

MAGNESITE



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MAGNESITE

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**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.

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 are given in the review on EXPLORATION & DEVELOPMENT in "GENERAL REVIEW".

PRODUCTION, STOCKS & PRICES

Production of magnesite in 2016-17 at 299 thousand tonnes decreased by 9% as compared to that in the previous year. There were 19 reporting mines in 2016-17 against 20 reporting mines in 2015-16. Five principal producers accounted for about 71% of the total output during the year 2016-17. About 54% of the total production of magnesite was contributed by public sector during 2016-17 as against 64% in the preceding year.

Tamil Nadu continued to be the major producing state with maximum contribution of 75% to the total output during 2016-17 followed by Uttarakhand (23%) and the remaining 2% was contributed by Karnataka.

Mine-head closing stock of magnesite for the year 2016-17 was 83 thousand tonnes as against 66 thousand tonnes in the previous year.

The average daily employment of labour in magnesite mines during the year was 1229 as against 1258 in the previous year.

The prices of magnesite are furnished in the General Review on 'Prices'. (Tables- 2 to 6)

**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 STD121 STD122	Total (A)	Feasibility STD211	Pre-feasibility STD221 STD222	Measured STD331	Indicated STD332	Inferred STD333		Reconnaissance STD334	Total (B)
All India : Total	77867	165 4244	82276	6210	9345 45574	59010	59652	131707	213	311711	393988
By Grades											
High Grade	-	-	-	3217	-	2	-	26	-	-	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	-	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	-	7310	1023	602 31534	58902	58756	73287	-	224103	231413

Figures rounded off.

MAGNESITE

Table-2: Principal Producers of Magnesite, 2016-17

Name & address of producer	Location of mine	
	State	District
Tamil Nadu Magnesite Ltd., 5/53, Omalur Main Road, Jagirammalayam, Distt. Salem-636 302, Tamil Nadu.	Tamil Nadu	Salem
Sail Refractory Company Ltd., Post Bag No. 565 Suramangalam Post, Distt. Salem – 636 005, Tamil Nadu.	Tamil Nadu	Salem
S. Sundararajan, 5/22-A, Periyakollapatti Kannankuruchi, Post – Gorimedu, Distt. Salem -636 008, Tamil Nadu.	Tamil Nadu	Salem
Almora Magnesite Ltd., Village Matela, P.O. Billori, Distt. Bageshwar-263630, Uttarakhand.	Uttarakhand	Bageshwar
N. B. Minerals Corporation, 6/575 Nawabi Road, Haldwani, Distt. Nainital – 263 139, Uttarakhand.	Uttarakhand	Pithoragarh

**Table – 3 : Production of Magnesite, 2016-17
(By States/Sector)**

(Qty in tonnes; Value in ₹'000)

State	2016-17(P)	
	Quantity	Value
India	299167	735655
Public Sector	162851	399216
Private Sector	136316	336439
Karnataka	8391	35562
Tamil Nadu	223424	612564
Uttarakhand	67352	87529

MAGNESITE

**Table – 4 : Production of Magnesite, 2013-14 to 2015-16
(By States)**

(Qty. in tonnes; Value in ₹'000)

State	2014-15		2015-16		2016-17 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	285009	748792	327663	827072	299167	735655
Karnataka	9129	40910	8161	39962	8391	35562
Tamil Nadu	225694	637938	264913	705318	223424	612564
Uttarakhand	50186	69944	54589	81792	67352	87529

**Table – 5 : Production of Magnesite, 2014-15 and 2015-16
(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	20	327663	827072	19	299167	735655
Public Sector	4	208979	479979	4	162851	399216
Private Sector	16	118684	347093	15	136316	336439
Karnataka	2	8161	39962	2	8391	35562
Mysore	2	8161	39962	2	8391	35562
Tamil Nadu	15	264913	705318	14	223424	612564
Karur	2	1754	1754	1	811	1217
Namakkal	1	7935	10316	1	2555	3322
Salem	10	254346	691530	10	219897	607622
Tiruppur	2	878	1718	2	161	403
Uttarakhand	3	54589	81792	3	67352	87529
Bageshwar	1	36980	61128	1	31632	51186
Pithoragarh	2	17609	20664	2	35720	36343

**Table-6 : Mine-head closing stocks of Magnesite,
2015-16 and 2016-17
(By States)**

(In tonnes)

State	2015-16	2016-17(P)
India	65950	83129
Jharkhand	-	1012
Karnataka	10543	11720
Tamil Nadu	54909	68090
Uttarakhand	498	2307

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 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 magnesite 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 is 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

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.), SiO₂ 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:

S. 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 ₂ O ₃ max.	0.50	0.50	0.50	0.50	0.50
iv)	Fe ₂ O 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:

S.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 ₂ O ₃), percent by mass, max.	0.3
iv)	Iron Oxide (Fe ₂ O 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

CONSUMPTION

The consumption of magnesite in 2016-17 decreased to 172 thousand tonnes from 265 thousand tonnes as recorded in the previous year. About 86% consumption was reported for calcination purposes followed by 9% for ferro-alloys purposes and 4% for refractories purposes. The Chemical Industry consumed magnesite predominantly for producing magnesium sulphate. Magnesite consumption pattern by industries is shown in Table - 7.

**Table - 7 : Consumption* of Magnesite
2014-15 to 2016-17
(By Industries)**

Industry	(In tonnes)		
	2014-15	2015-16 (R)	2016-17(P)
All Industries	275300	265000	171900
Calcination	171400	155100	148300
Chemicals	2300	3000	1500
Ferro-alloys	10700	14500	15400
Refractories	67500	69000	6700
Others (foundry, iron & steel, paper, etc.)	23400	23400	-

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

Whereas the apparent consumption for magnesite was 352,403 tonnes in the year 2016-17.

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 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 produce calcined magnesite and one that produce fused magnesia (Table-8). By-product magnesium carbonate and other magnesium salts were also produced during salt manufacture from sea water. Dalmia Magnesite Corporation and Tamil Nadu Magnesite Ltd are one of the major producers, producing DBM and caustic calcined grades.

Table - 8 : 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)

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

Sea Water Magnesia (SWM)

Sea water or lake bitters 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 need 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 15,768 tonnes production of magnesium chloride and 78 tonnes of by-product magnesium sulphate in 2015-16. 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 is still in 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 company. 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 7,800 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 is provided in Table-9.

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

(In '000 tonnes of magnesium oxide content)

Country	Reserves
World : Total (rounded)	780000
Australia	320000
Austria	50000
Brazil	390000
China	1000000
Greece	280000
India*	90000
Korea, Dem. P.R.	1500000
Russia	2300000
Slovakia	120000
Spain	35000
Turkey	230000
USA	35000
Other countries	1400000

Source: Mineral Commodity Summaries, 2018.

**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.*

The world production of magnesite was at 44.92 million tonnes in 2015. China continued to be the leading producer, accounting for about 73% production, followed by Turkey (7%), Russia (6%) and Brazil (3%). The world production of magnesite is furnished in Table-10. China, Turkey and Russia had the largest magnesite production capacity and accounted for about 84% 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-10 : World Production of Magnesite
(By Principal Countries)**

(In '000 tonnes)			
Country	2013	2014	2015
World : Total	40805	47154	44925
Australia	522	612	681
Austria	714	754	703
Brazil	1084	1152	1150 ^e
China ^e	30000	36000	33000
Greece	315	391	383
India*	197	285	265
Iran ^e	109	202	140
Korea, Dem. P. R. ^e	250	250	250
Netherlands**	250	286	258
Russia ^e	2600	2600	2600
Saudi Arabia	235	286	294
Slovakia	584	557	501
Spain	836	837	800 ^e
Turkey	2597	2377	3325
Other countries	511	565	565

Source: World Mineral Production, 2011-2015.

* India's production of magnesite in 2013-14, 2014-15 and 2015-16 was 197 thousand tonnes, 285 thousand tonnes and 265 thousand tonnes, respectively.

** Chloride produced from solution mining.

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 tonnes/year. 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.

Brazil

Magnesita Refratários SA dominates Dead Burnt Magnesite production from its Brumado operation, with production capacities of 3,20,000 tonnes/year. It also showed production of 60,000 tonnes/year Caustic Calcined Magnesia and 34,000 tonnes/year of fused magnesia. In Ceará state, Magnesium do

Brasil Ltd, mines magnesite at Jucás and Iguatu, and produces around 40,000 tonnes/year 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 tonnes/year high temperature shaft kiln to process briquetted calcined magnesia at its plant in Satka, Chelyabinsk and construction of furnace of 1,00,000 tonnes/year to produce Dead Burned Magnesite is under progress. Apart from this, setting up of 1,00,000 tonnes/year capacity to produce fused magnesia and 2,00,000 tonnes/year 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 tonnes/year of Dead Burnt Magnesite; 55,000 tonnes/year of Caustic Calcined Magnesia and 37,500 tonnes/year 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 tonnes/year to 1,00,000 tonnes/year is under progress.

MAGNESITE

Norway

RHI, Norway, has the production capacity of 85,000 tonnes/year 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 tonnes/year 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 tonnes/year. The Group in addition, also has a production capacity of 30,000 tonnes/year of Caustic Calcined Magnesia.

Nepal

The Nepalese 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 tonnes per year.

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 were 8,063 tonnes in 2016-17. Exports were mainly to Malaysia (22%), UAE (15%), Thailand (9%), Bangladesh (6%) and Singapore (4%).

The exports of magnesite decreased marginally to 6,204 tonnes in 2015-16 from 6,612 tonnes in the previous year. Exports were mainly to Malaysia (24%), UAE (20%), Nepal (11%), Bangladesh (8%) and Thailand (6%). Out of the total exports in 2015-16, those of fused magnesia were 708 tonnes, non-calcined magnesite 789 tonnes, other magnesite 3,402 tonnes, magnesium oxide 1,268 tonnes and

Dead Burnt Magnesite 37 tonnes. Exports of magnesium and scrap were 169 tonnes in 2015-16 as compared to 66 tonnes in the previous year. Exports were mainly to Luxembourg (28%), Uganda (24%), Zimbabwe (13%) and Saudi Arabia & UAE (11% each) (Tables - 11 to 19).

Imports

Imports of magnesite were 1,42,599 tonnes in 2016-17. Imports were mainly from China (23%), followed by Pakistan (18%), Turkey (11%) and Israel (10%).

Imports of magnesite increased to 1,18,788 tonnes in 2015-16 from 1,02,077 tonnes in the previous year. Imports were mainly from Pakistan (28%) followed by China (23%), Australia (19%), Turkey (13%), Ireland (8%) and Japan (3%). Out of the total imports in 2015-16, those of fused magnesia were 10,348 tonnes, calcined magnesite 4,019 tonnes, non-calcined 33,166 tonnes, Dead Burnt Magnesia 46,306 tonnes, other magnesite 9,925 tonnes and magnesium oxide 15,024 tonnes. Imports of magnesium and scrap increased to 20,187 tonnes in 2015-16 from 19,271 tonnes in the previous year. Imports were mainly from China (97%) (Tables-20 to 28).

Table – 11 : Exports of Magnesite : Total (By Countries)

Country	2016-17(P)	
	Qty (t)	Value (₹'000)
All Countries	8063	135153
UAE	1213	18626
Thailand	726	10527
Malaysia	1801	12712
Singapore	328	12008
Nepal	192	4810
Netherlands	200	4201
Bangladesh	608	15704
Pakistan	134	6700
Saudi Arabia	++	41
ChineseTaipei/ Taiwan	-	-
Other countries	2861	49824

MAGNESITE

**Table – 12 : Exports of Magnesite : Total
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	6612	120898	6204	124464
UAE	1438	27087	1246	25496
Thailand	520	11422	391	7490
Malaysia	1592	10964	1515	11351
Singapore	277	10163	285	11101
Nepal	54	1765	673	11098
Netherlands	550	9920	200	4516
Bangladesh	543	7811	523	14291
Pakistan	140	6356	122	5675
Saudi Arabia	303	5969	260	5168
Chinese Taipei/ Taiwan	68	2505	87	3655
Other countries	1127	26936	902	24623

**Table – 13 : Exports of Magnesia (Fused)
(By Countries)**

Country	2015-16		2016-17 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	565	22180	708	28794
Singapore	190	7410	145	6515
Thailand	187	7205	128	5880
Pakistan	80	3339	120	5569
Chinese Taipei/ Taiwan	56	2108	75	3208
Brazil	26	1088	35	1734
Argentina	20	833	20	851
Indonesia	-	-	1	44
China	-	-	33	1583
Bangladesh	-	-	151	3376
Germany	-	-	++	18
Other countries	6	197	++	16

**Table-14 : Exports of Magnesite (Non-Calcined)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	123	5340	789	14603
Japan	40	1295	40	1359
Nepal	2	25	624	9764
Myanmar	++	2	1	2
Sudan	-	-	75	2569
Indonesia	-	-	22	400
Oman	-	-	25	353
Egypt	-	-	1	87
Sri Lanka	-	-	1	64
Kuwait	-	-	++	3
Qatar	-	-	++	1
Other countries	81	4018	++	1

**Table-15 : Exports of Magnesite (Calcined)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	1	48	-	-
UAE	1	36	-	-
Spain	++	12	-	-

**Table – 16 : Exports of Magnesite:
Dead Burnt Magnesite
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	114	2923	37	1322
Sudan	60	1393	-	-
UAE	32	1271	36	1259
Chile	20	183	-	-
Malaysia	2	72	-	-
Norway	++	3	-	-
China	++	1	-	-
Indonesia	-	-	1	63

MAGNESITE

**Table – 17 : Exports of Magnesium Oxide
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	1251	32690	1268	38214
Netherlands	550	9920	200	4516
UAE	157	4780	250	7581
Saudi Arabia	2	279	250	5049
Singapore	87	2753	140	4586
Sri Lanka	58	1923	51	1843
Turkey	36	1409	33	1449
Kuwait	52	1400	52	1389
Nepal	44	1340	49	1315
Bangladesh	29	1134	67	3153
Indonesia	44	811	66	1210
Other countries	192	6941	110	6123

**Table – 18 : Exports of Magnesite (Other)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	4558	57717	3402	41531
UAE	1233	20643	960	16646
Malaysia	1590	10891	1515	11351
Bangladesh	488	5328	305	7762
Thailand	333	4217	263	1610
Indonesia	-	-	200	1090
Nigeria	20	2121	20	339
Russia	-	-	48	462
Ethiopia	154	1171	24	764
Kenya	24	473	24	630
USA	-	-	++	209
Other countries	716	12873	43	668

**Table – 19 : Exports of Magnesium & Scrap
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	66	30471	169	36842
Luxembourg	48	17219	48	15259
UAE	++	1085	18	2100
Indonesia	++	1001	3	940
Zimbabwe	-	-	22	7163
Saudi Arabia	2	1960	18	3777
USA	2	2601	1	1336
Iran	-	-	7	1289
Malaysia	3	1690	4	970
Mexico	++	14	2	739
Uganda	-	-	40	605
Other countries	11	4901	6	2664

**Table – 20: Imports of Magnesite : Total
(By Countries)**

Country	2016-17 (P)	
	Qty (t)	Value (₹'000)
All Countries	142599	3089942
China	32831	648163
Australia	13846	548890
Ireland	10788	411173
Turkey	15158	384892
Japan	5194	304495
Israel	501	61183
Netherlands	2356	88622
Pakistan	25666	102949
USA	697	52180
Greece	934	36362
Other countries	34628	451034

MAGNESITE

**Table – 21: Imports of Magnesite : Total
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	102077	3327761	118788	3256837
China	32350	855762	26860	863058
Australia	22258	827779	22835	881683
Ireland	16003	744862	9539	397918
Turkey	11692	316873	16022	432762
Japan	3399	197961	3545	208059
Israel	413	57748	400	46924
Netherlands	1188	52838	1562	61935
Pakistan	9217	46865	32857	143122
USA	523	41176	767	59294
Greece	980	36866	1122	40200
Other countries	4054	149031	3279	121882

**Table – 22 : Imports of Magnesia (Fused)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	5993	245797	10348	430234
China	5590	235940	9993	421149
South Africa	277	6750	-	-
Australia	100	1571	258	4346
Turkey	24	1093	97	4739
USA	2	443	-	-

**Table – 23 : Imports of Magnesite (Non-calcined)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	9286	48413	33166	146403
Pakistan	9215	46834	32758	141339
Korea, Rep. of	-	-	++	25
China	-	-	25	474
Philippines	-	-	69	442
Italy	-	-	20	438
South Africa	2	46	6	97
Korea, Dem. Rep. of	-	-	288	3588
Greece	30	814	-	-
Spain	39	719	-	-

**Table-24: Imports of Magnesite (Calcined)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	12347	458054	4019	146576
Ireland	6980	328268	3018	126800
Turkey	2250	60683	27	403
China	1463	32991	294	6401
Saudi Arabia	935	18265	625	10920
Australia	211	7883	-	-
Korea, Dem. Rep.of	288	4607	-	-
Iran	100	1469	-	-
Japan	13	1407	-	-
Netherlands	25	1119	33	1679
Pakistan	-	-	22	373
Other countries	82	1362	-	-

**Table-25: Imports of Magnesite: Dead Burnt
Magnesia
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	42316	1423690	46306	1589858
Australia	21667	807436	22469	872286
Ireland	4982	227033	4979	206483
China	8688	201224	4951	130827
Turkey	5875	149008	12599	333027
Netherlands	305	17603	774	32113
Greece	260	8039	312	9147
Brazil	-	-	75	1765
USA	-	-	20	1737
Pakistan	2	33	77	1410
Slovakia	204	5463	50	1063
Other countries	333	7851	-	-

MAGNESITE

**Table-26: Imports of Magnesite (Other)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	13448	535630	9925	368076
Ireland	4041	189561	1542	64634
Japan	2426	99949	2344	94960
Turkey	2921	84935	2724	79719
China	2215	77785	1473	60666
Netherlands	858	34092	755	28025
Greece	546	19258	652	21501
UK	85	9120	16	3054
USA	61	4076	42	3461
Sweden	21	1126	92	4888
Spain	-	-	46	1841
Other countries	274	15728	239	5327

**Table - 28 : Imports of Magnesium & Scrap
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	19271	3167018	20187	3054942
China	18600	3015103	19660	2879319
Hong Kong	230	53016	168	51480
Switzerland	30	19934	31	21153
USA	72	19299	6	14363
Austria	4	8978	28	24026
UK	17	8382	12	25232
Nigeria	57	7098	36	4606
Australia	-	-	203	25052
Chinese Tapei/ Taiwan	-	-	1	1530
South Africa	-	-	37	4591
Other countries	261	35208	5	3590

**Table - 27 : Imports of Magnesium Oxide
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	18687	616177	15024	575690
China	14394	307821	10124	243541
Japan	960	96605	1201	113099
USA	460	36657	705	54096
Israel	413	57748	400	46924
UK	246	25194	238	33247
Saudi Arabia	796	22125	836	18261
Mexico	91	7952	176	15650
Turkey	622	21154	575	14874
Germany	35	9569	66	12755
Greece	144	8755	158	9552
Other countries	526	22597	545	13691

FUTURE OUTLOOK

The Refractory Industry that consume 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 that which could yield high-grade material is probably a viable way forward 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, to meet the future demand significant steps to explore and exploit magnesite become essential. The apparent domestic demand of magnesite was estimated to touch 6,22,000 tonnes by 2016-17 at 9% growth rate as per the report of the Sub Group, Planning Commission of India, this demand in all probability is likely to rise further in the years beyond 2017.

