

Whereas the apparent consumption for magnesite was 2,36,614 tonnes in the year 2017-18.

CONSUMPTION

The consumption of magnesite in 2017-18 decreased to 200 thousand tonnes from 230 thousand tonnes as recorded in the previous year. About 69% consumption was reported for refractory purposes followed by16% for calcination purposes and 3% for ferro-alloys purposes. The Chemical Industry consumed magnesite predominantly for producing magnesium sulphate. Magnesite consumption pattern by industries is shown in Table - 6.

INDUSTRY

Dead Burnt Magnesite (DBM)

Raw magnesite when calcined at temperatures in the range of 1,660-1,800 °C in the rotary kiln, carbon dioxide gets expelled completely and a dense product 'Dead Burnt Magnesite' is obtained. Dead Burnt Magnesite refers to the magnesite that is chemically unreactive or 'dead' therefore, enabling it to be used in brick making or monolithic hearths without undue difficulty arising out of hydration or shrinkage.

Caustic Calcined Magnesite (CCM)

Low calcined magnesite also known as Caustic Calcined Magnesite is obtained by calcining magnesite in a shaft or rotary kiln at temperature ranging between 800 °C and 1000 °C the incomplete dissociation, causes retention of 8 to 10% carbon dioxide as carbonate. Low calcined magnesia when mixed with water forms a feebly plastic paste. Industries like paper, rubber, ceramic, asbestos products, glass, etc. use caustic magnesia.

Fused Magnesia

Fused magnesia is produced by the fusion of the high-grade magnesite in Higgin's or electric arc tilt furnaces between 2,500 °C and 3,000 °C. It is resistant to the action of molten metals, basic slags and fluxes and high temperatures. It is used in the form of moulded vessels and as compressed material for covering resistant elements of the furnaces used in the melting of lead, tin, etc.

As per the available information, presently there are seven major plants that manufacture Dead Burnt Magnesite, while there are four plants that produce calcined magnesite and one that produces fused magnesia (Table-7). By-product magnesium carbonate and other magnesium salts were also produced during salt manufacturing from sea water. Dalmia Magnesite Corporation and Tamil Nadu Magnesite Ltd are one of the major producers, producing DBM and caustic calcined grades.

As per Annual Report of National Mineral Development Corporation (NMDC) 2016-17, J & K Mineral Development Corporation Ltd, a subsidiary of NMDC has decided to set up a 30,000 TPA DBM plant at Panthal, Jammu.

Table - 7: Manufacturing Plants of Dead Burnt Magnesite (DBM), Calcined Magnesite, etc.

Name of the plant	Location	Installed capacity (tpy)
Tamil Nadu Magnesite Ltd (TANMAG)	Salem, Tamil Nadu	30,000 (DBM) 19,500 (calcined magnesite)
Ramakrishna Magnesite Mines (Two Units)	-do-	21,600 (calcined magnesite)
SAIL Refractory Co. Ltd (Formerly, Burn Standard Co.Ltd)	-do-	54,000 (DBM) 18,000 (Calcined magnesite)
Dalmia Magnesite Corporation	-do-	72,000 (DBM)
Sri Ponkumar Magnesite Ltd	-do-	26,500 (DBM)
Almora Magnesite Ltd	Bageshwar, Uttarakhand	24,000 (DBM)
Minerals & Refractories	Haldwani, Uttarakhand	3,000 (DBM)
Hansaflon Plastochem Ltd	NA	1,500 (Fused magnesia)

The project is pending with Ministry of Environment, Forest and Climate Change for Environment Clearance.

Sea Water Magnesia (SWM)

Sea water or lake bitterns is an alternative source to obtain magnesia by chemical reaction. The main raw materials required other than sea water are dolomite or limestone, fresh water and sulphuric acid. The magnesia content of sea water is about 0.2%, and even by enrichment with dolomite, around 300 kilograms sea water needs to be processed to obtain one kilogram of magnesia. The sea water magnesia can be used to manufacture Dead Burnt Magnesite, caustic magnesia and other magnesium compounds.

Marine By-products

Carbonates, chlorides and sulphates of magnesium are obtained as by-products in the production of common salt by solar evaporation. Salt Commissioner, Jaipur, reported 15,274 tonnes production of magnesium chloride and 58 tonnes of by-product magnesium sulphate in 2016-17. The production is normally reported from the salt pans in Jamnagar-Gandhidham, Gujarat.

Magnesium Metal

Magnesium metal is a fairly strong, silvery-white, light-weight metal (about one third lighter than aluminium). It is traditionally produced in ingot form of approximately 7 kg each with purity close to 99.9%. Its chief applications are, in die casting (alloyed with zinc), to remove sulphur in the production of iron and steel, for production of titanium in the Kroll process. The other application field of magnesium is in electronic devices. Defence equipment and nuclear reactor materials also consume magnesium.

Magnesium technology and its commercial production in India are still at its infancy. India has developed silico-thermic reduction process as well as fused salt electrolytic process, with capacity of 600 t/year for each process. However, the cost of production is very high as compared to the landed cost of imported magnesium metal. Hence, its production has been stopped by one of the companies. The production is only about 15-20% of the rated capacity.

TRADE POLICY

As per the Foreign Trade Policy (FTP) 2015-20, exports and imports of all grades and varieties of magnesite under Heading No. 2519 are allowed freely.

WORLD REVIEW

The world reserves of magnesite were 8,500 million tonnes in terms of magnesium oxide content, excluding large resources of magnesium-bearing substitutes, such as, dolomite, brucite and olivine. Further, magnesium compounds could be recovered economically from well & lake brines and from sea water. The latter, which contains 0.13% magnesium by weight, was a major source of magnesium metal and its compounds. The world reserves of magnesite are provided in Table-8.

Table – 8: World Reserves of Magnesite (By Principal Countries)

(In '000 tonnes of magnesium oxide content)

Country	Reserves
World : Total (rounded off)	**8500000**
Australia[(a)]	320000
Austria	50000
Brazil	390000
China	1000000
Greece	280000
India*	82000
Korea, Dem. P.R.	230000
Russia	2300000
Slovakia	120000
Spain	35000
Turkey	230000
USA	35000
Other countries	1400000

***Source**: Mineral Commodity Summaries, 2019*

**As Per NMI database, based on UNFC System, as on 1.4.2015, the total resources of magnesite in India are estimated at 394 million tonnes*

a: JORC-compliant reserves were about 38 million tonnes

The world production of magnesite was at 27 million tonnes in 2017. China continued to be the leading producer accounting for about 66% production, followed by Russia (10%) and Turkey & Brazil (6% each). The world production of magnesite is furnished in Table-9. China, Turkey and Russia had the largest magnesite production capacity and accounted for about 82% of the total world production. The largest capacity of magnesite processing facilities in the world are in China and Russia. These countries accounted for about two-third of world magnesia from magnesite production capacity.

World capacity of primary magnesium production is about 3.52 thousand tonnes of which about 72% is through electrolytic route and balance through silico-thermic route.

Table–9: World Production of Magnesite (By Principal Countries)

(In '000 tonnes)

Country	2015	2016	2017
World Total (rounded off)	**31700**	**31000**	**28700**
Australia	681	489	235
Austria	703	646	730
Brazil[C]	1621[c]	1600[ce]	1600[ce]
China[e]	19000	18600	18000
Greece	383	419	499
India	328	299	195
Iran	152	156	160
Korea, Dem. P.R.[e]	700	700	300
Netherlands[a]	258	266	283
Russia[e]	2600	2600	2600
Saudi Arabia	294	286	302
Slovakia	501	431	678
Spain	465	584	789
Turkey	3335	3258	1694
Other countries	658	636	631

Source: *World Mineral Production, 2013-17, BGS*
e: Estimated a: Chloride produced from solution mining.
c: Including beneficiated and directly shipped material

World production capacity for Caustic Calcined Magnesia was about 3.32 million tonnes/year and that of Dead Burnt Magnesite it is about 8.62 million t/yr. Worldwide, over 98% raw ore producers convert it to magnesia for commercial application, mainly in Refractory Industry (75%) based on both the sintered and fused forms generally called DBM and Electrofused Magnesia (EFM), respectively, for lining furnaces used in steel production, non-ferrous metals, cement, glass, ceramic and petrochemicals. Primary producers of magnesium metal and alloys were China, USA and Russia. The consuming market segments are aluminium alloying, die-casting and desulphurisation.

To give a generalised view of the development in various countries the country-wise description sourced from the latest available publication of Minerals Yearbook 'USGS' 2015 is furnished below.

Brazil

Magnesita Refratários SA dominates Dead Burnt Magnesite production from its Brumado operation, with production capacities of 3,20,000 t/yr. It also showed production of 60,000 t/yr Caustic Calcined Magnesia and 34,000 t/yr of fused magnesia. In Ceará state, Magnesium do Brasil Ltd, mines magnesite at Jucás and Iguatu, and produces around 40,000 t/yr Caustic Calcined Magnesia at Iguatu.

Xilolite SA, a small company, has talc and magnesite deposit in Brumado. The Company has recently invested in installation of a new Multiple Hearth Furnace (MHF) for 92+% MgO Caustic Calcined Magnesia production. In addition to the above, Buschle & Lepper SA produces high purity Caustic Calcined Magnesia from sea water at Joinville.

Russia.

Magnezit Group was developing a magnesite mine at the Talsky deposit in eastern Siberia. Magnezit Group, Moscow, has capacity of 80,000 t/yr high temperature shaft kiln to process briquetted calcined magnesia at its plant in Satka, Chelyabinsk and construction of furnace of 1,00,000 t/yr to produce Dead Burned Magnesite is under progress. Apart from this, setting up of 1,00,000 t/yr capacity to produce fused magnesia and 2,00,000 t/yr production capacity of Caustic Calcined Magnesia which are under implementation is likely to be completed by 2019.

Spain

Magnesitas Navarras S.A, Navarra was producing magnesite from its mine at Borobia and Zibeti deposits. The total reserves of these deposits are of the order of 57 million tonnes.

Turkey

Kumas Manyezit Sanyi A.S., Kutahya has the capacities to produce 2,75,000 t/yr of Dead Burnt Magnesite; 55,000 t/yr of Caustic Calcined Magnesia and 37,500 t/yr of fused magnesia.

RHI purchased a magnesite mine and adjacent processing facilities in Erzurum from Cihan Group. RHI has plans to reopen the mine and modernise the plant as well. Expansion of its sintered magnesia capacity from 60,000 t/yr to 1,00,000 t/yr is under progress.

Norway

RHI, Norway has the production capacity of 85,000 t/yr of fused magnesia that it converts from magnesia obtained from sea water in its fusion plant in Porsgrunn. The plant has recently scaled down its production to 30,000 t/yr due to low prices of the product.

Greece

Terna Mag S.A. did make progress with its construction plans of a multiple hearth furnace to produce Dead Burnt Magnesite at its Mantoudi plant. This will be commissioned in the near future and would increase DBM capacity to 90,000 t/yr. The Group in addition, also has a production capacity of 30,000 t/yr of Caustic Calcined Magnesia.

Nepal

The Nepal Government began activity seeking foreign investors to re-open magnesia production at Nepal Orind Magnesite's plant in Dolakha district, with a capacity of 65,000 t/yr.

China

The magnesite deposits are found in Dashiqiao, Haicheng, Xiuyan and Fengcheng in Liaoning Province. The country produced about 4.26 million tonnes of Caustic Calcined Magnesite, 3.81 million tonnes of Dead Burnt Magnesia and 1.59 million tonnes of fused magnesia during 2015.

FOREIGN TRADE

Exports

The exports of magnesite increased marginally to 9,553 tonnes in 2017-18 from 8,065 tonnes in the previous year. Exports were mainly to Iran (28%), Malaysia (20%), Singapore (8%), UAE (7%), Bangladesh & Thailand (6% each) and Etiopia (3%). Out of the total exports in 2017-18, those of fused magnesia was 370 tonnes, non-calcined magnesite 150 tonnes, other magnesite 6,910 tonnes, magnesium oxide 1,875 tonnes and Dead Burnt Magnesite 63 tonnes. Exports of magnesium and scrap were 162 tonnes in 2017-18 as compared to 115 tonnes in the previous year. Exports were mainly to Brazil (39%), Ḃhutan (20%) and UAE (12%) (Tables - 10 to 17).

Imports

Imports of magnesite drastically increased to 2,29,630 tonnes in 2017-18 from 1,42,599 tonnes in the previous year. Imports were mainly from China (33%), Pakistan (19%), Turkey (16%) and Ireland (13%). Out of the total imports in 2017-18, those of fused magnesia were 16,320 tonnes, calcined magnesite 35,060 tonnes, non-calcined 63,048 tonnes, Dead Burnt Magnesia 65,155 tonnes, other magnesite 27,784 tonnes and magnesium oxide 22,263 tonnes. Imports of magnesium and scrap remained static to 25,001 tonnes in 2017-18 from 25,029 tonnes in the previous year. Imports were mainly from China (99%) (Tables-18 to 25).

Table – 10: Exports of Magnesite : Total (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**8065**	**135150**	**9553**	**188589**
Singapore	329	12008	750	34962
Iran	811	5515	2633	19105
Thailand	751	11666	557	14962
Bangladesh	613	16175	562	14857
Malaysia	1801	12712	1958	13948
UAE	1215	18683	662	9870
Ethiopia	262	7161	324	8607
China	95	3901	128	8029
Sudan	286	5192	267	6874
UK	6	1022	35	6286
Other countries	1896	41115	1677	51089

Table – 11: Exports of Magnesia (Fused) (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (``'000)	Qty (t)	Value (``'000)
All Countries	**620**	**23858**	**370**	**16736**
Thailand	150	6903	112	4839
Pakistan	52	2576	82	4035
Singapore	92	4234	83	3528
China	73	3212	45	1914
Chinese Taipei/ Taiwan	52	2174	19	786
Hong Kong	-	-	13	559
UAE	2	53	4	498
Korea, Rep. of	-	-	6	259
Mexico	5	251	4	203
Nepal	-	-	++	73
Other countries	194	4455	2	42

Table–12: Exports of Magnesite (Calcined) (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (``'000)	Qty (t)	Value (``'000)
All Countries	**-**	**-**	**185**	**5823**
Spain	-	-	64	2241
Singapore	-	-	60	1944
Japan	-	-	40	1152
Nepal	-	-	21	486

Table–13: Exports of Magnesite (Non-calcined) (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (``'000)	Qty (t)	Value (``'000)
All Countries	**597**	**13781**	**150**	**4273**
Nepal	122	3049	11	1909
Oman	50	628	75	987
Azerbaijan	-	-	44	555
Vietnam	-	-	10	463
Egypt	101	3328	3	174
Iran	-	-	2	126
UAE	++	4	1	52
Qatar	++	1	4	7
Sudan	268	4634	-	-
Cameroon	50	1661	-	-
Other countries	6	476	-	-

Table – 14: Exports of Magnesite: Dead Burnt Magnesite (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (``'000)	Qty (t)	Value (``'000)
All Countries	**70**	**2152**	**63**	**1129**
Oman	21	454	27	642
UAE	47	1649	3	306
Chile	-	-	10	65
Australia	-	-	22	62
Indonesia	1	33	1	54
Kenya	1	16	-	-

Table – 15: Exports of Magnesium Oxide (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (``'000)	Qty (t)	Value (``'000)
All Countries	**1150**	**34910**	**1875**	**78644**
Singapore	237	7774	607	29490
Thailand	25	1139	229	8806
Italy	106	3934	125	4921
Bangladesh	49	1987	66	4265
China	12	577	48	3856
Ethiopia	-	-	121	3218
Baharain	++	16	98	2833
Sudan	-	-	78	2272
USA	2	387	58	2237
Pakistan	82	4124	44	2162
Other countries	637	14972	401	14584

Table – 16: Exports of Magnesium & Scrap (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (``'000)	Qty (t)	Value (``'000)
All Countries	**115**	**14078**	**162**	**28375**
Brazil	26	2476	63	8022
Bhutan	-	-	32	5655
UAE	++	138	20	3719
Kuwait	1	136	1	2049
Nepal	1	106	10	1729
Nigeria	-	-	9	1669
USA	++	811	++	1120
Malaysia	1	196	1	971
Indonesia	4	1534	2	695
France	++	30	++	423
Other countries	82	8651	24	2323

Table – 17 : Exports of Magnesite (Other)
(By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**5628**	**60449**	**6910**	**81984**
Iran	811	5515	2630	18912
Malaysia	1801	12712	1958	13948
Bangladesh	365	9268	496	10592
UAE	934	14042	640	8424
Ethiopia	262	7161	203	5389
UK	-	-	26	4797
Sudan	18	558	189	4602
Saudi Arabia	-	-	165	3689
Oman	65	1423	118	2602
Indonesia	1	33	72	2274
Other countries	1371	9737	413	6755

Table – 18: Imports of Magnesite : Total
(By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All countries	**142599**	**3089947**	**229630**	**5268653**
China	32831	856531	75539	2213095
Ireland	10788	411173	30928	1064578
Turkey	15158	384892	35825	811887
Japan	5194	304495	3580	250179
Netherlands	2357	88804	5636	213500
Pakistan	25656	102949	42992	174478
Saudi Arabia	2995	42145	8858	120796
Israel	501	61183	582	73249
USA	697	52179	930	66407
Greece	985	37413	1487	55345
Other countries	45437	748183	23273	225139

Table – 19 : Imports of Magnesia (Fused)
(By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**7961**	**335634**	**16320**	**1049128**
China	7688	326290	15946	1024471
Mexico	12	916	164	12474
Turkey	96	4727	96	4818
Netherlands	-	-	57	2369
USA	-	-	25	2344
Germany	12	929	27	2213
UK	-	-	4	278
Belgium	1	189	1	161
Austria	++	81	-	-
Korea, Rep. of	++	3	-	-
Australia	152	2499	-	-

Table – 20: Imports of Magnesite (Non-calcined)
(By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**53833**	**158425**	**63048**	**219644**
Pakistan	25656	102949	42847	172543
UAE	27892	50098	19410	35989
China	-	-	499	6421
Greece	30	522	73	2412
Japan	1	147	8	1118
Iran	-	-	206	969
South Africa	-	-	5	190
Germany	20	1303	++	2
Korea, Dem. P.R.	234	3406	-	-

Table–21: Imports of Magnesite (Calcined)
(By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**11062**	**259910**	**35060**	**930628**
Ireland	4131	139069	21153	724814
Saudi Arabia	2949	41025	7016	93040
China	762	14095	3716	51052
Turkey	1718	34513	2511	35777
Netherlands	81	4138	313	14677
Spain	446	12215	248	6783
Greece	21	529	80	2339
Japan	15	1561	19	1836
Belgium	269	4048	4	310
Korea, Dem. P.R.	670	8717	-	-

Table–22: Imports of Magnesite: Dead Burnt Magnesia
(By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**40332**	**1218748**	**65155**	**1458690**
Turkey	11074	281338	29675	669795
China	10542	207283	30521	617085
Netherlands	1900	70421	3538	134015
Brazil	100	3072	500	13436
Greece	150	4401	281	8458
Slovenia	-	-	208	5436
Slovak Rep.	284	6662	208	5401
Saudi Arabia	-	-	100	3109
Hong Kong	-	-	100	1540
Pakistan	-	-	24	415
Other countries	16282	645571	-	-

Table–23: Imports of Magnesite (Other) (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**13862**	**533572**	**27784**	**805152**
Ireland	4696	192720	9775	339764
China	2464	100495	9333	153154
Turkey	1975	54676	3275	93258
Japan	3475	138143	2011	85229
Netherlands	375	14063	1725	61641
Greece	548	17634	754	25397
Austria	-	-	480	15723
Russia	-	-	118	12781
UK	7	1554	99	7301
Korea, Rep. of	++	15	45	3215
Other countries	322	14272	169	7689

Table – 24 : Imports of Magnesium Oxide (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**15549**	**583658**	**22263**	**805411**
China	11375	208368	15524	360912
Japan	1303	151011	1542	161996
Israel	501	61183	582	73249
USA	673	49301	905	64016
Mexico	351	27083	486	35217
UK	323	37931	297	25697
Saudi Arabia	23	500	1719	24061
Greece	236	14327	299	16739
Germany	47	9893	41	11753
France	7	2543	29	11122
Other countries	710	21518	839	20649

Table – 25 : Imports of Magnesium & Scrap (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**25029**	**3938055**	**25001**	**3828671**
China	24711	3845753	24786	3751598
Switzerland	30	20581	30	20224
Austria	4	9940	19	16197
UK	4	15364	6	14261
Bahrain	-	-	47	6303
Hong Kong	35	8407	44	6265
USA	0	688	31	4190
Thailand	27	4761	24	3872
Korea, Rep. of	3	648	4	2785
Romania	1	798	++	987
Other countries	214	31115	10	1989

FUTURE OUTLOOK

The Refractory Industry that consumes magnesite to a large extent is experiencing a range of challenges. However, in India, the demand for refractories is not only promising but also encouraging as it rides on the prospects of the Cement and Steel Industries the growth of which is projected to show an upward trend in the near future. The demand for magnesite is therefore likely to grow correspondingly.

As Indian magnesite generally is of either containing high silica or high lime, the need for beneficiation concomitantly arises.

Beneficiation methods of magnesite at economic cost which could yield high-grade material is probably a viable way to meet the demand for magnesite in the future.

India's Refractory Industry is set to continue its expansion and is likely to benefit from the government's series of measures pitched specifically to stimulate the infrastructure development in the country. As the demand for magnesite too is concomitantly expected to rise, significant steps to explore and exploit magnesite become essential to meet the future demand.