

Lime

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“Lime” is a general term referring to burned or calcined limestone (burnt lime or quicklime) and its secondary products, including slaked lime and hydrated lime (or calcium hydroxide). In the calcining process, quicklime (CaO or CaO.MgO) begins to form when the dissociation temperature of the limestone occurs. (This occurs from 402°C for the magnesium carbonate component to 898°C for the calcium carbonate portion.) Temperatures are maintained sufficiently long until there is a complete breakdown of the limestone and a release of the carbon dioxide content.

Canadian shipments of all lime in 1997 amounted to approximately 2.5 Mt valued at \$209.5 million, based on preliminary data. Quicklime accounted for about 90% of the total volume, essentially the same ratio as in 1996; however, the total value of shipments increased about 3% in 1997. Production figures do not include some captive production from pulp and paper plants that burn sludge to recover lime for re-use in the causticization process.

THE CANADIAN INDUSTRY

The lime industry in Canada comprises 11 active companies operating 20 plants, of which 12 plants were in eastern Canada (Table 3). Total employment in the industry in 1996 (the most recent year for which data are available) was approximately 740, about 7% more than in 1995. Calcining capacity to produce quicklime did not change; the effective capacity utilization rate was approximately 70%.

Recent changes in ownership continued in the industry. In 1996, Calcitherm Nederland BV of the Netherlands, which owned BeachviLime Limited, Guelph Dolime Limited and Northern Lime Limited, was purchased by Carmeuse SA, a privately owned Belgian company.

In 1997, Redland Quarries Inc. of Dundas, Ontario, came under new ownership following the acquisition of its parent company, U.K.-based Redland plc, by Lafarge SA of France.

Graybec Calc Inc. started production of quicklime in 1997 at its new lime plant near Bedford, Quebec, in a rural area about 10 km from the U.S. border. This \$20 million project, which created about 50 jobs, is based on high-quality limestone that in the past had been used for relatively lower-valued construction and miscellaneous uses.

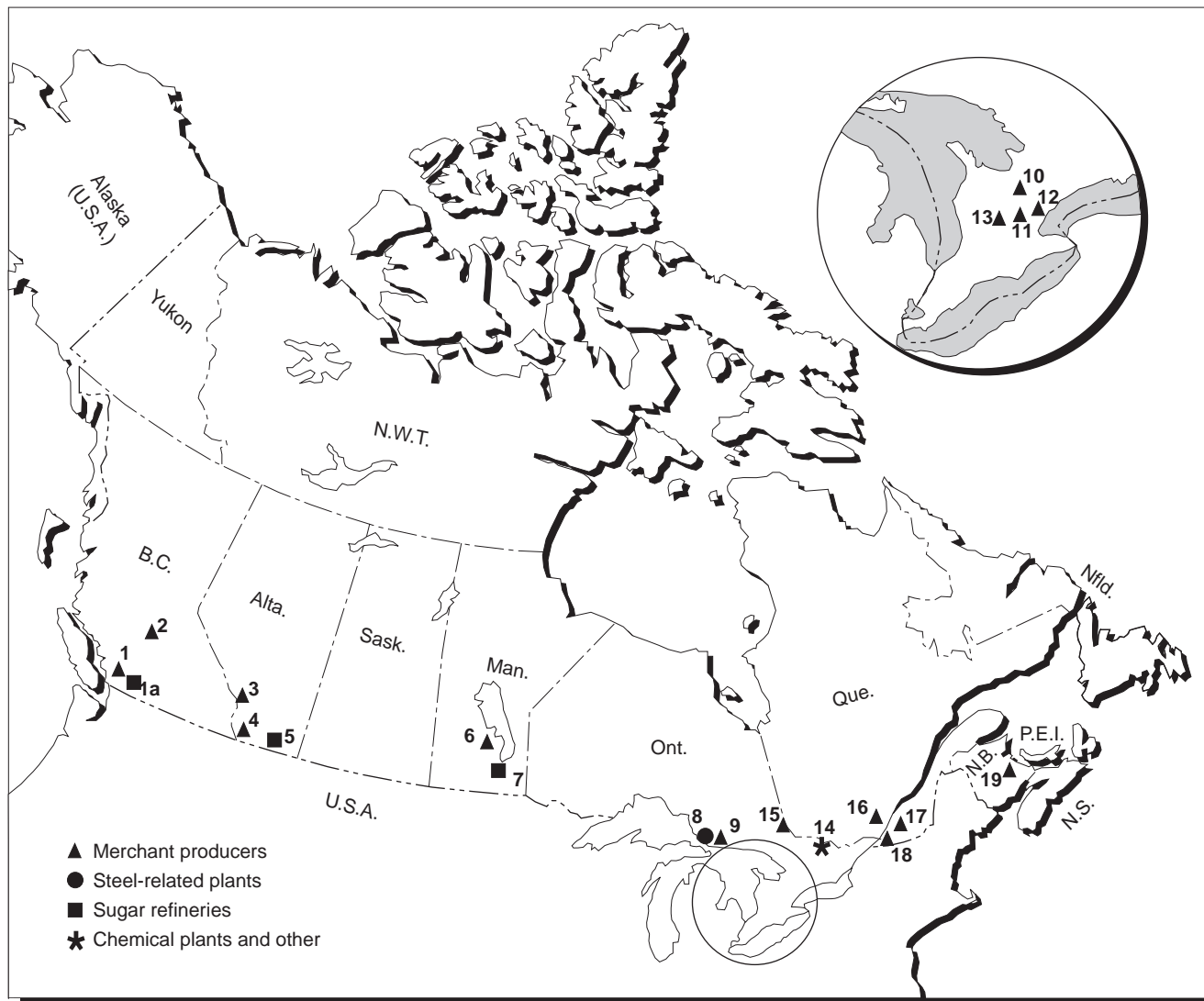
Global Stone Corp. of Oakville, Ontario, proceeded with kiln modifications at its Ingersoll, Ontario, plant. In addition, Global has now considerably expanded its limestone/lime operations that produce chemical- and construction-grade products in the United States. This company is currently 16% owned by Cominco Ltd. of Vancouver, after Cominco increased its common share holdings in 1996.

CONSUMPTION

High-calcium quicklime is commercially available in six forms: lump, crushed, pebble, ground, pulverized, and as briquettes or pellets. Slaked lime is produced from mixing quicklime and water, and may be purchased as a putty, dry powder or slurry. Hydrated lime is produced from slaked lime after drying and regrinding. The resulting hydrated lime products, which are categorized by their chemistry, include the following types: high-calcium lime, dolomitic lime, and magnesian or hydraulic lime. (The latter type contains siliceous, aluminous or ferrous compounds.) Aglime, or agricultural lime, refers to pulverized limestone used for soil neutralization, primarily during the fall and spring spreading seasons.

The consumption of lime produced in Canada consists of two basic categories: the captive market, which mainly includes lime produced internally by chemical plants, one steel producer, and two sugar refineries; and the merchant market, which is served by the mainstream lime producers. In 1996, captive consumption, including relatively large quantities dedicated to specific established uses, was estimated to be about 540 000 t, accounting for approximately 24% of apparent consumption (Table 2).

Figure 1
Lime Producers in Canada, 1997



Numbers refer to locations on map above.

MERCHANT PRODUCERS

1. Chemical Lime Company of Canada, Fort Langley
2. Continental Lime Ltd., Pavilion Lake
3. Continental Lime Ltd., Exshaw
4. Summit Lime Works Limited, Hazell
6. Continental Lime Ltd., Faulkner
9. Northern Lime Limited
10. Guelph DoLime Limited, Guelph
11. Global Stone (Ingersoll) Ltd.
12. Redland Quarries Inc., Dundas
13. BeachvilLime Limited, Ingersoll
15. Miller Minerals, Haileybury
16. Graybec Calc Inc., Joliette
17. Graybec Calc Inc., Marbleton
18. Graybec Calc Inc., Bedford
19. Havelock Lime, a division of Goldcorp Inc., Havelock

STEEL-RELATED PRODUCERS

8. Algoma Steel Inc., Sault Ste. Marie

SUGAR REFINERIES

- 1a. Rogers Sugar Ltd., Vancouver
5. Rogers Sugar Ltd., Taber
7. Rogers Sugar Ltd., Fort Garry

CHEMICAL PLANT OR OTHER

14. Timminco Limited, Haley Station

Consumption of quicklime, based on sales in the merchant market, amounted to 1 554 703 t in 1996. The major end uses were steel-making (50%), environmental control (14%), pulp and paper (14%), chemicals (8%), and other industrial uses, including metal concentration (13%). Hydrated lime shipments in the merchant market amounted to 165 444 t in 1996, and were sold mainly for environmental control (55%), other industrial uses (14%), metal concentration (6%), agricultural uses (3%), masonry (2%), and other miscellaneous uses related mainly to road and soil stabilization and other construction (20%). Eastern Canada, comprising Ontario eastward, accounted for about three quarters of total merchant sales of quicklime in 1996.

Lime is used widely in the metallurgical, industrial (including environment), agricultural and construction sectors. In the metallurgical industry, lime is consumed mainly as a basic flux in steel furnaces allowing impurities, including silica, alumina, phosphorus and sulphur, to form a slag. (Other fluxing agents may include limestone, dolomite and fluorspar.) Limestone and dolomite (or dolostone) are used mainly in blast furnaces for making pig iron and in sinter plants at steel mills; limestone, lime and dolime are used in both basic oxygen and electric-arc steel furnaces.

Industrial markets for lime mainly include the pulp and paper, mining, chemicals manufacturing, and environmental control industries. The pulp and paper industry is one of the major consumers of lime, mainly for the preparation of digesting liquor for manufacturing kraft or sulphate paper, and for pulp bleaching during a primary stage of production.

In the mining sector, acidic effluents are treated with alkalis or related industrial products. These include lime, limestone, soda ash, and ammonium and magnesium hydroxide to raise pH levels (for neutralization) and to precipitate metals. In the uranium industry, lime controls the hydrogen-ion concentration in the extraction process, as well as in the recovery of sodium carbonate and for neutralization of waste sludges.

Lime is increasingly needed for environmental control because of more stringent regulations. The neutralization of lakes has attracted attention in the past; however, research conducted mainly in Ontario has shown that pure limestone (or calcite) is the most cost-effective method.

Air pollution control is a major developing market for lime and limestone in North America. Major coal-fired power stations are taking measures to reduce emissions from the burning of high-sulphur coal, oil and lignite. Several methods apply, including the use of flue gas desulphurization (FGD) units, or scrubbers; in Canada, wet scrubbing processes using limestone or lime are becoming more important.

Agricultural uses apply mainly to neutralizing soil acidity. The current practice principally involves the use of pulverized limestone (or aglime). In the case of some sandy soils, dolomitic liming is carried out to help balance magnesium deficiencies.

Miscellaneous uses for lime include sugar refining (removal of acids from the crude sugar liquids) and petroleum refining (neutralization of sulphur compounds and sulphur dioxide emissions). Lime is also used in making plaster, mortar, leather and rubber, paint, glass, dolomitic refractories, and calcium-silicate bricks.

ENERGY AND TECHNOLOGY

Energy costs to produce quicklime account for about 40% of total production costs, one of the highest ratios in the mineral processing sector. Calcining takes place mainly in vertical (shaft-type) or rotary-type kilns, the latter technology being most common in North America. Preheater systems and computerized process control systems are now commonplace.

About 80% of the kilns in service use natural gas, with coal and electricity accounting for the remainder. Long rotary kiln systems consume an average of about 6.4 gigajoules per tonne (GJ/t) of calcined lime. New rotary kilns, with preheaters, consume less than 5.0 GJ/t, and short-shaft kilns consume about 4.2 GJ/t of calcined lime. Other types of kilns of comparatively recent design are the rotary hearth, travelling grate, fluo-solid, and inclined vibratory kiln. Dust-collecting equipment to meet current environmental control regulations is required for all systems.

PRICES

Published prices for lime represent only a broad range. Actual prices vary according to marketing strategies and supply and demand. Average prices for high-calcium quicklime and high-calcium hydrated lime, f.o.b. plant, in Ontario, in bulk, were quoted at \$70.80/t and \$80.40/t respectively at the end of 1997.

INTERNATIONAL DEVELOPMENTS

In 1997, world lime production was an estimated 124 Mt, compared to 121 Mt in 1996. China accounted for 18%, followed by the United States at 16% and Germany and Japan each with about 6%. Other countries throughout the world accounted for about 54%.

The United States produced 19.3 Mt of lime in 1997 compared to 19.1 Mt in 1996, according to prelimi-

nary figures. Apparent consumption amounted to 19.5 Mt in 1997 compared to 19.3 Mt in 1996. Environmental uses for lime in the United States, which include flue gas desulphurization (FGD), water treatment and waste-water treatment, have grown rapidly and are expected to surpass use by the iron and steel industry. FGD-related uses are now the second most important use after the steel industry.

Stricter rules are now in effect concerning wastewater treatment and the use of sewer sludges. As a result, it is expected that lime consumption will increase, and that the biosolids produced will find acceptable uses as fertilizers, soil amendments, covers for landfill sites, and in mine reclamation.

OUTLOOK

The production of lime in Canada in 1998 is expected to increase 1-2% based on continued strength in the pulp and paper, steel, and chemicals industries. In the medium to longer term, demand for lime as a flux in steel-making is forecast to decline because of several factors. These include: improved efficiencies in steel production and energy inputs, the use of larger amounts of scrap in basic oxygen furnaces, improved ore grades, and more use of fluxed iron ore pellets, as

well as growth of the mini-mill sector, which makes steel from scrap iron in electric furnaces.

Consumption in the environmental sector will expand in the short term with an increase in the treatment of effluents in the industrial and mining sectors. Ontario Hydro has installed wet scrubbers using limestone at two of its coal-fired units at the Lambton Generating Station near Sarnia, Ontario. Similarly, limestone technology has been installed for controlling sulphur dioxide emissions at major power installations in Nova Scotia and New Brunswick.

The lime industry has become more concentrated as fewer companies control more operations. These companies or corporate groups (often diversified geographically and in product line) will be in a better position to meet future economic downturns. However, the current low rate of capacity utilization, along with ongoing plant modernization, will allow the lime industry to be well positioned to respond to any major increases in demand.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 65. (2) Information in this review was current as of February 2, 1998.

PRICES

Canadian lime prices quoted in <i>Camford Chemical Report</i>	December 1996	December 1997
(\$ per tonne)		
Lime, carload and truckload f.o.b. Ontario plant		
High-calcium quicklime, bulk	70.80	70.80
High-calcium hydrated lime, bulk	80.40	80.40

f.o.b. Free on board.

TARIFFS

Item No.	Description	Canada			United States
		MFN	GPT	USA	Canada
2522.10	Quicklime	Free	Free	Free	Free
2522.20	Slaked lime	Free	Free	Free	Free
2522.30	Hydraulic lime	Free	Free	Free	Free

Sources: Customs Tariff, effective January 1998, Revenue Canada; Harmonized Tariff Schedule of the United States, 1998.

TABLE 1. CANADA, LIME PRODUCTION AND TRADE, 1995-97

Item No.	1995		1996		1997P	
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
PRODUCTION¹						
By type						
Quicklime	2 244 800	184 852	2 134 437	176 774	2 193 422	187 739
Hydrated lime	216 916	22 081	267 595	25 805	253 371	24 748
Total	2 461 716	206 933	2 402 032	202 579	2 446 793	212 487
By province						
New Brunswick	x	x	x	x	x	x
Quebec	x	x	x	x	x	x
Ontario	1 383 659	110 138	1 317 393	103 535	1 333 200	105 687
Manitoba	x	x	x	x	x	x
Alberta	x	x	x	x	x	x
British Columbia	x	x	x	x	x	x
Total	2 461 716	206 933	2 402 032	202 579	2 446 793	212 487
IMPORTS²						
2522.10	Quicklime					
	United States	40 706	4 456	28 575	3 416	4 723
	Other countries	1	1	54	24	6
	Total	40 707	4 457	28 629	3 440	4 729
2522.20	Slaked lime					
	United States	3 735	738	4 266	826	1 006
	Other countries	61	23	89	40	8
	Total	3 796	761	4 355	866	1 014
2522.30	Hydraulic lime					
	United States	8 256	1 527	3 643	746	589
	Belgium	120	31	—	—	13
	Other countries	5	2	12	2	6
	Total	8 381	1 560	3 655	748	608
EXPORTS						
2522.10	Quicklime					
	United States	244 731	26 996	149 664	17 852	22 508
	Chile	—	—	42	31	—
	Total	244 731	26 996	149 706	17 883	22 508
2522.20	Slaked lime					
	United States	20 249	2 880	21 333	2 638	4 538
	Bermuda	16	3	16	3	—
	Total	20 265	2 883	21 349	2 641	4 538
2522.30	Hydraulic lime					
	United States	1 479	210	45 763	4 171	154
	Bermuda	—	—	31	6	—
	Total	1 479	210	45 794	4 177	154

Sources: Natural Resources Canada; Statistics Canada.

— Nil; P Preliminary; x Confidential.

¹ Producers' shipments and quantities used by producers. ² Includes re-imports.

Notes: Numbers may not add to totals due to rounding. HS code 2522.30, as interpreted, applies mainly to hydrated lime.

TABLE 2. CANADA, LIME PRODUCTION, TRADE AND APPARENT CONSUMPTION, 1970, 1975, 1980 AND 1985-97

	Production ¹			Imports	Exports	Apparent Consumption ²
	Quick	Hydrated	Total			
(tonnes)						
1970	1 296 590	224 026	1 520 616	30 649	181 994	1 369 271
1975	1 533 944	199 195	1 733 139	30 099	234 034	1 529 204
1980	2 364 000	190 000	2 554 000	40 901	403 166	2 191 735
1985	2 054 294	157 286	2 211 580	23 056	194 097	2 040 539
1986	2 069 043	173 534	2 242 577	46 917	189 512	2 099 982
1987	2 140 793	189 278	2 330 071	44 290	163 767	2 210 594
1988 ^a	2 306 831	211 151	2 517 982	32 543	122 900	2 427 625
1989	2 349 312	202 622	2 551 934	39 095	83 608	2 507 421
1990	2 137 996	202 741	2 340 737	43 715	138 409	2 246 043
1991	2 184 836	190 424	2 375 260	45 012	134 405	2 285 867
1992	2 193 752	190 592	2 384 344	55 706	173 248	2 266 802
1993	2 186 749	192 247	2 378 996	52 690	190 068	2 241 618
1994	2 250 205	198 818	2 449 023	66 886	193 902	2 322 007
1995	2 244 800	216 916	2 461 716	52 884	266 475	2 248 125
1996	2 134 437	267 595	2 402 032	36 639	216 849	2 221 822
1997 ^P	2 193 422	253 371	2 446 793	47 199	224 203	2 269 789

Sources: Natural Resources Canada; Statistics Canada.

^P Preliminary.

^a Beginning in 1988, exports and imports are based on the new Harmonized System and may not be in complete accordance with previous method of reporting. Imports and exports include HS classes 2522.10, 2522.20 and 2522.30.

¹ Producers' shipments and quantities used by producers. ² Production plus imports, less exports.

TABLE 3. CANADIAN LIME INDUSTRY, 1997

Company	Plant Location	Calcining Capacity (000 t/y)	Market	Type of Quicklime and Other Products
NEW BRUNSWICK				
Havelock Lime, a division of GoldCorp. Inc.	Havelock	175	Merchant	High-calcium ¹
QUEBEC				
Graybec Calc Inc.	Marbleton	330	Merchant	High-calcium ¹
Graybec Calc Inc.	Joliette	200	Merchant/captive	High-calcium ¹
Graybec Calc Inc.	Bedford	200	Merchant	High-calcium
ONTARIO				
Algoma Steel Inc.	Sault Ste. Marie	200	Captive	High-calcium and dolomitic
Beachville Lime Limited	Ingersoll	600	Merchant	High-calcium ¹
Miller Minerals, a division of Miller Paving Limited	Haileybury	40	Merchant	High-calcium
Guelph DoLime Limited	Guelph	122	Merchant	Dolomitic ¹
Northern Lime Limited	Spragge	200	Merchant	High-calcium
Redland Quarries Inc.	Dundas	345	Merchant	Dolomitic
Global Stone (Ingersoll) Ltd.	Ingersoll	215	Merchant/captive	High-calcium
Timminco Limited	Haley Station	53	Captive	Dolomitic
MANITOBA				
Rogers Sugar Ltd.	Fort Garry	16	Captive	High-calcium
Continental Lime Ltd.	Faulkner	117	Merchant	High-calcium
ALBERTA				
Rogers Sugar Ltd.	Taber	66	Captive	High-calcium
Continental Lime Ltd.	Exshaw	130	Merchant	High-calcium ¹
Summit Lime Works Limited	Hazell	50	Merchant	High-calcium and dolomitic ¹
BRITISH COLUMBIA				
Continental Lime Ltd.	Pavilion Lake	235	Merchant	High-calcium
Chemical Lime Company of Canada Inc.	Fort Langley	135	Merchant	High-calcium ¹
Rogers Sugar Ltd.	Vancouver	. .	Captive	High-calcium

Source: Natural Resources Canada.

. . Not available.

¹ Production of hydrated lime.

Note: Lantic Sugar Limited operates sugar refineries in Quebec and New Brunswick.

TABLE 4. CANADA, CONSUMPTION¹ OF DOMESTIC LIME, QUICK AND HYDRATED, 1992-96

End Uses	1992	1993	1994	1995	1996
	(tonnes)				
CHEMICAL AND INDUSTRIAL					
Steel-making	794 700	746 111	825 605	836 826	780 386
Water and sewage treatment	201 685	237 766	219 438	236 315	260 221
Water purification	71 589	62 808	69 611	57 715	46 572
Gas scrubbing	20 608	13 736	14 274	12 058	8 276
Metal concentration	163 777	125 919	120 837	146 461	144 224
Pulp and paper mills	264 223	256 770	235 746	245 007	229 659
Chemicals	92 609	77 193	136 607	194 033	129 835
Other industrial uses	175 410	102 975	152 329	178 705	82 753
CONSTRUCTION					
Road and soil stabilization	14 676	9 395	6 757	2 504	7 337
Mason and finishing lime	12 176	6 060	3 387	3 834	3 427
Other	17 784	22 114	26 191	28 194	22 401
AGRICULTURE					
	9 616	11 001	12 500	5 600	5 056
Total	1 838 853	1 671 848	1 823 282	1 947 252	1 720 147

Source: Natural Resources Canada, based on producing companies' surveys, 1992-96.

¹ Includes merchant market; excludes companies that are completely captive producers/consumers.

TABLE 5. WORLD PRODUCTION OF QUICKLIME AND HYDRATED LIME, INCLUDING DEAD-BURNED DOLOMITE SOLD AND USED, 1993-97

	1993	1994	1995	1996	1997 ^p
	(000 tonnes)				
China	19 500	19 500	20 000	20 000	22 000
United States	16 900	17 400	18 500	19 100	19 300
Japan ¹	8 000	7 710	7 900	7 676	7 700
Germany	7 500	7 500	8 000	8 000	8 000
Mexico	6 500	6 500	6 600	6 600	6 600
Brazil	5 700	5 700	5 700	5 700	5 700
Italy ²	3 600	3 500	3 500	3 500	3 500
France	3 000	2 500	2 600	3 000	3 000
Poland	2 500	2 500	2 500	2 500	2 500
United Kingdom	2 500	2 500	2 500	2 500	2 500
Canada	2 400	2 450	2 450	2 400	2 400
Other countries	46 850	40 350	39 200	40 200	40 200
Total	124 950	118 110	119 450	121 180	123 400

Sources: Natural Resources Canada; Statistics Canada; U.S. Geological Survey.

^p Preliminary.

¹ Quicklime only. ² Includes hydraulic lime.