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 hydrated lime (calcium hydroxide), also referred to as slaked lime. In the calcining process, quicklime (CaO or CaO.MgO) begins to form at the dissociation temperature of limestone. Temperatures are maintained sufficiently long until there is a complete breakdown of the limestone and a release of the carbon dioxide content. High-calcium quicklime containing mainly CaO and less than 5% MgO is the most common type of lime produced. However, dolomitic quicklime (or dolime) as well as its hydrated products are also produced; these products contain 35-40% MgO.

CANADIAN INDUSTRY

Canadian shipments of all lime in 1999 amounted to 2.54 Mt valued at $236 million based on preliminary data. These amounts are about 3% and 10% higher, respectively, than in 1998 (Tables 1 and 2). Quicklime accounted for about 90% of the total volume. 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. Similarly, beginning with 1996 data, General Chemical Canada Ltd. has not been included as a producer of lime because lime, although of critical importance, is considered to be a raw material input for the large-volume manufacture of other chemicals for numerous industry needs.

The lime industry in Canada comprises 20 operating plants, of which 12 plants were in eastern Canada (Table 3). Total employment in the industry in 1997 (the most recent year for which Statistics Canada data are available) was approximately 812, about 10% more than in 1996. Calcining capacity to produce quicklime did not change; the effective capacity utilization rate was approximately 70%.

The Dundas, Ontario, plant of Lafarge Lime (Canada) Inc. is now essentially controlled by a 60-40 joint venture, completed in February 1999, between Carmeuse SA of Belgium and Lafarge SA of France.

An affiliate of the Belgian group, Carmeuse SA, purchased Global Stone Ingersoll Ltd. and Global Stone Detroit Lime Company from Oglebay Norton Co. of Cleveland, Ohio, for a reported cost of $85 million.

In 1999, Graymont Limited of Vancouver, British Columbia, the owner of Canadian-based companies Continental Lime Ltd. and Graybec Calc Inc., purchased Havelock Lime from Gold Corp. Inc. of Toronto for a reported cost of about $28 million. The combined operations of the Graymont group of companies are now estimated to account for approximately 30% of total lime capacity in North America. Official name changes will be effective in mid-2000, appearing on the company's web site at http://www.graymont.com. Carmeuse North America Group, which merged its lime operations with Dravo Lime Co. of the United States in 1998, and with Lafarge S.A.'s North American lime operations in 1999, is the leading producer of lime in North America. Chemical Lime Company, as shown in Table 3, with one operation in Canada, is the second largest producer of lime in North America.

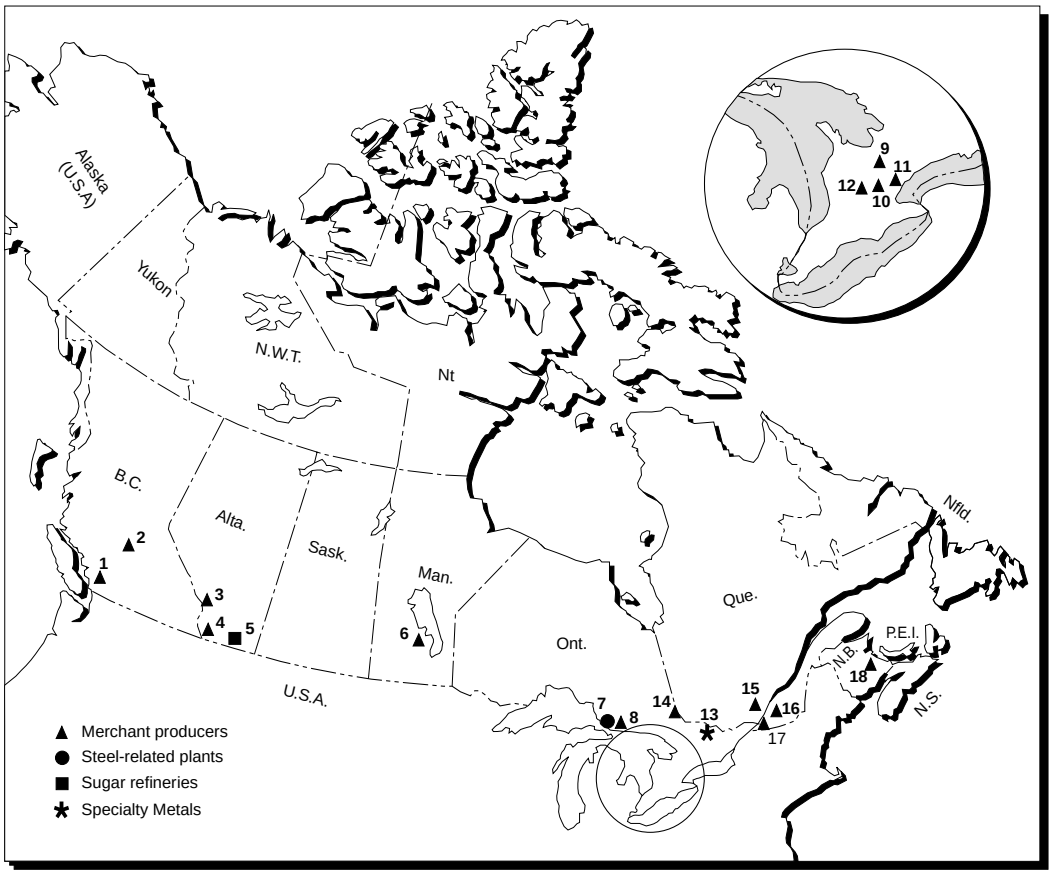
CONSUMPTION

The types or forms of lime commercially available are essentially the same as reported in the Lime chapter of the 1998 edition of the *Canadian Minerals Yearbook*.

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 three sugar refineries; and the merchant market, which is served by the mainstream lime producers.

The consumption of quicklime, based on sales in the merchant market, amounted to 1 692 822 t in 1999. The major end uses were steel-making (46%), environmental control (16%), pulp and paper (13%), chemicals (11%), and other industrial uses, including

Figure 1
Lime Producers in Canada, 1999



Numbers refer to locations on map above.

MERCHANT PRODUCERS

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

STEEL-RELATED PRODUCERS

7. Algoma Steel Inc., Sault Ste. Marie

SUGAR REFINERIES

5. Rogers Sugar Ltd., Taber

SPECIALTY METALS

13. Timminco Limited, Haley Station

metal concentration (12%). Hydrated lime shipments in the merchant market amounted to 141 302 t in 1999 and were sold mainly for environmental control (62%), other industrial uses (23%), metal concentration (6%), agricultural uses (2%), and other miscellaneous uses related mainly to road and soil stabilization, and other construction and masonry (8%). Eastern Canada, comprising Ontario eastward, accounted for about three quarters of total merchant sales of quicklime in 1999.

Uses for lime remained essentially the same as reported last year (refer to the Lime chapter of the 1998 edition of the *Canadian Minerals Yearbook).*

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) kilns or rotary-type kilns, the latter technology being most common in North America. Preheater systems and computerized process control systems are now commonplace.

About 50% of the kilns in service use natural gas, with petroleum coke, coal and heating oils accounting for the energy inputs required for the calcining process. Kiln efficiencies depend on the type of design and generally range from 5.0 gigajoules per tonne (GJ/t) of calcined lime for shaft kilns to as much as 13.0 GJ/t for long rotary kilns not equipped with preheaters. 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 1999.

INTERNATIONAL DEVELOPMENTS

In 1999, world lime production was an estimated 118 Mt, compared to 116 Mt in 1998 (Table 5). The United States and China, each accounting for more than 20 Mt, or about 18% of world output, were followed by Germany and Japan each with about 7% of world output.

Although Canada ranks in the top 10 lime-producing countries (2.5 Mt), it is a relatively small producer because of fewer industrial requirements. However, reserves of limestone are relatively large and the proximity of lime plants to U.S. markets has resulted in a favourable balance of trade in lime products, as shown in Table 2.

The United States produced 20.5 Mt of lime in 1999 compared to 20.1 Mt in 1998, according to preliminary figures. Apparent consumption amounted to 20.6 Mt in 1999 compared to 20.3 Mt in 1998. Environmental uses for lime in the United States, which include flue gas sulphur removal, water treatment and waste-water treatment, have grown rapidly and are the third most important uses after metallurgical and chemical and industrial uses.

Stricter rules are now in effect concerning waste-water 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 2000 is expected to increase by 2-4% compared to 1999 based on continued strength in the pulp and paper, steel and chemicals industries. Although demand for steel is expected to increase by 1-2% according to the Canadian Steel Producers Association, increased imports of steel from outside North America may restrain domestic production and the need for lime in this sector.

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

Lime is now marketed to several industries more as a specialty chemical than as a commodity because certain uses demand stricter specifications relating to ISO standards. In particular, these standards may apply to: 1) lime and dolime for steel-making; 2) the processing of lime for precipitated calcium carbonate (PCC) for a range of industrial uses; 3) lime for flue-gas desulphurization technology to make commercial-quality synthetic (FGD) gypsum; and 4) high-purity lime for water treatment. Consumption of lime in the environmental sector is expected to increase in the short term given the importance of treating effluents in the industrial and mining sectors.

The lime industry has continued to become more concentrated and these companies or corporate groups, now more diversified geographically and in product line, will be in a favourable position to meet future economic downturns.

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 1, 2000. (3) This and other reviews, including previous editions, are available on the Internet at http://www.nrcan.gc.ca/mms/cmy/index_e.html.

NOTE TO READERS

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PRICES

Canadian lime prices quoted in *Camford Chemical Report*	December 1998	December 1999
	($ 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 2000, Canada Customs and Revenue Agency; Harmonized Tariff Schedule of the United States, 2000.

TABLE 1. CANADA, LIME PRODUCTION AND TRADE, 1997-99

Item No.		1997		1998		1999p	
		(tonnes)	($000)	(tonnes)	($000)	(tonnes)	($000)
PRODUCTION[1]							
	By type						
	Quicklime	2 219 385	187 347	2 204 957	188 710	2 283 700	207 957
	Hydrated lime	257 186	25 691	256 086	26 256	254 400	27 664
	Total	2 476 571	213 038	2 461 043	214 966	2 538 100	235 621
	By province						
	New Brunswick	x	x	x	x	x	x
	Quebec	x	x	x	x	x	x
	Ontario	1 343 834	108 884	1 333 720	108 766	1 384 300	121 913
	Manitoba	x	x	x	x	x	x
	Alberta	x	x	x	x	x	x
	British Columbia	x	x	x	x	x	x
	Total	2 476 571	213 038	2 461 043	214 966	2 538 100	235 621
IMPORTS[2]							
2522.10	Quicklime						
	United States	39 204	4 741	23 327	3 244	37 814	4 569
	Switzerland	–	–	–	–	129	22
	Other countries	18	6	15	2	36	7
	Total	39 222	4 747	23 342	3 246	37 979	4 598
2522.20	Slaked lime						
	United States	5 286	1 016	5 389	1 221	5 837	1 217
	Other countries	18	8	29	27	–	–
	Total	5 304	1 024	5 418	1 248	5 837	1 217
2522.30	Hydraulic lime						
	United States	2 793	589	5 166	1 235	10 599	1 886
	Israel	–	–	–	–	66	13
	Belgium	53	13	58	20	16	5
	Other countries	10	6	4	2	19	6
	Total	2 856	608	5 228	1 257	10 700	1 910
2518.20	Calcined dolomite						
	United States	6 459	952	2 946	584	3 078	615
	Canada	–	–	143	13	756	86
	Total	6 459	952	3 089	597	3 834	701
EXPORTS							
2522.10	Quicklime						
	United States	185 996	22 515	143 541	17 476	79 112	10 857
	Belgium	–	–	91	10	–	–
	Total	185 996	22 515	143 632	17 486	79 112	10 857
2522.20	Slaked lime						
	United States	36 996	4 534	27 661	3 799	16 943	2 353
	China	–	–	10	3	–	–
	Total	36 996	4 534	27 671	3 802	16 943	2 353
2522.30	Hydraulic lime						
	United States	1 240	154	136	13	26	4
	China	–	–	7	3	–	–
	Total	1 240	154	143	16	26	4
2518.20	Calcined dolomite						
	United States	33 620	6 390	32 515	6 459	29 466	6 696
	Venezuela	26 602	355	–	–	–	–
	Trinidad and Tobago	50 559	670	–	–	–	–
	Other countries	40	11	–	–	110	30
	Total	110 821	7 426	32 515	6 459	29 576	6 726

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 1985-99

	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	2 219 385	257 186	2 476 571	47 382	224 232	2 299 721
1998	2 204 957	256 086	2 461 043	33 988	171 446	2 323 585
1999[p]	2 283 700	254 400	2 538 100	54 516	96 081	2 496 535

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, 1999

Company	Plant Location	Calcining Capacity	Market	Type of Quicklime and Other Products
		(000 t/y)		
NEW BRUNSWICK				
Havelock Lime, a division of Graybec Calc 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
BeachviLime Limited	Ingersoll	600	Merchant	High-calcium[1]
Miller Minerals, a division of Miller Paving Limited	Haileybury	40	Merchant	High-calcium
Guelph DoLime Limited	Guelph	100	Merchant	Dolomitic[1]
Northern Lime Limited	Spragge	200	Merchant	High-calcium
Lafarge Lime (Canada) Inc.	Dundas	345	Merchant	Dolomitic
Global Stone Ingersoll Ltd.	Ingersoll	215	Merchant/captive	High-calcium
Timminco Limited	Haley Station	53	Captive	Dolomitic
MANITOBA				
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]
Continental Lime Ltd., Summit plant	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]

Source: Natural Resources Canada.
[1] Production of hydrated lime.
Note: Lantic Sugar Limited operates sugar refineries in Quebec and New Brunswick.

TABLE 4. CANADA, CONSUMPTION[1] OF DOMESTIC LIME, QUICK AND HYDRATED, 1996-99

End Uses	1996	1997	1998	1999
		(tonnes)		
CHEMICAL AND INDUSTRIAL				
Steel-making	780 386	807 000	707 482	780 877
Water and sewage treatment	260 221	278 986	310 510	296 053
Water purification	46 572	52 026	48 366	51 323
Gas scrubbing	8 276	9 376	15 060	16 309
Metal concentration	144 224	151 258	158 482	138 431
Pulp and paper mills	229 659	225 363	200 824	213 627
Chemicals	129 835	126 375	193 693	194 362
Other industrial uses	82 753	73 879	96 416	101 102
CONSTRUCTION				
Road and soil stabilization	7 337	12 458	14 323	15 810
Mason and finishing lime	3 427	7 252	1 684	1 591
Other	22 401	13 851	17 807	22 126
AGRICULTURE	5 056	4 509	1 051	2 512
Total consumption	1 720 147	1 762 334	1 765 697	1 834 124

Source: Natural Resources Canada, based on producing companies' surveys, 1996-99.
[1] Includes merchant market only; excludes companies that are completely captive producers/consumers.

TABLE 5. WORLD PRODUCTION OF QUICKLIME AND HYDRATED LIME, INCLUDING DEAD-BURNED DOLOMITE SOLD AND USED, 1995-99

	1995	1996	1997	1998	1999p
			(000 tonnes)		
Canada	2 450	2 400	2 500	2 460	2 540
Brazil	5 700	5 700	5 700	5 700	5 700
China	20 000	20 000	20 500	21 000	22 000
France	2 600	3 000	2 800	2 800	2 800
Germany	8 000	8 000	8 000	7 600	7 800
Italy[1]	3 500	3 500	3 500	3 500	3 500
Japan[2]	7 900	7 676	7 850	8 100	8 200
Mexico	6 600	6 600	6 600	6 600	6 600
Poland	2 500	2 500	2 500	2 500	2 500
United Kingdom	2 500	2 500	2 500	2 500	2 500
United States	18 500	19 100	19 700	20 100	20 500
Other countries	39 200	40 200	37 850	33 050	33 150
Total	119 450	121 180	120 000	115 910	117 790

Sources: Natural Resources Canada; Statistics Canada; U.S. Geological Survey.
p Preliminary.
1 Includes hydraulic lime. **2** Quicklime only.