

# 79 Wollastonite

**W**ollastonite, a metasilicate of calcium ( $\text{CaSiO}_3$ ), contains theoretically 48.3% CaO and 51.7%  $\text{SiO}_2$ . 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 (P)  
(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 132 thousand tonnes in 2009-10 registered an increase of 19 % as compared to the preceding year. There were 2 reporting mines during both the year. The entire production was reported from private sector mines located in Rajasthan (Tables - 2 to 4).

Mine-head stocks at the end of the year 2009-10 were 1,009 tonnes as against 2,690 tonnes at the beginning of the year (Table - 5).

The average daily employment of labour during 2009-10 was 365 as against 609 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 2009-10**

Name & address of producer	Location of mine	
	State	District
Wolkem Industries Ltd, Lake House, P.P. Singhal Marg, Udaipur – 313 004, Rajasthan.	Rajasthan	Sirohi Udaipur

**Table – 5 : Mine-head Stocks of Wollastonite 2009-10 (P) (By State)**

State	(In tonnes)	
	At the beginning of the year	At the end of the year
<b>India</b>	<b>2690</b>	<b>1009</b>
Rajasthan	2690	1009

**Table – 3 : Production of Wollastonite, 2007-08 to 2009-10 (By State)**

(Qty. in tonnes; value in Rs.'000)

State	2007-08		2008-09		2009-10 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
<b>India</b>	<b>118666</b>	<b>106401</b>	<b>111581</b>	<b>125957</b>	<b>132385</b>	<b>111929</b>
Rajasthan	118666	106401	111581	125957	132385	111929

**Table – 4 : Production of Wollastonite, 2008-09 & 2009-10 (By Sector/State/Districts)**

(Qty. in tonnes; value in Rs. '000)

State/District	2008-09			2009-10 (P)		
	No. of mines	Quantity	Value	No. of mines	Quantity	Value
<b>India</b>	<b>2</b>	<b>111581</b>	<b>125957</b>	<b>2</b>	<b>132385</b>	<b>111929</b>
Private sector	2	111581	125957	2	132385	111929
<b>Rajasthan</b>	<b>2</b>	<b>111581</b>	<b>125957</b>	<b>2</b>	<b>132385</b>	<b>111929</b>
Sirohi	1	36441	34437	1	34102	35466
Udaipur	1	75140	91520	1	98283	76463

## MINING, PROCESSING & MARKETING

Wollastonite is being mined by opencast semi-mechanised method in Sirohi district, Rajasthan. 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 Ltd, a wollastonite mining and processing company, meets 20% of global

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requirements. Investigations carried out 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. Wollastonite with aspect ratio in the range from 15:1 to 20:1 is considered as a semi-fibrous. It can be used as replacement for asbestos and thus finds high potential growth as a potential growth as a performance filler for strengthening various plastic and resin systems of daily use. It reduces the volume of the expensive plastic or resin medium and contributes to physical and chemical properties of the finished products.

The whiteness of the mineral, low loss on ignition (L.O.I.), higher compressive and transverse strength values are important for its use in filler, coating and ceramic applications. The low thermal expansion of wollastonite reduces shrinkage and other dimensional instabilities and glaze defects. However, removal of associated calcite is necessary to avoid carbon dioxide generation during melting. The typical chemical composition of wollastonite marketed by Wolkem is : Cao 45.5-47%, SiO<sub>2</sub> 48-49.5%, Al<sub>2</sub>O<sub>3</sub> 0.6%, Fe<sub>2</sub>O<sub>3</sub> 0.43%, MnO 0.29% and MgO 0.2%.

Bulk demand for wollastonite in the country is in the ceramic industry for the manufacture of floor and wall tiles, while small quantities are used in asbestos-cement products, paint, insecticide and welding rod industries. The ceramic industry uses generally wollastonite analysing CaO 47%, SiO<sub>2</sub> 45%, Fe<sub>2</sub>O<sub>3</sub> 1.5% (max) and L.O.I. 3 to 4 percent. Because of absence of alkalies, it is highly suitable for ultra low-loss insulator and in ultra high frequency electric equipment, such as high temperature porcelain (spark plugs and H.T. circuit breakers, etc.).

## CONSUMPTION

The reported consumption of wollastonite is estimated at 3,800 tonnes in 2009-10. The ceramic industry consumed almost the entire quantity of wollastonite (Table -6).

**Table – 6 : Reported Consumption\* of Wollastonite  
2007-08 to 2009-10  
(By Industries)**

Industry	(In tonnes)		
	2007-08(R)	2008-09(R)	2009-10(P)
<b>All Industries</b>	<b>4200</b>	<b>3800</b>	<b>3800</b>
Asbestos products	++(4)	++(4)	++(4)
Ceramic	4200(16)	3800(16)	3800(16)

*Figures rounded off. Data collected on non-statutory basis.*

*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 production of crude wollastonite declined by an estimated 10-15% in 2009 probably because of the global recession. The growth in economy enabled producers in China and India, which account for about 70% of the world wollastonite production, to experience only slight declines in production compared with production in 2008.

The countrywise production of wollastonite in 2007 to 2009 is furnished in Table-7. As per available data, China was the largest producer, followed by India and USA.

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

Country	(In tonnes)		
	2007	2008	2009
China	350000 <sup>(e)</sup>	325000 <sup>(e)</sup>	300000
Finland	16364	15600	16000
India*	118666	103459	132385
Mexico	50809	46844	29728
Namibia	55	55	55
USA	125000	90000	65000

*Source: World Mineral Production, 2005-2009.*

\* India's production of wollastonite during 2007-08, 2008-09 and 2009-10 was 118,666 tonnes, 111,581 tonnes and 132,385 tonnes, respectively.

## FOREIGN TRADE

In 2009-10, exports of wollastonite decreased to 12,880 tonnes from 21,413 tonnes in the previous year. Exports were mainly to Belgium (46%), Japan (17%), Germany (11%), and Australia (10%). Imports of wollastonite were 351 tonnes in 2009-10 compared to 223 tonnes in the previous year. Imports were mainly from China and Spain (Tables - 8 and 9).

## 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

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

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>21413</b>	<b>220102</b>	<b>12880</b>	<b>153755</b>
Belgium	8187	82970	5940	67679
Germany	2260	33196	1392	23243
Japan	6473	55363	2163	20644
Australia	957	11142	1251	16520
Netherlands	596	5208	301	2865
USA	251	2800	203	1990
UK	1326	14904	122	1750
Saudi Arabia	241	3438	121	1685
Italy	698	6360	125	1157
Unspecified	1	15	959	10412
Other countries	423	4706	303	5810

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

Country	2008-09		2009-10	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
<b>All Countries</b>	<b>223</b>	<b>4785</b>	<b>351</b>	<b>3889</b>
China	100	796	305	2593
Spain	7	271	41	1041
Finland	4	107	4	194
Japan	–	–	1	60
Germany	1	105	–	–
Italy	80	1663	–	–
Mexico	7	722	–	–
UAE	++	14	–	–
USA	24	1044	–	–
Other countries	–	–	++	1

industry as well as export demand. There is an increasing demand for wollastonite in the international markets, especially in ceramic and plastic industries and in construction activities.