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An Investigation of
THE RECOVERY OF GOLD
from samples
submitted by
A/S SULFIDMALM
Progress Report No.3

Project No. L.R. 2570

Note:

This report refers to the samples as received.

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LAKEFIELD RESEARCH OF CANADA LIMITED
Lakefield, Ontario
April 12, 1983

I N T R O D U C T I O N

In a telex dated February 17, 1983, Mr. Frank Nixon of A/S Sulfidmalm requested testwork on F and C Zone samples to investigate a procedure for assessing an average ore grade. This procedure involved grinding and gravity concentration of the gold.

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S U M M A R Y

1. Head Analysis

Duplicate head samples were removed from Zone C and Zone F composites and assayed in duplicate with the following results:

Sample	Assay, g/t Au	
	Zone F	Zone C
Head Sample A	29.1	41.8
	12.6	27.6
Head Sample B	9.59	31.9
	7.20	30.5
Average	14.6	33.0
Average (from Progress Report No.1)	7.77	39.1

2. Zone F

Two tests were conducted to investigate the effect of fineness of grind on the liberation of gold. In both tests, the ground pulp was passed over a Deister concentrating table. The table concentrate was amalgamated for 2 hours in a bottle on rolls. The results are summarized below:

Table No. 1 - Effect of Fineness of Grind

Test No.	% -200 Mesh	Product	Weight %	Assay g/t Au	% Distribution Au
42	46	Amalgam	-	6.46*	8.6
		Amalgam Tailing	4.23	83.9	47.1
		Table Tailing	95.77	3.48	44.3
		Head (calc.)	100.00	7.86	100.0
43	87	Amalgam	-	10.73*	14.8
		Amalgam Tailing	2.11	139.	40.4
		Table Tailing	97.89	3.32	44.8
		Head (calc.)	100.00	7.41	100.0

* mg

Summary - Continued

2. Zone F - Cont'd

The table tailing assay is the average of assays performed on two samples of the tailing. The individual assays on this product were as follows:

Test 42: 4.14, 3.26, 4.03, 2.50 g/t Au

Test 43: 3.32, 3.32 g/t Au

These results would suggest that free gold was present in the tailing of Test No. 42. The finer grind was used in all subsequent testwork.

Due to the high arsenopyrite content in the gravity concentrate, a coating formed on the mercury inhibiting the amalgamation and preventing coalescence. A small xanthate addition was made to overcome the beading of the mercury. This procedure had limited success.

The amalgamation tailing from Test No. 43 was retreated with 20 g mercury, 1 g NaOH and 1 g white lead. The amalgam was easily recovered and was clean. It is thought that the lead precipitated soluble sulphides which were interfering with the amalgamation. The amalgam contained an additional 7.4% of the gold in the original feed.

Based on the results of these two tests, the remaining Zone F composite was treated in 10 kg batches. Each charge was ground to 87% minus 200 mesh and passed over the Deister concentrating table. Two samples of the tailing were taken directly from the table. The table concentrates were amalgamated with mercury, sodium hydroxide and white lead. The results of these tests are presented in Table No. 2.

Summary - Continued

2. Zone F - Cont'd

Table No. 2 - Zone F

Test No.	Amalgam % Dist. Au	Table Tailing		Head (calc.) g/t Au
		g/t Au	% Dist. Au	
45-A	17.1	3.92	48.8	7.92
B	6.1	3.17	44.3	6.98
C	14.5	3.62	47.6	7.39
D	22.0	3.21	47.3	6.66
E	23.5	3.16	44.7	6.84
F	8.7	3.21	48.2	6.49
G	4.2	3.00	41.5	6.88
H	8.6	3.41	47.5	6.98

The average calculated head assay was 7.0 g/t Au with a range from 6.5 g/t to 7.9 g/t Au.

A sample of the table tailing from cycle H was amalgamated to investigate the presence of free gold. Less than 1% of the gold in the tailing (0.4% overall) was recovered in the amalgam.

Similarly, the amalgamation tailing from cycle H was retreated under the same conditions as the first amalgamation. Because of the significant increase in the recovery of free gold, the tailing was amalgamated a third time. The following results were obtained:

Test 45-H

Product	% Dist. Au
Table Conc. Amalgam 1	8.6
Table Conc. Amalgam 2	32.2
Table Conc. Amalgam 3	5.7
Table Conc. Amal. 3 Tail.	6.0
Table Tail. Amalgam	0.4
Table Tail. Amal. Tail.	47.1
Feed	100.0

Summary - Continued

2. Zone F - Cont'd

In each amalgamation, the mercury easily coalesced and appeared clean. The overall amount of free gold in the ore at a grind of 87 % minus 200 mesh was 46.9 % with over 99 % of that gold present in the table concentrate.

By treating a larger sample, a more consistent head assay could be calculated. Amalgamation of the gravity concentrate was difficult due to the high content of arsenopyrite.

3. Zone C

A 10 kg Zone C sample was ground to 85 % minus 200 mesh. A gravity concentrate was recovered and amalgamated with mercury, sodium hydroxide and white lead. The results are given below.

Table No. 3 - Zone C

Test No.	Product	Weight %	Assay, g/t Au	% Distribution Au
44	Amalgam		50.44*	12.7
	Amal. Tail.	2.68	819.	55.1
	Table Tail.	97.32	13.2	32.2
	Head (calc.)	100.00	39.8	100.0

* mg

The calculated head is similar to the direct head assay. From the results of the testwork conducted on Zone F, it would seem quite probable that much of the free gold was not recovered during the amalgamation.

SAMPLE PREPARATION

The remaining ore from the Zone F samples was crushed to minus 10 mesh. Duplicate head samples were removed and the remaining ore riffled into test charges.

The Zone C sample was prepared in a similar manner.

DETAILS OF TESTS

Test No. 42

Purpose: To investigate tabling and amalgamation as a means of calculating a head assay for the ore.

Procedure: The sample was ground in a ball mill and transferred to a 20 liter conditioning tank. The pulp was fed over a Deister concentrating table and a gravity concentrate collected. The concentrate was transferred to a bottle for amalgamation. The pH was raised with NaOH to 11, and the sample was amalgamated with 15 g of mercury for 2 hours. The amalgam was recovered by elutriation.

Feed: 10 kg minus 10 mesh Zone F.

Grind: 20 minutes in a large ball mill at 65% solids.

Observations: A few small pieces of free gold were seen on the table. The recovered mercury was dirty and did not coalesce. 10 mL of xanthate (1% sol'n) were added. This aided in coalescing the amalgam to a limited extent.

Metallurgical Results

Product	Weight %	Assays, mg, g/t Au	% Distribution Au
Amalgam	-	6.46	8.6
Amal. Tailing	4.23	83.9	47.1
Table Tailing	95.77	3.48*	44.3
Head (calculated)	100.00	7.86	100.0

* average of four assays: 4.14 g/t Au
3.26
4.03
2.50

Test No. 42 - Continued

Screen Analysis - Table Tailing

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 65	10.4	10.4	89.6
100	13.1	23.5	76.5
150	16.5	40.0	60.0
200	14.5	54.5	45.5
270	11.3	65.8	34.2
400	8.6	74.4	25.6
- 400	25.6	100.0	-
Total	100.0	-	-

Test No. 43

Purpose: To repeat Test No. 42 with a finer grind.

Procedure: The ground sample was fed over a Deister concentrating table and a gravity concentrate was collected. The concentrate was amalgamated for 2 hours on rolls at pH 11 with NaOH. Xanthate was added for an additional 30 minutes. The amalgam was recovered by elutriation.

Feed: 10 kg minus 10 mesh Zone F.

Grind: 50 minutes in a large ball mill at 65% solids.

Observations: The amalgam was largely covered with a black coating. The amalgamation tailing was retreated with 1.5 g NaOH, 2 g white lead and 15 g Hg. The recovered amalgam was clean.

Metallurgical Results

Product	Weight %	Assays, mg, g/t Au	% Distribution Au
Amalgam	-	10.73	14.8
Amal. Tailing	2.11	139.	40.4
Table Tailing	97.89	3.32	44.8
Head (calculated)	100.00	7.41	100.0

Amalgam B	-	3.75	7.4
Amal. Tailing B	2.11	110.	33.0
Head (calculated)	-	13.5	40.4

Test No. 43 - Continued

Screen Analysis

Table Tailing

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 100	0.6	0.6	99.4
150	3.7	4.3	95.7
200	9.2	13.5	86.5
270	16.8	30.3	69.7
400	14.8	45.1	54.9
- 400	54.9	100.0	-
Total	100.0	-	-

Test No. 44

Purpose: To repeat Test No. 43 on Zone C.

Procedure: As for Test No. 43, except 2 g NaOH, 1 g white lead and 30 g Hg were added to the amalgamation.

Feed: 10 kg minus 10 mesh Zone C.

Grind: 50 minutes in large ball mill at 65% solids.

Observations: The recovered amalgam was clean with many small pieces of gold visible.

Metallurgical Results

Product	Weight %	Assays, mg, g/t Au	% Distribution Au
Amalgam	-	50.44	12.7
Amal. Tailing	2.68	819.	55.1
Table Tailing	97.32	13.2	32.2
Head (calculated)	100.00	39.8	100.0

Screen Analysis

Table Tailing

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 65	0.1	0.1	99.9
100	0.6	0.7	99.3
150	4.3	5.0	95.0
200	10.1	15.1	84.9
270	14.9	30.0	70.0
400	14.6	44.6	55.4
- 400	55.4	100.0	-
Total	100.0	-	-

Test No. 45

Purpose: To investigate tabling and amalgamation as a means of calculating a head grade for the ore.

Procedure: Each 10 kg charge was ground and fed over the Deister concentrating table. Two table tailing samples were taken directly from the table. The table concentrate was amalgamated with 1 g white lead, 2 g NaOH and 30 g Hg. The amalgam was recovered by elutriation. Two of the amalgamation tailings and one table tailing were amalgamated under similar conditions to determine if any free gold was present in these products.

Feed: 8 x 10 kg minus 10 mesh Zone F.

Grind: 50 min/10 kg in large ball mill at 65% solids.

Note: A to E: Pb added after 2 hours
A and B - elutriated after 15 minutes with lead
C to E - elutriated after 30 minutes with lead
F to H - lead added initially

Metallurgical Results

Test No.	Product	Weight %	Assay, g/t Au	% Distribution Au
45-A	Amalgam	-	13.54*	17.1
	Amal. Tail.	1.53	177.	34.1
	Table Tail.	98.47	3.92	48.8
	Head (calc.)	100.00	7.92	100.0
45-B	Amalgam 1	-	4.27*	6.1
	Amal. 1 Tail.	2.56	135.	49.6
	Table Tail.	97.44	3.17	44.3
	Head (calc.)	100.00	6.98	100.0
	Amalgam 2	-	7.08*	11.5
	Amal. 2 Tail.	2.56	107.	38.1
45-C	Head (calc.)	2.56	139.	49.6
	Amalgam	-	10.68*	14.5
	Amal. Tail.	2.77	101.	37.9
	Table Tail.	97.23	3.62	47.6
	Head (calc.)	100.00	7.39	100.0

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Lakefield, Ontario
April 12, 1983 / tmg

Test No. 45 - Continued

Metallurgical Results - Cont'd

Test No.	Product	Weight %	Assay, g/t Au	% Distribution Au
45-D	Amalgam	-	14.63*	22.0
	Amal Tail.	1.90	108.	30.7
	Table Tail.	98.10	3.21	47.3
	Head (calc.)	100.00	6.66	100.0
45-E	Amalgam	-	16.11*	23.5
	Amal Tail.	3.34	65.0	31.8
	Table Tail.	96.66	3.16	44.7
	Head (calc.)	100.00	6.84	100.0
45-F	Amalgam	-	5.66*	8.7
	Amal Tail.	2.49	112.	43.1
	Table Tail.	97.51	3.21	48.2
	Head (calc.)	100.00	6.49	100.0
45-G	Amalgam	-	2.87*	4.2
	Amal. Tail.	4.64	80.5	54.3
	Table Tail.	95.36	3.00	41.5
	Head (calc.)	100.00	6.88	100.0
45-H	Amalgam 1	-	5.99*	8.6
	Amal 1 Tail.	2.73	112.	43.9
	Table Tail.	97.27	3.41	47.5
	Head (calc.)	100.00	6.98	100.0
	Amalgam 2	-	20.94*	32.2
	Amal 2 Tail.	2.73	30.6	11.7
	Head (calc.)	2.73	115.	43.9
	Amalgam 3	-	2.45*	5.7
	Amal 3 Tail.	2.73	12.0	6.0
	Head (calc.)	2.73	23.5	11.7
	Table Tail. Amal	-	0.25*	0.4
	Table Tail. Amal Tail.	97.27	3.08	47.1
	Head (calc.)	97.27	3.11	47.5

* mg