IC

INDUSTRY PROFILE

Industry, Science and Technology Canada
Industrie, Sciences et Technologie Canada

Lead and Zinc Smelting and Refining

Canada

INDUSTRY PROFILE

LEAD AND ZINC SMELTING AND REFINING

1988

FOREWORD

In a rapidly changing global trade environment, the international competitiveness of Canadian industry is the key to survival and growth. This Industry Profile is one of a series of papers which assess, in a summary form, the current competitiveness of Canada's industrial sectors, taking into account technological and other key factors, and changes anticipated under the Canada-U.S. Free Trade Agreement. Industry participants were consulted in the preparation of the papers.

The series is being published as steps are being taken to create the new Department of Industry, Science and Technology from the consolidation of the Department of Regional Industrial Expansion and the Ministry of State for Science and Technology. It is my intention that the series will be updated on a regular basis and continue to be a product of the new department. I sincerely hope that these profiles will be informative to those interested in Canadian industrial development and serve as a basis for discussion of industrial trends, prospects and strategic directions.

Minister

1. Structure and Performance

Structure

The close association of lead with zinc minerals in Canadian and many other world ore bodies has given rise to a common industry structure under which the production of one metal affects the supply of the other. Canada's lead and zinc operations are of two basic geological types. Ore bodies in eastern and western Canada contain mainly lead and zinc, whereas those in central Canada are made up of mostly copper and zinc.

Canada is a major producer of lead and zinc, accounting for 17 and 28 percent, respectively, of the western world's production. Canada also produces one-quarter to one-third of world exports of lead and zinc ores, concentrates and metals. Most companies in the Canadian lead and zinc smelting and refining industry are linked through ownership to mining operations and are therefore actively engaged in buying and selling ores and concentrates, as well as the sale of refined metals.

A number of factors affect the form in which these commodities are traded. Tariff barriers (which escalate with each stage of processing), ownership patterns and historic trading relationships have created a three-tier market in which Canada ships primarily ores and concentrates to Europe and Japan, refined metals to the United States, and metals and alloys to domestic customers. While Canada imports some ores and concentrates, it does not import lead and zinc in either refined or alloyed form.

DESTINATION OF CANADIAN SHIPMENTS, 1986
(thousands of tonnes of metal and contained metal in ores and concentrates)

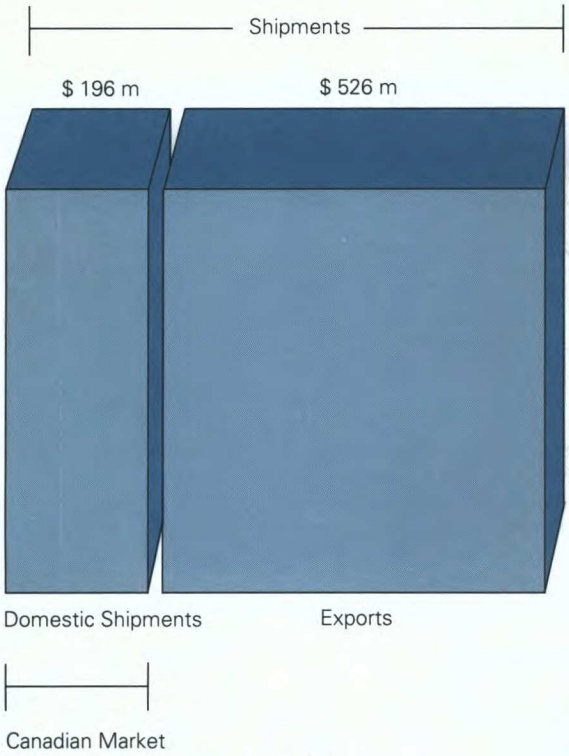
	Canadian Production*		Exports									
			Total		Europe		Japan		U.S		Other	
	Pb	Zn	Pb	Zn	Pb	Zn	Pb	Zn	Pb	Zn	Pb	Zn
Ores and concentrates	349	1 291	108	411	41	262	45	67	6	14	16	68
Refined metals	258	571	112	427	26	29	—	—	83	333	3	65

Pb = lead Zn = zinc
* Includes inventory

The primary end-use for zinc is in galvanized steel production, used to manufacture products such as automobiles and appliances. It accounts for about 55 percent of total consumption. Other major uses include die casting alloys (21 percent), brass alloys (12 percent) and zinc oxide (eight percent). More than one-half of lead consumption is used to produce automotive batteries. Other major end-uses include chemical applications (10 percent), leaded gasoline (six percent), ammunition (six percent), construction pipes and sheets (five percent) and cable sheathing (five percent).

Canada

Industry, Science and Technology Canada
Industrie, Sciences et Technologie Canada



Exports and Domestic Shipments 1986

In 1986, the latest year for which complete statistics are available, the value of Canadian smelter and refinery shipments of lead and zinc metal was $722 million ($580 million zinc, $142 million lead). Employment in that year was estimated at 5500 people.

The primary activity of the industry is the smelting and refining of mine concentrates. Producers also recycle lead from scrap. Zinc, however, is not recycled. Its major end-use, galvanizing, makes most of this metal non-recoverable.

Primary smelting and refining operations are carried out by five large companies. They operate four zinc refineries and two lead smelters located in New Brunswick, Quebec, Ontario, Manitoba and British Columbia.

Ownership is largely Canadian, though there are complex corporate relationships. All of the companies are vertically integrated through ownership of mining, smelting and refining operations. The five also purchase significant quantities of lead and zinc concentrates from smaller mining companies that do not have their own smelters or refineries. The existence of a lead-zinc smelter in a mining district is therefore strategically important to the industrial development of the area, as it permits the exploitation of a number of small ore bodies in that district.

The secondary lead industry in Canada comprises six secondary lead smelters. These plants are located in or near large cities (Montréal, Toronto, Winnipeg, Vancouver) in order to obtain scrap efficiently. The total capacity of these smelters is about 116 000 tonnes. The recycling of lead scrap into secondary lead accounts for about 40 percent of Canadian lead metal production, the same proportion as the average for other world producers. Ownership is by private Canadian interests. There are no corporate connections between Canadian primary and secondary lead companies.

Performance

Lead and zinc companies, not only in Canada but in the western world, have been affected by the extreme volatility of supply and demand. Metal consumption and prices increased sharply in the early 1970s, and were forecast to continue rising, causing new sources of supply to be brought into production. Heavy investments were initiated to modernize and expand facilities and to meet new stringent environmental regulations.

As a result, when the second oil-price shock of 1979 reduced the consumption of both metals, the industry found itself facing a significant overcapacity. This situation was aggravated by structural changes in demand which had a negative impact on lead consumption. Downsizing in the automotive industry and the introduction of more efficient lead-calcium alloys had reduced the demand for lead in automotive batteries. In addition, health and environmental legislation had restricted the amount of lead allowed in gasoline and paint pigments.

This declining demand caused world production of both lead and zinc to decrease. While zinc markets remained relatively stable, however, the fact that the two metals are mined and smelted together caused a severe lead surplus, as lead continued to be produced as a zinc by-product. Lead prices plummeted, dropping from a high of US$0.53 per pound in 1979 to US$0.19 during the 1983-86 period.

Consequently, the years between 1980 and 1986 were characterized by low demand, excess capacity, high debt loads and significant losses for the world industry. A number of important closures took place in the United States. Canadian primary producers were not as severely affected during this period. Canadian lead-zinc and copper-zinc ores are complex and typically contain a number of other important metals such as silver, gold, antimony, cadmium, germanium and arsenic. In addition, sulphuric acid and fertilizers are obtained from sulphur dioxide produced during the smelting and refining process. The presence of these by-products reduced the impact of sustained low prices, and permitted Canadian companies to maintain production in spite of substantial losses.

Canadian secondary lead smelters were also able to maintain production partly because of lower scrap prices and less stringent environmental regulations than those in the United States.

The 1980-86 recession provoked substantial restructuring in the industry, with companies selling off assets not directly related to their core operations and issuing new shares to raise equity capital. Some new investment also took place in zinc smelting and refining. Cominco Ltd. undertook a major expansion and modernization of its zinc operations. Falconbridge Limited added to its zinc capacity. Because of depressed lead prices, no modernization of primary lead smelting facilities took place during that period other than measures to improve the environment of the workplace. For the most part, Canadian secondary lead producers made investments to improve efficiency and to meet more stringent environmental standards.

World demand and prices began to recover in 1987, so that company profits have improved substantially. The industry now has returned to a more healthy position with good profits and acceptable debt-to-equity ratios.

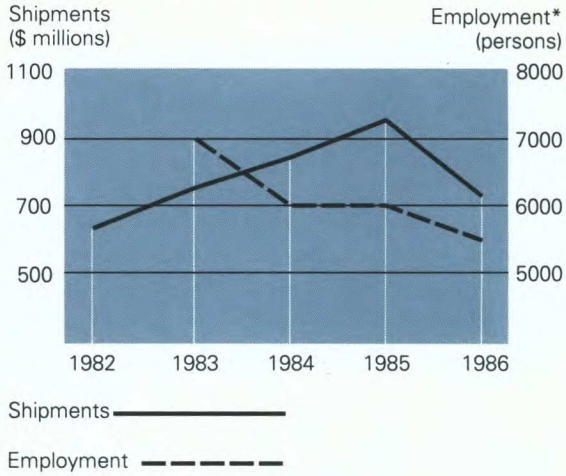
2. Strengths and Weaknesses

Structural Factors

Two of Canada's primary zinc operations are among the largest in the world. The other two are considered to be of medium size compared to those in Australia, Europe, Peru, Mexico, the United States and Japan. Canada's two primary lead operations are also mid-sized compared to facilities in those countries, although Cominco's capacity will increase significantly when the new smelter begins to operate in 1989.

Canadian lead and zinc operations benefit from the sale of valuable co-products and by-products which arise from the complexity of Canadian ores. In addition to precious metals such as gold and silver, acids, fertilizers and other metals are also produced. Revenues from these products can make the difference between profit and loss.

Canada is considered to have the western world's lowest-cost zinc smelting and refining operations. Canadian plants, with one exception, are modern. They employ state-of-the-art technology and enjoy the advantages of long-term supply of concentrates, large-scale integrated production and a high degree of extraction of metal from feed. Yet another major advantage in Canada is the low cost of electrical energy, which represents a substantial proportion of the cost of producing zinc (10 to 20 percent in Canada, 30 percent in Europe).



Total Shipments and Employment

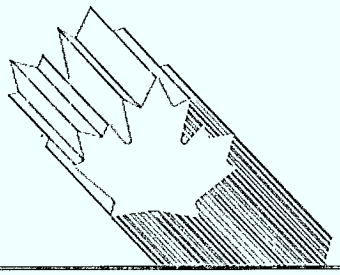
** Estimate*

With the exception of one smelter which has been operating for only one year, the world's lead smelters are basically old Imperial smelters developed at the turn of the century. New, more efficient technologies were developed in the 1970s and 1980s but depressed lead prices inhibited their immediate adoption. In 1986, Cominco Ltd. began construction of a new lead smelter in Trail, British Columbia, which uses the Queneau-Schuhmann-Lurgi (QSL) process. A bath smelting procedure, QSL uses oxygen for the oxidation reaction and a carbonaceous fuel for the reduction reaction. The new smelter is scheduled to begin producing in 1989. The Brunswick Mining and Smelting Corporation is evaluating a similar conversion to state-of-the-art technology.

Trade-related Factors

While Canada does not impose tariffs on lead and zinc metals, other countries do. These tariffs tend to accelerate with the degree of processing. U.S. tariffs are three percent on lead and 1.5 percent on zinc. European Community (E.C.) tariffs are 3.5 percent on both metals. Japanese tariffs are applied on a weight basis of eight yen per kilogram or US2.95¢ per pound of unwrought lead and zinc, based on current exchange rates. On the basis of the current price of lead, US40¢ per pound, the Japanese ad valorem tariff equivalent for lead is 7.4 percent; the Japanese ad valorem tariff equivalent for zinc is 3.9 precent, based on the current price of zinc, US75¢ per pound.

There are no non-tariff barriers (NTBs) inhibiting sales in any markets where Canadian lead and zinc are sold.



The tariffs affecting Canada-U.S. trade in lead and zinc smelting and refining and their phased reductions negotiated under the Canada-U.S. Free Trade Agreement (FTA) follow.

CURRENT TARIFF STRUCTURE AND EFFECTS OF THE FTA

Description	Base Rate Canada	Base Rate United States	Years for Tariffs to be Phased Out
	(percent)		
Unwrought lead, refined	Free	3.0*	10
Lead waste and scrap	Free	2.3*	Immediate
Powders	4.0	11.2	10
Unwrought zinc, over 99.99 percent pure	Free	1.5	10
Unwrought zinc alloys	Free**	19	10
Zinc waste and scrap	Free	Free	Immediate
Zinc dust	Free	0.7¢/kg	10

* On the basis of lead content value
** On the basis of zinc content of between 90 and 97.5 percent by weight

A number of elements of the FTA will have an impact on this industry. In addition to the elimination of duties, there will be safeguard-action provisions, a trade dispute-settlement mechanism, development of new rules on dumping and more secure access to the U.S. market.

Technological Factors

The overriding technical factor facing the Canadian industry is its ability to treat complex ores and extract significant values from them. Canadian companies devote considerable attention and resources to research and development. All are involved in buying or selling (or both) of process technologies. Primary lead smelting operations in Canada, like most others in the world, use the sinter-blast furnace process. These plants are now outdated and have lower productivity, higher operating costs and less hygienic working conditions than those using the new smelting technology. Cominco Ltd. is replacing its existing lead smelter with one employing the QSL process, and the Brunswick Mining and Smelting Corporation is considering a similar move.

Canada's zinc producers are world leaders in technology. This technology includes not only pyrometallurgical processing and electrolytic refining but also pressure leaching. The latter, used by Cominco and Falconbridge for about one-fifth of their zinc production, eliminates sulphur dioxide emissions. Instead, elemental sulphur is produced as a saleable by-product. The net effect is a reduction of acid rain in the environment.

3. Evolving Environment

The moderate supply imbalance currently keeping world prices high is not expected to persist.

World markets for both lead and zinc are mature. The projected growth in world demand is low — about 1.5 percent annually. While not clear at this time, supply will probably outpace demand. Canada itself will increase its production when Cominco's huge Red Dog mine in Alaska begins to feed its Trail, British Columbia smelting and refining operations in 1989. This mine, as well as several other large, new lead-zinc mines being brought into production in Australia, will dampen world lead and zinc prices. The exact degree of supply-demand imbalance is difficult, if not impossible, to predict. However, it is clear that the large price fluctuations which have characterized past markets, particularly lead markets, will continue.

The world industry thus faces a good deal of uncertainty. As a result, both its downstream consumers and upstream producers are now exploring corporate realignments and mergers to attain long-term ore reserves, modern efficient facilities and assured markets. For example, M.I.M. of Australia purchased a large interest (28 percent) in Asarco Inc., one of the largest U.S. producers. More recently, a Canadian-Australian-German consortium (Teck Corp., M.I.M., and Metallgesellschaft) gained control of Cominco. This consortium now accounts for almost 20 percent of the western world's zinc mining capacity, 10 percent of its zinc refining capacity, significant proportions of world lead mining and smelting capacities, and important downstream fabricating facilities. In addition, lead and zinc mining and smelting operations of CRA and North Broken Hill located in Australia, Europe and the United States will merge soon. In Canada, the Noranda group has purchased a 20 percent share of Falconbridge Limited, a significant producer of zinc, copper and nickel. In Europe, six large European zinc producers are continuing to rationalize smelting and refining capacity to achieve control of about 20 percent of the western world's zinc production capacity (50 percent of E.C. capacity).

To improve profit margins, Canadian lead and zinc producers must modernize and improve productivity. Most of this has already taken place in zinc operations and is beginning to happen in lead smelting operations.

Exchange rates play an important role in Canada's competitive position. Future fluctuations will continue to have a significant effect on the industry's competitiveness, particularly in relation to producers in countries such as Mexico and Peru, which have large inflation rates.

Because the Canadian industry is already producing for the world market, its volume of production and level of employment should not increase significantly as a result of the FTA. The reduction of basic U.S. tariffs of three percent on lead and 1.5 percent on zinc will increase Canadian profits and accelerate planned modernizations and expansions. In addition, the removal of the 19 percent U.S. tariff on zinc alloys will open up this market to Canadian companies and could result in the production of significant quantities of zinc alloys for export to the United States.

4. Competitiveness Assessment

Canadian companies are competitive world-class producers of lead and zinc. The industry is currently benefiting from relatively high world prices of both metals. Important modernizations are under way which will strengthen Canada's competitive position. The industry is well positioned to exploit the opportunities presented by the FTA. Improved access to the U.S. market under the FTA will improve company profits and provide new markets for high value-added products.

For further information concerning the subject matter contained in this profile, contact:

Resource Processing Industries Branch
Industry, Science and Technology Canada
Attention: Lead and Zinc Smelting and Refining
235 Queen Street
Ottawa, Ontario
K1A 0H5

Tel.: (613) 954-3124

PRINCIPAL STATISTICS

SIC(s) COVERED: 295 (1980)

	1973	1982	1983	1984	1985	1986
Companies	N/A	5	5	5	5	5
Employment[e]	8 000	N/A	7 000	6 000	6 000	5 500
Gross domestic product* (constant 1981 $ millions)	1 390	1 510	1 600	1 930	2 018	2 039
Investment ($ millions)*	258	807	745	1 049	1 321	964
Profit after tax ($ millions)**	N/A	8	-37	51	-162	-179
Shipments of refined metals						
($ millions)	600[e]	664	760	873	957	722
(volume '000 tonnes) lead	126[e]	165	183	163	147	140
zinc	474	521	612	695	718	529

TRADE STATISTICS

	1982	1983	1984	1985	1986
Exports ($ millions)	479	554	648	731	526
Domestic shipments ($ millions)	185	206	225	226	196
Imports ($ millions)	13	12	3	—	—
Canadian market ($ millions)	198	218	228	226	196
Exports as % of shipments	72	73	74	76	73
Imports as % of domestic market	7	6	1	—	—
Canadian share of international trade lead – %	9	9	8	9	15
zinc – %	15	14	15	16	26

Destination of exports (% of total tonnage)	U.S.		E.C.		Asia[e]		Others[e]	
	Lead	Zinc	Lead	Zinc	Lead	Zinc	Lead	Zinc
1983	44	62	36	5	14	11	6	22
1984	64	62	31	7	2	10	3	21
1985	65	67	31	7	3	10	1	16
1986	74	78	23	7	2	1	1	14

(continued)

REGIONAL DISTRIBUTION — Average over the last 3 years

	Atlantic	Quebec	Ontario	Prairies	B.C.
Establishments – % total	16	17	17	7	43
Employment – % total	8	22	15	8	47
Shipments – % total	7	25	16	7	45

MAJOR FIRMS

Primary Lead and Zinc Producers

Company	Ownership	Capacity (tonnes) Lead	Zinc
Cominco Ltd, Trail, British Columbia	Canadian	135 000	272 000
Canadian Electrolytic Zinc (CEZ) Valleyfield, Quebec	Canadian	—	230 000
Falconbridge Limited, Timmins, Ontario	Canadian	—	136 000
Brunswick Mining & Smelting Corporation (BMS) Belledune, New Brunswick	Canadian	68 000	—
Hudson Bay Mining and Smelting Co. Ltd. (HBMS), Flin Flon, Manitoba	American/ South African	—	83 000

Secondary Lead Producers

Nova PB Inc., Montreal	Canadian	Total capacity for the six secondary lead producers is 116 000 tonnes.
Tonolli Canada Ltd., Toronto	N/A	
Canada Metal Company Limited, Toronto & Winnipeg	Canadian	
Toronto Refiners & Smelters Ltd., Toronto	Canadian	
Metalex Products Ltd., Vancouver	Canadian	
Northwest Smelting and Refining Ltd., Winnipeg	Canadian	

e Estimate
* Includes all of SIC 295 (Smelting and Refining Nonferrous Metals), not specifically lead and zinc
** Profits refer to Cominco, BMS and HBMS, which represent 100 percent of lead and 66 percent of zinc capacity, and relate to overall profits, not specifically to lead and zinc
N/A Not available

Sources: Statistics Canada and *Lead and Zinc Statistics,* Monthly bulletin of the International Lead and Zinc Study Group, Vol. 28, No. 2, February 1988. London, England.

Regional Offices

Newfoundland

Parsons Building
90 O'Leary Avenue
P.O. Box 8950
ST. JOHN'S, Newfoundland
A1B 3R9
Tel: (709) 772-4053

Prince Edward Island

Confederation Court Mall
Suite 400
134 Kent Street
P.O. Box 1115
CHARLOTTETOWN
Prince Edward Island
C1A 7M8
Tel: (902) 566-7400

Nova Scotia

1496 Lower Water Street
P.O. Box 940, Station M
HALIFAX, Nova Scotia
B3J 2V9
Tel: (902) 426-2018

New Brunswick

770 Main Street
P.O. Box 1210
MONCTON
New Brunswick
E1C 8P9
Tel: (506) 857-6400

Quebec

Tour de la Bourse
P.O. Box 247
800, place Victoria
Suite 3800
MONTRÉAL, Quebec
H4Z 1E8
Tel: (514) 283-8185

Ontario

Dominion Public Building
4th Floor
1 Front Street West
TORONTO, Ontario
M5J 1A4
Tel: (416) 973-5000

Manitoba

330 Portage Avenue
Room 608
P.O. Box 981
WINNIPEG, Manitoba
R3C 2V2
Tel: (204) 983-4090

Saskatchewan

105 - 21st Street East
6th Floor
SASKATOON, Saskatchewan
S7K 0B3
Tel: (306) 975-4400

Alberta

Cornerpoint Building
Suite 505
10179 - 105th Street
EDMONTON, Alberta
T5J 3S3
Tel: (403) 495-4782

British Columbia

Scotia Tower
9th Floor, Suite 900
P.O. Box 11610
650 West Georgia St.
VANCOUVER, British Columbia
V6B 5H8
Tel: (604) 666-0434

Yukon

108 Lambert Street
Suite 301
WHITEHORSE, Yukon
Y1A 1Z2
Tel: (403) 668-4655

Northwest Territories

Precambrian Building
P.O. Bag 6100
YELLOWKNIFE
Northwest Territories
X1A 1C0
Tel: (403) 920-8568

For additional copies of this profile contact:

Business Centre
Communications Branch
Industry, Science and Technology Canada
235 Queen Street
Ottawa, Ontario
K1A 0H5

Tel: (613) 995-5771

PU 3114