

Silica

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SUMMARY

Preliminary data reported by users in Canada show that silica use was 2.8 Mt in 2000, a slight decrease of 129 090 t from the revised quantity of the previous year. Preliminary data reported by Canadian producers for 2001 indicate production was valued at \$41.35 million, a \$111 000 increase from 2000 (for which data were revised to \$41.24 million from the NRCan published data on silica in 2000). Imports were valued at almost \$108.2 million for 2001, a \$5.3 million increase from 2000. Preliminary exports for 2001 represented close to \$10.7 million, an increase of \$3.8 million from the 2000 value of \$6.9 million (Table 1).

In 2000, the increase in silica use was a result of increases in all major silica-using industry sectors, with the exception of the "primary glass and glass containers, and glass fibre wool" and "other products" sectors. The nonferrous smelting and refining industry, which represents 30.3% of the total use of silica in Canada, shows a preliminary increase of 11.7% from 1999. The primary glass and glass containers, and glass fibre wool sector, which represents 18.4% of total use, shows a decrease of 21.0% from 1999. Foundries, which represent 11.0% of the total use, show an increase of 21.4% from 1999. Chemicals, which represent 3.5% of total use, show an increase of 57.8% from 1999. The "other products" category, which includes a multitude of industry users, represents 36.8% of total silica use in Canada and shows a decrease of 10.5% from 1999 (Table 3).

With respect to the reported quantity of silica used by category, sand represents 61.0% of the total with barely an increase from 1999. For lump silica, which represents 35.2% of the total, a decrease of 12.4% from 1999 was observed, while flour, which represents 3.8% of the total, increased 12.5% (Table 4).

PRICES

Due to the unavailability of prices for Canada's silica industry, the following price examples from other sources are provided.

The May 2002 edition of *IM Magazine*, #416 reported that silica sand prices (foundry sand, dry, bulk, ex-works) were in the range of £15.50-£16.50/t (\$35.45-\$37.74/t). The price range for the other categories (glass sand, flint, container, ex-works) was £15-£17/t (or \$34.31-\$38.88/t). Ex-works USA (foundry sand, dry, bulk) prices were in the range of \$11.50-\$25.00/t. Prices for actual transactions vary accordingly to geographic region and will take into account the quantity purchased, application, quality assurance, the exact grade purchased, credit terms, and other parameters.

U.S. prices (United States Geological Survey [USGS]), as an example, for the North American market, when compared with the average value of 1999 (i.e., the average value, free on board [f.o.b.] plant) of U.S. industrial sand and gravel,¹ increased by 4.7% to US\$19.57/t in 2000. The average unit values for industrial sand and industrial gravel were US\$19.87/t and \$14.69/t, respectively. The average price for sand ranged from US\$6.50/t for metallurgical flux to \$114.62/t for ground fillers. For gravel, prices ranged from US\$8.97/t for non-metallurgical flux to \$23.36/t for filtration. U.S. producer prices reported to the USGS for silica commonly ranged from several dollars to hundreds of dollars per tonne and occasionally exceeded the US\$1000/t level. In the United States, ground sand used as fillers for rubber, paint and putty had the highest value per tonne (US\$114.62), followed by silica for swimming pool filters (US\$68.29), ground sand for ceramics (US\$51.94), ground sand for fibreglass (US\$43.05), ground sand for scouring cleansers (US\$37.47), refractory foundry sand (US\$36.11), abrasives for sawing and sanding (US\$35.56), and sand for hydraulic fracturing (US\$34.75).

¹ Different countries have different terminology and specifications for silica. In the United States, industrial sand and gravel is often called "silica," "silica sand" and "quartz sand," which includes sand and gravel with high silicon dioxide content.

TRADE

Although Canada is sufficient in silica production for its needs, it still imports the commodity to serve particular markets in regions where market conditions warrant this action. Imports for 2000 from the United States totaled 330 392 t (94.1%) of all imports (351 130 t) from all countries.

Imports from the United States come from loosely consolidated and easily processed sandstone or lake sand deposits located near the Great Lakes. Major U.S. operations are located in the states of Illinois, Wisconsin, Michigan and Indiana.

The bulk of imports (63.3%) from the United States is used by the Canadian iron and steel foundry industries and the Canadian glass manufacturing industries. Foundries imported 51.3% while the glass manufacturing industries imported 12.0% (Tables 1 and 2).

Preliminary data for 2001 indicate that Canada's exports of silica totaled 415 625 t, an increase of 5.4% over 2000. The value associated with this preliminary 2001 data (\$10.7 million) shows an increase of 54.5% over the 2000 value (\$6.9 million). This phenomenon is partly due to increases in the silicon dioxide category and in the quartz, silica sands and quartz sands categories (Table 1). Exports to the United States represented 85.7% of this preliminary total with the majority of those exports being silica sand and quartz sand.

PRODUCTION AND MARKET CONSIDERATIONS

The economics of the production and sale of the many types of silica are governed by many factors, but demand for silica is controlled mostly by the fortunes of the glass and foundries industries. Throughout North America, the silica sand industry is highly competitive on a regional basis and the industry is dominated by a few large producers. A silica sand source located substantially closer to its plant can save users hundreds of thousands of dollars per year by reducing transportation costs by only a few dollars per tonne. Lower-priced material is shipped only to local or regional markets. Beneficiation is the key to producing high-quality glass or foundry sand from most deposits.

As an example of market considerations, the demand for foundry sand (source: USGS) is dependent mainly on automotive and light truck production. In 2001, the U.S. slump in the auto sector (source: *Camford Chemical Report*) had a negative impact on rubber sales. The drop in North American rubber production reflects the decline in tire output (source: The Rubber Association of Canada). Canada's rubber

processing industry mirrored U.S. economic conditions, although the Canadian auto market is rolling strong and has reached an all-time high of 1.57 million vehicles sold. This would explain why there was an increase in demand from 1999 to 2000 for foundry sand in Canada.

SUPPLY

The most important Canadian producers are described below.

The provinces of Quebec, Ontario and Alberta are the main producers of silica, followed by Saskatchewan, British Columbia and Nova Scotia.

In **Newfoundland and Labrador**, Shabogamo Mining and Exploration Co. Ltd. began mining its Roy's Knob quartzite deposit near Labrador City in October 1999. The company's washing and screening plant is located in Wabush, Labrador. The quartzite product is sent by rail to Sept-Îles, Quebec. Shabogamo has a contract to supply quartzite to Aluminerie de Bécancour Inc. of Quebec, which uses the material to manufacture silicon metal.

In **Nova Scotia**, Shaw Resources Ltd., a member of The Shaw Group Limited, produces a high-purity (98.5-99.5%) silica from sand deposits located near Shubenacadie. The silica is used mainly in sandblasting, as foundry sand and as filter sand. In addition, fine sand from its silica operation is beneficiated to flint glass-grade material. Fine sand products are sold in the Maritimes, Quebec and northeastern United States for use in sandblasting, filter sand, traction sand, cement and concrete manufacturing, refractory and decorative sand, and as a flux for base-metal smelters; the sand could also be used in glass-making.

In **New Brunswick**, Shaw Resources, Chaleur Silica – a division of The Shaw Group Limited, manufactures abrasive products using raw material from Nova Scotia, Ontario and the United States. The company also produces silica for use as a flux at the Belledune lead smelter and for use in cement manufacture.

Atlantic Silica Inc. mines a high-grade (+98%) silica deposit near Sussex for use in sandblasting, silicon metal, silicon carbide, foundry sand, filtration sand and ornamental sand. Most of it is used in eastern Canada although some is shipped to the United States.

In **Quebec**, Unimin Canada Ltd., a subsidiary of Unimin Corp. of the United States, is the largest producer of silica. Silica is mined from a quartzite deposit at Saint-Donat-de-Montcalm and from a sandstone deposit at Saint-Canut. Silica from Saint-

Donat is shipped and refined at the Saint-Canut plant near Montréal. Most of the silica produced by Unimin originates from Saint-Canut where the ore is ground, screened and beneficiated by magnetic separation. Most of Unimin's output is used in the production of glass containers, flat glass and fibreglass, and also in the silicon carbide industries.

Bécancour Chemical Industries operates the silica plant in Bécancour. It also owns the quartzite deposit north of La Mabaie that is being developed by Sitec Inc.

Sitec Inc. is a joint venture between Baskatong Quartz Inc., which produces high-purity quartz, and SOQUEM INC., a wholly owned subsidiary of SGF Minéral inc.

La Compagnie Bon Sable Ltée mines silica sand at Saint-Joseph-du-Lac and Ormstown. The material is used mainly for sandblasting and as concrete sand; it is also suitable for the production of fibreglass.

Silco Sands Inc. mines and grinds its silica at its plant in Sainte-Clotilde-de-Châteauguay. The products are sold to a chemical company, a cement plant and a ferromanganese plant.

Temisca inc., which was recently sold to Stake Technology Ltd. (StakeTech) of Norval, Ontario, mines and processes silica near Saint-Bruno-de-Guigues. Temisca supplies the golf course, filtration, frac, abrasives and construction markets. The processing facility includes a 200 000-t/y hydrosizer and screening, drying and packaging equipment.

Other significant producers include Silco Sands Inc., with a silica sandstone quarry in Sainte-Clotilde-de-Châteauguay; Béton provincial ltée, with a silica sandstone quarry in Gaspé's Larivière County; and Société Minière Gerdin Inc., in Saint-Rémi-d'Amherst, with a silica sand quarry.

In **Ontario**, Unimin Canada Ltd. is also the largest producer of silica with a reported capacity of about 500 000 t/y. Lump quartzite from Badgeley Island (150 000-t/y capacity) in northern Georgian Bay is shipped by lake boat to Canadian destinations for the manufacture of ferrosilicon. The finer material, produced by grinding, is shipped to Unimin's plant at Midland (400 000-t/y capacity), south of Georgian Bay, where it is further processed to a glass-grade silica sand and silica flour for ceramic and other uses.

Other significant producers include Arriscraft International Inc. with its Elgin Quarry, Damron Minerals with its Ellis Quarry, Great White Minerals Ltd. with its Fripp Quarry, Inco Limited with its Lawson Quarry, and Hunt Engineering Group with its Penhorwood and Roseval quarries.

In **Manitoba** there are no silica quarries currently in operation.

In **Saskatchewan**, Hudson Bay Mining and Smelting Co., Limited (HBMS) produces silica in the Amisk Lake area of northern Saskatchewan and is the largest user of the province's silica sand at its Flin Flon, Manitoba, smelter. HBMS uses sand as a fluxing agent which, in the molten state, reacts with various impurities in the copper and zinc ore to produce a slag. The slag is produced in the smelter where the impurities are drawn off, leaving a more refined metal behind.

Red Deer Silica Inc. produces a small amount of silica, northeast of the village of Hudson Bay, for use in golf course bunkers, stucco sand and sandblasting sand.

Hanson Lake Sand Corp. (HLSC), a wholly owned subsidiary of Daren Industries Ltd. of Vancouver, British Columbia, has doubled its capacity to transport silica from its mining/processing operations to its distribution facility in Prince Albert. As a result, the company will be able to increase its shipments of Canadian White frac sand to the Alberta market.

In **Alberta**, Sil Industrial Minerals Inc. of Edmonton produces silica sand from local sand dunes in the Bruderheim area. It also operates a silica processing facility near Edmonton. The silica is sold mainly for the manufacture of fibreglass and as sandblasting material. Other uses include foundry sand, filtration sand, fracturing sand and railway traction sand. The company also produces silica flour by processing the silica sand through a ball mill; the flour is used in thermal insulating cement in the oil and gas industries.

United Industrial Services Ltd. (UIS) of Calgary, Alberta, owns a silica mine and a processing plant in Peace River that began production in 1999. Customers for the silica include the foundry, fibreglass and frac sand industries. In June 2001, UIS and its subsidiaries, Alberta Silica Corp. and Alberta Silica Mining Corp., were ordered into receivership. The business is continuing to operate with a skeleton staff and the intent is to sell it as a going concern.

In **British Columbia**, the Mountain Minerals Division of Highwood Resources Ltd., in Calgary, Alberta, mines a high-purity (99.5%) silica sand for diverse industrial applications (e.g., glass grade) at the Moberley mine in the Golden area. The friable sandstone is ground, screened, washed, dried and separated into several sizes at a plant near Golden. These different sizes are sold mainly as glass sand, but also as sandblasting sand, foundry sand, filter media sand and golf course sand. In addition, the Division produces lump silica for use in the production of silicon.

Monteith Bay Resources Ltd. produces silica sand at its Monteith Bay quarry on Western Vancouver Island.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 64. (2) Information in this review was current as of July 15, 2002. (3) This and other reviews, including previous editions, are available on the Internet at www.nrcan.gc.ca/mms/cmy/index_e.html.

NOTE TO READERS

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TARIFFS

Item No.	Description	Canada			United States
		MFN	GPT	USA	Canada
2804.61	Silicon containing by weight not less than 99.99% of silicon	Free	Free	Free	Free
2804.69	Silicon, n.e.s.	5%	3%	3%	Free
2811.22	Silicon dioxide	Free	Free	Free	Free
2849.20	Silicon carbide	Free	Free	Free	Free
7202.21.10	Ferro-silicon containing by weight more than 55% but less than 60% of silicon	Free	Free	Free	Free
7202.21.20	Ferrosilicon containing by weight 60% or more of silicon but less than 90%	Free	Free	Free	Free
7202.21.30	Ferro-silicon containing by weight 90% or more of silicon	Free	Free	Free	Free
7202.29	Ferro-silicon, n.e.s.	Free	Free	Free	Free
7202.3	Ferro-silico-manganese	Free	Free	Free	Free
7202.5	Ferro-silico-chromium	Free	Free	Free	Free

Sources: *Customs Tariff*, effective January 2002, Canada Customs and Revenue Agency; *Harmonized Tariff Schedule of the United States*, 2002.

n.e.s. Not elsewhere specified.

TABLE 1. SILICA, CANADIAN PRODUCTION AND TRADE, 2000 AND 2001

Item No.	2000		2001 (p)		
	(tonnes)	(\$000)	(tonnes)	(\$000)	
PRODUCTION (shipments)					
By province					
Newfoundland and Labrador	x	x	x	x	
Nova Scotia	x	x	x	x	
New Brunswick	x	x	x	x	
Quebec	522 049	13 363	534 000	13 411	
Ontario	427 989	10 444	475 540	10 565	
Manitoba	x	x	x	x	
Alberta	261 664	8 453	261 664	8 453	
British Columbia	x	x	x	x	
Total	1 508 490	41 239	1 567 306	41 350	
IMPORTS (1)					
2505.10	Silica sands and quartz sands				
	United States	312 325	44 812	289 827	46 758
	China	544	505	687	852
	Germany	1 461	804	726	516
	South Africa	1 448	410	1 503	423
	Australia	226	224	446	376
	Other countries	1 610	725	1 538	646
	Total	317 614	47 480	294 727	49 571
2506.10	Quartz (other than natural sands)				
	United States	18 828	1 052	16 512	755
	Brazil	5 213	220	4 514	251
	Germany	1 134	62	2 316	132
	Japan	–	–	152	11
	Other countries	20 856	882	33	1
	Total	46 031	2 216	23 557	1 152
2506.21	Quartzite, crude or roughly trimmed				
	United States	949	211	1 302	253
	Brazil	–	–	20	4
	Other countries	20	6	11	–
	Total	969	217	1 333	257
2506.29	Quartzite n.e.s.				
	Japan	503	41	1 648	112
	United States	2 094	136	1 318	83
	Brazil	8	...	922	55
	Other countries	128	11	493	20
	Total	2 733	188	4 381	270
2811.22	Silicon dioxide				
	United States	21 588	41 102	21 433	40 830
	Germany	1 633	7 647	1 526	7 508
	Other countries	1 675	3 962	4 173	8 563
	Total	24 896	52 711	27 132	56 901
	Total imports	392 243	102 812	351 130	108 151

TABLE 1 (cont'd)

Item No.		2000		2001 (p)	
		(tonnes)	(\$000)	(tonnes)	(\$000)
EXPORTS					
2505.10	Silica sands and quartz sands				
	United States	370 528	4 740	350 095	5 620
	Norway	9 567	318	19 006	666
	Venezuela	260	55	2 735	145
	Other countries	147	52	23 752	116
	Total	380 502	5 165	395 588	6 547
2506.10	Quartz (other than natural sands)				
	United States	1 708	459	4 974	1 881
	Bulgaria	538	35	2 142	136
	Cuba	–	–	213	24
	Japan	–	–	28	4
	Taiwan	508	28	–	–
	Total	2 754	522	7 357	2 045
2506.21	Quartzite, crude or roughly trimmed				
	Norway	10 250	520	11 294	565
	United States	673	263	845	323
	Total	10 923	783	12 139	888
2506.29	Quartzite n.e.s.				
	Cuba	–	–	93	9
	United States	180	69	–	–
	Philippines	–	–	–	–
	Total	180	69	93	9
2811.22	Silicon dioxide				
	United States	90	340	159	714
	Hong Kong	–	–	76	344
	Other countries	50	39	213	141
	Total	140	379	448	1 199
	Total exports	394 499	6 918	415 625	10 688

Sources: Natural Resources Canada; Statistics Canada.

– Nil; . . . Amount too small to be expressed; n.e.s. Not elsewhere specified; (p) Preliminary; x Confidential.

(1) Includes sand for use in foundries and glass manufacturing, ground and flour sand, and volatized and silica flue dust.

Note: Numbers may not add to totals due to rounding.

TABLE 2. IMPORTS OF SILICA SAND FROM THE UNITED STATES, BY PROVINCE AND BY USE, 2000 AND 2001

	2000		2001 (p)	
	(tonnes)	(\$000)	(tonnes)	(\$000)
FOUNDRY				
Nova Scotia	1 000	18 467	461	20 327
New Brunswick	121	8 186	20 671	874 989
Quebec	26 408	616 885	95 332	8 653 771
Ontario	101 215	10 826 747	22 200	882 475
Manitoba	26 717	1 098 726	116	30 385
Saskatchewan	220	87 481	26 316	1 303 040
Alberta	26 910	1 044 663	4 381	320 133
British Columbia	5 733	370 293	114	71 560
Total	188 324	14 071 448	169 591	12 156 680
GLASS MANUFACTURING				
Nova Scotia	298	95 326	12	2 431
Quebec	646	136 138	213	73 291
Ontario	62 768	2 173 250	38 460	1 950 140
Manitoba	6	3 275	24	985
Alberta	758	28 545	857	46 861
British Columbia	72	59 782	77	45 297
Total	64 548	2 496 316	39 643	2 119 005

Source: Statistics Canada.

(p) Preliminary.

Note: Numbers may not add to totals due to rounding.

TABLE 3. REPORTED USE⁽¹⁾ OF SILICA IN CANADA, BY INDUSTRY, 1999 AND 2000

	1999	2000 (p)
	(tonnes)	
Nonferrous smelting and refining	(r) 771 900	862 584
Primary glass and glass containers, and glass fibre wool	662 046	523 021
Foundries	305 858	312 400
Chemicals	62 498	98 649
Other products (2)	1 170 806	1 047 364
Total	(r) 2 973 108	2 844 018

Source: Natural Resources Canada.

(p) Preliminary; (r) Revised.

(1) Available data, as reported by users. (2) Includes asbestos products, asphalt roofing products, cement, ceramic products, structural clay products, cleansers, fertilizers, paint and varnish, pulp and paper products, refractory brick, rubber products, ferroalloys, primary steel, and other miscellaneous products.

TABLE 4. SILICA, REPORTED QUANTITY USED⁽¹⁾ IN CANADA, 1999 AND 2000^(p)

	1999	2000 (p)
	(tonnes)	
Sand	(r) 1 732 848	1 733 853
Lump	1 144 408	1 002 303
Flour	95 852	107 862
Total	(r) 2 973 108	2 844 018

Source: Natural Resources Canada.

(p) Preliminary; (r) Revised.

(1) Available data, as reported by users.