

**Giant
YELLOWKNIFE MINES LIMITED**

MEMO TO: T.R. Raponi

CC: G.B. Halverson, M.E. Goodfellow, S. El-Alfy

FROM: L. Dufour

DATE: June 27, 1988

SUBJECT: Roasting/Cyanidation Testwork on composite samples of
test hole #7 from the Polishing Pond

Summary:

Testwork was conducted to investigate the effect of roasting a composite of test hole #7 at 1500°F. Testwork using the Lakefield cyanidation method was conducted. The washed roasted sample achieved the highest gold recovery at 69.14% Au with a calculated headgrade of 0.110 oz/ton Au. The roasted but unwashed samples achieved an average recovery of 67.19% Au with a calculated headgrade of 0.108 oz/ton Au. The composite samples that were unroasted obtained a much lower gold recovery being 37.25% Au with a calculated headgrade of 0.102 oz/ton Au. The reagent consumptions for the unroasted composite samples were 1.99 lb/ton CaO and the cyanide consumption averaged 3.78 lb/ton. The cyanide reagent consumption for the roasted composite samples were slightly higher at 3.92 lb/ton. The roasted sample consumed no lime. Roasting prior to cyanidation should be considered as a treatment process for polishing pond tailings material.

Purpose:

To investigate the effect of roasting at 1500°F on the gold cyanidation recovery.

Procedure:

i) For the unroasted samples

Test hole #7 was used for this testwork, two 200 g samples were taken for this cyanidation testwork. The 200 g samples were placed in a Winchester acid bottle and pulped with tap water to 33.0% solids. Lime (CaO) and cyanide (NaCN) were added to raise the pH to 10.5 and give an initial free cyanide strength of 2.0 lb/ton. The sample was then placed on the rolls for one hour. A sample was withdrawn to check pH and NaCN levels. CaO and NaCN were added to restore pH to 10.5 and give a free cyanide strength of 1.0 lb/ton. The sample was rolled for a further 23 hours. The sample was then filtered to separate the pregnant solution. The filter cake was washed three times with 250 mL tap water and a separate wash sample was obtained. Both solution samples were submitted for assay. pH and NaCN levels were checked. The cake was repulped to 33.0% solids with tap water. Lime (CaO) and cyanide (NaCN) were added to raise pH to 10.5 and give an initial free cyanide strength of 2.0 lb/ton. Samples were rolled for a final 24 hours for a total of 48 hours leaching. The samples were then filtered to separate the pregnant solutions. The filter cakes were washed three times with 250 mL tap water and a separate wash sample was obtained. Both solution samples and the solid residue were assayed for Au. The NaCN level and pH were also determined for each pregnant solution. The Winchester acid bottles were rolled uncapped for the entire 48 hour test.

ii) For the roasted samples

The oven was preheated the night before testing to 1500°F. A 1000 g sample of the #7 test hole composite was weighed and placed in two rectangular vessels with sides, but with front open so that the sample could be rabbled. The sample was heated to 1500°F with the door closed in an electric furnace for twenty minutes. The door was then opened 1 1/2 inches. The sample was rabbled every ten minutes for one hour. After one hour, the sample was dead roasted. The sample was cooled and reweighed and sent for assay of Au, Fe, S, As and Sb.

From the roasted sample, three 200 g samples were taken for this cyanidation testwork. One of the 200 g samples was washed with 450 ml of tap water prior to cyanidation. This wash solution was submitted for assay of Au. The 200 g samples were placed in winchester acid bottles and pulped to 33.0% solids. Cyandide (NaCN) was added to give an initial free cyanide strength of 2.0 lb/ton. The sample was then placed on the rolls for one hour. A sample was withdrawn to check pH and NaCN levels. NaCN was added to restore pH to 1.0 lb/ton. The sample was rolled for a further 23 hours. The sample was then filtered to separate the pregnant solution. The filter cake was washed three times with 250 ml tap water and a separate wash sample was obtained. Both solution samples were submitted for assay. pH and NaCN levels were checked. The cake was repulped to 33.0% solids with tap water. Cyanide (NaCN) was added to give an initial free cyanide strength of 2.0 lb/ton. Samples were rolled for a final 24 hours for a total of 48 hours leaching. The samples were then filtered to separate the pregnant solutions. The filter cakes were washed three times with 250 ml tap water and a separate wash sample was obtained. Both solution samples and the solid residue were assayed for Au. The NaCN and pH were also determined for each pregnant solution. The winchester acid bottles were rolled uncapped for the entire 48 hour test.

Note: Lime (CaO) addition was unnecessary since the pH was well above 10.5, being 12.0.

Results:

Test and assay results are attached. A summary of the tests can be found in Table 1.

Conclusions:

1. The washed roasted calcine (at 1500°F) recovered 69.14% Au with a calculated headgrade of 0.110 oz/ton Au. Reagent consumptions were calculated to be 4.05 lb/ton NaCN. No lime was required for this sample.
2. The unwashed roasted calcine samples recovered an average of 67.19% Au with a calculated headgrade of 0.108 oz/ton Au. The reagent consumption being 3.85 lb/ton NaCN. No lime was required for this sample.

3. The Gold recovery results for the roasted calcine gold cyanidation is 31.89 higher than that of the unroasted gold cyanidation recovery.
4. Cyanidation consumption was 0.15 lb/ton higher for the roasted calcine compared to the unroasted sample.
5. Roasting prior to cyanidation should be considered as a treatment process of polishing pond tailings material.

Discussion:

These test results confirm that roasting at 1500°F prior to cyanidation improves gold cyanidation recovery. The washed roasted composite sample of test hole #7 recovered 69.14% Au while the unroasted composite sample recovery was 37.25% Au. The recovery of the roasted composite sample was 31.89% higher than the recovery for the unroasted composite samples. The calculated headgrades of the composite samples were higher than the assayed headgrade for the unroasted samples, but were lower for the roasted samples. The calculated headgrade for the unroasted composite sample was 1.93% higher than the actual assayed headgrade. The calculated headgrade for the roasted composite sample was 1.86% lower than the actual assayed headgrade.

No problems were experienced during roasting. The material glowed bright red after 15 minutes in the furnace and did not clinker. High temperature roasting was conducted due to the low sulphur content of the tailings material.

From the results of this testwork, roasting prior to cyanidation of polishing pond tailings material should be considered.

L. Dufour

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TABLE 1 : SUMMARY OF TEST RESULTS

SAMPLE #	CALC HEAD (oz/ton)	AVE HEAD (oz/ton)	RESIDUE (oz/ton)	CALC Au RECOVERY(%)	REAGENT CONSUMPTION		DEPTH (feet)
					NaCN (lb/ton)	CaO (lb/ton)	
R1	0.107	0.111	0.035	67.30	3.90	0.00	(0-40)
R2	0.109	0.111	0.036	67.07	3.80	0.00	(0-40)
WR	0.110	0.111	0.034	69.14	4.05	0.00	(0-40)
AVE	0.109	0.111	0.038	67.84	3.92	0.00	(0-40)
T1	0.102	0.100	0.064	37.43	3.75	2.24	(0-40)
T2	0.102	0.100	0.064	37.07	3.80	1.75	(0-40)

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ROASTING TEST DATA

DATE: May 27, 1988

SAMPLE: Test Hole #7 Composite

REF: ROAST.FRM

Roaster Temperature = 1500 °F

Wt of sample to be roasted = 1000 g

Wt of roasted calcine = 899 g

$$\% \text{ Reduction} = \frac{\text{wt of concentrate} - \text{wt of calcine}}{\text{wt of concentrate}} \times 100 = 10.1\%$$

	ASSAYS				
	Au	Fe	S	As	Sb
Unroasted Concentrate	0.100	10.00	0.89	0.17	0.02
Roasted Calcine	0.111	11.50	0.65	0.21	0.05

Roasting Efficiency

$$\text{Fe Ratio} = \frac{\% \text{ Fe in concentrate}}{\% \text{ Fe in calcine}} = 0.869$$

Adjusted calcine As assay = Fe ratio x %As in calcine = 0.183

Adjusted calcine S assay = Fe ratio x %S in calcine = 0.565

$$\% \text{ As elimination} = \frac{\% \text{ As in concentrate} - \text{adjusted \% As in calcine}}{\% \text{ As in concentrate}} \times 100 = 7.65\%$$

$$\% \text{ S elimination} = \frac{\% \text{ S in concentrate} - \text{adjusted \% S in calcine}}{\% \text{ S in concentrate}} \times 100 = 36.25\%$$

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CYANIDATION TESTS

Date of Test: May 30, 1988

Sample: Composite of #7 Test Hole

Sample Code #: T1

REF: CYANID1.FRM

Initial					
Size = 200 g	Reagents	1 hr Roll	After 24 Hrs.	After 48 Hrs.	After Hrs.
pH = 8.2	CaO = 0.10 g	pH = 10.1	pH = 9.3	pH = 9.7	pH =
X-200=	NaCN = 2.0 lb/t	CN ⁻ = 0.60 lb/t	CN ⁻ = 0.65 lb/t	CN ⁻ = 0.65 lb/t	CN ⁻ = lb/t
H2O = 400 mL	Other =	Tit = 10 mL	Tit = --- mL	Tit = --- mL	Tit = ---- mL
Other=	pH to 10.6	Other =	Other =	Other =	Other =
		added 0.40 lb/ton NaCN added 0.025 g Cao	added 2 lb/ton NaCN " 0.10 g Cao		

Sample Calculations:

	Units	Gold			Arsenic		
		Assay	Distribution	Recovery	Assay	Distribution	Recovery
24 Preg	380 mL	0.442 mg/L	0.168 mg	24.00 %	mg/L	mg	%
24 Wash	750 mL	0.072 mg/L	0.054 mg	7.71 %	mg/L	mg	%
48 Preg	440 mL	0.051 mg/L	0.022 mg	3.14 %	mg/L	mg	%
48 Wash	750 mL	0.024 mg/L	0.018 mg	2.57 %	mg/L	mg	%
Total	2320 mL	0.113 mg/L	0.262 mg	37.43 %	mg/L	mg	%
Residue	200 g	2.192 g/t	0.438 mg	62.57 %	%	mg	%
Calc Head	200 g	3.500 g/t	0.700 mg	100.00 %	%	mg	%
Assay Head	200 g	3.425 g/t	0.685 mg		%	mg	

Note: Preg (mL) = Preg + Tit

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CYANIDATION TESTS

Date of Test: May 30, 1988

Sample: Composite of #7 Test Hole

Sample Code #: T2

REF: CYANID1.FRM

Initial					
Size = 200 g	Reagents	1 hr Roll	After 24 Hrs.	After 48 Hrs.	After Hrs.
pH = 8.2	CaO = 0.10 g	pH = 10.0	pH = 9.0	pH = 9.5	pH =
%-200=	NaCN = 2.0 lb/t	CN ⁻ = 0.65 lb/t	CN ⁻ = 0.65 lb/t	CN ⁻ = 0.55 lb/t	CN ⁻ = lb/t
H2O = 400 mL	Other =	Tit = 10 mL	Tit = --- mL	Tit = --- mL	Tit = ---- mL
Other=	pH to 10.6	Other =	Other =	Other =	Other =
		added 0.35 lb/ton NaCN added 0.025 g Cao	added 2 lb/ton NaCN " 0.05 g Cao		

Sample Calculations:

	Units	Gold			Arsenic		
		Assay	Distribution	Recovery	Assay	Distribution	Recovery
24 Preg	395 mL	0.442 mg/L	0.175 mg	25.14 %	mg/L	mg	%
24 Wash	750 mL	0.065 mg/L	0.049 mg	7.04 %	mg/L	mg	%
48 Preg	440 mL	0.048 mg/L	0.021 mg	3.02 %	mg/L	mg	%
48 Wash	750 mL	0.017 mg/L	0.013 mg	1.87 %	mg/L	mg	%
Total	2335 mL	0.110 mg/L	0.258 mg	37.07 %	mg/L	mg	%
Residue	200 g	2.192 g/t	0.438 mg	62.93 %	%	mg	%
Calc Head	200 g	3.482 g/t	0.696 mg	100.00 %	%	mg	%
Assay Head	200 g	3.425 g/t	0.685 mg		%	mg	

Note: Preg (mL) = Preg + Tit

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CYANIDATION TESTS

Date of Test: May 30, 1988

Sample: Composite of #7 Test Hole

Sample Code #: R1

REF: CYANID1.FRM

Initial					
Size = 200 g	Reagents	1 hr Roll	After 24 Hrs.	After 48 Hrs.	After Hrs.
pH = 12.6	CaO = --- g	pH = 12.2	pH = 11.8	pH = 11.8	pH =
%-200=	NaCN = 2.0 lb/t	CN ⁻ = 0.65 lb/t	CN ⁻ = 0.70 lb/t	CN ⁻ = 0.45 lb/t	CN ⁻ = lb/t
H2O = 400 mL	Other =	Tit = 10 mL	Tit = --- mL	Tit = --- mL	Tit = --- mL
Other=	pH to 10.6	Other =	Other =	Other =	Other =
		added 0.35 lb/ton NaCN	added 2 lb/ton NaCN		

Sample Calculations:

	Units	Gold			Arsenic		
		Assay	Distribution	Recovery	Assay	Distribution	Recovery
24 Preg	325 mL	0.829 mg/L	0.269 mg	36.65 %	mg/L	mg	%
24 Wash	750 mL	0.250 mg/L	0.188 mg	25.61 %	mg/L	mg	%
48 Preg	420 mL	0.045 mg/L	0.019 mg	2.59 %	mg/L	mg	%
48 Wash	750 mL	0.024 mg/L	0.018 mg	2.45 %	mg/L	mg	%
Total	2245 mL	0.220 mg/L	0.494 mg	67.30 %	mg/L	mg	%
Residue	200 g	1.199 g/t	0.240 mg	32.70 %	%	mg	%
Calc Head	200 g	3.669 g/t	0.734 mg	100.00 %	%	mg	%
Assay Head	200 g	3.802 g/t	0.760 mg		%	mg	

Note: Preg (mL) = Preg + Tit

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CYANIDATION TESTS

Date of Test: May 30, 1988

Sample: Composite of #7 Test Hole

Sample Code #: R2

REF: CYANID1.FRM

Initial					
Size = 200 g	Reagents	1 hr Roll	After 24 Hrs.	After 48 Hrs.	After Hrs.
pH = 12.6	CaO = --- g	pH = 12.2	pH = 11.8	pH = 11.8	pH =
%-200=	NaCN = 2.0 lb/t	CN ⁻ = 0.65 lb/t	CN ⁻ = 0.65 lb/t	CN ⁻ = 0.55 lb/t	CN ⁻ = lb/t
H2O = 400 mL	Other =	Tit = 10 mL	Tit = --- mL	Tit = --- mL	Tit = ---- mL
Other=	pH to 10.6	Other =	Other =	Other =	Other =
		added 0.35 lb/ton NaCN	added 2 lb/ton NaCN		

Sample Calculations:

	Units	Gold			Arsenic		
		Assay	Distribution	Recovery	Assay	Distribution	Recovery
24 Preg	315 mL	0.836 mg/L	0.263 mg	35.07 %	mg/L	mg	%
24 Wash	750 mL	0.260 mg/L	0.195 mg	26.00 %	mg/L	mg	%
48 Preg	485 mL	0.051 mg/L	0.025 mg	3.33 %	mg/L	mg	%
48 Wash	750 mL	0.027 mg/L	0.020 mg	2.67 %	mg/L	mg	%
Total	2300 mL	0.219 mg/L	0.503 mg	67.07 %	mg/L	mg	%
Residue	200 g	1.233 g/t	0.247 mg	32.93 %	%	mg	%
Calc Head	200 g	3.750 g/t	0.750 mg	100.00 %	%	mg	%
Assay Head	200 g	3.802 g/t	0.760 mg		%	mg	

Note: Preg (mL) = Preg + Tit

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CYANIDATION TESTS

Date of Test: May 30, 1988

Sample: Composite of #7 Test Hole

Sample Code #: WR

REF: CYANID2.FRM

Initial					
Size = 200 g	Reagents	1 hr Roll	After 24 Hrs.	After 48 Hrs.	After Hrs.
pH = 12.3	CaO = --- g	pH = 12.2	pH = 11.8	pH = 11.9	pH =
%-200=	NaCN = 2.0 lb/t	CN = 0.55 lb/t	CN = 0.50 lb/t	CN = 0.40 lb/t	CN =
H2O = 400 mL	Other =	Tit = 10 mL	Tit = --- mL	Tit = --- mL	Tit = ---
Other=	pH to	Other =	Other =	Other =	Other =
		added 0.45 lb/ton NaCN	added 2.0 lb/ton NaCN		

Sample Calculations:

	Units	Gold			Arsenic		
		Assay	Distribution	Recovery	Assay	Distribution	Recovery
wash	450 mL	0.164 mg/L	0.074 mg	9.80 %	mg/L	mg	%
24 Preg	325 mL	0.757 mg/L	0.246 mg	32.58 %	mg/L	mg	%
24 Wash	750 mL	0.229 mg/L	0.172 mg	22.78 %	mg/L	mg	%
48 Preg	400 mL	0.034 mg/L	0.014 mg	1.85 %	mg/L	mg	%
48 Wash	750 mL	0.021 mg/L	0.016 mg	2.12 %	mg/L	mg	%
Total	2675 mL	0.195 mg/L	0.522 mg	69.14 %	mg/L	mg	%
Residue	200 g	1.165 g/t	0.233 mg	30.86 %	%	mg	%
Calc Head	200 g	3.775 g/t	0.755 mg	100.00 %	%	mg	%
Assay Head	200 g	3.802 g/t	0.760 mg		%	mg	

Note: Preg (ml) = Preg + Tit

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MILL TESTING ASSAY REPORT

REF: MILLASSY

SAMPLES FROM Tailings Pond Testing DATE ASSAYED June 3, 1988

SAMPLE NUMBER	Au (oz/ton)	Ag (oz/ton)	Fe	S	As	Sb
Test Hole #7	0.100		10.00	0.89	0.17	0.02
Roasted Test Hole #7	0.111		11.50	0.65	0.21	0.05
T1 24 Hrs Preg Soln	0.0129					
Wash	0.0021					
48 Hrs Preg Soln	0.0015					
Wash	0.0007					
Residue	0.064					
T2 24 Hrs Preg Soln	0.0129					
Wash	0.0019					
48 Hrs Preg Soln	0.0014					
Wash	0.0005					
Residue	0.064					
R1 24 Hrs Preg Soln	0.0242					
Wash	0.0073					
48 Hrs Preg Soln	0.0013					
Wash	0.0007					
Residue	0.035					
R2 24 Hrs Preg Soln	0.0244					
Wash	0.0076					
48 Hrs Preg Soln	0.0015					
Wash	0.0008					
Residue	0.036					
WR 24 Hrs Preg Soln	0.0221					
Wash	0.0067					

REF: MILLASSY

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