O T T A W A January 25th, 1943.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1349.

IR 1349

Concentration of a Lead-Zinc Ore
from the Reeves McDonald Mine,
Salmo District,
British Columbia.

(Copy No.___.)

1949
122

O T T A W A January 25th, 1943.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1349.

Concentration of a Lead-Zinc Ore from the Reeves McDonald Mine, Salmo District, British Columbia.

==========

Shipment:

Two separate lots of ore from the Reeves McDonald mine were received on December 9th, 1942. Lot No. 1, weighing 49 pounds, was from the "River Tunnel Level" and Lot No. 2, weight 399 pounds, was from the "Reeves Tunnel Level." The shipment consisted of assay sample rejects from the Haileybury Assay Office, Haileybury, Ontario.

These representative samples were submitted by Dr. B.S.W. Buffam, of the Wartime Metals Corporation, Ottawa, on behalf of Mr. G. C. Bateman, Metals Controller.

Location of the Property:

The property of the Reeves McDonald mine from which the present shipment was received is situated just north of the United States border, in the Salmo district, Nelson mining division, British Columbia.

Sampling and Analysis:

After crushing, cutting, and grinding by standard methods, representative samples of the shipments were obtained which assayed as follows:

		River Tunnel	Reeves Tunnel
Lead, per cent	-	2.08	1.12
Zinc, "	-	6.40	5.24
Copper, "	-	Trace	Trace
Iron, "	-	6.29	8.60
Sulphur, "	-	9.74	11.17
Gold, oz./ton	-	Trace	Trace
Silver, "	-	0.09	0.10

Characteristics of the Ore:

Owing to the finely crushed condition of the lots it was not found possible to determine the associations of the different minerals constituting the ore bodies.

Investigative Work:

The test work on the lots consisted of differential flotation concentration by means of which lead and zinc concentrates were obtained. The results gave zinc concentrates assaying up to 60 per cent zinc with recoveries of over 80 per cent of the zinc in the ore. The lead concentrates were rather low in grade as it was not found possible, in the small-scale test work, to clean the rougher lead concentrates successfully, owing to the small amounts of galena in the ore. No difficulties in this regard should be encountered in the milling practice, however.

(Continued on next page)

(Investigative Work, cont'd) -

In the test work which follows, Part I consists of the work done on the River Tunnel Level lot and Part II on the Reeves Tunnel Level lot.

Details of Test Work:

PART I. - RIVER TUNNEL LEVEL.

Test No. 1. - Flotation Concentration.

A portion of the ore at minus 14 mesh was ground in a ball mill to pass 96 per cent minus 200 mesh, at a 75 per cent dilution. The pulp was then transferred to a Denver flotation cell, conditioned with soda ash, and a lead concentrate was obtained. The pulp was then conditioned with lime and a zinc concentrate secured. These concentrates were cleaned in a smaller flotation machine. The different products were assayed for lead and zinc.

Reagents added to cell, lb./ton feed:

Lead Flotation -		Zinc Flotation -	
Soda ash	- 3.0	Lime	- 3.0
Zinc sulphate	- 1.0	Copper sulphate	- 1.5
Sodium cyanide	- 0.2	Potassium amyl xanthate	- 0.10
Butyl xanthate	- 0.07	Cresylic acid	- 0.13
Cresylic acid	- 0.13		
To Cleaner Cell -			
Lime	- 0.5	Lime	- 1.0
NaCN	- 0.05		

Results of Flotation:

Product	Weight, per cent	Assays, per cent Pb	Assays, per cent Zn	Distribution, per cent Pb	Distribution, per cent Zn	Ratio of concentration
Feed	100.00	2.27	6.56	100.0	100.0	
Pb concentrate	2.17	58.92	10.33	56.2	3.4	46:1.
Pb middling	4.56	14.93	12.65	29.9	8.8	
Zinc conc.	6.71	1.39	55.44	4.1	56.7	14.9:1.
Zinc middling	5.69	1.77	11.99	4.4	10.4	
Tailing	80.87	0.15	1.68	5.4	20.7	

pH of lead float = 7.6.
" " zinc " = 8.0

(Test No. 1, cont'd) -

From these results, it seems likely that the low recovery of the zinc was due to the small amounts of lime used in conditioning and the consequent pH of 8.0.

-

Test No. 2.

This test followed the same grinding and flotation procedure as Test No. 1. The grind was 93 per cent minus 200 mesh.

Reagents added to cell, lb./ton feed:

Lead Flotation -		Zinc Flotation -	
Soda ash	- 5.0	Lime	- 6.0
Zinc sulphate	- 1.0	Copper sulphate	- 2.0
Sodium cyanide	- 0.40	Potassium amyl xanthate	- 0.10
Butyl xanthate	- 0.07	Cresylic acid	- 0.09
Cresylic acid	- 0.09	Pine oil	- 0.03
Pine oil	- 0.03		
To Cleaner Cell -			
Lime	- 0.5	Lime	- 1.0
Sodium cyanide	- 0.05		

Results of Flotation:

Product	Weight, per cent	Assays, per cent Pb	Assays, per cent Zn	Distribution, per cent Pb	Distribution, per cent Zn	Ratio of concentration
Feed	100.00	2.70	6.32	100.0	100.0	
Pb concentrate	1.23	67.85	5.22	30.9	1.0	81:1.
Pb middling	8.06	20.82	13.62	62.2	17.4	
Zn concentrate	8.42	1.23	53.16	3.8	70.8	11.9:1.
Zn middling	4.51	0.78	10.57	1.3	7.5	
Tailing	77.78	0.06	0.27	1.8	3.3	

pH of lead float = 7.9.
" " zinc " = 8.6.

In this test the grade of the zinc concentrate is rather low and a sizable percentage of the zinc is contained in the lead middling product, thus lowering the recovery of the zinc.

-

(Test Work, cont'd) -

Test No. 3.

In this test the grind was 80.2 per cent minus 200 mesh and different quantities of reagents were added, as noted. Both the lead and the zinc rougher concentrates were cleaned twice.

Reagents added to cell, lb./ton feed:

Lead Flotation -		Zinc Flotation -	
Soda ash	6.0	Lime	11.0
Zinc sulphate	1.0	Copper sulphate	2.0
Sodium cyanide	0.50	Potassium amyl xanthate	0.10
Butyl xanthate	0.05	Cresylic acid	0.09
Cresylic acid	0.09	Pine oil	0.03

To Cleaner Cell, lb./ton feed -

Zinc sulphate	0.50	Lime	1.5
Sodium cyanide	0.10		

Results of Flotation:

Product	Weight, per cent	Assays, per cent Pb	Assays, per cent Zn	Distribution, per cent Pb	Distribution, per cent Zn	Ratio of concentration
Feed	100.00	2.63	6.71	100.0	100.0	
Pb concentrate	0.90	60.81	7.26	20.8	0.9	111:1.
Pb middling	6.03	26.66	12.53	61.2	11.3	
Zn concentrate	7.02	1.08	60.32	2.9	63.1	14.3:1.
Zn middling	9.21	3.57	14.13	12.5	19.4	
Tailing	76.84	0.09	0.46	2.6	5.3	

pH of lead float = 8.2
" " zinc " = 9.2

The zinc concentrate assayed:

	Per cent
Zinc -	60.32
Lead -	1.08
Iron -	1.86
Arsenic -	Nil

The zinc concentrate is satisfactory in this test, the lessening in amount of butyl xanthate added and the cancellation of the use of pine oil in the lead float giving less zinc in the lead middling product. The double cleaning of the rougher zinc concentrate raises the grade appreciably.

(Test Work, cont'd) -

PART II. - REEVES TUNNEL LEVEL.

Flotation Concentration.

In the test work done on the Reeves Tunnel Level lot, the same flotation procedure was followed as in Part I on the River Tunnel Level lot.

Portions of the ore at minus 14 mesh were ground in a ball mill to different degrees of fineness, the pulp was transferred to a Denver flotation cell, and rougher lead and zinc concentrates were obtained. These concentrates were cleaned in a smaller flotation machine. Flotation reagents were added in the different tests, as noted.

Test No. 4.

In this test the ore was ground to pass 96 per cent minus 200 mesh. The lead and zinc concentrates were cleaned once.

Reagents added to cell, lb./ton feed:

Lead Flotation -		Zinc Flotation -	
Soda ash	- 5.0	Lime	- 4.0
Zinc sulphate	- 1.0	Copper sulphate	- 1.5
Sodium cyanide	- 0.20	Potassium amyl xanthate	- 0.10
Butyl xanthate	- 0.07	Cresylic acid	- 0.13
Cresylic acid	- 0.13		

To Cleaner Cell, lb./ton feed -

Lime	- 1.0	Lime	- 1.0
Sodium cyanide	- 0.05		

Results of Flotation:

Product	Weight, per cent	Assays, per cent Pb	Assays, per cent Zn	Distribution, per cent Pb	Distribution, per cent Zn	Ratio of concentration
Feed	100.00	1.32	5.03	100.0	100.0	
Pb concentrate	1.96	38.45	6.75	57.1	2.6	51:1.
Pb middling	5.66	6.46	9.02	27.7	10.1	
Zn concentrate	3.03	1.15	55.74	2.6	33.7	33:1.
Zn middling	3.55	1.06	11.54	2.8	8.1	
Tailing	85.80	0.15	2.67	9.8	45.5	

(Continued on next page)

(Test No. 4, cont'd) -

pH of lead float = 7.4
" " zinc " = 8.0

The zinc recovery was very poor in this test, probably due to the pH (8.0) of the zinc float.

-

Test No. 5.

Additional soda ash and lime were used in this test for the lead and zinc flotations. The grind was 90.2 per cent minus 200 mesh.

Reagents added to cell, lb./ton feed:

Lead Flotation -		Zinc Flotation -	
Soda ash	7.0	Lime	8.0
Zinc sulphate	1.0	Copper sulphate	2.0
Sodium cyanide	0.40	Potassium amyl xanthate	0.10
Butyl xanthate	0.07	Cresylic acid	0.07
Cresylic acid	0.09	Pine oil	0.03
Pine oil	0.03		

To Cleaner Cell, lb./ton feed -

Zinc sulphate	0.50	Lime	1.0
Sodium cyanide	0.10		

The lead and zinc concentrates were cleaned once.

Results of Flotation:

Product	Weight, per cent	Assays, per cent Pb	Assays, per cent Zn	Distribution, per cent Pb	Distribution, per cent Zn	Ratio of concentration
Feed	100.00	1.23	5.65	100.0	100.0	
Pb concentrate	0.54	35.75	6.30	15.6	0.6	185:1.
Pb middling	6.77	13.18	9.68	72.2	11.6	
Zn concentrate	9.12	0.66	49.64	4.9	80.1	11:1.
Zn middling	3.11	1.13	10.71	2.8	5.9	
Tailing	80.46	0.07	0.13	4.5	1.8	

pH of lead float = 8.3
" " zinc " = 9.0

While the recoveries of both lead and zinc are satisfactory in this test, the grade of concentrate is low, possibly due to there being only one cleaning operation.

-

(Test Work, cont'd) -

Test No. 6.

In this test the ore was ground to 78.8 per cent minus 200 mesh. The amounts of butyl xanthate and soda ash used were decreased and the amount of added lime increased.

Reagents added to cell, lb./ton feed:

Lead Flotation -			Zinc Flotation -		
Soda ash	-	5.0	Lime	-	15.0
Sodium cyanide	-	0.50	Copper sulphate	-	2.0
Zinc sulphate	-	1.0	Potassium amyl xanthate	-	0.10
Butyl xanthate	-	0.05	Cresylic acid	-	0.09
Cresylic acid	-	0.09	Pine oil	-	0.05

To Cleaner Cell, lb./ton feed -					
Zinc sulphate	-	0.50	Lime	-	1.5
Sodium cyanide	-	0.05			

Results of Flotation:

Product	Weight, per cent	Assays, per cent Pb	Assays, per cent Zn	Distribution, per cent Pb	Distribution, per cent Zn	Ratio of concentration
Feed	100.00	1.82	5.04	100.0	100.0	
Pb concentrate	0.64	64.45	5.41	22.7	0.7	156:1.
Pb middling	4.57	20.56	9.02	51.7	8.2	
Zn concentrate	5.65	1.28	60.92	3.9	68.0	17.7:1.
Zn middling	9.06	2.85	10.22	14.2	18.4	
Tailing	80.08	0.17	0.30	7.5	4.7	

pH of lead float = 7.5
" " zinc " = 9.7

The lead and the zinc concentrates were cleaned twice.

The zinc concentrate assayed:

		Per cent
Zinc	-	60.92
Lead	-	1.28
Iron	-	1.96
Arsenic	-	0.02

The grade and recovery of the zinc in this test were satisfactory, due to the pH of 9.7 used and the double cleaning of the rougher zinc concentrate. The lessening in the amounts of butyl xanthate and frothers used in the lead flotation also tended to decrease the amount of zinc in the lead middling product.

=====

SUMMARY AND CONCLUSIONS:

River Tunnel Level -

On the River Tunnel Level lot, in Test No. 3 a zinc concentrate was obtained assaying 60.3 per cent zinc, 1.1 per cent lead and 1.86 per cent iron, with a recovery of 82.5 per cent of the zinc in the combined zinc concentrate and middling products. In the lead concentration, 82 per cent of the lead was recovered in the combined lead concentrate and middling products. The grade of the lead concentrate was rather low at 60.8 per cent lead, which was in great part due to the difficulties in the cleaning operation in the small-scale test work owing to the small amount of lead in the ore. This difficulty should not be noticeable in mill practice. The grind in this test was 80.2 per cent minus 200 mesh.

Reeves Tunnel Level -

On the Reeves Tunnel Level lot, in Test No. 6 a zinc concentrate was obtained assaying 60.9 per cent zinc, 1.28 per cent lead and 1.96 per cent iron, with a recovery of 86.4 per cent of the zinc in the combined zinc concentrate and middling products. In the lead concentration, 74.4 per cent of the lead was recovered in the combined lead concentrate and middling products. A lead concentrate assaying 64.4 per cent lead was obtained, the rather low grade being due to the small amount of lead available for cleaning operations in the small-scale test work. The grind in this test was 78.8 per cent minus 200 mesh.

The test work shows the results obtained by using different quantities of flotation reagents in conjunction with different pH in the various tests. In this connection, it was shown that a low pH and only sparse amounts of reagents were essential to obtain a lead concentration comparatively

(Summary and Conclusions, cont'd) -

free from zinc; also that a pH of over 9.0 was necessary in order to give a good recovery of the zinc in the zinc flotation. The test work did not show any appreciable difference in the results obtained in the treatment of the two lots. The Reeves Tunnel lot required more lime for conditioning in the zinc flotation, but otherwise conditions and quantities of added flotation reagents were approximately the same for both lots. No particular difficulties should be met with in milling practice on this ore, and high-grade concentrates with good recoveries should be obtained.

oooooooooooo
ooooooo
o

HLB:GHB.