

Ottawa, June 23, 1927

REPORT
of the
ORE DRESSING AND METALLURGICAL LABORATORIES

Report No. 278

Tests on ore from Cooper Gold Mines, Michipicoton
district, Ontario

by J. S. Godard

Tests on ore from No. 1 level Shipment 140 lbs. received May 25, 1927

Assay of head sample -

Au	1.33 oz/ton
Cu	0.12 %
Fe	1.42 %

Test No. 1 - Amalgamation Results of screen test on tailings

<u>Product</u>	<u>Weight %</u>	<u>Assay</u>	<u>% values</u>
+100	4.3	0.26	5.2
+150	12.4	0.24	12.8
+200	19.3	0.26	23.1
-200	64.0	0.20	58.9
Average		0.217	% gold amalgamated 83.4

Test No. 2 - Amalgamation Results of screen test on tailings
screened on 200 mesh

+200	12.9	0.26	15.5
-200	87.1	0.21	84.5
Average		0.216	% gold amalgamated 83.8

Test No. 3 - Amalgamation, flotation, tabling flotation tailing

Flot. conc.	14.5	1.14	68.0
Table "	10.2	0.31	13.0
" midd.	5.4	0.08	1.8
" tail	52.5	0.063	13.6
" slime	17.4	0.05	3.6

Amalgamation tailing from products 0.243 oz/ton

Table tailing screened on 200 mesh -

+200	15.6	0.08	19.8
-200	84.4	0.06	80.2
Average		0.063	

Recovery - By amalgamation 81.6 %
Total, middlings from table
included in tailings 96.5 %

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Test No. 4 - Flotation, and tabling the flotation tailing

Product	Weight %	Assay	% values	
Flot. conc.	12.1	5.63	79.1	
Table "	11.7	1.22	16.6	
" midds	11.5	0.10	1.3	
" tailing	52.7	0.042	2.6	
" slime	12.0	0.03	0.4	Cu in flot.conc. 0.98 %
Table tailing screened on 200 mesh				
+200	24.0	0.05	28.3	
-200	76.0	0.04	71.7	
Average		0.042		Head sample from products 0.86 oz/ton
Recovery in concentrates		95.7 %	✓	

Test No. 5 - Flotation

Concentrate	12.2	8.86	80.7	
Tailing	87.8	0.294	19.3	
Flotation tailing screened on 200 mesh -				
+200	18.7	1.27	80.7	
-200	81.3	0.07	19.3	Head sample from products 1.34 oz/ton
Average		0.294		Cu in concentrate 0.92 %

Tests on ore from No. 3 level - shipment 50 lbs. Received May 25, 1927

Assay of head sample -	Au	0.40 oz/ton
	Cu	trace
	Fe	2.75 %

Test No. 1 - Amalgamation

Screen test on tailings				
+100	7.6	0.09	8.2	
+150	15.1	0.12	21.7	
+200	16.1	0.09	18.6	
-200	61.2	0.07	51.5	
Average		0.083		% gold amalgamated 79.3 ✓

Test No. 2 - Amalgamation Tailing screened on 200 mesh

+200	16.7	0.03	18.7	
-200	83.3	0.07	81.3	
Average		0.072		% gold amalgamated 82.0 ✓

Test No. 3 - Amalgamation, flotation, and tabling

Flot. conc.	5.4	0.86	39.0	
Table "	4.2	1.05	37.1	
" midd	7.5	0.07	4.5	
" tail	54.4	0.032	14.6	Amalgamation tailing from products 0.119 oz/ton
" slime	28.5	0.02	4.8	
Table tailing screened on 200 mesh				
+200	14.0	0.04	17.8	
-200	86.0	0.03	82.2	
Average		0.032		
Recovery - Amalgamated		70.2 %		
Total, table middling included in tails		93.0 %	✓	

Test No. 4 - Flotation and tabling flotation tailing

Flot. conc.	3.0	5.82	46.1	
Table "	10.7	1.53	44.7	
" midd	10.1	0.07	1.9	
" tailing	54.2	0.043	6.1	
" slime	22.0	0.02	1.2	Head from products 0.38 oz/t
Table tailing screened on 200 mesh				
+200	30.7	0.05	35.7	
-200	69.3	0.04	64.3	
Average		0.043		Recovery in concs. 90.8 %

Test No. 5 - Flotation

Product	Weight %	Assay	% values
Flot. conc.	4.0	5.16	47.4
" tailing	96.0	0.239	52.6
Head from products		0.44	
Tailing screened on 200 mesh			
+200	17.8	1.02	76.0
-200	82.2	0.07	24.0
Average		0.239	

Tests on composite sample - 75% No.1 level ore, and 25% No.3 level ore
Calculated head sample 1.10 oz/ton

Tests Nos. 1 & 2 - Cyanidation. Two charges of 750 grams each were ground for 2 hours in a pebble mill in 1:1 pulp, 0.025% KCN and lime equivalent to 4 lbs/ton. Pulps were washed into agitators and diluted to 1:2.5, agitated 48 hours using 0.05% KCN. Solutions were sampled and cyanide strengthened to 0.05% KCN twice daily. Average protective alkalinity 0.02% CaO. Tailings were filtered and washed

using - 250 cc 0.05% KCN
250 cc 0.025% KCN
250 cc H₂O then repulped and filtered

Solutions from Nos. 1 and 2, exclusive of ^{washings} washings, were saved and used for cycle No. 2 shown as test No. 2A.

Results Test No. 1 - tailings screened on 200 mesh

+200	2.5	9.25	85.6	
-200	97.5	0.04	14.4	
Average		0.27		Extraction 75.4 %

Results Test No. 2 - tailings screened on 200 mesh

+200	2.1	13.52	66.0	
-200	97.9	0.15	34.0	
Average		0.43		Extraction 60.8 %

Reagent consumption in lbs/ton	Test	KCN	CaO
	1	2.07	6.6
	2	2.17	6.4

Solution analysed for Ca and was found to contain 0.038 gms/litre

Test No. 2A - 750 grams ore ground in pebble mill for 2 hours in 1:1 pulp using the solution from tests 1 and 2. KCN 0.034% CaO 0.009%, lime equivalent to 4 lbs/ton was added to the mill. The pulp was washed and diluted in agitator to 1:2.5 and cyanided for 48 hours under similar conditions to tests nos. 1 and 2. Tailings treated as in 1 & 2 and screened on 200 mesh -

+200	2.8	9.12	55.5	
-200	97.2	0.21	44.5	
Average		0.46		Extraction 58.0 %

Reagents consumed in lbs/ton KCN 2.20 CaO 5.8

Solution, exclusive of washings, analysed for Ca and found to contain 0.073 gms/litre

Test No. 3 - Amalgamation. Screen test on tailing

Product	Weight %	Assay	% values		
+100	11.7	0.20	12.9		
+150	15.3	0.22	18.6		
+200	18.1	0.20	20.0		
-200	54.9	0.16	48.5		
Average		0.181		Recovery	83.5 %

Test No. 4 - Amalgamation. Tailing screened on 200 mesh

+200	13.9	0.54	35.2		
-200	86.1	0.06	64.8		
Average		0.213		Recovery	80.6 %

Test No. 5 - Amalgamation, Flotation, and tabling.

Flot. conc.	9.4	1.32	58.6		
Table "	6.5	0.80	24.6		
" middling	7.7	0.12	4.3		
" tailing	58.4	0.033	9.1		
" slime	18.0	0.04	3.4	Cu in flotation conc	1.0%
Amalg. tailing from products		0.212		Recovery - Amalgamation	80.7%
Table tailing screened on 200 mesh				Total	96.7%
+200	16.6	0.05	24.9	(table middling included with tailing & slime)	
-200	83.4	0.03	75.1		
Average		0.033			

Test No. 6 - Flotation and tabling

Flot. conc.	10.4	9.02	72.1		
Table "	6.4	5.10	25.2		
" middling	7.9	0.11	0.7	Cu in flot. conc.	0.92 %
" tailing	53.3	0.043	1.7		
" slime	22.0	0.02	0.3		
Head from products		1.30			

Table tailing screened on 200 mesh

+200	33.9	0.05	39.2		
-200	66.1	0.04	60.8	Recovery in concentrates	97.3%
Average		0.043			

Test No. 7 - Flotation

Flot. conc.	12.1	4.80	59.7	Cu in concentrate	0.80%
Tailing	87.9	0.447	40.3		
Head from products		0.97			
Tailing screened on 200 mesh					
+200	15.9	2.39	84.9		
-200	84.1	0.08	15.1		
Average		0.447			

Test No. 8 - Cyanidation. In this test, 116 lbs. of ore used. It

was fed at -20 mesh to a small rod mill in closed circuit with a classifier. The classifier overflow was pumped into a small pachuca tank and agitated for 36 hours in 0.05% KCN. The pulp density was approximately 1:3.25. The average protective alkalinity was about 0.02% CaO. The grinding was done in 0.03% KCN solution. Cyanide tailing filtered, washed, and repulped. Sampled in duplicate and assayed. The head sample was composed of 90 lbs. of 1st. level and 26 lbs. of 3rd. level ore. The sample was thoroughly mixed before entering feeder. Calculated head sample 1.12 oz/ton gold.

Results:

<u>Product</u>	<u>Weight %</u>	<u>Assay</u>	<u>% values</u>	
Tailing screened on 200 mesh				
Sample 1 +200	14.7	0.05	17.8	
-200	85.3	0.04	83.2	
Average		0.042		
Sample 2 +200	12.3	0.05	15.0	
-200	87.7	0.04	85.0	
Average		0.041		Extraction 96.3 %

Summary:

Amalgamation: Amalgamation yielded good results on all three samples of ore. About 80 per cent of the gold is recoverable by this method. The results are nearly the same at 5% +100 as they are after grinding to 15-20% +200

Concentration: Flotation alone showed erratic results. The +200 material in the tailings being very high in gold on all three samples. This is probably due to presence of free gold rather than that associated with the sulphides, although it is difficult to remove all the pyrrhotite by flotation. Where flotation is followed by tabling, the gold that reported with the +200 material reports in the table concentrate and a satisfactory tailing is obtained. When amalgamation precedes flotation and tabling, good recoveries are made, but the grade of concentrates is low, and there is the problem of their disposal.

Cyanidation: Small scale tests - were unsatisfactory from a standpoint of extraction, because of the free gold. The +200 mesh tailing was very high. This could be overcome in larger scale operations, as is shown by the test where 116 pounds of ore was used. The cyanide consumption was about 2 lb/ton and while good check results were obtained, this figure is probably a little high, and 1.5 lb/ton should be the maximum used in practice. The ore was slightly over-ground, only about 2.5% remaining on 200 mesh screen. This alone would increase the cyanide consumption. The soluble copper is almost negligible. After the 1st. run it amounted to 0.038 gms/liter. This and at the end of the second run, 0.073 gms/liter. This latter quantity amounts to 0.146 lb/ton of solution and should not present any serious trouble.