File

DEPARTMENT OF MINES AND RESOURCES

BUREAU OF MINES

CANADA

FILE COPY

Ottawa, January 8, 1947.

REPORT

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 2164.

Gravity and Flotation Concentration of Lead-Zinc Ore from the Van Mer Mines Limited, Tichborne, Ontario.

Note:

This report relates essentially to the samples as received. It shall not, nor any correspondence connected therewith, be used in part or in full as publicity or advertising matter for the sale of shares in any promotion.

(Copy No. 13)

Bureau of Mines

Mineral Dressing and
Metallurgy Division

CANADA

DEPARTMENT
OF
MINES AND RESOURCES

Mines and Geology Branch

O T T A W A January 8, 1947.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 2164.

Gravity and Flotation Concentration of Lead-Zinc Ore from the Van Mer Mines Limited, Tichborne, Ontario.

==========

Shipment:

A shipment of three bags of ore, weight 420 pounds, was received on September 23, 1946. The shipment was sent from Tichborne, Ontario, and was submitted by N. E. DeMers, 2648 Wurtele Street, Montreal, Quebec.

The property of the Van Mer Mines Limited from which the sample was taken was said to be the old Frontenac Lead Mine, located in Loughborough township, Frontenac county, Ontario.

Purpose of the Investigation:

The sample of ore was submitted to determine its response to table concentration and flotation.

Sampling and Analysis:

The shipment was crushed and sampled by standard methods. A representative portion was found to contain the following:

Gold	-	None.
Silver	-	0.49 oz./ton
Arsenic	-	None detected.
Lead	-	1.10 per cent
Zinc	-	22.5 "
Iron	-	7.07 "
Copper	-	0.04 "
Sulphur	-	14.87 "
Insoluble	-	37.48 "

Results of Experimental Tests:

Table concentration did not produce satisfactory grades of concentrates of lead and zinc.

Flotation tests indicated that a cleaner lead concentrate containing 51.75 per cent lead, 7.91 per cent zinc and 22.02 ounces of silver per ton could be obtained from the ore. Recovery in the rougher flotation concentrate was 89.7 per cent of the lead.

The zinc concentrate contained 56.58 per cent zinc, 0.08 per cent lead, 7.45 per cent iron, 1.71 per cent insoluble, with a recovery of 90.1 per cent of the zinc.

Character of the Ore:

Polished sections were prepared from selected specimens of the ore and were examined microscopically.

Gangue -

The gangue material is an assemblage of hard rock silicates with rather abundant, moderately coarse to fine, disseminated carbonate.

(Continued on next page)

(Character of the Ore, cont'd) -

Metallic Minerals -

Metallic mineralization is strong in the polished sections. It is represented by sphalerite, pyrite, pyrrhotite, chalcopyrite, and galena. The first three of these five sulphides as named above are abundant. Chalcopyrite and galena are present only in minor amounts.

Sphalerite, the most abundant metallic mineral, is disseminated through gangue as coarse to very fine irregular grains with the coarser sizes predominant and, in many places, sufficiently abundant to be called massive. Most of the sphalerite (zinc sulphide) is almost free of inclusions, but in one section it contains rather numerous small grains of gangue and sulphides, especially pyrrhotite and chalcopyrite. The latter range down to 10 microns or less in size and are too small to be economically released by grinding, but the total quantity tied up in this way appears to be very small.

Pyrite is almost as abundant as sphalerite, with which mineral it is often closely associated. It occurs in gangue and sphalerite, largely as coarse irregular grains and small masses which contain occasional inclusions of gangue and sulphides.

Pyrrhotite is relatively abundant in only one polished section and is present as coarse to fine disseminated grains, small masses and narrow veinlets in gangue, and also as small inclusions in sphalerite and pyrite.

Chalcopyrite and galena are visible in comparatively small amounts as medium coarse to fine scattered grains in gangue, sphalerite and pyrite.

EXPERIMENTAL TESTS:

Test No. 1. - Table Concentration of Sized Feed.

For this test a 25-pound sample of the ore was crushed to pass 20 mesh. It was screened on 28-, 35-, 48- and 65-mesh screens. The various screen fractions were tabled on a laboratory Wilfley table. Each screen fraction was treated as a separate test. The products recovered were a concentrate, middling and tailing. Each product was analysed for lead and zinc. The analysis of the feed for each screen fraction was calculated from the analysis of the products.

Results:

Test 1A, -20 +28 Mesh Ore.

Products	Weight, per cent	Assays, per cent		Distribution, per cent		Ratio of Concentration
		Pb	Zn	Pb	Zn	
Feed	100.0	0.78	20.61	100.0	100.0	
Lead and zinc conc.	20.8	2.35	38.73	62.2	39.0	4.8:1.
Middling	35.8	0.50	22.31	22.8	38.8	
Tailing	43.4	0.27	10.55	15.0	22.2	

Test 1B, -28 +35 Mesh Ore

Feed	100.0	0.77	21.24	100.0	100.0	
Conc. (Lead)	8.9	4.15	37.52	47.9	15.7	11.2:1.
Conc. (Zinc)	30.1	0.90	33.26	35.1	47.1	3.3:1.
Middling	22.9	0.27	23.32	8.0	25.1	
Tailing	38.1	0.18	6.69	9.0	12.1	

Test 1C, -35 +48 Mesh Ore.

Feed	100.0	0.79	23.12	100.0	100.0	
Conc. (Lead)	6.6	8.30	33.87	69.4	9.6	15.2:1.
Conc. (Zinc)	20.0	0.47	39.61	18.0	48.0	3.3:1.
Middling	15.3	0.27	34.58	5.2	22.9	
Tailing	48.1	0.12	9.38	7.4	19.5	

Test 1D, -48 +65 Mesh Ore.

Feed	100.0	0.87	24.38	100.0	100.0	
Conc. (Lead)	2.0	21.70	24.64	49.6	2.0	50.0:1.
Conc. (Zinc)	16.0	1.42	41.57	26.1	27.4	6.2:1.
Middling (1)	21.8	0.27	37.21	6.7	33.2	
Middling (2)	28.8	0.35	25.06	11.5	29.6	
Tailing	31.4	0.17	6.08	6.1	7.8	

Test 1E, -65 Mesh Ore

Feed	100.0	1.90	27.33	100.0	100.0	
Conc. (Lead)	6.1	23.10	32.75	74.0	7.3	16.4:1.
Conc. (Zinc)	23.9	0.72	43.60	9.1	38.1	4.2:1.
Middling	47.4	0.20	20.28	5.0	35.2	
Sand Tailing	14.3	0.90	23.12	6.8	12.1	
Slime	8.3	1.17	24.03	5.1	7.3	

(Continued on next page)

(Experimental Tests, cont'd) -

The table concentration did not result in separating zinc from lead

Test No. 2. - Flotation.

Concentration was attempted by selective flotation.

Reagents to the Ball Mill -

Soda ash	-	2.0 lb./ton
$ZnSO_4$,	-	1.0 "
NaCN	-	0.2 "

Grind, 67 per cent minus 200 mesh.
Dilution, 4:3.

Reagents to Lead Flotation - (pH, 8.8)

Pot. ethyl xanthate	-	0.02 lb./ton
Cresylic acid	-	0.20 "

The lead rougher concentrate recovered was recleaned without additional reagents.

The pulp in the flotation machine was now conditioned for zinc.

Reagents to Zinc Flotation - (pH, 11.5)

Lime	-	4.0 lb./ton
$CuSO_4$	-	1.0 "
Pot. ethyl xanthate	-	0.8 " , stage fed.
Pine oil	-	0.1 " " "

A zinc rougher concentrate was recovered which was recleaned with 0.5 pound lime per ton and 0.05 pound potassium ethyl xanthate per ton.

Results:

Products	Weight, per cent	Assays, per cent		Distribution, per cent		Ratio of Concentration
		Pb	Zn	Pb	Zn	
Feed	100.0	0.70	22.73	100.0	100.0	
Lead conc.	1.2	36.82	10.95	63.7	0.6	82.6:1.
Lead middling	2.3	7.94	9.65	26.1	1.0	43.5:1.
Zinc conc.	34.5	0.10	59.52	0.5	90.3	2.9:1.
Zinc middling	3.6	0.59	18.45	3.0	2.9	2.8:1.
Flot. tailing	58.4	0.08	2.03	6.7	5.2	

(Experimental Tests, cont'd) -

Test No. 3. - Flotation.

This test was made to attempt to raise the grade of the lead concentrate.

Reagents to Ball Mill -

Soda ash	-	1.0 lb./ton
$ZnSO_4$	-	1.0 "
NaCN	-	0.2 "

Grind, 78 per cent minus 200 mesh.
Dilution, 4:3.

Reagents to Lead Flotation - (pH, 8.5)

Butyl xanthate	-	0.10 lb./ton, stage fed
Cresylic acid	-	0.17 " , " "

Reagents to Lead Rougher Concentrate Recleaned - (pH, 9.5)

Soda ash	-	0.2 lb./ton
$ZnSO_4$	-	0.2 "
NaCN	-	0.05 "
Sodium silicate	-	1.0 "
Butyl xanthate	-	0.025 "
Cresylic acid	-	0.10 "

A lead cleaner concentrate and a lead middling were recovered.

Reagents for Zinc Flotation - (pH, 10.5)

Lime	-	2.0 lb./ton
$CuSO_4$	-	1.0 "
Amyl xanthate	-	0.5 " , stage fed.
Pine oil	-	0.1 "

The zinc rougher concentrate obtained was recleaned with 1.0 pound lime and 0.02 pound amyl xanthate per ton. A zinc cleaner concentrate and a zinc middling were recovered.

Results:

Products	Weight, per cent	Assays, per cent		Distribution, per cent		Ratio of Concentration
		Pb	Zn	Pb	Zn	
Feed	100.0	0.76	21.97	100.0	100.0	
Lead conc.*	0.7	51.75	7.91	47.6	0.3	142.8:1.
Lead middling	2.9	10.92	12.57	42.1	1.7	34.0:1.
Zinc conc.**	35.0	0.08	56.58	3.7	90.1	2.9:1.
Zinc middling	3.8	0.42	18.56	2.1	3.2	26.4:1.
Flot. tailing	57.6	0.06	1.82	4.5	4.7	

* Lead concentrate contained Ag, 22.02 oz./ton.

** Zinc concentrate contained Fe 7.43 per cent, Ag 0.32 ounce per ton, insoluble 1.71 per cent.

(Experimental Tests, cont'd) -

In continuous operation, the percentage of zinc in the tailing would be lowered by the use of scavenger cells.

Additional flotation tests in which various reagents were tried showed that the recovery of lead in the rougher concentrate was not appreciably increased.

In one test the lead concentrate contained lead 35.77 per cent, zinc 7.19 per cent, copper 0.10 per cent, silver 15.2 ounces per ton, and insoluble 34.0 per cent.

-

Conclusions:

The unfavourable ratio of galena to sphalerite in the feed (1.25:35.5), and the presence of considerable iron pyrite, make the table concentration of this ore more complicated than if the separation were only for lead and zinc. The results obtained on a laboratory-size table were unsatisfactory. It is possible that full-sized equipment would effect a better grade of lead concentrate.

Selective flotation of the lead and zinc is the most suitable method for treatment of this ore. By this method the iron pyrite is depressed and passes out in the mill tailing, and marketable grades of lead and zinc concentrates can be produced.

Comparing the results obtained in this investigation with those obtained in 1926, 1928 on ore from the same property leads to the conclusion that this present sample does not represent ore similar to that previously investigated. Former shipments contained a much higher ratio of lead to zinc than does this one; jig and table concentration produced high-grade lead concentrates with a low percentage of zinc.

The low ratio of lead to zinc and the presence of

(Conclusions, cont'd) -

much pyrite in the sample on which this present investigation was made leads to the conclusion that the material is from the dump and has had most of the lead removed by previous operations.

The results obtained in this investigation can only be considered to apply to ore similar in grade and character to that submitted in the shipment.

oooooooooooooo
oooooooo
oo

WSJ:LB.