

66 Quartz & Other Silica Minerals

The term 'quartz' is often referred to as a synonym for silica. Silica (SiO_2) is one of the ubiquitous materials in the earth's crust. Quartz, quartz crystals, quartzite, silica sand, sand (others) and moulding sand are all coined together in one generic name 'silica minerals'. This is because all these commodities are essentially crystalline silicon dioxide (SiO_2) with variations mostly related to their crystalline structure and presence of minor or trace impurities. Silica occurs in several forms giving rise to different varieties.

Crystalline Varieties

The important varieties of crystalline quartz are vein quartz (massive crystalline quartz); milky quartz (white, translucent to opaque); ferruginous quartz (containing brown limonite and red haematite and almost opaque); aventurine quartz (containing glistening flakes of mica or haematite); cat's eye (opalescent greenish quartz with fibrous structure); rock crystal (clear, colourless, well-crystallised transparent quartz); amethyst (clear-purple or violet-blue), transparent quartz; rose quartz; smoky quartz; etc. Occurrences of massive crystalline quartz in veins or pegmatites have been recorded in almost all the states.

Clastic or Granular Varieties

These varieties include sand consisting largely of unconsolidated quartzose grains (0.06 mm to 2 mm diameter), gravel consisting of largely unconsolidated coarse quartzose grains or pebbles (2 mm to 8 mm in diameter), sandstone and quartzite. The occurrences are reported from Andhra Pradesh, Bihar, Delhi, Haryana, Karnataka, Kerala, Madhya Pradesh, Rajasthan, Tamil Nadu, Uttar Pradesh, etc. The silica sand from Naini area in Allahabad district, Uttar Pradesh is of a very high quality.

Cryptocrystalline Varieties

This group includes chalcedony, agate, jasper, onyx, flint and chert. These varieties appear non-crystalline (amorphous) in hand specimens, but under microscope show double refraction which reveals their concealed crystalline nature. These varieties are reported from Gujarat, Uttar Pradesh, Tamil Nadu, Andhra Pradesh, Maharashtra, Madhya Pradesh, Karnataka and Punjab. The most important occurrences of agate are in Ratnapur, Rajpipla area and

further west between Tapi and Narmada rivers in Bharuch district, Gujarat, where it is found as pebbles in varying sizes associated with clay washed down by the river flow. Other occurrences of economic importance are reported from Amravati, Aurangabad, Buldhana, Chandrapur, Nashik and Pune districts in Maharashtra; beds of Krishna and Godavari rivers in Andhra Pradesh; Dumka district in Jharkhand; Dhar, Mandasaur, Sihore and Shahdol districts in Madhya Pradesh; and Kachchh district in Gujarat.

RESOURCES

As per the UNFC system as on 1.4.2005, the total resources of quartz and silica sand in the country are estimated at 3,238 million tonnes out of which 24% i.e. 771 million tonnes are placed under reserves category while 76% i.e. 2,467 million tonnes are placed under remaining resources category. Resources by grades reflect foundry & moulding grade as 20%, glass grade 10%, ceramic & pottery grade 10% and ferro-silicon grade as 6%. The unclassified, others and not-known grades account for about 53% of the total resources. Haryana alone accounts for about 56% resources, followed by Rajasthan (8%), Jharkhand (5%), Maharashtra (5%), Tamil Nadu (5%), Andhra Pradesh (5%), Kerala (4%), Gujarat (3%), Uttar Pradesh (3%), Karnataka (2%) and Odisha (2%) (Table - 1).

The total resources of quartzite in the country as per the UNFC system as on 1.4.2005 are estimated as 1,145 million tonnes of which reserves are about 99 million tonnes (about 9%) and remaining resources are 1,046 million tonnes (about 91%). Bulk resources of about 54% are located in Haryana followed by Bihar (24%), Punjab (7%), Odisha (5%) and Jharkhand (4%). Resources of refractory grade are 26%, ceramic & pottery grade 19% and BF grade 6%. The remaining 49% resources are of low, unclassified, others and not-known grades (Table - 2).

EXPLORATION & DEVELOPMENT

Exploration for quartz and silica minerals was conducted by DMG, Rajasthan and Karnataka. Details of exploration carried out for quartz and other silica minerals during 2009-10 are given in Table - 3.

QUARTZ & OTHER SILICA MINERALS

**Table – 1 : Reserves/Resources of Quartz and Silica Sand as on 1.4.2005
(By Grades/Stages)**

(In '000 tonnes)

| Grade/State | Reserves | | | | Remaining resources | | | | Total resources (A+B) | | | |
|--------------------------|------------------|---------------|---------------|-----------------------|---------------------|---------------|--------------------|--------------------------|-----------------------|--------------------|---------------------|----------------|
| | Proved STD111 | Probable | | Feasibility STD211 | Pre-feasibility | | Inferred STD333 | Reconnaissance STD334 | | | | |
| | | STD121 | STD122 | | STD221 | STD222 | | | | Measured STD331 | Indicated STD332 | |
| Total | (A) | (B) | (C) | (D) | (E) | (F) | (G) | (H) | | | | |
| All India : Total | 271614 | 190580 | 309314 | 771508 | 2618 | 134965 | 152072 | 251843 | 1869517 | 123 | 2466703 | 3238211 |
| By Grades | | | | | | | | | | | | |
| Glass | 65516 | 17065 | 52808 | 135390 | 183 | 10142 | 12007 | 1682 | 164197 | 100 | 190651 | 326041 |
| Ferro-silicon | 33704 | 4434 | 23751 | 61889 | - | 8845 | 2924 | 65589 | 44553 | - | 121940 | 183829 |
| Sodium silicate | 2357 | 533 | 7225 | 10115 | - | 1186 | 20 | 146 | 31810 | - | 33162 | 43277 |
| Ceramic and pottery | 74084 | 2018 | 68995 | 145097 | - | 17850 | 26636 | 9958 | 122660 | - | 183439 | 328536 |
| Foundry and moulding | 77282 | 27314 | 43536 | 148132 | 1728 | 26778 | 107155 | 32080 | 305281 | - | 488184 | 636315 |
| Abrasive | 2454 | 112 | 427 | 2993 | - | - | - | - | 815 | - | 815 | 3807 |
| Others | 926 | 992 | 56720 | 58638 | 399 | 61494 | 274 | 1860 | 865694 | - | 929722 | 988360 |
| Unclassified | 11924 | 137285 | 37052 | 186261 | - | 4714 | 1113 | 46221 | 188443 | 17 | 272213 | 458474 |
| Not-known | 3369 | 826 | 18800 | 22994 | 307 | 3955 | 1941 | 94307 | 146063 | 6 | 246579 | 269573 |
| By States | | | | | | | | | | | | |
| Andhra Pradesh | 43626 | 7717 | 33112 | 84455 | 22 | 959 | 5114 | 1502 | 55840 | 100 | 69461 | 153916 |
| Assam | - | - | - | - | - | - | - | - | 1790 | - | 1790 | 1790 |
| Bihar | - | - | - | - | - | - | - | - | 23378 | - | 23378 | 23378 |
| Chhattisgarh | 424 | - | 304 | 727 | - | - | 457 | - | 282 | - | 739 | 1466 |
| Goa | - | - | - | - | - | 20 | 1736 | - | 18248 | - | 20004 | 20004 |
| Gujarat | 26367 | 3111 | 21964 | 51442 | - | 2442 | 7708 | 2144 | 30017 | - | 45311 | 96753 |
| Haryana | 196 | 138259 | 129444 | 267900 | 307 | 114776 | 96071 | 27839 | 1257938 | - | 1543231 | 1811131 |
| Himachal Pradesh | - | - | - | - | - | - | - | 428 | 2500 | - | 2928 | 2928 |
| Jammu & Kashmir | - | - | - | - | - | - | - | - | 3110 | - | 3110 | 3110 |
| Jharkhand | 7213 | 980 | 6222 | 14414 | 1615 | 941 | 1223 | 64 | 135745 | 6 | 140352 | 154766 |
| Karnataka | 15276 | 3464 | 13582 | 32321 | 305 | 1504 | 1829 | 80 | 44397 | 17 | 48211 | 80532 |
| Kerala | 864 | 765 | 749 | 2379 | - | 1626 | 1753 | 31419 | 76350 | - | 125759 | 128138 |
| Madhya Pradesh | 106 | 11 | 35 | 152 | - | - | 75 | 47 | 2195 | - | 2634 | 2786 |
| Maharashtra | 32650 | 5037 | 27937 | 65624 | - | 524 | 29079 | - | 355 | 52624 | 82581 | 148205 |
| Meghalaya | - | - | - | - | - | - | - | - | 177 | 6906 | 7083 | 7083 |
| Odisha | 907 | 502 | 990 | 2399 | 167 | 96 | - | 63077 | 4022 | - | 67362 | 69761 |
| Punjab | - | - | - | - | - | - | - | 2550 | 1377 | - | 3927 | 3927 |
| Rajasthan | 103741 | 11668 | 65736 | 181145 | 161 | 5351 | 3964 | 66 | 69181 | - | 78890 | 260035 |
| Tamil Nadu | 33910 | 433 | 6054 | 40398 | - | 4476 | 73 | 3387 | 95837 | - | 130601 | 170998 |
| Tripura | - | - | - | - | - | - | - | 326 | 164 | - | 490 | 490 |
| Uttar Pradesh | 6095 | 18621 | 2275 | 26991 | 40 | 2248 | 2992 | 6307 | 51421 | - | 63659 | 90650 |
| West Bengal | 239 | 11 | 912 | 1162 | - | - | - | - | 5203 | - | 5203 | 6365 |

Figures rounded off.

QUARTZ & OTHER SILICA MINERALS

**Table – 2 : Reserves/Resources of Quartzite as on 1.4.2005
(By Grades/States)**

| Grade/State | (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 | | Total (B) |
| All India | 26419 | 26051 | 46074 | 98544 | 801 | 90774 | 96281 | 91089 | 111326 | 656142 | 1046413 | 1144957 |
| By Grades | | | | | | | | | | | | |
| Refractory | 3480 | 5845 | 10711 | 20036 | - | 926 | 97 | 3888 | 24922 | 247678 | 277511 | 297547 |
| Ceramic/pottery | 18949 | 4478 | 28670 | 52098 | 48 | 35206 | 39799 | - | - | 91003 | 166057 | 218155 |
| Low | 1000 | 3730 | 1007 | 5737 | - | 34 | 13 | - | - | 8458 | 8505 | 14242 |
| Ferro-silicon | - | 1728 | 376 | 2104 | - | - | - | - | - | - | - | 2104 |
| BF | - | 834 | 2067 | 2901 | - | 18 | - | 197 | 275 | 63117 | 63606 | 66507 |
| Others | 701 | 396 | 1186 | 2283 | 153 | 316 | 145 | 53 | - | 75232 | 75899 | 78181 |
| Unclassified | 2289 | 7750 | 2057 | 12096 | 600 | 48034 | 54147 | 66016 | 54999 | 126151 | 349947 | 362043 |
| Not-known | - | 1290 | - | 1290 | - | 6240 | 2080 | 20935 | 31130 | 44503 | 104888 | 106178 |
| By States | | | | | | | | | | | | |
| Andhra Pradesh | 3300 | 3496 | 7187 | 13982 | - | - | 2 | - | - | 4586 | 4588 | 18570 |
| Arunachal Pradesh | - | - | - | - | - | - | - | - | - | 5270 | 5270 | 5270 |
| Bihar | 16 | 6114 | 12084 | 18213 | - | - | - | 3118 | 22306 | 227568 | 252992 | 271205 |
| Chhattisgarh | 3402 | 4142 | 4121 | 11664 | - | - | - | - | - | 14688 | 14688 | 26353 |
| Haryana | 15702 | - | 16200 | 31902 | - | 89742 | 96165 | 86951 | 85333 | 231887 | 590078 | 621980 |
| Himachal Pradesh | 95 | - | 39 | 134 | 48 | - | - | - | - | - | 48 | 182 |
| Jammu & Kashmir | - | 1112 | - | 1112 | - | - | - | - | - | - | - | 1112 |
| Jharkhand | 409 | - | 416 | 825 | - | - | - | 197 | 275 | 38934 | 39405 | 40230 |
| Karnataka | 43 | - | 680 | 724 | - | - | - | - | - | 393 | 393 | 1116 |
| Madhya Pradesh | - | - | - | - | - | - | - | - | - | 832 | 832 | 832 |
| Maharashtra | 4 | 28 | 43 | 75 | - | - | - | - | - | 17 | 17 | 92 |
| Odisha | 3263 | 11160 | 4075 | 18498 | 753 | 1014 | 114 | 823 | 234 | 36534 | 39473 | 57971 |
| Punjab | - | - | - | - | - | - | - | - | 3178 | 78734 | 81912 | 81912 |
| Rajasthan | 185 | - | 104 | 289 | - | 18 | - | - | - | 706 | 724 | 1013 |
| Sikkim | - | - | 1125 | 1125 | - | - | - | - | - | 15994 | 15994 | 17119 |

Figures rounded off.

QUARTZ & OTHER SILICA MINERALS

Table – 3 : Details of Exploration Activities for Quartz and Silica Sand, 2009-10

| Mineral/ Agency/ State/District | Location | Mapping | | Drilling | | Sampling | Remarks |
|---|---|---------------------------------|----------------------|-----------|----------|----------|---|
| | | Scale | Area (sq km) | Boreholes | Meterage | | |
| SILICA SAND | | | | | | | |
| Directorate of Mines & Geology Rajasthan | | | | | | | |
| Bharatpur | Bhonda-gaon Badanappura | 1:10,000 | 5 | – | – | 33 | About 225,000 tonnes of resources of silica sand were estimate in the area. |
| Jaisalmer | Modha, Jasawala Nada (Gaj) Singh ki Dhani, Devikot, Teh. Fatehgarh | 1:50,000 1:10,000 1:2,000 | 150 10 1 | – | – | 14 | Small occurrences of fragile sand stone (silica sand) were noted at E & SE of Village Devikot which are about 100 M - 300 m in length & 50- 100 m in width. |
| Karauli | N/V Pator, Pura Ata, Kalyani | 1:50,000 1:10,000 1:2,000 | 105 10 1 | – | – | 06 | Whitish brown coloured silica sand was observed at two places, N/V poter (250 x 50m and 200m x 50m) and N/V Pura Ata (200m x 50 m) |
| QUARTZ | | | | | | | |
| Udaipur | N/V Nimri Shid Jaswantpura of Vallabhanagar Teh | 1:50,000 1:10,000 1:2,000 | 200.0 20.0 2.0 | – | – | – | Quartz veins were encountered near village Ker-pura, Nimri & Jhunipura. A pegmatite body was mapped & it is 10 to 20 m in strike length & its width varies from 2 to 3 m. The pagmative body was found rich in quartz. Near village Jhanpura - Lunda five quartz veins were mapped, which are 10 to 20 m in length & 2 to 3 m in width. |
| Tonk Kakor, Kabra, etc. | Jhalra,Nayagaon, 1:10,000 | 1:50,000 12 1:2,000 | 200 1.2 | – | – | – | – |
| DMG, Karnataka Mandya | Katteri, Hagga- nahalli & Malligere Vill. of Pandavapura Teh. | 1:50,000 | 80 | – | – | 20 | About 15,000 tonnes of quartz resources, were estimated. |

PRODUCTION, STOCK & PRICES

QUARTZ

The production of quartz at 507 thousand tonnes in 2009-10 increased by 18% as compared to that of preceding year , There were 89 reporting mines in 2009-10 as against 92 in the preceding year. Besides, the production of quartz was also reported from 48 mines as an associated mineral. The share of public sector mines, in the total output was about 1% in both the years. The share of 12 principal producers was about 66 % of the total output.

Andhra Pradesh continued to be the major producing state of quartz during the year 2009-10 accounting for 33% of the total production followed by Rajasthan 29%, Gujarat 17%, Jharkhand 13%, West Bengal 3%, Maharashtra 2%, and remaining 3% production was contributed by Chhasttisgarh, Karnataka, Odisha and Tamil-Nadu. About 62% of the production during the year 2009-10 was reported by 10 mines along with 2 associated mines having production in the range of 10,001 tonnes & above (Tables 4 to 7).

QUARTZ & OTHER SILICA MINERALS

The mine-head stocks of quartz at the end of the year 2009-10 were 264 thousand tonnes as against 206 thousand tonnes at the beginning of the year. (Table - 8).

The average number of daily labourers employed in quartz mines in 2009-10 was 1,041 as against 1,019 in the previous year. Domestic prices of quartz are furnished in the General Review on Prices.

Table – 4 : Principal Producers of Quartz 2009-10

| Name & address of producer | Location of mine | |
|---|------------------|---------------|
| | State | District |
| Shri Ram Minerals Industries, C/o Goyar Enterprises, Bagda Bhawan, Opposite Jyoti, Petrol Pump, Road No. 1, Vishwakarma Industrial Area, Jaipur - 302 013, Rajasthan. | Rajasthan | Tonk |
| * Shri Vijaya Gimpex Mining Pvt. Ltd, Shriram Chamber, Kamalapuri Colony, Phase III, Hyderabad-500073, Andhra Pradesh. | Andhra Pradesh | Mahaboobnagar |
| *B. Narsimhahulu, C/o Dollifine Mines Minerals, 4 th floor, 6-3-1239/2/A, Raj Bhawan Road, Po. - Somajiguda, Hyderabad, Andhra Pradesh. | Andhra Pradesh | Mahaboobnagar |
| Kusumben Sureshkumar Parmar, 38, Vaibhav Society, Bhuravav, Near Jay-Jogeshwar, P O. - Godhra, Dist:Panchmahals, Gujarat. | Gujarat | Panchmahals |
| Suresh Kumar Fakirchand Parmar, 38 Vaibhav Society, Godhara Panchmahal, Gujarat. | Gujarat | Panchmahals |

Table - 4 (Concl'd.)

| Name & address of producer | Location of mine | |
|--|------------------|---------------|
| | State | District |
| Chandi Prasad Sharma, At-Amlatola, Chaibasa-833 201, Dist:- Singhbhum (W) Jharkhand. | Jharkhand | Singhbhum (E) |
| V. B. C. Woods Distillation Pvt Ltd, III floor, Progressive Towers, Kheiratabad, Hyderabad - 500 004 Andhra Pradesh. | Andhra Pradesh | Medak |
| Anandraj Singh, (Raj Minerals) 8-4-316, Sanath Nagar Hyderabad-500 018, Andhra Pradesh. | Andhra Pradesh | Medak |
| Dilipsingh P. Solanki, C/o Latesh H. Pandye Pattha Talawadi, Near Hanuman Mandir, Godhra-389001, Gujarat. | Gujarat | Panchmahals |
| Renuka Pati, Q. No. : 11, A, OB East Plant, Basti, PO. : Jamshedpur-831003, Dist. : Singhbhum (W), Jharkhand. | Jharkhand | Singhbhum(E) |
| Tirupati Agencies, 8/1, Lal Bazar Street, Room No. - 18, Mezzanine Floor, Kolkata-1, West Bengal. | West Bengal | Bankura |
| Sheetal Minerals, Main Road, Chandawa-829203, Dist. : Latehar, Jharkhand. | Jharkhand | Latehar |

(Contd.)

* Associated mines of quartz with feldspar.

QUARTZ & OTHER SILICA MINERALS

**Table – 5 : Production of Quartz, 2007-08 to 2009-10
(By States)**

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

| State | 2007-08 | | 2008-09 | | 2009-10 (P) | |
|----------------|---------------|--------------|---------------|--------------|---------------|--------------|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| India | 315281 | 53721 | 430734 | 75564 | 506740 | 91796 |
| Andhra Pradesh | 113245 | 16779 | 139837 | 22138 | 168179 | 27279 |
| Chhattisgarh | – | – | 1846 | 258 | 384 | 54 |
| Gujarat | 71180 | 6565 | 77400 | 8031 | 85611 | 8825 |
| Jharkhand | 26148 | 2882 | 39434 | 5607 | 66057 | 11538 |
| Karnataka | 2500 | 155 | 17500 | 1289 | 275 | 108 |
| Madhya Pradesh | 1365 | 82 | – | – | – | – |
| Maharashtra | 18860 | 3836 | 15989 | 3619 | 10159 | 2300 |
| Odisha | 1000 | 250 | 1500 | 375 | 5570 | 1307 |
| Rajasthan | 68270 | 13183 | 120512 | 23769 | 147646 | 29342 |
| Tamil Nadu | 12243 | 9895 | 10589 | 9324 | 6954 | 7836 |
| West Bengal | 470 | 94 | 6127 | 1154 | 15905 | 3207 |

**Table – 6 : Production of Quartz, 2008-09 & 2009-10
(By Sectors/States/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 |
| India | 92(44) | 430734 | 75564 | 89(48) | 506740 | 91796 |
| Public sector | 1 | 3837 | 7098 | 2(1) | 5191 | 6823 |
| Private sector | 91(44) | 426897 | 68466 | 87(47) | 501549 | 84973 |
| Andhra Pradesh | 27 (10) | 139837 | 22138 | 26(11) | 168179 | 27279 |
| Anantapur | – | – | – | 2 | 17 | 3 |
| Khammam | 1 | 10 | 2 | 2 | 456 | 68 |
| Krishna | 2 | 1053 | 158 | 2 | 445 | 67 |
| Kurnool | 1 | 13489 | 1956 | 2 | 1495 | 212 |
| Mahaboobnagar | 7 (2) | 67132 | 10616 | 6 (5) | 96023 | 15746 |
| Medak | 5 | 27318 | 3574 | 4 | 40215 | 5826 |
| Nalgonda | 1 | 5150 | 953 | 1 | 2600 | 481 |
| Nellore | 3 (8) | 8504 | 1810 | 3 (6) | 7456 | 1452 |
| Prakasam | 1 | 10 | 1 | – | – | – |
| Ranga Reddi | 1 | 32 | 5 | 1 | 8 | 1 |
| Visakhapatnam | 2 | 8929 | 1844 | 1 | 9159 | 1923 |
| Vizianagaram | 3 | 8210 | 1219 | 2 | 10305 | 1500 |
| Chhattisgarh | 1 | 1846 | 258 | 1 | 384 | 54 |
| Jashpur | 1 | 1846 | 258 | 1 | 384 | 54 |
| Gujarat | 7 | 77400 | 8031 | 7 | 85611 | 8825 |
| Panchamahals | 7 | 77400 | 8031 | 7 | 85611 | 8825 |

(Contd.)

QUARTZ & OTHER SILICA MINERALS

Table - 6 (Concl.)

| State/District | 2008-09 | | | 2009-10 (P) | | |
|---------------------|----------------|---------------|--------------|----------------|---------------|--------------|
| | No. of mines | Quantity | Value | No. of mines | Quantity | Value |
| Jharkhand | 8 (3) | 39434 | 5607 | 9 (3) | 66057 | 11538 |
| Deoghar | 1 | 4118 | 581 | 1 | 1604 | 271 |
| Dumka | 1 | 3449 | 535 | 1 | 7418 | 1199 |
| Hazaribagh | (1) | 811 | 158 | (1) | 1174 | 229 |
| Jamtara | (1) | 3469 | 416 | (1) | 3046 | 366 |
| Latehar | 4 (1) | 18134 | 1812 | 4 (1) | 18119 | 1832 |
| Ranchi | - | - | - | 1 | 30 | 4 |
| Saraikala-Kharsawan | 1 | 5783 | 1463 | 1 | 20136 | 5094 |
| Singhbhum East | 1 | 3670 | 642 | 1 | 14530 | 2543 |
| Karnataka | 4 | 17500 | 1289 | (1) | 275 | 108 |
| Bagalkot | 1 | 100 | 11 | - | - | - |
| Bengaluru | - | - | - | (1) | 275 | 108 |
| Gulbarga | 1 | 2400 | 120 | - | - | - |
| Tumkur | 2 | 15000 | 1158 | - | - | - |
| Maharashtra | 4 | 15989 | 3619 | 4 | 10159 | 2300 |
| Bhandara | 3 | 15116 | 3492 | 3 | 10061 | 2286 |
| Chandrapur | 1 | 873 | 127 | 1 | 98 | 14 |
| Odisha | (1) | 1500 | 375 | 1 (1) | 5570 | 1307 |
| Sundergarh | (1) | 1500 | 375 | 1 (1) | 5570 | 1307 |
| Rajasthan | 27 (30) | 120512 | 23769 | 31 (32) | 147646 | 29342 |
| Ajmer | 8 (10) | 18388 | 4179 | 8 (9) | 20426 | 4488 |
| Alwar | 1 | 364 | 73 | 1 | 219 | 44 |
| Bhilwara | 3 (18) | 6036 | 830 | 3 (18) | 8853 | 1198 |
| Bundi | (1) | 252 | 25 | - | - | - |
| Chittorgarh | 2 | 39 | 10 | 2 | 359 | 90 |
| Rajsamand | 2(1) | 4283 | 716 | 5 (5) | 9962 | 1846 |
| Sikar | 4 | 7509 | 983 | 2 | 4675 | 720 |
| Sirohi | - | - | - | 2 | 4090 | 614 |
| Jaipur | 1 | 3829 | 574 | 1 | 7853 | 1178 |
| Tonk | 6 | 79812 | 16379 | 6 | 90194 | 18987 |
| Udaipur | - | - | - | 1 | 1015 | 177 |
| Tamil Nadu | 12 | 10589 | 9324 | 7 | 6954 | 7836 |
| Coimbatore | 1 | 1248 | 187 | 1 | 1092 | 218 |
| Dharmapuri | 1 | 1490 | 1118 | 1 | 230 | 173 |
| Dindigul | 2 | 473 | 370 | 2 | 634 | 506 |
| Erode | 2 | 36 | 11 | - | - | - |
| Karur | 2 | 368 | 118 | 1 | 1055 | 211 |
| Madurai | 2 | 221 | 130 | 1 | 469 | 301 |
| Nammakal | 1 | 3837 | 7098 | 1 | 3474 | 6427 |
| Salem | 1 | 2916 | 292 | - | - | - |
| West Bengal | 2 | 6127 | 1154 | 3 | 15905 | 3207 |
| Bankura | 1 | 5615 | 1011 | 1 | 13305 | 2595 |
| Birbhum | 1 | 512 | 143 | 1 | 1158 | 324 |
| Purulia | - | - | - | 1 | 1442 | 288 |

Figures in parentheses indicate number of associated mines of quartz with felspar, mica, silica sand & asbestos.

QUARTZ & OTHER SILICA MINERALS

Table – 7 : Production of Quartz, 2008-09 and 2009-10 (P)
(By Frequency Group)

(Qty in tonnes)

| Production group | No. of mines | | Production for the group | | Percentage in total production | | Cumulative percentage | |
|-------------------|----------------|----------------|--------------------------|---------------|--------------------------------|---------------|-----------------------|---------|
| | 2008-09 | 2009-10 | 2008-09 | 2009-10 | 2008-09 | 2009-10 | 2008-09 | 2009-10 |
| All Groups | 92 (44) | 89 (48) | 430734 | 506740 | 100.00 | 100.00 | – | – |
| Up to 500 | 37 (24) | 32 (25) | 7564 | 10181 | 1.76 | 2.01 | 1.76 | 2.01 |
| 501-1000 | 8 (10) | 10 (7) | 12970 | 12620 | 3.01 | 2.49 | 4.77 | 4.50 |
| 1001-5000 | 28 (8) | 28(13) | 97372 | 88484 | 22.61 | 17.46 | 27.38 | 21.96 |
| 5001-10000 | 12 | 9 (1) | 89836 | 79676 | 20.85 | 15.72 | 48.23 | 37.68 |
| 10001 & above | 7 (2) | 10 (2) | 222992 | 315779 | 51.77 | 62.32 | 100.00 | 100.00 |

Figures in parentheses indicate number of associated mines of quartz, felspar, mica, silica sand and asbestos.

Table – 8 : Mine-head Stocks of Quartz, 2009-10(P)
(By States)

(In tonnes)

| State | At the beginning of the year | At the end of the year |
|----------------|------------------------------|------------------------|
| India | 205870 | 264061 |
| Andhra Pradesh | 123853 | 150940 |
| Chhattisgarh | 260 | 279 |
| Gujarat | 4294 | 4275 |
| Jharkhand | 2146 | 2409 |
| Karnataka | 12158 | 12438 |
| Madhya Pradesh | 135 | 135 |
| Maharashtra | 2775 | 5549 |
| Odisha | – | 1027 |
| Rajasthan | 53395 | 85523 |
| Tamil Nadu | 6643 | 998 |
| West Bengal | 211 | 488 |

SILICA SAND

The production of silica sand at 2,283 thousand tonnes in 2009-10 decreased by about 19 % over that of the previous year due to lack of demand from cement plants and labour problems. Andhra Pradesh the major producing state reported decrease of about 28 % in comparison with the previous year due to frequent labour problems.

During the year under review, there were 133 reporting mines as against 138 in the preceding year. Besides, the production of silica sand was also reported as an associated mineral by four mines during the year. Ten principal producers accounted for about 54% of the total production. The share of public sector in the total production was 5 % in 2009-10 as against 1 % in the preceding year.

Andhra Pradesh, the leading producing state accounted for 39 % of the total production during the year followed by Gujarat (17%), Rajasthan (14%), Maharashtra (13%), Uttar Pradesh (7%), Jharkhand and Karnataka (4% each). The remaining two percent production was the contribution of Kerala, Odisha and Tamil Nadu.

About 62% of the total production of silica sand was contributed by 15 silica sand mines and two associated mines, each mine producing more than 50 thousand tonnes annually and about 33 % by 56 silica sand mines and one associated mine, each producing five thousand to fifty thousand tonnes. The remaining 5% of the output was contributed by 62 silica sand mines and one associated mine, each producing less than 5000 tonnes annually (Tables 9 to 12).

Mine-head stocks of silica sand at the end of 2009-10 were 3,260 thousand tonnes as against of 1,280 thousand tonnes in the beginning of the year (Table - 13).

The average daily employment of labourers in 2009-10 was 2,401 as against 2,257 in the previous year. Domestic prices of silica sand are furnished in the General Review on Prices.

Table – 9 : Principal Producers of Silica Sand 2009-10

| Name & address of producer | Location of mine | |
|--|------------------|-------------|
| | State | District |
| Kumaraswamy Silica Mine, Momidi P. O. Chillakur Mandal, Dist. Nellore, Andhra Pradesh. | Andhra Pradesh | Nellore |
| Bhavani Minerals At & PO. - Bhilod, Tehsil: Valia, Dist. - Baruch, Gujarat-393 135 | Gujarat | Bharuch |
| B .V. Subbareddy At & PO. - Chintavaram, Mandal - Chillakur, Dist. - Nellore, Andhra Pradesh. | Andhra Pradesh | Nellore |
| N. N. Ankleshwara Vill. Amod, Dist. Bharuch, Gujarat. | Gujarat | Bharuch |
| Moha. Sher Khan Pathan S/o Gulbaz Khan, Vill- Banesti, PO. - Sawa, Dist. - Chittorgarh, Rajasthan. | Rajasthan | Chittorgarh |
| Maharashtra Mineral Corporation Ltd, 5 th Floor, Industrial Assurance Building, Churchgate, Mumbai, Maharashtra. | Maharashtra | Sindhudurg |
| Asha Yadav Vill. Nagla Mukrab, PO. - Nagla Mukrab, Dist. Bharatpur, Rajasthan. | Rajasthan | Bharatpur |
| Bundi Silica Sand Supply Co. Kanhaiyalal Ghatiwala, Rishabh Bhavan, New Colony Gumanpura, Dist. - Kota – 324 007, Rajasthan. | Rajasthan | Kota |
| Esmo Minechem Industries Vill. - Lore, Taluk -Kankavali, Dist. -Sindhudurg, Maharashtra | Maharashtra | Sindhudurg |
| S. S. Chawla Vill. -Lakhnauti, Taluk -Bara, Dist. -Allahabad, Uttar Pradesh. | Uttar Pradesh | Allahabad |

QUARTZ & OTHER SILICA MINERALS

**Table – 11 : Production of Silica Sand, 2008-09 and 2009-10
(By Sector/States/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 |
| India | 138(5) | 2832322 | 365719 | 133(4) | 2282712 | 298207 |
| Public Sector | 5 | 32604 | 14533 | 6 | 112433 | 26169 |
| Private Sector | 133(5) | 2799718 | 351186 | 127(4) | 2170279 | 272038 |
| Andhra Pradesh | 43 | 1247298 | 61320 | 49 | 895533 | 54738 |
| Kurnool | 4 | 4199 | 460 | 5 | 3018 | 340 |
| Nellore | 39 | 1243099 | 60860 | 44 | 892515 | 54398 |
| Gujarat | 14 | 368720 | 32025 | 14(1) | 383431 | 31083 |
| Bharuch | 11 | 336098 | 30152 | 10 (1) | 319668 | 27926 |
| Kachchh | - | - | - | 1 | 50656 | 608 |
| Sabarkantha | 1 | 3251 | 1138 | 1 | 6190 | 2167 |
| Surat | 1 | 5 | 1 | 1 | 30 | 4 |
| Surendranagar | 1 | 29366 | 734 | 1 | 6887 | 378 |
| Jharkhand | 1(1) | 120170 | 38772 | 1(1) | 100434 | 31819 |
| Sahibganj | 1(1) | 120170 | 38772 | 1(1) | 100434 | 31819 |
| Karnataka | 29 | 107266 | 12961 | 24 | 94402 | 12217 |
| Belgaum | 2 | 450 | 54 | 2 | 2525 | 233 |
| Dawangere | 1 | 1030 | 102 | 1 | 232 | 20 |
| Gulbarga | 3 | 13250 | 1193 | 3 | 13250 | 1193 |
| Haveri | 6 | 32860 | 2663 | 5 | 16967 | 2039 |
| Udupi | 12 | 35310 | 6184 | 9 | 47508 | 7250 |
| Uttar Kannad | 5 | 24366 | 2765 | 4 | 13920 | 1482 |
| Kerala | 8 | 46965 | 17112 | 8 | 32247 | 23568 |
| Alappuzha | 8 | 46965 | 17112 | 8 | 32247 | 23568 |
| Madhya Pradesh | 1 | 40 | 5 | - | - | - |
| Khargone | 1 | 40 | 5 | - | - | - |
| Maharashtra | 16 | 341866 | 92503 | 16 | 285760 | 53094 |
| Ratnagiri | 7 | 44561 | 10377 | 5 | 10844 | 2545 |
| Sindhudurg | 9 | 297305 | 82126 | 11 | 274916 | 50549 |
| Odisha | 1 | 7381 | 1845 | 1 | 2800 | 700 |
| Sundergarh | 1 | 7381 | 1845 | 1 | 2800 | 700 |
| Rajasthan | 9(4) | 398540 | 82051 | 10(2) | 328573 | 62578 |
| Alwar | 1 | 5245 | 839 | 1 | 5896 | 690 |
| Bharatpur | 5 | 41406 | 6225 | 4 | 89248 | 14284 |
| Bundi | 1 | 77288 | 28983 | 1 | 79979 | 28114 |
| Chittorgarh | (2) | 228680 | 38699 | 1(1) | 111600 | 13392 |
| Dausa | 1 | 19186 | 5276 | 1 | 14690 | 3342 |
| Bhilwara | (1) | 465 | 56 | - | - | - |
| Bikaner | (1) | 225 | 20 | 1(1) | 4030 | 790 |
| Sikar | 1 | 26045 | 1953 | 1 | 23130 | 1966 |
| Tamil Nadu | 4 | 12009 | 3396 | 4 | 6163 | 3445 |
| Kanchipuram | 3 | 3129 | 2508 | 3 | 2975 | 2648 |
| Villupuram | - | - | - | 1 | 3188 | 797 |
| Cuddalore | 1 | 8880 | 888 | - | - | - |
| Uttar Pradesh | 12 | 182067 | 23729 | 6 | 153369 | 24965 |
| Allahabad | 10 | 177551 | 23223 | 4 | 144487 | 23886 |
| Chitrakut | 2 | 4516 | 506 | 2 | 8882 | 1079 |

Figures in parentheses indicate number of associated mines with agate, ball clay & kaolin.

QUARTZ & OTHER SILICA MINERALS

**Table – 10 : Production of Silica Sand, 2007-08 to 2009-10
(By States)**

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

| State | 2007-08 | | 2008-09 | | 2009-10 (P) | |
|----------------|----------------|---------------|----------------|---------------|----------------|---------------|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| India | 4303513 | 507257 | 2832322 | 365719 | 2282712 | 298207 |
| Andhra Pradesh | 2373862 | 127740 | 1247298 | 61320 | 895533 | 54738 |
| Gujarat | 419098 | 42763 | 368720 | 32025 | 383431 | 31083 |
| Jharkhand | 111920 | 34886 | 120170 | 38772 | 100434 | 31819 |
| Karnataka | 91833 | 12382 | 107266 | 12961 | 94402 | 12217 |
| Kerala | 46685 | 17181 | 46965 | 17112 | 32247 | 23568 |
| Madhya Pradesh | 160 | 30 | 40 | 5 | – | – |
| Maharashtra | 513556 | 134180 | 341866 | 92503 | 285760 | 53094 |
| Odisha | 8106 | 2027 | 7381 | 1845 | 2800 | 700 |
| Rajasthan | 519120 | 81698 | 398540 | 82051 | 328573 | 62578 |
| Tamil Nadu | 36436 | 14910 | 12009 | 3396 | 6163 | 3445 |
| Uttar Pradesh | 182737 | 39460 | 182067 | 23729 | 153369 | 24965 |

**Table – 12 : Production of Silica Sand, 2008-09 and 2009-10 (P)
(By Frequency Groups)**

(Qty in tonnes)

| Production group | No. of mines | | Production for the group | | Percentage in total production | | Cumulative percentage | |
|-------------------|---------------|---------------|--------------------------|----------------|--------------------------------|---------------|-----------------------|---------|
| | 2008-09 | 2009-10 | 2008-09 | 2009-10 | 2008-09 | 2009-10 | 2008-09 | 2009-10 |
| All Groups | 138(5) | 133(4) | 2832322 | 2282712 | 100.00 | 100.00 | – | – |
| Up to 500 | 20(2) | 14 | 4520 | 3883 | 0.16 | 0.17 | 0.16 | 0.17 |
| 501 to 1000 | 5 | 10(1) | 4456 | 7978 | 0.16 | 0.35 | 0.32 | 0.52 |
| 1001 to 3000 | 18 | 26 | 37645 | 53498 | 1.33 | 2.34 | 1.65 | 2.86 |
| 3001 to 5000 | 13 | 12 | 52188 | 44264 | 1.84 | 1.94 | 3.49 | 4.80 |
| 5001 to 10000 | 40 | 26(1) | 279042 | 186460 | 9.85 | 8.17 | 13.34 | 12.97 |
| 10001 to 15000 | 7 | 12 | 85912 | 146877 | 3.03 | 6.43 | 16.37 | 19.40 |
| 15001 to 25000 | 8 | 13 | 148474 | 236964 | 5.24 | 10.38 | 21.61 | 29.78 |
| 25001 to 50000 | 13 | 5 | 448247 | 190774 | 15.83 | 8.36 | 37.44 | 38.14 |
| 50001 and Above | 14(3) | 15(2) | 1771838 | 1412014 | 62.56 | 61.86 | 100.00 | 100.00 |

**Table – 13 : Mine-head Stocks of Silica Sand, 2009-10 (P)
(By States)**

(In tonnes)

| State | At the beginning of the year | At the end of the year |
|---------------|------------------------------|------------------------|
| India | 1280474 | 3260430 |
| Gujarat | 339426 | 340487 |
| Jharkhand | 8638 | 17105 |
| Karnataka | 66013 | 69251 |
| Kerala | 20854 | 14111 |
| Maharashtra | 139135 | 297636 |
| Odisha | 2539 | 569 |
| Rajasthan | 150404 | 182681 |
| Tamil Nadu | 172 | 158 |
| Uttar Pradesh | 41098 | 71727 |

QUARTZ & OTHER SILICA MINERALS

QUARTZITE

Production of quartzite at 108 thousand tonnes in 2009-10 increased by 11% as compared to that of the previous year.

There were 14 reporting mines during the year as against 15 in the previous year. Besides, production of quartzite was reported by 3 associated mines in both the years. During the year under review five principal producers accounted for about 73% of the total production. Entire output of quartzite was reported from mines operated in the private sector.

Bihar was the leading producing state during the year under review contributing about 50% of total production which was followed by Odisha 27%, Jharkhand 8%, Karnataka 7%, Rajasthan 5% and Maharashtra contributed 2% of the total production. Nominal production was reported from Andhra Pradesh (Tables -14 to 16).

Mine-head stocks of quartzite at the end of the year 2009-10 were 25 thousand tonnes as against 32 thousand tonnes at the beginning at the year (Table 17).

The average daily employment of labourers during the year under review was 277 as against 282 in 2008-09. Domestic prices of quartzite are furnished in the General Review on Prices.

Table – 14 : Principal Producers of Quartzite 2009-10

| Name & address of producer | Location of mine | |
|--|------------------|----------------|
| | State | District |
| Khalsa Stone Works, Albert Road, Jamalpur, Munger, Bihar | Bihar | Munger |
| Janardan Singh Shitalpur P.O. Dariyapur, Dist. Munger, Bihar. | Bihar | Munger |
| Tata Refractories Ltd., At & P. O. Bhelpur, Dist. Jharsuguda-768 218, Odisha. | Odisha | Jharsuguda |
| Bharat Mining Company, 52, Khasmahal, Tatanagar-831 002, Jharkhand. | Jharkhand | Singhbhum East |
| OCL India Ltd, At & PO Rajgangpur-770017, Dist. Sundergarh Odisha. | Chhattisgarh | Raigarh |

Table – 15 : Production of Quartzite, 2007-08 to 2009-10 (By States)

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

| State | 2007-08 | | 2008-09 | | 2009-10 (P) | |
|----------------|--------------|--------------|--------------|--------------|---------------|--------------|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| India | 95850 | 37665 | 97458 | 31459 | 108079 | 31155 |
| Andhra Pradesh | 260 | 16 | 595 | 89 | 122 | 18 |
| Bihar | 22440 | 9604 | 33760 | 13027 | 53782 | 16162 |
| Chhattisgarh | 3278 | 3640 | 50 | 8 | – | – |
| Jharkhand | 14655 | 1466 | 2014 | 201 | 9117 | 1823 |
| Karnataka | 50 | 8 | 5500 | 1513 | 7537 | 1306 |
| Maharashtra | – | – | 1054 | 264 | 2481 | 620 |
| Odisha | 48027 | 15791 | 47451 | 13149 | 29613 | 10656 |
| Rajasthan | 7140 | 7140 | 7034 | 3208 | 5427 | 570 |

QUARTZ & OTHER SILICA MINERALS

**Table – 16: Production of Quartzite, 2008-09 and 2009-10
(By Sector/States/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 |
| India | 15(3) | 97458 | 31459 | 14(3) | 108079 | 31155 |
| Private Sector | 15(3) | 97458 | 31459 | 14(3) | 108079 | 31155 |
| Andhra Pradesh | 2 | 595 | 89 | 2 | 122 | 18 |
| Cuddapah | 2 | 595 | 89 | 2 | 122 | 18 |
| Bihar | 2 | 33760 | 13027 | 3 | 53782 | 16162 |
| Munger | 2 | 33760 | 13027 | 3 | 53782 | 16162 |
| Chhattisgarh | 1 | 50 | 8 | – | – | – |
| Rajnandgaon | 1 | 50 | 8 | – | – | – |
| Jharkhand | 1 | 2014 | 201 | 1 | 9117 | 1823 |
| Singhbhum (East) | 1 | 2014 | 201 | 1 | 9117 | 1823 |
| Karnataka | 1 | 5500 | 1513 | 2 | 7537 | 1306 |
| Belgaum | 1 | 5500 | 1513 | 2 | 7537 | 1306 |
| Maharashtra | (1) | 1054 | 264 | (1) | 2481 | 620 |
| Bhandara | (1) | 1054 | 264 | (1) | 2481 | 620 |
| Odisha | 7(2) | 47451 | 13149 | 5(2) | 29613 | 10656 |
| Jharsuguda | 2 | 19901 | 10159 | 2 | 23692 | 9968 |
| Keonjhar | (2) | 4600 | 781 | (2) | 1862 | 295 |
| Mayurbhanj | 3 | 16545 | 1477 | 2 | 3290 | 296 |
| Sonepur | 1 | 1605 | 300 | 1 | 769 | 97 |
| Sundergarh | 1 | 4800 | 432 | – | – | – |
| Rajasthan | 1 | 7034 | 3208 | 1 | 5427 | 570 |
| Sawai Madhopur | 1 | 7034 | 3208 | 1 | 5427 | 570 |

Figures in parantheses indicate associated mines of pyrophyllite and quartz.

**Table – 17 : Mine-head Stocks of Quartzite, 2009-10 (P)
(By States)**

(In tonnes)

| State | At the beginning of the year | At the end of the year |
|----------------|------------------------------|------------------------|
| India | 31525 | 24884 |
| Andhra Pradesh | 4250 | 4372 |
| Bihar | 2356 | 2794 |
| Chhattisgarh | 505 | 505 |
| Jharkhand | – | 1918 |
| Karnataka | 550 | 105 |
| Maharashtra | 41 | 237 |
| Odisha | 18018 | 9241 |
| Rajasthan | 5805 | 5712 |

QUARTZ & OTHER SILICA MINERALS

SAND (OTHERS)

The production of sand (others) at 2,159 thousand tonnes in 2009-10 increased by about 19% from that of the previous year.

There were twelve reporting mines in 2009-10 as against fifteen in the previous year. The Singareni Collieries Co. Ltd., having ten mines in Andhra Pradesh contributed 82 % of the total production of sand (others). The remaining 18% was from two mines of Western Coal Fields Ltd. located in Chandrapur district of Maharashtra. The entire production was reported by public sector in both the years (Tables - 18 to 20).

All mines were captive in nature and contract labourers were employed by the producers.

Mine-head stocks at the end of 2009-10 were 400 thousand tonnes as against 414 thousand tonnes at the beginning of the year (Table - 21).

Table – 18 : Producers of Sand (Others) 2009-10

| Name & address of producer | Location of mine | |
|--|------------------|------------|
| | State | District |
| Singareni Collieries Co. Ltd, P.O. Kothagudam Collieries, Bhadrachalam Road, Station S.C.Railway, Dist. Khammam-507 101, Andhra Pradesh. | Andhra Pradesh | Karimnagar |
| Western Coalfields Ltd, Sasti Colliery, P .O. Sasti, Dist. Chandrapur, Maharashtra. | Maharashtra | Chandrapur |

Table – 19 : Production of Sand (Others), 2007-08 to 2009-10 (By States)

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

| State | 2007-08 | | 2008-09 | | 2009-10 (P) | |
|----------------|----------------|--------------|----------------|---------------|----------------|---------------|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| India | 1804306 | 78991 | 1808185 | 106971 | 2159407 | 101976 |
| Andhra Pradesh | 1020844 | 33826 | 1338315 | 55406 | 1763497 | 75621 |
| Maharashtra | 783462 | 45165 | 469870 | 51565 | 395910 | 26355 |

Table – 20 : Production of Sand (Others), 2008-09 and 2009-10 (By Sector/States/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 |
| India | 15 | 1808185 | 106971 | 12 | 2159407 | 101976 |
| Public sector | 15 | 1808185 | 106971 | 12 | 2159407 | 101976 |
| Andhra Pradesh | 13 | 1338315 | 55406 | 10 | 1763497 | 75621 |
| Adilabad | 4 | 309559 | 15139 | 4 | 616904 | 28789 |
| Karimnagar | 8 | 1002143 | 39176 | 5 | 1135694 | 46283 |
| Vizianagaram | 1 | 26613 | 1091 | 1 | 10899 | 549 |
| Maharashtra | 2 | 469870 | 51565 | 2 | 395910 | 26355 |
| Chandrapur | 2 | 469870 | 51565 | 2 | 395910 | 26355 |

Table – 21 : Mine-head Stocks of Sand (Others), 2009-10 (P) (By States)

(In tonnes)

| State | At the beginning of the year | At the end of the year |
|----------------|------------------------------|------------------------|
| India | 413528 | 399644 |
| Andhra Pradesh | 358200 | 281015 |
| Maharashtra | 5328 | 118629 |

QUARTZ & OTHER SILICA MINERALS

AGATE

The production of agate was 11 tonnes in 2009-10 as compared to nil production during the preceding year. There was only a single private sector mine (Tables - 22 to 24).

Mine-head stocks of agate at the end of the year 2009-10 was 51 as against 40 tonnes reported at the beginning of the year (Table - 25).

The average daily employment of labourers was 6 in 2009-10 as against nil in the previous year.

Table – 22 : Producer of Agate 2009-10

| Name & address of producer | Location of mine | |
|---|------------------|----------|
| | State | District |
| Almiya I. Saiyad, 16, Vyapar Bhawan, Himmatnagar, Gujarat. | Gujarat | Bharuch |

**Table – 23 : Production of Agate, 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 |
| India | 25 | 14 | – | – | 11 | 6 |
| Gujarat | 25 | 14 | – | – | 11 | 6 |

**Table – 24 : Production of Agate, 2008-09 and 2009-10
(By Sector/State/District)**

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

| State/District | 2008-09 | | | 2009-10 (P) | | |
|----------------|--------------|----------|-------|--------------|-----------|----------|
| | No. of mines | Quantity | Value | No. of mines | Quantity | Value |
| India | – | – | – | 1 | 11 | 6 |
| Private sector | – | – | – | 1 | 11 | 6 |
| Gujarat | – | – | – | 1 | 11 | 6 |
| Bharuch | – | – | – | 1 | 11 | 6 |

**Table – 25 : Mine-head Stocks of Agate, 2009-10(P)
(By State)**

(In tonnes)

| State | At the beginning of the year | At the end of the year |
|--------------|------------------------------|------------------------|
| India | 40 | 51 |
| Gujarat | 40 | 51 |

QUARTZ & OTHER SILICA MINERALS

JASPER

No production of jasper was reported during 2009-10 as compared to 99 tonnes in the previous year. The only mine which reported production in 2008-09, wound up its operation due to lack of demand (Tables - 26 & 27).

The mine-head stock of jasper at the end of the year 2009-10 was nil as against 6 tonnes at the beginning of the year (Table - 28).

The average daily employment of labourers during the year was nil as against 10 during the preceding year.

**Table – 26 : Production of Jasper, 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 |
| India | – | – | 99 | 51 | – | – |
| Rajasthan | – | – | 99 | 51 | – | – |

**Table – 27 : Production of Jasper, 2008-09 and 2009-10
(By Sector/State/District)**

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

| State/District | 2008-09 | | | 2009-10 (P) | | |
|------------------|--------------|-----------|-----------|--------------|----------|-------|
| | No. of mines | Quantity | Value | No. of mines | Quantity | Value |
| India | 1 | 99 | 51 | – | – | – |
| Private sector | 1 | 99 | 51 | – | – | – |
| Rajasthan | 1 | 99 | 51 | – | – | – |
| Jadhpur | 1 | 99 | 51 | – | – | – |

**Table – 28 : Mine-head Stocks of Jasper, 2009-10(P)
(By State)**

(In tonnes)

| State | At the beginning of the year | At the end of the year |
|--------------|------------------------------|------------------------|
| India | 6 | – |
| Rajasthan | 6 | – |

MINING

Mining for silica minerals is carried out by manual opencast method. Quartz produced in the form of lump along with other associated minerals is invariably hammered to pieces and manually sorted before it is despatched to the consuming industries. It is sometimes crushed and marketed. Glass sand is generally screened and washed to remove all the deleterious constituents for its use in glass industry.

APMDC owns two crushing plants located at Mahaboobnagar district in Andhra Pradesh with crushing capacity of 45 tonnes and 1,000 tonnes a month, respectively. Besides, Maharashtra Minerals Corp. Ltd has a 50,000-tonnes per year beneficiation plant at Phondaghat in Sindhudurg district. The plant has advanced technology in washing both by water and chemicals and further grading it in required fractions.

HEALTH HAZARDS

Respirable silica is still a cause of major concern to miners and consumers since many minerals especially, industrial sand and gravel contain crystalline silica. There is a potential threat of workers getting subjected to "silicosis" in quartz, silica sand and gravel mines. Occupational safety measures & regulations to monitor the levels of crystalline silica in these mines are mandatory. In the USA, the Occupational Safety and Health Administration (OSHA) listed "crystalline silica" as one of their top five priorities for formulation of necessary rules. The OSHA, on the basis of significant information put out by International Agency for Research on Evaluation of Cancer, has declared that any material containing more than 0.1% crystalline silica should indicate its carcinogenic hazard.

USES

Quartz, quartzite and silica sand are used in various industries like glass, refractory, foundry, ceramic, cosmetic, electrical, abrasives, paints, etc.

The primary use of silica is in the manufacture of virtually all types of glasswares, ceramics and ceramic glazes. Other major uses are in metallurgy, (where silica is used as a refractory, foundry mould, fluxes and as a source of silicon for the production of silicon metal and ferro-silicon and other ferro-alloys), silicon carbide manufacture, chemical & construction sectors and as a natural abrasive. Known for its piezoelectric properties, high quality quartz crystal is used in electronic devices, multiple telephone lines, depth-sounding devices, range finders, chronometers, etc.

Sand is also used as a fireproofing material, for sandstowing in mines, soundproofing material and as a filler. Silica sand is also used to maintain or increase the permeability of oil and gas-bearing formations; its application as a filler in acid proof cements, putty, paints, epoxy & polyester resins is inevitable. Besides, it is widely used in horticulture, as a filtration medium, and for ornamental purposes as well. Silica flour is used as a filler in plastic and rubber products.

Flint and chert are used in abrasives and tube-mill lining. Besides, chert is used in crushed form as aggregate for concrete and road surfacing. Rounded pebbles of chalcedony are used as balls in ball mill for finer crushing and grinding feldspar, calcite and barytes. The different cryptocrystalline varieties of transparent and translucent chalcedony are valued as semiprecious stones and are carved out into a variety of ornaments and used for making different ornamental wares or articles of decoration. Agate pieces after cutting and polishing are sold as semiprecious stones. Big pieces are used in making mortars and pestles for laboratory use. Agate cut into requisite shapes is also used as fulcra of scientific balances and in making edges, planes and bearings of precision instruments.

INDUSTRY & SPECIFICATIONS

In India, quartz, quartzite and silica sand are used mainly in glass, foundry, ferro-alloys and refractory industries and also as building

QUARTZ & OTHER SILICA MINERALS

materials. According to its suitability for different purposes, it may be named as building sand, having sand, moulding or foundry sand, refractory sand or furnace sand, engine sand, filter sand, glass sand and grinding & polishing sand.

Glass

Glass industry is a delicensed industry. Main use of silica minerals is in the manufacture of different types of glasses, i.e. glass containers, bottles, amber glass containers, clear flint glass, vacuum bottles and other glasswares. It is reported that a large fraction of the requirement of float glass, container glass, glass fibre and glass tablewares is being produced by about 100 large-scale producers. Most of them are located in Gujarat, Mumbai, Kolkata, Bengaluru and Hyderabad. There are more than 600 medium and small cottage-scale industries. The production during 2008-09 and 2009-10 of bottle glassware was 904,124 tonnes and 896,636 tonnes, respectively. The status of glass industry is also discussed in the Review on 'Mineral-based Industries'.

The natural silica sand is the preferred material in glass industry, but in some cases where the glass plants are located far away from silica deposits, crushed quartz is also used. For use in glass industry, the silica sand must be uniform in chemical composition, size and shape of grains. Uniform grain size promotes even melting in the glass tank. The sand should not be coarser than 20 or 30 mesh and finer than 100 to 120 mesh. As a general rule, the grains should be angular rather than rounded, because angular grains melt more readily than the rounded ones.

For glass manufacturing, the silica sand should be fairly free from contaminations of clay materials, pebbles, etc. Silica sand usually contains iron oxide, calcium oxide, potassium oxide and sodium oxide in small amounts. Iron is the most objectionable impurity because it imparts colouration to the glass. The common permissible limits of iron oxide in silica sand for use in the

manufacture of different types of glass are as follows:

| Glass type | Fe ₂ O ₃ % |
|-------------------------------|----------------------------------|
| Optical glass | 0.005-0.008 |
| Flint or soda-lime glass | 0.02-0.05 |
| Plate glass | 0.1-0.2 |
| White bottles or window glass | 0.2-0.5 |
| Dark bottle glass | 0.5-0.7 |

Chromium compounds, alumina, lime and magnesia are the other deleterious impurities. Chromium compounds are undesirable because these compounds impart more colouration to the glass than iron. Alumina tends to decrease transparency and makes the batch more difficult to melt. The maximum quantity of alumina permissible in sand is 1.5 percent. The maximum permissible limit for lime and magnesia is about 0.05% and for alkalies it is 0.01% or less.

Ceramic

The Ceramic Industry in India is around 100 years old and ranks fifth in the world in terms of production of ceramic tiles. Ceramic industry comprises ceramic tiles, sanitaryware and crockeryware items. These products are manufactured both in large- and small-scale sectors. In organised sector, there were 16 units for ceramic tiles with an installed capacity of 2.1 million tonnes per year, 16 units for potteryware with 43,000 tpy and 7 units for sanitaryware with 1,43,000 tpy capacity in the country. The production during 2008-09 and 2009-10 of ceramic tiles was 332.9 and 340.0 million sq m, potteryware 66,324 and 72,956 tonnes and sanitaryware 399,514 and 431,475 tonnes, respectively (Table - 29).

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Table – 29 : Ceramic Industry

| Industry | Unit | 2008-09 | | 2009-10 | |
|---------------|--------------|------------------------|------------|------------------------|------------|
| | | No. of Units | Production | No. of Units | Production |
| Ceramic Tiles | million sq m | 16 + 200 SSI Units | 332.90 | 16 +200 SSI Units | 340.0 |
| Potteryware | tonnes | 16 + 1200 SSI Units | 66324 | 16 + 1400 SSI Units | 72956 |
| Sanitaryware | tonnes | 7 + 200 SSI Units | 399514 | 7 + 210 SSI Units | 431475 |

Source: Ministry of Commerce & Industry, Department of Industrial Policy & Promotion, Annual Report, 2009-10 and 2010-11.

In the small-scale sector, there were over 210 units of sanitaryware with capacity of 53,000 tpy and over 1400 plants of potteryware with a capacity of 3 lakh tpy.

Ceramic whiteware contains about 40% silica, besides other constituents except for bone china in which it is not used at all. The silica serves to provide whiteness, renders the ceramic body to dry easily and provides compatibility between the body and the glass to prevent crazing or peeling. Main source of silica for this application is silica sand. In addition, silica flour is used in formulation of ceramic body for enamels and frits. Silica flour produced by fine grinding of quartzite, sandstone or lump quartz is used in enamels. The silica flour normally contains more than 97.5% SiO₂, less than 0.55% Al₂O₃ and less than 0.2% Fe₂O₃. Purity and small particle size (BS mesh-200) are fundamentally important for silica in manufacture of ceramics.

Foundry

The Indian foundry industry is the largest in the world. This industry is well established in the country and is spread across a wide spectrum consisting of large, medium, small and tiny sector. A special feature of domestic foundry industry is its geographical clustering i.e. Coimbatore cluster is famous for pump sets castings, Kolhapur and Belgaum cluster for automotive castings, Rajkot cluster for diesel engine castings and Batala and Jalandhar cluster for machinery parts and agriculture implements.

A large number of foundries in both ferrous and non-ferrous sectors are functioning in the organised sector in the country. Most of the foundry units use moulding sand having 40 to 65 A.F.S. (American Foundrymen's Society) numbers.

Silica sand is used in both foundry cores and moulds because of its resistance to thermal shock. Silica content of 85% is used in iron casting. In steel foundries, silica content should be at least 95 percent.

Natural moulding sand contains variable amount of clay which acts as a bond between the sand grains. These sands, therefore, possess strength, plasticity and refractoriness to varying extent depending upon the clay minerals present. When it contains more clay, it is blended with river sand, which is relatively clay-free so as to get the optimum properties desired in the sand mixture.

Washed grains shall be mostly sub-angular to rounded shape. As far as possible, the sand shall be free from gravel. As per IS:3343-1965, natural moulding sand for use in foundries shall be of three main grades, namely, A, B and C with respect to clay content.

| Grade | Clay (%) |
|-------|----------|
| A | 5 to 10 |
| B | 10 to 15 |
| C | 15 to 20 |

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Refractoriness of the natural moulding sand based on sintering temperature range should be as follows:

Grade A - 1350 to 1450 °C

Grade B - 1200 to 1350 °C

Grade C - 1100 to 1200 °C

Washed sand grains are required to be sub-angular to rounded shape.

Silica flour is particularly used in the steel foundry in dressing for moulds and cores and also as essential ingredient in the moulding sand mixtures. It is also used to obtain elevated temperature strength, high density and resistance to metal penetration in cores. Silica flour is produced by crushing, washing and grading high-grade quartz/quartzite rocks or white silica sand or other deposits sufficiently pure to get the desired material.

Refractory

Quartz and quartzite are used in the manufacture of refractory silica bricks. However, recently these bricks are being replaced by basic linings of magnesite, dolomite or natural types such as bauxite, etc. in LD basic oxygen and electric furnaces. Silica reacts readily with basic slag and is therefore unsuitable in the basic steel making process. Nevertheless, silica bricks continue to be used in coke ovens, ceramic kilns, glass tank crowns and as blast furnace chequers in some steel mills. Silica bricks have excellent load resistance capacity at high temperature. For the manufacture of refractory bricks, silica mineral should be free from aluminosilicates (felspar, mica, etc.), as aluminosilicates adversely affect refractoriness of the bricks. Silica rock (raw material) should be hard, having high bulk density and low porosity.

Fluxes

Massive quartz, quartzite, sandstone and unconsolidated sands are the main sources of silica that get used as flux in smelting base metal ores where iron and basic oxides are slagged as

silicates. Silica is also used to balance the lime and silica ratio of the blast furnace mix. The silica content for this purpose must be as high as 90% with minor amounts of impurities like iron and alumina up to 1.5% maximum.

Ferro-silicon and Other Alloys

Ferro-silicon contains about 75-90% silicon and minor amounts of iron, carbon, etc. It is estimated that for the manufacture of one tonne ferro-silicon of 70-75% grade, about 1.78 tonnes quartz is required besides other raw materials like coke, iron scrap, etc. Quartz is the major source of silica in the manufacture of ferro-silicon. Occasionally, quartzite is also used. However, use of quartzite is restricted as it contains higher alumina and iron and more likely that it would break down in the furnace. Lump silica in the size range from 3/4 to 5 inches are generally preferred. Ferro-silicon is produced by smelting a mixture of quartz, metallic iron (steel scrap and turnings) and a reducing agent like coke, charcoal or wood chips.

Quartz suitable for ferro-silicon production should have more than 98% SiO_2 , less than 0.4% Al_2O_3 and not more than 0.2% each of Fe_2O_3 , CaO and MgO . Phosphorus or arsenic should not be present in quartz. If Al_2O_3 is more than the prescribed limit, it affects reduction in the electric furnace. Alkali has a tendency to promote a sticky slag which contaminates the products. If higher iron (more than 0.3%) is present in quartz, the fusion in the furnace takes place at lower temperature and affects reduction process. Another important factor is that quartz should have good thermal stability at 1200 °C or more.

As per Indian Ferro Alloys Producers' Association, 35 units having a capacity of 205,750 tpy were established for the production of ferro-silicon. However, presently only 20 units are in operation with a total capacity of 145 thousand tpy. The production of ferro-silicon was estimated at around 1,01,917 tonnes in 2009-10. List of principal producers of ferro-silicon is furnished in Table - 30.

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Silico-manganese, a combination of 60-70% manganese, 10-20% silicon and 20% carbon, substitutes low carbon ferro-manganese in steel industry. The production of silico-manganese including medium and low carbon silico-manganese was estimated at 1,099,838 tonnes in 2009-10. The details of silicon ferro-alloys are also discussed in the review on 'Ferro-Alloys'.

Silicon Metal

A high purity quartz containing about 99.80% SiO₂, without any other contaminant,

is used in the production of silicon metal. The production of silicon metal is similar to that for ferro-silicon except that no iron is added. The alumina and iron contents are specified to be below 0.1% each with calcium and phosphorus contents each restricted to 0.005 percent. For production of one tonne of silicon metal, about 2.6 tonnes silica is consumed. Specifications of silica minerals to be used in different industries are given in Tables - 31 to 33.

Table – 30 : Principal Producers of Ferro-silicon

| Name of the plant | Installed capacity (tpy) |
|---|--------------------------|
| Ferro Alloys Corp. Ltd, (Ferro Alloys Division), Vizianagaram, Andhra Pradesh. | 72500 (Total) |
| Navbharat Ferro-alloys Ltd, Paloncha, Dist. Khammam, Andhra Pradesh. | 9300 |
| VBC Ferro Alloys Ltd, Medak, Andhra Pradesh. | 19000 |
| GMR Technologies & Ind. Ltd, Ravivalasa, Dist. Srikakulam, Andhra Pradesh. | 25000 (Total) |
| Akshay Ispat & Ferro Alloys Ltd, Namchi Distt., South Sikkim, Sikkim. | 6000 |
| Hindustan Malleables & Forgings Ltd, Dhanbad, Jharkhand. | 1800 |
| Anjaney Ferro-alloys Ltd, Mihijam, Dist. Dumka, Jharkhand. | NA |

(Contd.)

(Table - 30 Concltd.)

| Name of the plant | Installed capacity (tpy) |
|---|--------------------------|
| Sandur Manganese & Iron Ore Ltd, Vyasankere, Bellary, Karnataka. (closed) | 24000 |
| Sri Laxmi Electro Smelters (Pvt.) Ltd, Erumathala, Aluva, Kerala. | NA |
| Indsil Electrosmelts Ltd, Pallabhari, Dist. Pallakad, Kerala. | NA |
| Indian Metals & Ferro Alloys Ltd, Therubali, Dist. Cuttack, Odisha. | 53000 |
| The Silical Metallurgic Ltd, Puducherry. | 10560 |
| Snam Alloys Ltd, Village Kariamanickam, Puducherry. | 12000 |
| V.S.K. Ferro-alloys Ltd, Thuthipet, Puducherry. | 3000 |
| Hindustan ferro-Alloys, Hamirpur, Uttar Pradesh. | 3200 |

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Table – 31 : BIS Specifications of Silica Minerals for various Industries

| Industry | Mineral consumed | BIS No. | Physical specifications | Grade | Chemical Specifications | | | | | | Remarks | |
|-----------|---------------------------|---|---|-------------|-------------------------|------------------------------------|------------------------------------|-----------|---------|----------------------|---|---|
| | | | | | SiO ₂ (%) | Al ₂ O ₃ (%) | Fe ₂ O ₃ (%) | CaO (%) | MgO (%) | TiO ₂ (%) | | P (%) |
| Glass | Silica sand | IS: 488 - 1980 (Second Revision; Reaffirmed 1998) | - | Special Gr. | 99 | 0.020 (min) | - | - | - | 0.10 | - | For manufacturing high-grade colourless glass, viz, crystal glass, tableware and decoratedware. |
| | | | | Gr. I | 98.0 (min) | 0.04 (max) | - | - | - | 0.10 (max) | - | For manufacturing decolourised glassware, viz, containerware, lampware, etc. |
| | | | | Gr. II | 97.5 (min) | 0.07 (max) | - | - | - | 0.10 (max) | - | For manufacturing glassware where slight tint is permissible. |
| | | | | Gr. III | 97% (max) | 0.2 (max) | - | - | - | - | - | For manufacturing of decolourised and some coloured glasses. |
| Foundry | Silica flour | IS:3339 - 1975 (First Revision; Reaffirmed 2003) | - | - | 98.0 (min) | - | - | - | - | - | 100% silica flour should pass through 150-micron I.S. sieve and atleast 95% through 75-micron sieve. The fusion temperature should be >1700 °C. | |
| Ceramic | Quartz | IS:11464 - 1985 (Reaffirmed 2001) | - | Gr. I | 98.0 (min) | 1.0 (max) | 0.25 (max) | 0.5 (max) | - | 0.10 (max) | - | Suitable for white opaque, transparent glaze & whiteware body. |
| | | | | Gr. II | 96.0 (min) | 2.0 (max) | 1.0 (max) | 1.0 (max) | - | 1.0 (max) | - | |
| Iron (BF) | Quartzite | IS:13676 - 1993 (Reaffirmed 2003) | Lumpy, Hard, Non-friable of size -150 to +10 mm | - | 96-98 | 2-4 | - | - | - | - | - | After prescribed thermal stability test on -25+19 mm material, +19 mm fraction should be more than 55% and -5 mm fraction should be less than 5%. |
| | Banded Hematite Quartzite | -do- | -do- | - | 48-50 | 1.0 (max) | 50-52 (Fe) | - | - | - | - | After prescribed tumbling test on +5 mm material, +5 mm fraction should be more than 90%. |

Note: In addition, BIS has prescribed following specifications: - silica for paint industry (IS : 67 - 1998; Second Revision; Reaffirmed 2002), High-silica sand for use in foundries (IS : 1987-2002; Second Revision), Quartz quartzite for production of ferro-alloys (IS : 13054-1991; Reaffirmed 2003).

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Table – 32 : General Industrial Specifications of Silica (International)

| End-use | Minimum SiO ₂ (%) | Maximum Al ₂ O ₃ (%) | Maximum Fe ₂ O ₃ (%) | Minimum CaO/MgO(%) | Grain size | Remarks |
|------------------------------|---------------------------------|---|---|-----------------------|----------------|---|
| Glass sand | 99.5 | Variable | 0.008 | – | 0.1-0.5 mm | Must have less than 6 ppm chromium, 2 ppm cobalt and 0.01-0.05% TiO ₂ . Grain size and purity need to be constant. |
| Optical | | | | | | |
| Colourless | | | | | | |
| domestic | 99.5 | 0.1-0.5 | 0.013 | – | – | – |
| container/flat | 98.5 | | 0.030 | | | |
| Foundry sand | 88-99 | Extremely variable | – | – | 20-200 mesh | Chemical composition variable, 98-99% SiO ₂ is preferred. Sub-angular to rounded grains. |
| Silicon carbide | 99.5 | 0.06-0.25 | 0.1 | Absent | 100 mesh | No phosphorus is allowed. Maximum 0.25% Al ₂ O ₃ . |
| Silica flour | 97-98 | 0.5 | 0.2 | – | Micron | – |
| Silicon | 98.0 | 0.4 | – | 0.2 each | 25 mm diameter | No arsenic/phosphorus allowed. |
| Ferro-silicon | 96.0 | 0.4 | 0.2 | – | 25 mm diameter | 0.1% P maximum. |
| Silica brick (refractory) | 96-98 | 0.1 | Low | – | 8 mesh | – |
| Sodium silicate | 99 | 0.25 | 0.02 | 0.05 | 20-100 mesh | Same as glass grade. |
| Silica flux | 90 | 1.5 | 1.5 | 0.2 | 5-6 mm | |

Source : Industrial Minerals.

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Table – 33 : Specifications of Silica Minerals by User Industries

| Mineral consumed | Industry | Physical property | SiO ₂ (%) | Al ₂ O ₃ (%) | Fe ₂ O ₃ (%) | Combined CaO/MgO (%) | Remarks |
|-------------------------------------|--|--|-------------------------------|------------------------------------|------------------------------------|----------------------|--|
| Silica sand or powder | Sodium & potassium silicate | 20 to 100 mesh | 99 | Less than 0.25 | 0.03 | 0.05 | Combined CaO/MgO content of 0.85% with sodium carbonate at 1200-1400 °C. The ratio of Na ₂ CO ₃ to SiO ₂ can be varied to obtain a wide range of products. Potassium silicate can be manufactured with silica minerals by using potassium carbonate in place of sodium carbonate. |
| Quartz | Ferro-silicon | - | 98 | Less than 0.4 | 0.2 | 0.4 | No phosphorus/arsenic should be present in quartz. Al ₂ O ₃ should not be more than prescribed limits. Quartz should have good thermal stability at 1200 °C or more. |
| Quartzite | Refractory (Product: acid silica bricks) | Medium, fine-grained, compact crypto-crystalline, granular texture homogeneous | Gr. I +98 Gr. II +96 | Less than 0.75 to Less than 1 | Less than 0.75 to Less than 1 | - | High silica is essential with least possible Al ₂ O ₃ and that is free from iron bands and pyrite spots. |
| Quartzite | Iron & steel | Chips 10 to 80 mm | 94 (min) | 1 (max) | - | - | The quartzite is added to the blast furnace charge to correct silica to alumina ratio. Some steel plants use banded haematite quartzite in place of quartzite. |
| Silica sand/sand/ crushed sandstone | Cement | - | 65-98 | 3.58 to 10 | 0.5 to 0.6 | 1-1.5 | In Cement Industry, silica sand or crushed sandstone is used as additive to make for the silica deficiency in the raw mill. Indian Standard Specification for Standard sand for testing cement is IS : 650-1966. |
| Silica sand | Fertilizer | 18 to 100 mesh | 80 (min) 1% moisture (max) | - | - | - | Silica sand is used in Fertilizer Industry as a filler to balance the fertilizer grades. There is no rigid specifications in this Industry. In some cases, river sand is used. |

(Contd.)

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Table - 33 (Concl.)

| Mineral consumed | Industry | Physical property | SiO ₂ (%) | Al ₂ O ₃ (%) | Fe ₂ O ₃ (%) | Combined CaO/MgO (%) | Remarks |
|-------------------------------|-----------------------------------|--------------------------------------|----------------------|------------------------------------|------------------------------------|--|--|
| Quartz | Ceramic | - | 97-99.9 | 0.1 to 2 | 0.05-1 | - | Quartz is used in Ceramic Industry to reduce shrinkage while drying & firing and to impart rigidity to the body. Iron is the most deleterious constituent and it should be as less as possible. Mostly high silica quartz with low iron content is used in Ceramic Industry. |
| Silica sand & quartz | Silicon carbide & other abrasives | - | 99% | 0.1 | (-) 0.1 | - | It should not contain lime, magnesia and phosphorus. Quartz is also used for the manufacture of sandpaper. Flint is used with silica 99% and low iron as far as possible. For abrasives, size frequency distribution is very important. |
| Quartz | Chemical | - | + 96 | - | - | - | Quartz is used in the manufacture of phosphorus pentasulphide. Silica sand having 99% SiO ₂ and free from iron is used in the manufacture of ultramarine blue. |
| Silica powder | Asbestos products | - | + 97.5 | - | - | 1.5/0.8 (CaO) (R ₂ O ₃) | Silica powder is used as one of the constituents in the manufacture of asbestos-cement sheets/pipes. |
| Silica sand | Insecticide | - | +95 | - | - | - | Silica sand is used as a carrier in the Insecticide Industry. Specification is not that very rigid. |
| Silica sand and quartz powder | Electrode | 100 - 200 mesh | 97.5-99.5 | - | - | 5.2 (max) | Silica sand or quartz powder is used as one of the components of welding flux mixture in Electrode Industry. Sulphur should be 0.03% max. |
| Silica sand | Coal washery | 30 - 100 mesh | - | - | - | - | In coal washeries, silica sand is used as one of the ingredients in the flotation process of coal. Sand having constant density of more than 2.64 is used. Clay content is limited to 0.5%. |
| Quartz powder | Paint | Crystalline and amorphous dry powder | - | - | - | - | Specifications are stipulated by BIS vide IS:67-1998; Second Revision, Reaffirmed 2002. |

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CONSUMPTION

The consumption of quartz and silica sand was estimated at 1.45 million tonnes in 2009-10. Major consuming industries were glass (39%), cement (19%), ferro-alloys (15%), foundry (9%) and fertilizer (7%). Other industries like iron & steel, ceramic, alloy steel, insecticide, refractory, abrasive, etc. consumed the remaining 11%.

The consumption of quartzite was estimated around 279 thousand tonnes out of which iron and steel industry consumed about 54%, followed by refractory & ferro-alloys (19% each) and cement (6%).

The estimated consumption of moulding sand in 2009-10 was 59,900 tonnes. Major consuming industries were foundry (91%), followed by mining machinery (7%) and iron & steel (2%).

The total ferro-silicon consumed by various industries in 2009-10 was estimated at 44,600 tonnes. Major consuming industries were iron & steel (83%), alloy steel (11%) and foundry (5%). Besides, reported consumption of ferro-silico-magnesium was 14 tonnes in foundry industry in 2009-10 (Tables - 34 to 38).

POLICY

Foreign Trade Policy (FTP) for 2009-2014 was notified and made effective from 27.8.2009.

The amended Export and Import Policy incorporated in the FTP freely allows the import of quartz and quartzite lumps and powder as also silica sands and quartz sands. However, the exports of silica sands and quartz sands are restricted and permitted under licence. The export of river sand to Maldives is permitted, subject to 'No Objection Certificate' by CAPEXCIL within the annual ceiling of 1,077,686 tonnes for 2009-10.

SUBSTITUTION

In order to reduce the potential threat of "silicosis," a variety of materials are used as substitutes for silica. Basic and neutral refractories (including magnesite, mag-chrome, dolomite and high alumina bricks) have replaced silica in a large number of applications. Chromite, olivine and zircon are alternatives to foundry sands. Garnet and to a lesser extent, olivine are used in sand blasting to avoid the risk of silicosis. Wollastonite is more favoured than free silicon for use in the ceramic industry, again due to the risk of silicosis. In electronic industry, replacement of natural quartz crystal by cultured quartz crystal is increasing steadily.

**Table – 34 : Reported Consumption of Quartz/Silica Sand, 2007-08 to 2009-10
(By Industries)**

| Industry | 2007-08 | 2008-09 (R) | 2009-10(P) |
|--|----------------|----------------|----------------|
| All Industries | 1461900 | 1457600 | 1449800 |
| Alloy steel | 14500 (10) | 14500 (10) | 14500 (10) |
| Cement | 283400 (14) | 280500 (14) | 274400 (15) |
| Ceramic | 70500 (38) | 71500 (38) | 75000 (41) |
| Ferro-alloys | 236200 (30) | 218400 (33) | 214200 (33) |
| Fertilizer | 105800 (4) | 105800 (4) | 105800 (4) |
| Foundry | 136600 (32) | 129900 (32) | 133500 (32) |
| Glass | 552000 (52) | 574900 (52) | 569500 (52) |
| Iron & steel | 13500 (1) | 13500 (1) | 13500 (1) |
| Others (Abrasive, asbestos, chemical, dry cell battery, electrical, paint, pesticide, refractory and rubber) | 49400 (74) | 48600 (75) | 49400 (76) |

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

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

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

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**Table – 35 : Reported Consumption of Quartzite 2007-08 to 2009-10
(By Industries)**

| (In tonnes) | | | |
|------------------------------|---------------|---------------|---------------|
| Industry | 2007-08 (R) | 2008-09 (R) | 2009-10(P) |
| All Industries | 258900 | 273700 | 278800 |
| Cement | 9800 (2) | 17600 (2) | 17600 (2) |
| Ferro-alloys | 45800 (9) | 50300 (11) | 53600 (11) |
| Foundry | 800 (4) | 800 (4) | 800 (5) |
| Iron & steel | 144400 (17) | 148600 (20) | 150500 (20) |
| Pelletisation (Iron & Steel) | 5600 (1) | 2400 (1) | 2400 (1) |
| Refractory | 52500 (13) | 53900 (13) | 53900 (13) |
| Sponge Iron | – | 100 (1) | 100 (1) |

Figures rounded off. Data collected on non-statutory basis.
Figures in parentheses denote the number of units in organised sector reporting* consumption.
(*Includes actual reported consumption and/or estimates made wherever required).

**Table – 36 : Reported Consumption of Moulding Sand, 2007-08 to 2009-10
(By Industries)**

| (In tonnes) | | | |
|--------------------------|--------------|--------------|--------------|
| Industry | 2007-08 (R) | 2008-09 (R) | 2009-10(P) |
| All Industries | 59900 | 59900 | 59900 |
| Foundry | 54300 (15) | 54300 (15) | 54300 (15) |
| Iron & steel | 1400 (4) | 1400 (4) | 1400 (4) |
| Mining machinery | 4100 (3) | 4100 (3) | 4100 (3) |
| Others (Sugar & Textile) | 100 (7) | 100 (7) | 100 (7) |

Figures rounded off. Data collected on non-statutory basis.
Figures in parentheses denote the number of units in organised sector reporting* consumption.
(*Includes actual reported consumption and/or estimates made wherever required).

**Table – 37 : Reported Consumption of Ferro-silicon, 2007-08 to 2009-10
(By Industries)**

| (In tonnes) | | | |
|-----------------------|--------------|--------------|--------------|
| Industry | 2007-08 | 2008-09 (R) | 2009-10(P) |
| All Industries | 46300 | 43000 | 44600 |
| Alloy steel | 4700 (12) | 4700 (12) | 4700 (12) |
| Electrode | ++ (6) | ++ (6) | ++ (6) |
| Ferro-alloys | 100 (1) | 100 (1) | 100 (1) |
| Foundry | 2200 (27) | 2100 (27) | 2100 (27) |
| Iron & steel | 37800 (13) | 35100 (13) | 36900 (13) |
| Sponge iron | 1500 (2) | 1000 (5) | 800 (5) |

Figures rounded off. Data collected on non-statutory basis.
Figures in parentheses denote the number of units in organised sector reporting consumption.
(*Includes actual reported consumption and/or estimates made wherever required).

**Table – 38 : Reported Consumption of Ferro-silicon-magnesium, 2007-08 to 2009-10
(By Industries)**

| (In tonnes) | | | |
|-----------------------|-----------|-------------|------------|
| Industry | 2007-08 | 2008-09 (R) | 2009-10(P) |
| All Industries | 23 | 14 | 14 |
| Foundry | 23 (3) | 14 (3) | 14 (3) |

Figures rounded off. Data collected on non-statutory basis.
Figures in parentheses denote the number of units in organised sector reporting* consumption.
(*Includes actual reported consumption and/or estimates made wherever required).

WORLD REVIEW

Basically, silica is abundant in the earth's crust. Sand and gravel reserves of the world are large. Quartz-rich sand and sandstone are the main sources of industrial silica sand which occurs throughout the world. Reserves of natural quartz crystal suitable for electronics or optical use in the world are limited. The world's dependence on these reserves will continue to decline because of the increased usage of cultured quartz crystal as an alternate material. Electronic applications accounted for the most industrial uses of quartz crystal, followed by optical application.

All quartz crystals used for electronics were cultured. The world production of industrial silica sand and gravel by principal countries is given in Table - 39.

Table – 39: World Production of Sand and Gravel (Industrial), 2007 to 2009 (By Principal Countries)

| Country | (In '000 tonnes) | | |
|-------------------------------|---------------------|---------------------|---------------------|
| | 2007 ^(e) | 2008 ^(e) | 2009 ^(e) |
| World: Total (rounded) | 126000 | 121000 | 112000 |
| Australia | 5300 | 5300 | 5300 |
| Austria | 6800 | 2000 | 1500 |
| Belgium | 1800 | 1800 | 1800 |
| Bulgaria | 1500 | 1500 | 1500 |
| Canada | 1900 | 1990 | 2000 |
| Chile | 1200 | 1400 | 600 |
| Czech Republic | 1000 | 1000 | 1900 |
| France | 5000 | 5000 | 5000 |
| Gambia | 1400 | 1400 | 1400 |
| Germany | 7700 | 8190 | 6500 |
| Hungary | 3800 | 3800 | 300 |
| India | 1600 | 1700 | 1700 |
| Iran | 2000 | 2000 | 2000 |
| Italy | 14000 | 13800 | 14000 |
| Japan | 4300 | 4500 | 4500 |
| Korea Rep of | 2200 | 2000 | 2000 |
| Mexico | 2700 | 2780 | 2800 |
| Norway | 1500 | 1500 | 1500 |
| Poland | 4000 | 4000 | 5300 |
| Slovakia | 2000 | 2000 | 2000 |
| South Africa | 3300 | 3650 | 2900 |
| Spain | 5000 | 5000 | 5000 |
| Turkey | 1200 | 1200 | 1200 |
| UK | 5600 | 5600 | 5600 |
| USA | 30000 | 30400 | 27400 |
| Other countries (rounded) | 9200 | 7500 | 6200 |

Source: Mineral Commodity Summaries, 2009 & 2010.

FOREIGN TRADE

Exports

Exports of quartz and quartzite (natural) increased to 256,421 tonnes in 2009-10 from 185,306 tonnes in the previous year. Out of total exports, quartz comprised 202,138 tonnes (79%) and quartzite 54,283 tonnes (21%). Exports were mainly to Japan (16%), Bhutan (14%), and UAE, Malaysia & Bangladesh (13% each). Exports of silica sand decreased to 7,478 tonnes in 2009-10 from 17,164 tonnes in 2008-09. Exports were mainly to Maldives (53%), Nepal (12%), Japan (6%) and UAE (5%). Exports of sand (excluding metal bearing) decreased substantially to 26,932 tonnes in 2009-10 from 469,008 tonnes in the previous year. Exports were mainly to Maldives (49%), China (25%) and Bhutan (12%). Exports of agate (uncut) registered an upward trend with 39,090 tonnes in 2009-10 as against 24,540 tonnes recorded in the previous year. USA (49%) and Australia (48%) were the main buyers in 2009-10. Exports of agate (cut) decreased to 125 thousand carats in 2009-10 from 630 thousand carats in the previous year. Exports of flint increased to 940 tonnes in 2009-10 from 693 tonnes in 2008-09. Exports of silicon increased to 536 tonnes in 2009-10 from 289 in the previous year. Exports were mainly to Saudi Arabia and Kenya, (Tables - 40 to 48).

Imports

Imports of quartz and quartzite (natural) were 823 tonnes in 2009-10 as compared to 326 tonnes in 2008-09. Out of the total imports in 2009-10, those of quartz were 486 tonnes and mainly from China, Germany and Spain, while quartzite imports reported were 337 tonnes as compared 41 tonnes the preceding year. The imports were mainly from Sri Lanka. Imports of silica sand increased to 15,384 tonnes in 2009-10 from 10,240 tonnes in the previous year. Bhutan, Italy, Singapore and Germany were the main suppliers. Imports of sand (excluding metal bearing) sharply decreased to 493 thousand tonnes in 2009-10 from 1,041 thousand tonnes in 2008-09. Imports were almost entirely from Nepal. Imports of flint decreased to 862 tonnes in 2009-10 as compared to 1,309 tonnes in the previous year. Nepal and China were the main suppliers. Imports of agate (uncut) were 39 tonnes in 2009-10 as compared to

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42 tonnes in 2008-09. Imports were mainly from Madagascar and China. Imports of agate (cut) were nominal in 2009-10, mainly from USA. Imports

of silicon were 24,245 tonnes as compared to 19,998 tonnes in 2008-09, mostly from China (Tables - 47 to 55).

Table – 40 : Exports of Quartz and Quartzite (Natural) : Total (By Countries)

| Country | 2008-09 | | 2009-10 | |
|----------------------|---------------|-----------------|---------------|-----------------|
| | Qty (t) | Value (Rs.'000) | Qty (t) | Value (Rs.'000) |
| All Countries | 185306 | 859700 | 256421 | 1092657 |
| Japan | 26850 | 175492 | 41782 | 336939 |
| Vietnam | 11029 | 72282 | 15638 | 118830 |
| UAE | 38896 | 115687 | 33694 | 92392 |
| Malaysia | 3449 | 24306 | 32828 | 90498 |
| Bangladesh | 30065 | 64724 | 32500 | 75194 |
| Italy | 11280 | 77065 | 8245 | 65099 |
| Bhutan | 9065 | 11021 | 35749 | 40828 |
| Germany | 2860 | 15080 | 5336 | 32365 |
| Israel | 10268 | 57181 | 5226 | 27154 |
| Oman | 6938 | 43122 | 5050 | 20418 |
| Other countries | 34606 | 203740 | 40373 | 192940 |

Table – 42 : Exports of Quartz (Natural) (By Countries)

| Country | 2008-09 | | 2009-10 | |
|----------------------|---------------|-----------------|---------------|-----------------|
| | Qty (t) | Value (Rs.'000) | Qty (t) | Value (Rs.'000) |
| All Countries | 148661 | 629584 | 202138 | 831203 |
| Japan | 18851 | 131568 | 34069 | 295857 |
| UAE | 38761 | 114768 | 33659 | 92185 |
| Malaysia | 3156 | 22441 | 32704 | 90202 |
| Bangladesh | 28973 | 62003 | 29140 | 66037 |
| Vietnam | 7573 | 45827 | 6141 | 49106 |
| Korea, Rep. of | 942 | 6078 | 3976 | 29511 |
| Germany | 2399 | 13134 | 3584 | 28103 |
| Bhutan | 6694 | 7680 | 22464 | 26818 |
| Oman | 6533 | 41020 | 4582 | 18112 |
| Iran | 3758 | 29055 | 1133 | 8159 |
| Other countries | 31021 | 156010 | 30686 | 127113 |

Table – 41 : Exports of Quartzite (Natural) (By Countries)

| Country | 2008-09 | | 2009-10 | |
|----------------------|--------------|-----------------|--------------|-----------------|
| | Qty (t) | Value (Rs.'000) | Qty (t) | Value (Rs.'000) |
| All Countries | 36645 | 230116 | 54283 | 261454 |
| Vietnam | 3456 | 26455 | 9497 | 69724 |
| Italy | 9091 | 63904 | 6608 | 52268 |
| Japan | 7999 | 43924 | 7713 | 41082 |
| Israel | 4851 | 38153 | 2229 | 15354 |
| Bhutan | 2371 | 3341 | 13285 | 14010 |
| Thailand | 43 | 1177 | 1727 | 11569 |
| Bangladesh | 1092 | 2721 | 3360 | 9157 |
| Germany | 461 | 1946 | 1752 | 4262 |
| Iran | 816 | 6738 | 384 | 3207 |
| New Zealand | 637 | 5180 | 330 | 2606 |
| Other countries | 5828 | 36577 | 7398 | 38215 |

Table – 43 : Exports of Silica Sand (By Countries)

| Country | 2008-09 | | 2009-10 | |
|----------------------|--------------|-----------------|-------------|-----------------|
| | Qty (t) | Value (Rs.'000) | Qty (t) | Value (Rs.'000) |
| All Countries | 17164 | 182087 | 7478 | 30073 |
| Japan | 5910 | 83201 | 421 | 7664 |
| Thailand | 20 | 374 | 220 | 4105 |
| Maldives | 7 | 224 | 4000 | 3481 |
| UAE | 581 | 9625 | 391 | 3024 |
| Nepal | 1370 | 7164 | 928 | 2001 |
| Saudi Arabia | 328 | 3169 | 106 | 719 |
| Vietnam | 4056 | 27611 | 12 | 143 |
| Malaysia | 1328 | 16402 | 35 | 136 |
| Belgium | 220 | 7084 | – | – |
| Singapore | 460 | 6475 | – | – |
| Other countries | 2884 | 20758 | 1365 | 8800 |

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**Table – 44 : Exports of Sand (Excl. Metal Bearing)
(By Countries)**

| Country | 2008-09 | | 2009-10 | |
|----------------------|---------------|-----------------|--------------|-----------------|
| | Qty (t) | Value (Rs.'000) | Qty (t) | Value (Rs.'000) |
| All Countries | 469008 | 339987 | 26932 | 88278 |
| China | 4595 | 20753 | 6658 | 27558 |
| Maldives | 459005 | 291457 | 13077 | 14266 |
| Saudi Arabia | ++ | 1 | 117 | 8874 |
| Indonesia | 30 | 217 | 272 | 5277 |
| Tunisia | - | - | 100 | 4108 |
| Thailand | - | - | 201 | 3770 |
| Bhutan | 603 | 1234 | 3322 | 3226 |
| Tanzania | 161 | 919 | 61 | 2582 |
| UAE | 1140 | 7556 | 228 | 1509 |
| Oman | 1045 | 7488 | 198 | 1158 |
| Other countries | 2429 | 10362 | 2698 | 15950 |

**Table – 45 : Exports of Agate (Uncut) :
(By Countries)**

| Country | 2008-09 | | 2009-10 | |
|----------------------|--------------|-----------------|--------------|-----------------|
| | Qty (t) | Value (Rs.'000) | Qty (t) | Value (Rs.'000) |
| All Countries | 24540 | 8540 | 39090 | 8750 |
| USA | 688 | 1329 | 19046 | 3131 |
| UK | 245 | 2397 | 53 | 2137 |
| Australia | 33 | 177 | 18587 | 1519 |
| Bahrain | - | - | 1200 | 630 |
| German | - | - | 10 | 306 |
| China | 110 | 728 | 100 | 300 |
| Canada | 100 | 205 | 8 | 93 |
| Hong Kong | 23162 | 2365 | 1 | 66 |
| Ireland | 105 | 350 | - | - |
| Saudi Arabia | 50 | 588 | - | - |
| Other countries | 47 | 401 | 85 | 568 |

**Table – 46 : Exports of Agate (Cut) :
(By Countries)**

| Country | 2008-09 | | 2009-10 | |
|----------------------|------------------|-----------------|------------------|-----------------|
| | Qty ('000 carat) | Value (Rs.'000) | Qty ('000 carat) | Value (Rs.'000) |
| All Countries | 630 | 57167 | 125 | 19774 |
| USA | 33 | 35952 | 49 | 6136 |
| Germany | 2 | 1088 | 9 | 4463 |
| France | 1 | 338 | 2 | 1709 |
| Italy | ++ | 59 | 2 | 1288 |
| UK | 1 | 581 | 21 | 1234 |
| Kuwait | - | - | 1 | 1058 |
| China | 1 | 751 | 26 | 996 |
| Czech Republic | 3 | 762 | ++ | 428 |
| Hong Kong | 544 | 12663 | 4 | 233 |
| South Africa | ++ | 2036 | - | - |
| Other countries | 45 | 2937 | 11 | 2229 |

**Table – 47 : Exports of Flint
(By Countries)**

| Country | 2008-09 | | 2009-10 | |
|----------------------|-------------|-----------------|------------|-----------------|
| | Qty (t) | Value (Rs.'000) | Qty (t) | Value (Rs.'000) |
| All Countries | 1693 | 7102 | 940 | 2653 |
| Djibouti | 878 | 2538 | 588 | 1428 |
| Saudi Arabia | 347 | 1277 | 161 | 722 |
| Sudan | 71 | 244 | 162 | 476 |
| Oman | - | - | 28 | 26 |
| Nepal | 2 | 14 | 1 | 1 |
| Bangladesh | 100 | 235 | - | - |
| Germany | 100 | 62 | - | - |
| South Africa | 104 | 2376 | - | - |
| Sri Lanka | 7 | 16 | - | - |
| UAE | 80 | 321 | - | - |
| Other countries | 4 | 19 | - | - |

**Table – 48 : Exports of Silicon
(By Countries)**

| Country | 2008-09 | | 2009-10 | |
|---------------------------|------------|-----------------|------------|-----------------|
| | Qty (t) | Value (Rs.'000) | Qty (t) | Value (Rs.'000) |
| All Countries | 289 | 26518 | 536 | 28455 |
| Hong Kong | 28 | 3979 | 14 | 10843 |
| Saudi Arabia | 26 | 2297 | 245 | 5754 |
| Kenya | 62 | 5085 | 92 | 4388 |
| Congo, People's Rep. of | 27 | 2180 | 54 | 2731 |
| Tanzania | 1 | 58 | 43 | 2186 |
| Nepal | 47 | 1888 | 31 | 664 |
| Nigeria | 32 | 857 | 4 | 431 |
| Azerbaijan | 10 | 1246 | - | - |
| Chinese Taipei/ Taiwan | 2 | 5663 | - | - |
| Unspecified | 30 | 1117 | - | - |
| Other countries | 24 | 2148 | 53 | 1458 |

**Table – 49 : Imports of Quartz and Quartzite
(Natural) : Total
(By Countries)**

| Country | 2008-09 | | 2009-10 | |
|----------------------|------------|-----------------|------------|-----------------|
| | Qty (t) | Value (Rs.'000) | Qty (t) | Value (Rs.'000) |
| All Countries | 326 | 9794 | 823 | 11964 |
| Germany | 3 | 90 | 143 | 4083 |
| Sri Lanka | - | - | 352 | 3112 |
| China | 49 | 6008 | 160 | 1432 |
| Spain | 99 | 984 | 115 | 1112 |
| Italy | 100 | 1404 | 19 | 768 |
| Brazil | - | - | 13 | 415 |
| Japan | 4 | 223 | 8 | 390 |
| USA | 60 | 816 | 3 | 251 |
| UK | 6 | 126 | 6 | 223 |
| Belgium | 3 | 105 | 3 | 143 |
| Other countries | 2 | 38 | 1 | 35 |

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**Table – 50 : Imports of Quartzite (Natural)
(By Countries)**

| Country | 2008-09 | | 2009-10 | |
|----------------------|------------|--------------------|------------|--------------------|
| | Qty (t) | Value (Rs.'000) | Qty (t) | Value (Rs.'000) |
| All Countries | 41 | 694 | 337 | 4199 |
| Sri Lanka | - | - | 309 | 2846 |
| Italy | - | - | 19 | 768 |
| Japan | - | - | 8 | 390 |
| China | 40 | 674 | 1 | 99 |
| UK | - | - | ++ | 76 |
| Germany | ++ | 4 | ++ | 19 |
| France | 1 | 15 | - | - |
| Other countries | ++ | 1 | ++ | 1 |

**Table – 51: Imports of Quartz (Natural)
(By Countries)**

| Country | 2008-09 | | 2009-10 | |
|----------------------|------------|--------------------|------------|--------------------|
| | Qty (t) | Value (Rs.'000) | Qty (t) | Value (Rs.'000) |
| All Countries | 285 | 9100 | 486 | 7765 |
| Germany | 3 | 86 | 143 | 4064 |
| China | 9 | 5334 | 159 | 1333 |
| Spain | 99 | 984 | 115 | 1112 |
| Brazil | - | - | 13 | 415 |
| Sri Lanka | - | - | 43 | 266 |
| USA | 60 | 816 | 3 | 251 |
| UK | 6 | 126 | 6 | 147 |
| Belgium | 3 | 105 | 3 | 143 |
| Italy | 100 | 1404 | - | - |
| Japan | 4 | 223 | - | - |
| Other countries | 1 | 22 | 1 | 34 |

**Table – 52 : Imports of Silica Sand
(By Countries)**

| Country | 2008-09 | | 2009-10 | |
|---------------------------|--------------|--------------------|--------------|--------------------|
| | Qty (t) | Value (Rs.'000) | Qty (t) | Value (Rs.'000) |
| All Countries | 10240 | 220828 | 15384 | 287033 |
| Italy | 2133 | 71756 | 2562 | 69450 |
| Germany | 1382 | 44975 | 1095 | 37538 |
| Bhutan | 2872 | 20587 | 4753 | 34982 |
| Singapore | 95 | 1498 | 1123 | 31192 |
| Australia | 252 | 12889 | 443 | 25036 |
| USA | 250 | 12954 | 895 | 24503 |
| Chinese Taipei/ Taiwan | 194 | 11246 | 394 | 22243 |
| China | 141 | 3347 | 411 | 9042 |
| UK | 542 | 11004 | 280 | 7908 |
| Spain | 207 | 10267 | ++ | 12 |
| Other countries | 2172 | 20305 | 3428 | 25127 |

**Table – 53 : Imports of Sand (Excl. Metal Bearing)
(By Countries)**

| Country | 2008-09 | | 2009-10 | |
|----------------------|----------------|--------------------|---------------|--------------------|
| | Qty (t) | Value (Rs.'000) | Qty (t) | Value (Rs.'000) |
| All Countries | 1041318 | 332095 | 493454 | 177268 |
| Nepal | 1039169 | 298019 | 492839 | 165822 |
| Belgium | 378 | 5088 | 486 | 6730 |
| Germany | 386 | 13547 | 124 | 4617 |
| China | 22 | 639 | 2 | 56 |
| UK | 23 | 907 | ++ | 4 |
| Australia | 20 | 310 | - | - |
| France | 66 | 1628 | - | - |
| Italy | 324 | 7617 | - | - |
| Singapore | 857 | 1481 | - | - |
| USA | 60 | 2673 | - | - |
| Other countries | 13 | 186 | 3 | 39 |

**Table – 54 : Imports of Flint
(By Countries)**

| Country | 2008-09 | | 2009-10 | |
|----------------------|-------------|--------------------|------------|--------------------|
| | Qty (t) | Value (Rs.'000) | Qty (t) | Value (Rs.'000) |
| All Countries | 1309 | 7522 | 862 | 5413 |
| New Zealand | - | - | 18 | 3612 |
| China | 25 | 1038 | 124 | 1567 |
| Nepal | 588 | 106 | 711 | 189 |
| USA | - | - | 9 | 45 |
| Bangladesh | 20 | 35 | - | - |
| Indonesia | 75 | 922 | - | - |
| Malaysia | 2 | 32 | - | - |
| Singapore | 13 | 30 | - | - |
| Turkey | 100 | 1237 | - | - |
| UK | 486 | 4122 | - | - |

**Table – 55 : Imports of Agate : Uncut
(By Countries)**

| Country | 2008-09 | | 2009-10 | |
|----------------------|------------|--------------------|------------|--------------------|
| | Qty (t) | Value (Rs.'000) | Qty (t) | Value (Rs.'000) |
| All Countries | 42 | 230 | 39 | 3354 |
| China | 17 | 10 | 11 | 2584 |
| Madagascar | - | - | 20 | 568 |
| Turkey | 10 | 31 | 5 | 112 |
| USA | - | - | 2 | 59 |
| Australia | - | - | 1 | 29 |
| Germany | 1 | 12 | - | - |
| Korea, Rep. of | 7 | 4 | - | - |
| Tanzania | 7 | 173 | - | - |
| Other countries | - | - | ++ | 2 |

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**Table – 56 : Imports of Agate : Cut
(By Countries)**

| Country | 2008-09 | | 2009-10 | |
|----------------------|---------------------|--------------------|---------------------|--------------------|
| | Qty (‘000 Carat) | Value (Rs.‘000) | Qty (‘000 Carat) | Value (Rs.‘000) |
| All Countries | ++ | 47 | ++ | 1400 |
| USA | - | - | ++ | 1028 |
| Hong Kong | - | - | ++ | 351 |
| Thailand | - | - | ++ | 20 |
| Germany | ++ | 47 | - | - |
| Other countries | - | - | ++ | 1 |

**Table – 57 : Imports of Silicon
(By Countries)**

| Country | 2008-09 | | 2009-10 | |
|----------------------|--------------|--------------------|--------------|--------------------|
| | Qty (t) | Value (Rs.‘000) | Qty (t) | Value (Rs.‘000) |
| All Countries | 19998 | 2140234 | 24245 | 2186037 |
| China | 18499 | 1772028 | 22762 | 2031858 |
| Australia | 22 | 2053 | 524 | 45242 |
| France | 564 | 88326 | 229 | 27827 |
| Norway | 74 | 8599 | 142 | 18650 |
| Hong Kong | 60 | 6744 | 163 | 14724 |
| Korea, Rep. of | ++ | 80 | 136 | 9908 |
| UK | 110 | 16224 | 15 | 2214 |
| Germany | 22 | 126413 | 4 | 2142 |
| USA | 5 | 12232 | 2 | 1457 |
| Unspecified | 266 | 86421 | 38 | 3372 |
| Other countries | 376 | 21114 | 230 | 28643 |

FUTURE OUTLOOK

The demand for quartz, silica sand, moulding sand and quartzite has been steadily increasing over the years to cater to the requirement of ferro-silicon, silico-manganese, silico-chrome, silica refractories, glass and for moulding and casting purposes. The requirements of these

products except glass are linked directly with iron & steel industry including alloy steel production. Further, setting up foundries and enhancing their capacities are also linked with metallurgical industry. It is reported that glass industry is expected to grow by 10% every year due to rapid rise in infrastructural activities in the country.