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*Summary*

O T T A W A

July 15th, 1940.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 866.

Amalgamation and Microscopic Examination  
of Gold-Bearing Mill Products from the  
Kenopo Mining and Milling Company, Limited,  
Kenora, Ontario.

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BUREAU OF MINES  
DIVISION OF METALLIC MINERALS  
—  
ORE DRESSING AND  
METALLURGICAL LABORATORIES



CANADA  
DEPARTMENT  
OF  
MINES AND RESOURCES  
MINES AND GEOLOGY BRANCH

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Shipment:

Two one-pound samples of gold-bearing mill products were received on July 4th, 1940, from the Kenopo Mining and Milling Company, Limited, P. O. Box 910, Kenora, Ontario.

Sample No. 1, consisting of classifier pulp,

assayed 2.25 ounces gold per ton and screened 78.5 per cent minus 200 mesh. Sample No. 2, consisting of amalgam tailing, assayed 0.80 ounce gold per ton and screened 63.6 per cent minus 200 mesh. The samples were also assayed for tellurium and bismuth and gave a result of "Nil" in each case.

Location of Mill:

The mill of the Kenopo Mining and Milling Company, Limited, is at High Lake, in the Kenora district of western Ontario.

Investigative Work:

Mr. J. E. Beardsley, the mill superintendent of the company, desired an analysis of the samples showing which minerals are present; why the gold is only visible in a pan on addition of nitric acid; and, finally, whether the ore is suitable for amalgamation and what reagents to use in the amalgam barrel.

Details of the tests are given below:

Test No. 1 (A, B, C, and D). - Amalgamation of Classifier Pulp.

Test 1-A. - A 50-gram sample of the pulp was amalgamated with mercury and water in a mortar.

Test 1-B. - Same as 1-A, with 3 pounds of lime per ton of pulp was added prior to amalgamation.

Test 1-C. - A 50-gram sample was barrel-amalgamated with mercury and water for one hour.

Test 1-D. - Same as 1-C, with 3 pounds of lime per ton added.

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(Test No. 1, cont'd) -

The amalgam tailings from these tests were assayed for gold, with the following results:

<u>Test No.</u>	<u>Tailing assay, Au oz./ton</u>	<u>Extraction of gold, per cent</u>
1-A	0.53	76.5
1-B	0.37	84.9
1-C	1.45	35.6
1-D	0.87	61.3

After amalgamation, the amalgam of Test 1-A showed some signs of flouring but it could be agglomerated quite easily by the copious use of water.

After amalgamation the pH of the pulp was:

7.2 in Test 1-A, and  
9.2 " Test 1-B.

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Test No. 2 (A, B, C, and D). - Amalgamation of Amalgam  
Tailing.

Test 2-A. - A 50-gram sample was amalgamated with mercury and water in a mortar.

Test 2-B. - Same as 2-A, with 0.01 pound of NaCN per ton added.

Test 2-C. - A 50-gram sample was ground in water, the pulp was decanted, and the residue was amalgamated with Flynn's reagents in a mortar.

Test 2-D. - Same as 2-C, without prior grinding and decantation.

(Note: Flynn's reagents are: 2.5 pounds  $PbCO_3$ ,  
0.25 pound  $As_2O_3$  and 0.20 pound  $NaOH$  per ton.)

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(Test No. 2, cont'd) -

The amalgam residues were assayed for gold, with the following results:

<u>Test No.</u>	<u>Tailing assay, Au oz./ton</u>	<u>Extraction of gold, per cent</u>
2-A	0.45	43.8
2-B	0.37	53.8
2-C	0.37	53.8
2-D	0.37	53.8

Some flouring and slight sickening of the mercury occurred after amalgamation in Test 2-A. No flouring or sickening was visible in 2-B, 2-C, or 2-D. The pH of the pulp in Test 2-A was 9.4.

Superpanning Tests.

Classifier Pulp -

A portion of the classifier pulp was concentrated on the Haultain superpanner, with the following results:

<u>Product</u>	<u>:Weight, : : per : : cent :</u>	<u>: Assay, : : Au : : oz./ton :</u>	<u>:Distribution : : of gold, : : per cent :</u>
Feed	: 100.0	2.25	100.0
Tip of concentrate	: 4.2	40.10 <sup>⊕</sup>	74.9
Bulk of concentrate	: 13.0	2.49	14.4
Sands	: 36.3	0.18	2.9
Slimes and sands with no visible sulphides	: : : 46.5	0.38	7.8

<sup>⊕</sup> Calculated.

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(Superpanning Tests, cont'd) -

Amalgam Tailing -

A portion of the amalgam tailing was concentrated on the Haultain superpanner, with the following results:

Product	Weight, : : per : : cent	Assay, : : Au : : oz./ton	Distribution : : of gold, : : per cent
Feed	: 100.0	0.80	100.0
Tip of concentrate	: 1.7	29.70*	63.2
Bulk of concentrate	: 7.3	1.16	10.6
Sands	: 81.2	0.17	17.2
Slimes	: 9.8	0.74	9.0

\* Calculated.

Microscopic Examination.

The tips of the concentrates in the two previous tests were examined under the binocular microscope, with the following results:

100 grams from each of the samples was panned and the concentrates were examined under the binocular microscope. Microchemical tests were carried out on numerous heavy grains possessing a bluish-grey colour and being malleable in some cases. The mineragrapher was unable to substantiate the claim that maldonite, or "Australian black gold", is present. Galena is present along with other sulphides, such as pyrite and possibly sphalerite, and steel fragments are common. In addition, malleable grey particles proved to be chiefly lead and probably are from machinery bearings.

Numerous small particles of gold were seen

(Microscopic Examination, cont'd) -

in Sample No. 1 and gold particles are common in Sample No. 2. While much of the gold is bright and clean, some, particularly in Sample No. 2, is coated with grey to iridescent coatings, assumed to be due probably to mercury and soluble iron compounds respectively. Occasional grains of partially amalgamated and hence coated gold were encountered. The addition of nitric acid cleans up much of this contaminated gold, of course, and this probably explains the appearance of gold in the pan after addition of  $\text{HNO}_3$  as noted by the correspondents.

No floured mercury was detected in panning Sample No. 2. However, distinction must be made between "floured" and "sickened" mercury, and it is likely that some "sickened" mercury is present in the grey coatings.

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Summary and Conclusions:

On the No. 1 sample, of classifier pulp, it was shown that 84 per cent of the gold could be amalgamated under the proper conditions. On Sample No. 2, of amalgam tailing, 54 per cent of the remaining gold was recovered by amalgamation.

The superpanner tests show that 89 per cent of the gold could be concentrated in the case of the classifier pulp and 74 per cent of the gold in the amalgam

tailing. These concentrates consisted largely of free gold and comparative results should be obtained by means of jigs, traps, and blankets.

Slight flouring of the mercury was observed in the different amalgamation tests but the copious use of water, in separation of the amalgam, eliminated this condition.

In the amalgam tailing test No. 2-B it was shown that the use of a very small quantity of cyanide cleaned the amalgam and gave an added recovery.

In the classifier pulp the addition of lime was shown to be beneficial in amalgamation.

Answering the questions, it was shown that the ore was suitable for amalgamation and that the addition of lime, and perhaps a very small quantity of cyanide, to the amalgam barrel improved the recovery and lessened the possibilities of flouring or sickened mercury.

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