

WOLLASTONITE



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**WOLLASTONITE**

**(FINAL RELEASE)**

**GOVERNMENT OF INDIA  
MINISTRY OF MINES  
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**W**ollastonite, a metasilicate of calcium ( $\text{CaSiO}_3$ ), contains theoretically 48.3% CaO and 51.7%  $\text{SiO}_2$  with hardness of 4.5 on Moh's scale. It occurs as aggregates of bladed or needle-like crystals. Ceramic industry uses substantially, domestic production of wollastonite, as a filler. Some other uses of wollastonite are as a filler in ceramic floor and wall tiles, marine wallboard, paint, plastic and in refractory liners in steel mills, and as a partial replacement for short-fibre asbestos in certain applications, such as brake-lining. Technical improvements in filler properties in plastic and rubber have been made in recent years. A better compatibility between the polymer and the filler is achieved by chemical surface treatment of the mineral filler. Wollastonite, when treated in such a manner, results in improved flexural modules in polypropylene and improved reinforcement in nylon.

## RESOURCES

Major deposits of wollastonite have been found in Dungarpur, Pali, Sirohi and Udaipur districts in Rajasthan. Besides, in Ghoda area, Banaskantha district in Gujarat and in Dharmapuri and Tirunelveli districts in Tamil Nadu, a few deposits also occur. As on 1.4.2010, the resources of wollastonite, as per UNFC system are placed at 16.57 million tonnes. Out of total resources, about 88% (14.58 million tonnes) including 2.49 million tonnes reserves are located in Rajasthan and the remaining about 12% resources (1.99 million tonnes) in Gujarat. Meagre resources are located in Tamil Nadu (3,533 tonnes) (Table-1).

**Table – 1 : Reserves/Resources of Wollastonite as on 1.4.2010  
(By Grades/States)**

(In tonnes)

Grade/State	Reserves			Remaining Resources						Total resources (A+B)
	Proved STD111	Probable STD122	Total (A)	Feasibility STD211	Pre-feasibility STD222	Measured STD 331	Indicated STD332	Inferred STD333	Total (B)	
<b>All India (Total)</b>	<b>2289869</b>	<b>197253</b>	<b>2487122</b>	<b>3750545</b>	<b>3724191</b>	<b>76088</b>	<b>3325042</b>	<b>3206885</b>	<b>14082751</b>	<b>16569873</b>
<b>By Grades</b>										
Marketable	2289869	197253	2487122	837864	3724191	76088	–	1083475	5721618	8208740
Unclassified	–	–	–	2912681	–	–	3325042	2044800	8282523	8282523
Not-known	–	–	–	–	–	–	–	78610	78610	78610
<b>By States</b>										
Gujarat	–	–	–	–	–	–	–	1990000	1990000	1990000
Rajasthan	2289869	197253	2487122	3750545	3724191	76088	3325042	1213352	12089218	14576340
Tamil Nadu	–	–	–	–	–	–	–	3533	3533	3533

Figures rounded off.

## PRODUCTION, STOCKS & PRICES

Production of wollastonite at 184000 tonnes in 2011-12 registered an increase by one percent as compared to that in the preceding year. There were 4 reporting mines as compared to 3 mines in the previous year. The entire production was reported from private sector mines located in Rajasthan. One of the producers of wollastonite, namely, Wolkem Industries Ltd.

contributed 98% of the total production during the year (Tables- 2 to 4).

Mine-head stocks at the end of the year 2011-12 were 432 tonnes as against 294 tonnes in the beginning of the year (Table - 5).

The average daily employment of labour during 2011-12 was 580 as against 540 in the previous year. Prices of wollastonite are furnished in the General Review on 'Prices'.

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**Table – 2 : Principal Producer of Wollastonite  
2011-12**

Name & address of producer	Location of mine	
	State	District
E-101, Mewar Industrial Area Madri, Udaipur – 313 004, Rajasthan.	Rajasthan	Sirohi Udaipur

**Table – 5 : Mine-head Stocks of Wollastonite  
2011-12(P)  
(By State)**

State	(Qty in tonnes)	
	At the beginning of the year	At the end of the year
<b>India</b>	<b>294</b>	<b>432</b>
Rajasthan	294	432

**Table – 3 : Production of Wollastonite, 2009-10 to 2011-12  
(By State)**

State	(Qty in tonnes; value in ₹'000)					
	2009-10		2010-11		2011-12(P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>132385</b>	<b>111930</b>	<b>183381</b>	<b>145958</b>	<b>184445</b>	<b>159931</b>
Rajasthan	132385	111930	183381	145958	184445	159931

**Table – 4 : Production of Wollastonite, 2010-11 & 2011-12  
(By Sector/State/Districts)**

State/District	(Qty in tonnes; value in ₹'000)					
	2010-11			2011-12 (P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>India</b>	<b>3</b>	<b>183381</b>	<b>145958</b>	<b>4</b>	<b>184445</b>	<b>159931</b>
Private sector	3	183381	145958	4	184445	159931
<b>Rajasthan</b>	<b>3</b>	<b>183381</b>	<b>145958</b>	<b>4</b>	<b>184445</b>	<b>159931</b>
Ajmer	1	1325	382	2	3670	917
Sirohi	1	30105	31309	1	31368	33987
Udaipur	1	151951	114267	1	149407	125027

## MINING, PROCESSING & MARKETING

Wollastonite is being mined by opencast manual and semi-mechanised methods in Rajasthan. In some of the mines viz. Chaura Nimberi mine in Ajmer district, Rajasthan, manual selective and manual sorting being carried out at mine for improving recovery of ore. Working along the strike of mineralised zone with bench height 2 to 6 metre. The run-of-mine is selectively hand-sorted to the size 30 cm to 50 cm to remove the associated minerals, such as calcite, diopside, garnet, quartz and iron.

Wollastonite, thus separated, is then crushed to various sizes at two crushing plants near Sirohi railway station, having a total capacity of 80,000 tpy by Wolkem India Ltd. Principal commercial grades produced are: White Kemolit (S1 to S5) and off-white Kemolit (H1 to H5 and LG 25) which are milled products in the size range of 100 to 500 mesh. Besides, micronised products being marketed are Wolkron (1008, 1010, 1015, 1020, 1025 and 10825) in the low aspect ratio and Kemolit 1025 and 1020 in the high aspect ratio. In addition, speciality products and surface modified products are also marketed as Kemolit and Fillex, respectively. Wolkem Industries

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Ltd, a wollastonite mining and processing company, meets 20% of global requirements. Investigations carried out in the past on a sample sent by the party at Central Building Research Institute (CBRI) revealed that it could substitute chrysotile asbestos to a little extent in the manufacture of cement products. The Belkapahar deposit, Sirohi district, Rajasthan, produces wollastonite of the following grades:

Constituent	Grade-I	Grade-II	Grade-III
CaO	48.16%	47.62%	46.20%
SiO <sub>2</sub>	46.12%	47.42%	48.00%
Al <sub>2</sub> O <sub>3</sub>	0.23%	0.60%	0.76%
Fe <sub>2</sub> O <sub>3</sub>	0.49%	0.40%	0.44%
MgO	0.20%	0.40%	0.30%
L.O.I.	1.51%	2.37%	2.71%

### USES & SPECIFICATIONS

The use of wollastonite depends on the accicularity or the aspect ratio; i.e., ratio between length and width of a crystal. Wollastonite having aspect ratio in the range from 3:1 to 5:1 has little potential for reinforcing applications and hence, market is primarily confined to ceramic, metallurgical fluxes and simple filler and coating applications. Wollastonites acicular nature allows it to compete with other acicular materials, such as ceramic fibre, glass fibre, steel fibre, and several organic fibres, such as aramid and polyethylene etc. It reduces the volume of the expensive plastic or resin medium and contributes to physical and chemical properties of the finished products. It improves tear strength, dielectric properties and retains mechanical properties at elevated temperatures.

Wollastonite is used primarily in automobile brakes, ceramics, metallurgical processing, paper, paint, plastic, cosmetics, adhesives and as a replacement of asbestos in asbestos, cement boards and sheets. Some of the properties that make it so useful are high brightness and whiteness, low moisture and oil absorption, low volatile content, and the acicular nature of some wollastonite. A better compatibility between the polymer and the filler is achieved by chemical surface treatment of the mineral filler. Wollastonite, when treated in such a manner, results in improved flexural modules in polypropylene and improved reinforcement in nylon.

Bulk demand for wollastonite in the country is in the ceramic industry for the manufacture of floor and wall tiles. In ceramics, wollastonite decreases shrinkage

and gas evolution during firing. Small quantities are used in asbestos-cement products as a partial replacement for short fibre asbestos, paint, insecticide, marine wallboard, and welding rod industries. In metallurgical applications, wollastonite serves as a flux for welding, a source for calcium oxide, as slag conditioners and to protect the source of molten metal during the continuous casting of steel.

### CONSUMPTION

The estimated consumption of wollastonite is at 3,300 tonnes in 2011-12. The ceramic industry consumed almost the entire quantity of wollastonite (Table -6).

**Table – 6 : Estimated\* Consumption of Wollastonite, 2009-10 to 2011-12 (By Industries)**

(In tonnes)			
Industry	2009-10	2010-11(R)	2011-12 (P)
<b>All Industries</b>	<b>112385</b>	<b>121043</b>	<b>102990</b>
Asbestos products	++(2)	++(2)	++(2)
Ceramic	112385(15)	121043(15)	102990(15)

*Figures rounded off.*

*Figures in parentheses denote the number of units in organised sector reporting\* consumption.*

*(\*Includes reported consumption and/or estimates made wherever required).*

### WORLD REVIEW

World resources have not been estimated for wollastonite. The larger reserves were in China, Finland, India, Mexico, and the United States. Significant wollastonite resources also are in Canada, Chile, Kenya, Namibia, South Africa, Spain, Sudan, Tajikistan, Turkey, and Uzbekistan.

In 2011, the world production of wollastonite was 617,000 tonnes, which increased by 6% as against previous year. China (300,000 tonnes) and India (181,000 tonnes) were the major producers. The United States ranked third in wollastonite production.

The ceramic industry probably accounts for the major consumption of wollastonite worldwide, followed by polymers (plastic and rubber) and paint. The remaining were used in construction, friction products and metallurgical applications.

**Spain**—Aroche SL announced plans to mine wollastonite at its Huelva Province deposit near Aroche. Planned production capacity was 43,000 t/yr with sales primarily to the ceramics industry.

The countrywise production of wollastonite in 2009 to 2011 is furnished in Table-7.

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

Country	(In tonnes)		
	2009	2010	2011
China <sup>e</sup>	300000	300000	300000
Finland	9200	12100	11500
India <sup>*</sup>	132385	182600	180774
Mexico	29728	46548	47523
Spain <sup>e</sup>	7000	6000	7147
USA <sup>e</sup>	65000	67000	70000

*Source: World Mineral Production, 2007-2011.*

*\* India's production of wollastonite during 2009-10, 2010-11 and 2011-12 was 132,385 tonnes, 183,381 tonnes and 184,445 tonnes respectively.*

## FOREIGN TRADE

### Exports

In 2011-12, exports of wollastonite increased to 23759 tonnes from 17759 tonnes in the previous year. Exports were mainly to Belgium (45%), Japan (19%), Australia (12%), and Germany (7%) (Table- 8).

### Imports

Imports of wollastonite decreased considerably to 806 tonnes in 2011-12 compared to 2600 tonnes in the previous year.

Imports were mainly from China (67%), Spain (20%) and Mexico (4%) (Table - 9).

**Table – 8 : Exports of Wollastonite  
(By Countries)**

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>17759</b>	<b>208907</b>	<b>23759</b>	<b>297241</b>
Belgium	8480	97623	10703	129440
Japan	3263	29451	4499	45669
Australia	489	6781	2743	41542
Germany	1719	31079	1766	32641
Netherlands	1194	11138	1782	20501
USA	363	5416	407	6530
Indonesia	281	3729	393	5671
UK	731	10077	218	3180
Saudi Arabia	448	2308	558	3038
Malaysia	42	1726	197	2670
Other countries	749	9579	493	6359

**Table – 9 : Imports of Wollastonite  
(By Countries)**

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
<b>All Countries</b>	<b>2600</b>	<b>23913</b>	<b>806</b>	<b>12873</b>
China	159	1372	541	5121
Spain	58	1309	164	3491
USA	4	156	24	1662
Mexico	65	3052	30	1385
Japan	6	322	4	282
Germany	19	588	2	256
UAE	-	-	26	217
Finland	48	1024	4	196
Indonesia	-	-	10	176
Korea Rp of	-	-	1	62
Other countries	2241	16090	++	25

## FUTURE OUTLOOK

Presently, India is world's second largest producer of wollastonite after China. The existing mines in the country are in a position to meet the domestic requirements of the ceramic industry as well as export demand. There is an increasing demand for wollastonite in the international markets, especially in ceramic, metallurgy, paint, construction and as asbestos substitute. Present consumption is 3300 tonnes and as per the Sub- Group Report for 12th Plan Period, the apparent domestic demand was estimated as 203000 tonnes by 2016-17 at 9% growth rate.

As per USGS Mineral Year Book 2011 after increasing production capacity at its mine in the Sirohi district of Rajasthan in 2010, Wolkem India Ltd. planned to further increase production by 30,000 metric tonnes per year (t/yr) during the next 2 to 3 years. The planned expansion was in response to improved domestic markets, primarily for ceramics, friction products, and plastics and increasing exports to Asia Pacific and Southeast Asian markets.

The Sub Group Report for 12th Plan Period has recommended that the exports of processed wollastonite with high aspect ratio and powdered wollastonite may be encouraged for better unit value realisation. The Sub Group Report further recommended that to augment the reserves of wollastonite in the country, exploration in the states of Tamil Nadu and Gujarat would need to be pursued.