MINES BRANCH

DEPARTMENT OF MINES

OTTAWA, CANADA

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(1931-32-33)

Memorandum Series
No.61
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ZINC DUST CONSUMPTION AT CANADIAN GOLD MINES(a)

By

A. Buisson*

The commercial production of zinc dust in Canada began only a few years ago and has already increased to about 100 tons a year, which quantity represents about 40 per cent of the present apparent Canadian consumption in the gold treatment plants. The only Canadian producer of commercial zinc dust is the Watts Chemical Company with plant in Toronto.

About 98 per cent of the Canadian production is consumed as a precipitant of gold in the cyanide process, the other 2 per cent being used in the dyeing and the chemical industries and in the sherardizing process and the total amount used would probably not exceed 50,000 pounds per year.

The consumption of zinc dust at the Canadian gold treatment plants amounted in 1933 to approximately 556,600 pounds as against 530,500 pounds in 1932. The present monthly consumption is at the rate of 48,000 pounds.

The consumption of zinc dust per ton of ore milled in

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(a) This report is a revision of a similar report published in April 1933, as Memorandum Series No.59.

1933 varied from a minimum of 0.040 pound to a maximum of 0.201 pound. These figures of consumption per unit do not include the consumption at the McIntyre, and Granada mines, where the concentrates only are cyanided, or at the Flin Flon where flotation tailings are cyanided.

The commercial production in the United States began in 1910 and is now about 18,000,000 pounds a year.

The imports of zinc dust, as given by the Department of Trade and Commerce, amounted in 1933 to 841,341 pounds valued at $47,826 or 5.684 cents per pound, as against 530,628 pounds valued at $40,623 or 7.642 cents per pound in 1932.

The cost of zinc dust at the mine as reported by the operators varied from a minimum of 7.5 cents to a maximum of 14.5 cents per pound, the average cost being approximately 10.5 cents per pound.

Zinc dust varies in composition, but on the average contains about 90 per cent of metallic zinc and 10 per cent of zinc oxide, the latter occurring as a film on the surface of the metallic particles.

In the early years of the cyanide process zinc shavings were principally used as a precipitant of gold. A number of other methods have been tried such as precipitation by charcoal, aluminium and by electrical precipitation, but in recent years the Merrill-Crowe combination process has been adopted in most new mills erected in Canada. This well-known process of de-oxidizing the solution and precipitating the gold by the addition of zinc dust, assures a fairly uniform product for refining. Introduction of Merrill-Crowe process of de-oxidization and zinc dust precipitation besides giving more refined bullion decreased considerably the zinc consumption over old zinc shaving methods, lowered the cyanide consumption and gave more complete precipitation of gold from solutions. At some of the plants, small quantities of lead acetate or lead nitrate are added to the solution to intensify the action.

Three distinct methods of precipitating silver have been used in the cyanidation of the silver ores at Cobalt, Ontario: (a) precipitation with zinc; (b) precipitation with aluminium; and (c) precipitation with sodium sulphide. The use of zinc as a

precipitant, in a solution containing appreciable amounts of arsenic and antimony, was found to be very unsatisfactory and was discontinued. In addition to causing a heavy consumption of cyanide, the zinc fouled the solution, resulting in a marked decrease in dissolving efficiency.

Precipitation with aluminium dust was first developed by the O'Brien Company at the Deloro smelter, Deloro, Ontario, and later introduced at their Cobalt mill. This method has three advantages in that there is no fouling of solution, a regeneration of cyanide and the recovery of silver as a clean high grade precipitate.

Sodium sulphide precipitation was developed at the Nipissing mill. To the pregnant solution sodium sulphide is added and the resultant precipitate of silver sulphide desulphurized by contact with aluminium ingots in a caustic soda solution.

Zinc dust is being consumed at the following gold mines:-

Ontario: (Porcupine area); Hollinger, McIntyre, Dome, Coniaurum, Vipond and Ankerite.
(Kirkland Lake area); Lake Shore, Teck-Hughes, Wright-Hargreaves, Sylvanite, Kirkland Lake, Macassa, Toburn, and Barry-Hollinger.
(Other areas); Ashley, Howey, Moss, Minto and Parkhill.

Quebec: Granada and Siscoe.

Manitoba: Flin Flon, Central Manitoba and San Antonio.

British Columbia: Pioneer and Reno.

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The survey of the zinc dust situation in Canada has revealed the following facts, which are presented in tabular form:-

	1931	1932	1933
Number of gold mines using zinc dust..	25	24	26
Total tonnage of ore cyanided	5,642,000	6,410,800	6,968,100
Total present rated daily capacity of the treatment plants	18,900	18,800	21,530
Total present actual daily operating capacity of the treatment plants.	18,700	18,300	20,850

Zinc dust consumption:-

Total consumption for 1931	431,000	lb.
" " " 1932	530,500	"
" " " 1933	556,600	"
Monthly rate of consumption Jan.1934...	48,000	"

Consumption by areas (at Gold Mines);-	1931 lb.	1932 lb.	1933 lb.
Ontario	366,000	428,800	417,900
Quebec	4,100	3,700	3,000
Manitoba	46,300	85,600	105,800
British Columbia	14,500	16,400	29,900
CANADA	430,900	530,500	556,600

	1931 lb.	1932 lb.	1933 lb.
Lowest reported consumption per ton of ore	0.043	0.042	0.040
Highest " " " " " "	0.33	0.367	0.201
Lowest reported consumption per ton of solution	0.023	0.023	0.021
Highest " " " " " "	0.15	0.100	0.129

These figures of consumption per unit do not include the consumption at the McIntyre, and Granada mines, where the concentrates only are cyanided, or at the Flin Flon where flotation tailings are cyanided.

	1931	1932	1933
Maximum cost of zinc dust, per lb. (at the mine)..	15.0¢	15.3¢	14.5¢
Minimum " " " " " " (" " ")..	8.0	7.5	7.5
Average " " " " " " (approx.).....	11.0	11.0	10.5

IMPORTS OF ZINC DUST INTO CANADA(a)

Year	Quantity	Value	Average value per pound	Price of Zinc per pound.*
	lb.	$	¢	¢
1920	378,556	50,597	13.366	9.558
1921	434,981	46,440	10.676	6.509
1922	313,652	27,390	8.733	7.210
1923	394,378	41,167	10.438	8.267
1924	359,219	30,668	8.537	7.837
1925	315,440	28,664	9.087	9.060
1926	435,440	46,800	10.747	8.825
1927	339,055	34,110	10.060	7.710
1928	458,923	44,906	9.785	7.144
1929	483,192	38,891	8.049	6.870
1930	506,670	37,853	7.471	5.084
1931	403,001	28,783	7.142	3.961
1932	530,628	40,623	7.656	3.724
1933	841,381	47,826	5.684	4.488

(a) Mineral Production of Canada,1920-26,and Trade of Canada,1927-33.
(*) Montreal quotations.

PRODUCER OF ZINC DUST IN CANADA.

Watts Chemical Company.....Toronto.

PRODUCERS OF ZINC DUST IN THE UNITED STATES IN 1931 (b)

The Alloys Company	San Francisco,Cal.
American Smelting & Refining Co. . . .	Sand Springs,Ohio & Reading, Pa.
Federated Metals Corporation	Trenton,N.J.
John Finn Metal Works	San Francisco,Cal.
Grasselli Chemical Co..	Meadowbrook, W.Va.
New Jersey Zinc Co.	Palmerton, Pa.
Superior Zinc Corporation	Philadelphia,Pa.

(b) "Zinc in 1931", by Elmer W.Pehrson,(1:8) U.S.Bureau of Mines.

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WORLD PRODUCTION OF ZINC DUST[c]
(In tons of 2,000 lbs.)

COUNTRY	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
United States..	7,726	8,314	7,994	8,098	9,172	11,050	9,237	10,611	8,046	11,157
Belgium...	3,693	2,831	4,719	5,346	4,442	4,255	2,822	4,332	4,178	(d)
Poland....	4,920	3,739	5,967	9,446	8,975	8,579	7,855	8,830	4,380	5,820
Germany...	(Figures not available.....)					4,400	3,200	2,400	2,428	5,757

(c) Year Book of the American Bureau of Metal Statistics,(1933) N.Y.
(d) Not yet available.

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