



Department of Mines Laboratory.

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N^o 42

RESEARCH INVESTIGATION NO. 857/40.

DOVE SILVER MINE (OLD DEVON MINE).

Silver-Lead-Gold Ore.

Sample of ore weighing 17 lbs was received from the Inspector of Mines, Burnie.

The Director of Mines desired investigations as to treatment.

No responsibility is taken for the results given in this report except in so far as they apply to the sample tested.
Assay values are based on the long ton (2240-lbs).

Preliminary.

Inspection of the ore showed that a fair proportion of the Galena present was massive, the remainder was finely disseminated in the gangue minerals, and indicated that complete galena recovery could not be obtained without fine grinding. Minor amounts of Sphalerite, Chalcopyrite and pyrite were present together with secondary Lead and Copper minerals. Major gangue minerals were Quartz and Siderite.

Several ore specimens were ground and polished but microscopical examination did not give any additional information as to the nature of the ore nor was any gold observed. A sample of ore was ground and carefully concentrated. Examination of the concentrate showed heavy particles suspected of being gold but owing to dull surfaces treatment with nitric acid was necessary before this was verified. Average size of gold particles - 60 microns.

Hand Picking.

Examination of the sample showed that hand picking was worthy of attention but a reliable test could only be made by treatment of commercial quantities and examination of the cost of treatment as compared with mechanical processes.

Treatment (1) Flotation (2) Jigging and flotation of jig tailings were investigated.

The sample was crushed to pass a 5 mesh B. S. screen and a portion reserved for jig concentration. The remainder was crushed to minus 10 mesh for flotation tests.

Portion of the sample was ground and assayed with the following results.

Probable Combinations.

Lead	34.7%		
Silver	40.8-ozs.	Galena	40.2%
Gold	4.6-dwts		
Copper	0.94%	Chalcopyrite	2.71%
Zinc	0.9%	Sphalerite	1.34%
Iron	3.7%	Pyrite	0.56%
Sulphur	7.06%	Siderite	5.24%
Insoluble	49.0%	Insoluble	49.0%

Variable assays were obtained with this sampling.

Flotation.

Grinding. - Wet ground in an Iron ball mill for 20 minutes. Typical screen analysis of product was.:

+80 mesh	0.1%	
+100 mesh	0.2%	
+150 mesh	1.1%	
+200 mesh	4.3%	
-200 mesh	94.3%	B. S. Screen.

Analysis of the ore showed sulphides other than galena to be present in minor amounts only, consequently it was unnecessary to depress any of the sulphides.

Reagents.

		<u>Test No. 1.</u>	<u>Test No. 2.</u>
Soda Ash lbs/ton.	-	3	3
Pot. Ethyl Xanthate	-	0.5	-
Pot. Amyl Xanthate	-	-	0.5

Flotation time 7 - 10 minutes.

p.H. of pulp 7.5 - 8

Frother Cresylic Acid.

Test	Product	% Weight	Assays			Percent Distribution.		
			Pb. %	Ag. Ozs.	Au. Dwts	Pb	Ag	Au
1.	Feed	100	33.4	40.47	6.79	100	100	100
	Conc.	43.24	68.1	81.15	13.6	88.2	86.7	86.6
	Tailings	56.76	6.7	9.11	1.54	11.8	13.3	13.4
2.	Feed	100	34.3	42.59	6.31	100	100	100
	Conc.	44.42	70.0	85.45	12.2	90.7	89.1	85.9
	Tailings	55.58	5.5	8.01	1.54	9.3	10.9	14.1

Flotation tests with increased quantities of Amyl Xanthate, Sodium Sulphide and Ammonium phosphate and Reagent 404 gave inferior results to the above tests.

JIG CONCENTRATION & FLOTATION OF JIG TAILINGS.

The sample weighing 2438 grams minus 5 mesh (previously referred to) was treated in a 4" x 4" laboratory moving sieve jig. Stroke 3/8", Strokes per minute 240. Screen frame 30 m.m. above water level.

Operation. Compartment nearly filled with wet ore and jigged for 2 minutes, top portion of tailings removed, and replaced, and jigging repeated until the whole of the sample had been treated. To imitate commercial operation it is necessary to treat a considerably larger sample as compromise is necessary in making a final cut of screen concentrate and tailings.

Jig Concentration.

Assays.

Product	Weight Percent	%Lead	Silver-Ozs.	Gold-dwts.
Feed	100	36.2	42	5.0
Conc. (Screen)	28.8	51.2	60.5	3.4
Conc. (Hutch)	34.5	56.2	63.1	2.8
Tailings	36.7	5.7	7.7	8.55

Flotation of Jig Tailings.

Soda Ash 2-lbs/ton p.H. 8.0
 Pot. Amyl Xanthate 0.25-lbs/ton.
 One stage of cleaning "
 Frother - Cresylic Acid.

Flotation time - 10 minutes.

Product	Weight Percent	%Pb.	Silver-Ozs.	Gold-Dwts.
Feed	100	5.7	7.8	8.55
Concentrate	9.6	44.0	57.5	67 --- (Cu 3.0% --- (Fe 8.6%)
Cleaner Tailings	1.3	-	24.3	19.6
Tailings	89.1	1.5	2.2	2.1

Combined Treatment by Jigging and Flotation of Jig Tailings:-

Product	% Wt.	%Pb.	Ag-Ozs	Au-Dwts.	Percent Distribution.		
					Pb	Ag	Au
Feed	100	36.2	42.0	5.0	100	100	100
Jig Cts.(Screen)	28.8	51.2	60.5	3.4	40.7	41.5	19.2
Jig Cts.(Hutch).	34.5	56.2	63.1	2.8	53.6	51.8	18.9
Float Concentrate from Jig Tailings	3.5	44.0	57.5	67.0	4.3	4.8	46.6
Float Recleaner Tailings	0.47	-	24.3	19.6	-	0.2	1.8
Tailings from Combined Treatment	32.7	1.5	2.2	2.1	1.3	1.7	13.5

Recoveries Percent.

	Lead	Silver	Gold
Jig Concentrates	94.3	93.3	38.1
Flotation Concentrate	4.3	5.0	48.4
Totals	98.6	98.3	86.5

Summary & Conclusions.

Bulk flotation of the ore recovered 90.7%, 89.1% and 85.9% of the Lead, Silver and Gold respectively as a marketable product. Sulphide minerals other than Galena were present in such small amounts that selective flotation was unnecessary to obtain a marketable concentrate. If future development of the deposits shows increases in the amounts of Pyrite, Sphalerite etc. flotation treatment would have to be selective. These tests produced tailings containing 5.5 to 6.7% Lead and secondary minerals would be partially responsible for

these values.

Jig concentration recovered 94.3%, 93.3% and 38.1% of the Lead, Silver and Gold respectively. Grade of concentrate was low but no difficulty should be encountered in production on a higher quality concentrate. Flotation of the jig tailings increased the recoveries to 98.6, 98.3 and 86.5 per cent, leaving a tailing assaying 1.5% Lead, 2.2 Ozs Silver and 2.1 Dwts of Gold. Amalgamation of this tailing extracted 0.3 Dwt of Gold. Flotation concentrate was low grade and contained 3.0% Copper and 8.6% Iron equivalent to 8.7% Chalcopyrite and 13% of Pyrite showing a concentration of these sulphides in the jig tailings.

The ore requires further testing to investigate:-

- 1). Additional flotation reagents.
- 2). Treatment by selective flotation.
- 3). Extension of jigging tests to produce a higher grade product, selective flotation of the tailings and investigation of the distribution of the Gold values.

CHIEF CHEMIST & METALLURGIST.

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