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	LR 2570			

Tittel

An investigation of the recovery of gold from samples from Bindalen
Progress report No. 2

Forfatter	Dato	Bedrift
Williamson, R. G.	03.06 1982	Sulfidmalm A/S Lakefield Research of Canada Ltd.

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Sammendrag

OV 1986

An Investigation of

THE RECOVERY OF GOLD

from samples

submitted by

A/S SULFIDMALM

Progress Report No. 2

Project No. L.R. 2570

NOTE:

This report refers to the samples as received.

LAKEFIELD RESEARCH OF CANADA LIMITED
Lakefield, Ontario
June 3, 1982

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S U M M A R Y

1. Head Analysis

Representative samples were removed from C and F zone ore for analysis.

Element	C Zone	F Zone
Au (g/t)	39.1 (41.8)	7.77 (6.83)
Ag (g/t)	3.3	2.3
As (%)	7.71	10.9
Fe (%)	6.13	9.26
S (%)	3.39	5.05

( ) average from testwork.

2. Cyanidation

Cyanidation tests were conducted on both samples to investigate various methods of reducing cyanide consumption as follows:

1. Preaerate at natural pH. Filter and discard solution. Cyanide under standard conditions (1 g/L NaCN, 33 % solids, pH 10.5-11.5, 2x24 h) in bottle test on rolls.
2. Preaerate with 0.5 g/L CaO. No intermediate filtration. Cyanide under standard conditions using preaeration solution.
3. Preaerate with 0.5 g/L CaO. No intermediate filtration. Cyanide under standard conditions using preaeration solution but increase pulp density to 50 % solids.
4. Cyanide under standard conditions but add 0.5 kg/t $Pb(NO_3)_2$ per stage.
5. Cyanide under standard conditions but maintain 0.5 g/L CaO.
6. Cyanide under standard conditions but reduce NaCN concentration to 0.25 g/L.

Preaeration significantly reduced the NaCN consumption. NaCN consumption by Sample C decreased from 2.9 kg/t under standard conditions to 1.3 kg/t with preaeration at natural pH to $\overline{0.9}$ kg/t with preaeration with 0.5 g/L CaO. NaCN consumption by Sample F decreased from 2.8 kg/t under standard conditions to 1.1 kg/t with preaeration at natural pH to $\overline{1.7}$ kg/t with preaeration with 0.38 g/L CaO.

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

Additional cyanidation tests were conducted on two samples of gold-arsenopyrite ore from Bindal, Norway as a continuation of Progress Report No. 1. The purpose of the testwork was to reduce cyanide consumption.

In a telex dated May 26, 1982, Mr. Frank Nixon of A/S Sulfidmalm requested that no further testwork be conducted at the present time.

LAKEFIELD RESEARCH OF CANADA LIMITED

D.M. Wyslouzil, P. Eng.,

Manager

R.G. Williamson, P. Eng.,

Senior Project Engineer

Investigation by: B. Thomas
L. Paquette

Summary - Continued

2. Cyanidation - Cont'd

The preaeration procedures did not have any significant effect on gold extraction which ranged from 93 to 95 % from Sample C and 75-80 % from Sample F. The higher gold extraction figures reflected higher head assays: the cyanide residue assays were similar.

Cyanidation with high lime and the addition of lead nitrate reduced NaCN consumption by Sample C by 10 and 20 % respectively.

An NaCN concentration of 0.25 g/L NaCN reduced gold extraction from Sample C to 77 % after 48 hours.

The test conditions and results are contained in Table No. 1.

Table No. 1 - Cyanidation Test Conditions and Results

Test No.	Sample	Grind % -200 mesh	Treatment	R.P.*	Reagent Conc.		Reagent Cons.		Gold Ext'n %	Residue Assay Au, g/t	Head Assay Au, g/t
					NaCN g/L	CaO g/L	NaCN kg/t	CaO kg/t			
28	C	70	Standard test, P.R. No. 1	200	1.0	-	2.9	1.2	93	2.47	36.8
33	C	70	Aerate 1 h with no lime Filter and discard solution	129	1.0	-	1.3	1.6**	95	2.48	47.7
34	C	70	Aerate 1 h with 0.5 g/L CaO. No intermediate filtration	130	1.0	0.5	0.7	2.9	93	3.07	44.6
35	C	70	0.5 kg/t $Pb(NO_3)_2$ per stage	187	1.0	-	2.3	1.4	94	2.48	42.7
36	C	70	Repeat Test 28 with high lime	125	1.0	0.5	2.6	1.9	94	2.61	40.7
37	C	70	Repeat Test 34 with higher pulp density (50 % solids)	141	1.0	0.5	1.1	2.5	93	2.63	39.0
38	C	70	Repeat Test 37 but reduce NaCN to 0.25 g/L	149	0.25	0.5	0.3	2.9	77	9.60	41.0
31	F	76	Standard test, P.R. No. 1	218	1.0	-	2.8	2.0	80	1.57	7.76
39	F	76	Aerate 1 h with no lime Filter and discard solution	118	1.0	-	1.1	1.7**	76	1.58	6.61
40	F	76	Aerate 1 h with 0.38 g/L CaO. No intermediate filtration	155	1.0	0.38	1.8	2.9	75	1.58	6.39
41	F	76	Repeat Test 40 with higher pulp density (50 % solids)	176	1.0	0.38	1.6	2.2	76	1.58	6.57

* Reducing Power: mL of 0.1 N $KMnO_4$/L pregnant solution after 24 hours
**Does not include lime required to neutralize filtrate.

D I S C U S S I O N

Gold extraction was essentially complete from both samples within 24 hours under the standard cyanidation conditions. Increasing the lime concentration to 0.38-0.5 g/L CaO slightly reduced the gold dissolution rate. Increasing the pulp density to 50 % solids also slightly reduced the gold dissolution rate such that an additional 2-3 % gold extraction was obtained in the second 24 hour stage.

Cyanide consumptions discussed in the report are NaCN consumption after 2 x 24 hours of leaching.

R E C O M M E N D A T I O N S

Determine the cause of the cyanide consumption by analysis of the heavy metal and cyanide complexes.

Examine the effect of alkali chlorination and SO_2/aeration in batch tests on the chemical composition of the barren solution after zinc dust precipitation.

SAMPLE PREPARATION

Described on page 13, Progress Report No. 1, April 1982.

INVENTORY

The following samples are on hand at Lakefield:

- 10 mm C Zone	8 kg
- 1.7 mm (10 mesh) C Zone	1 x 2 kg + 2 x 500g
- 10 mm F Zone	100 kg
- 1.7 mm (10 mesh) F Zone	2 x 2 kg + 1 x 500 g
Cleaner Concentrate Test 15 C Zone	1 x 250 g
Cleaner Concentrate Test 16 F Zone	4 x 250 g
Combined Cleaner Tailing Test 16 F Zone	2 x 250 g

DETAILS OF TESTS

Test No. 33

Purpose: To investigate the effect of preaeration on NaCN consumption.

Procedure: The ground sample was filtered and preaerated for one hour in a Denver flot cell with no lime at 40 % solids. The pulp was filtered and washed three times with water. The residue was then cyanided as for Test 27.

Feed: 500 g minus 10 mesh Sample C.

Solution Volume: 1000 mL Pulp Density 33 % solids

Solution Composition: 1.0 g/L NaCN

pH Range: 10.5-11.5 with $Ca(OH)_2$

Grind: 10 minutes at 66 % solids in the lab rod mill.

Reagent Balance:

Time Hours	Added, grams				Residual		Consumed		pH	R.P.*
	Actual		Equivalent		Grams		Grams			
	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO		
1 h preaeration										
	-	-	-	-	-	-	-	-	8.1- 7.8	-
Cyanidation - 1st Stage										
-2	1.06	0.30	1.0	0.23	0.75	0.00	0.25	0.23	11.1-10.0	-
-6	0.26	0.20	0.25	0.15	0.95	0.00	0.05	0.15	10.9-10.3	-
6-24	0.05	0.20	0.05	0.15	0.86	0.00	0.14	0.15	11.1-10.3	129
2nd Stage										
-28	1.06	0.30	1.00	0.23	0.90	0.03	0.10	0.20	11.4-10.7	-
28-48	0.11	0.10	0.10	0.08	0.90	0.03	0.10	0.08	11.1-10.3	88
Total	2.54	1.10	2.40	0.84	1.76	0.03	0.64	0.81	-	-

Reagent Consumption (kg/t of cyanide feed) NaCN: 1.28 CaO: 1.62

*Reducing Power: mL 0.1 N $KMnO_4$/L pregnant solution

Test No. 33 - Continued

Metallurgical Results

Product	Amount	Assays, mg/L,g/t Au	% Distribution Au
24 h Preg. + Wash	2150 mL	10.37	93.5
48 h Preg. + Wash	2000 mL	0.15	1.3
48 h Residue	498.8 g	2.48	5.2
Head (Calculated)	500.0 g	47.68	100.0

Test No. 34

Purpose: Preaerate with 0.5 g/L CaO. Add cyanide and continue test, without intermediate filtration.

Procedure: Same as Test 33, but with 0.5 g/L CaO in the preaeration. The pulp was not filtered and washed before cyanidation. 0.5 g/L CaO was maintained throughout cyanidation.

Feed: 500 g minus 10 mesh Sample C.

Solution Volume: 1000 mL Pulp Density 33 % solids

Solution Composition: 1.0 g/L NaCN
0.5 g/L CaO

Grind: 10 minutes at 66 % solids in the lab rod mill.

Reagent Balance:

Time Hours	Added, grams				Residual		Consumed		pH	R.P.*
	Actual		Equivalent		Grams		Grams			
	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO		
1 h Preaeration										
	-	0.50	-	0.38	-	0.01	-	0.37	11.2- 8.5	-
Cyanidation - 1st Stage										
0-2	1.06	0.66	1.00	0.50	0.80	0.11	0.20	0.40	11.7-11.2	-
2-6	0.21	0.51	0.20	0.39	0.93	0.30	0.07	0.20	11.7-11.7	-
6-24	0.07	0.26	0.07	0.20	1.00	0.39	0.00	0.11	11.7-11.7	130
2nd Stage										
24-29	1.06	0.66	1.00	0.50	0.95	0.25	0.05	0.25	11.7-11.5	-
29-48	0.05	0.33	0.05	0.25	0.96	0.38	0.04	0.12	11.7-11.6	43
Total	2.45	2.92	2.32	2.22	1.96	0.77	0.36	1.45	-	-

*Reducing Power: mL 0.1 N $KMnO_4$/L pregnant solution

Reagent Consumption (kg/tonne of cyanide feed) NaCN: 0.72 CaO: Preaeration - 0.74
Cyanidation - 2.16

Test No. 34 - Continued

Metallurgical Results

Product	Amount	Assays, mg/L,g/t Au	% Distribution Au
24 h Preg. + Wash	2160 mL	9.40	91.0
48 h Preg. + Wash	2130 mL	0.22	2.1
48 h Residue	499.5 g	3.07	6.9
Head (Calculated)	500.0 g	44.60	100.0

Test No. 35

Purpose: To repeat Test 28, but with 0.5 kg/t $Pb(NO_3)_2$/stage.

Procedure: Same as Test 27.

Feed: 500 g minus 10 mesh Sample C

Solution Volume: 1000 mL Pulp Density 33 % solids

Solution Composition: 1.0 g/L NaCN

pH Range: 10.5-11.5 with $Ca(OH)_2$

$Pb(NO_3)_2$: 0.5 kg/t/stage

Grind: 10 minutes at 66 % solids in the lab rod mill.

Reagent Balance:

Time Hours	Added, grams				Residual		Consumed		pH	R.P.*
	Actual		Equivalent		Grams		Grams			
	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO		
1st Stage										
0-2	1.06	0.30	1.00	0.23	0.20	0.03	0.80	0.20	11.3-10.7	-
2-4	0.84	0.00	0.80	0.00	0.90	0.03	0.10	0.00	10.7-10.6	-
4-7	0.11	0.20	0.10	0.15	1.00	0.07	0.00	0.11	11.3-10.9	-
7-24	0.00	0.00	0.00	0.00	0.85	0.01	0.15	0.06	10.9-10.5	187
2nd Stage										
24-28	1.06	0.30	1.00	0.23	0.90	0.02	0.10	0.21	11.4-10.6	-
28-48	0.11	0.20	0.10	0.15	1.00	0.06	0.00	0.11	11.4-10.6	64
Total	3.18	1.00	3.00	0.76	1.85	0.07	1.15	0.69	-	-

*Reducing Power: mL 0.1 N $KMnO_4$/L pregnant solution

Reagent Consumption (kg/tonne of cyanide feed) NaCN: 2.30 CaO: 1.38

Metallurgical Results

Product	Amount	Assays, mg/L,g/t Au	% Distribution Au
24 h Preg. + Wash	2120 mL	9.48	94.0
48 h Preg. + Wash	2000 mL	0.018	0.2
48 h Residue	500.3 g	2.48	5.8
Head (Calc.)	500.3 g	42.73	100.0

Test No. 36

Purpose: To repeat Test 28, but with 0.5 g/L CaO.

Procedure: Same as Test 27.

Feed: 500 g minus 10 mesh Sample C.

Solution Volume: 1000 mL Pulp Density 33 % solids

Solution Composition: 1.0 g/L NaCN
0.5 g/L CaO

Grind: 10 minutes at 66 % solids in the lab rod mill.

Reagent Balance:

Time Hours	Added, grams				Residual		Consumed		pH	R.P.*
	Actual		Equivalent		Grams		Grams			
	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO		
1st Stage										
0-2	1.06	0.66	1.00	0.50	0.13	0.19	0.87	0.31	11.7-11.4	-
2-4	0.92	0.41	0.87	0.31	0.90	0.35	0.10	0.15	11.8-11.7	-
4-7	0.11	0.20	0.10	0.15	0.95	0.42	0.05	0.08	11.8-11.8	-
7-24	0.05	0.11	0.05	0.08	0.88	0.46	0.12	0.04	11.9-11.9	125
2nd Stage										
24-28	1.06	0.66	1.00	0.50	0.90	0.25	0.10	0.25	11.7-11.6	-
28-48	0.11	0.33	0.10	0.25	0.95	0.40	0.05	0.10	11.8-11.7	32
Total	3.31	2.37	3.12	1.79	1.83	0.86	1.29	0.93	-	-

*Reducing Power: mL 0.1 N $KMnO_4$/L pregnant solution

Reagent Consumption (kg/tonne of cyanide feed) NaCN: 2.58 CaO: 1.86

Metallurgical Results

Product	Amount	Assays, mg/L,g/t Au	% Distribution Au
24 h Preg. + Wash	2075 mL	9.07	92.3
48 h Preg. + Wash	2000 mL	0.14	1.4
48 h Residue	501.8 g	2.61	6.3
Head (Calc.)	501.8 g	40.65	100.0

Test No. 37

Purpose: To repeat Test 34, but at higher pulp density.

Procedure: Same as Test 34, but the preaeration was performed at 60 % solids and the cyanidation at 50 % solids.

Feed: 500 g minus 10 mesh Sample C.

Solution Volume: 500 mL Pulp Density 50 % solids

Solution Composition: 1.0 gpl NaCN
0.5 gpL CaO

Grind: 10 minutes at 66 % solids in the lab rod mill.

Reagent Balance:

Time Hours	Added, grams				Residual		Consumed		pH	R.P.*
	Actual		Equivalent		Grams		Grams			
	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO		
1 h Pre-aeration										
	-	0.22	-	0.17	-	0.00	-	0.17	9.6- 8.0	-
Cyanidation - 1st Stage										
0-1	0.53	0.33	0.50	0.25	0.25	0.01	0.25	0.24	11.5-10.7	-
1-5	0.26	0.32	0.25	0.24	0.45	0.04	0.05	0.21	11.7-11.2	-
5-21	0.05	0.28	0.05	0.21	0.45	-	0.05	-	11.7-11.0	-
21-24	0.05	0.00	0.05	0.00	0.44	0.05	0.06	0.20	11.0-11.0	141
2nd Stage										
24-28	0.53	0.33	0.50	0.25	0.48	0.05	0.02	0.20	11.8-11.3	-
28-43	0.02	0.26	0.02	0.20	0.45	0.06	0.05	0.19	11.8-11.4	-
43-48	0.05	0.25	0.05	0.19	0.45	0.22	0.05	0.03	11.7-11.6	58
Total	1.49	1.99	1.42	1.51	0.89	0.27	0.53	1.24	-	-

*Reducing Power: mL 0.1 N $KMnO_4$/L pregnant solution

Reagent Consumption (kg/tonne of cyanide feed) NaCN: 1.06 CaO: Preaeration - 0.34
: Cyanidation - 2.14

Metallurgical Results

Product	Amount	Assays, mg/L,g/t Au	% Distribution Au
24 h Preg. + Wash	1760 mL	9.67	87.2
48 h Preg. + Wash	1800 mL	0.66	6.1
48 h Residue	499.9 g	2.63	6.7
Head (Calc.)	500.0 g	39.04	100.0

Test No. 38

Purpose: To repeat Test 37, but with 0.25 g/L NaCN.

Procedure: Same as Test 37, but with 0.25 g/L NaCN.

Feed: 500 g minus 10 mesh Sample C.

Solution Volume: 500 mL Pulp Density 50 % solids

Solution Composition: 0.25 gpl NaCN
0.50 gpL $Ca(OH)_2$

Grind: 10 minutes at 66 % solids in the lab rod mill.

Reagent Balance:

Time Hours	Added, grams				Residual		Consumed		pH	R.P.*
	Actual		Equivalent		Grams		Grams			
	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO		
1 h - preaeration										
	-	0.22	-	0.17	-	0.00	-	0.17	9.8- 8.1	-
Cyanidation - 1st Stage										
0-1	0.14	0.33	0.13	0.25	0.08	0.00	0.05	0.25	11.3-10.3	-
1-3	0.05	0.33	0.05	0.25	0.13	0.03	0.00	0.22	11.5-11.0	-
3-5	0.00	0.29	0.00	0.22	0.10	0.08	0.03	0.17	11.7-11.4	-
5-21	0.03	0.22	0.03	0.17	0.09	-	0.04	-	11.7-10.9	-
21-24	0.04	0.00	0.04	0.00	0.13	0.06	0.00	0.19	10.9-10.9	149
2nd Stage										
24-28	0.14	0.33	0.13	0.25	0.11	0.05	0.02	0.20	11.5-11.1	-
28-43	0.02	0.26	0.02	0.20	0.13	0.06	0.00	0.19	11.7-11.2	-
43-48	0.00	0.25	0.00	0.19	0.13	0.19	0.00	0.06	11.6-11.5	49
Total	0.42	2.23	0.40	1.70	0.26	0.25	0.14	1.45	-	-

*Reducing Power: mL 0.1 N $KMnO_4$/L pregnant solution

Reagent Consumption (kg/tonne of cyanide feed) NaCN: 0.28 CaO: Preaeration = 0.34
: Cyanidation = 2.56

Metallurgical Results

Product	Amount	Assays, mg/L,g/t Au	% Distribution Au
24 h Preg. + Wash	1860 mL	5.67	51.4
48 h Preg. + Wash	1740 mL	2.98	25.3
48 h Residue	498.2 g	9.60	23.3
Head (Calc.)	500.0 g	41.04	100.0

Test No. 39

Purpose: To repeat Test 33, but on Sample F.

Procedure: As for Test 33.

Feed: 500 g minus 10 mesh Sample F.

Solution Volume: 1000 mL Pulp Density 33 % solids

Solution Composition: 1.0 gpl NaCN

pH Range: 10.5-11.5 with $Ca(OH)_2$

Grind: 10 minutes/500 g at 66 % solids in a lab rod mill.

Reagent Balance:

Time Hours	Added, grams				Residual		Consumed		pH	R.P.*
	Actual		Equivalent		Grams		Grams			
	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO		
Pre-aeration										
0-1	-	-	-	-	-	-	-	-	8.3-7.9	-
1st Stage										
0-2	1.0	0.28	0.95	0.21	0.73	0.00	0.22	0.21	10.9-10.0	-
2-18	0.23	0.25	0.22	0.19	0.83	0.00	0.12	0.19	11.0-10.0	-
18-24	0.13	0.24	0.12	0.18	0.95	0.08	0.00	0.10	10.9-10.5	118
2nd Stage										
0-1½	1.0	0.25	0.95	0.19	0.88	0.06	0.07	0.13	10.7-10.5	-
1½-17½	0.07	0.15	0.07	0.11	0.84	0.02	0.11	0.15	10.9-10.4	-
17½-24	0.12	0.16	0.11	0.15	0.95	0.10	0.00	0.07	10.8-10.5	39
Total	2.55	1.33	2.42	1.03	1.90	0.18	0.52	0.85	-	-

Reducing Power: mL 0.1 N $KMnO_4$/L pregnant solution

Reagent Consumption (kg/tonne of cyanide feed)

24 hours	48 hours
NaCN : 0.69	NaCN : 1.05
CaO : 1.01	CaO : 1.72

Metallurgical Results

Product	Amount	Assays, mg/L, g/t Au	% Distribution Au
24 h Preg. Solution	950 mL	2.36	68.5
24 h Wash Solution	1150 mL	0.20	7.0
48 h Preg. + Wash	2030 mL	0.01	0.6
48 h Residue	494.9 g	1.58	23.9
Head (Calc.)	494.9 g	6.61	100.0

Test No. 40

Purpose: To repeat Test 34, but on Sample F.

Procedure: As for Test 34.

Feed: 500 g minus 10 mesh Sample F.

Solution Volume: 1000 mL Pulp Density 33 % solids

Solution Composition: 1.0 gpl NaCN
0.5 gpL $Ca(OH)_2$

Grind: 10 minutes/500 grams at 66 % solids in a lab rod mill.

Reagent Balance:

Time Hours	Added, grams				Residual		Consumed		pH	R.P.*
	Actual		Equivalent		Grams		Grams			
	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO		
Preaeration										
0-1	-	0.50	-	0.38	-	0.00	-	0.38	11.0-8.6	-
1st Stage										
0-2	1.0	0.50	0.95	0.38	0.28	0.14	0.67	0.24	11.3-11.1	-
2-18	0.71	0.32	0.67	0.24	0.85	0.09	0.10	0.29	11.5-10.7	-
18-24	0.11	0.38	0.10	0.29	0.93	0.28	0.02	0.10	11.2-11.2	155
2nd Stage										
0-1½	1.0	0.50	0.95	0.38	0.91	0.18	0.04	0.20	11.3-11.3	-
1½-17½	0.04	0.26	0.04	0.20	0.86	0.17	0.09	0.21	11.4-11.2	-
17½-24	0.09	0.28	0.09	0.21	0.95	0.35	0.00	0.03	11.2-11.3	21
Total	2.95	2.62	2.80	1.99	1.88	0.63	0.92	1.36	-	-

*Reducing Power: mL 0.1 N $KMnO_4$/L pregnant solution

Reagent Consumption (kg/t of cyanide feed)

Preaeration	24 hours	48 hours
NaCN : -	NaCN : 1.58	NaCN : 1.84
CaO : 0.76	CaO : 2.02	CaO : 2.90

Metallurgical Results

Product	Amount	Assays, mg/L, g/t Au	% Distribution Au
24 h Preg. Solution	920 mL	2.28	65.8
24 h Wash Solution	2060 mL	0.12	7.8
48 h Preg. + Wash	2000 mL	0.024	1.6
48 h Residue	499.3 g	1.58	24.8
Head (Calc.)	499.3 g	6.39	100.0

Test No. 41

Purpose: To repeat Test 40, but at a higher pulp density.

Procedure: As for Test 37.

Feed: 500 g minus 10 mesh Sample F.

Solution Volume: 500 mL Pulp Density 50 % solids

Solution Composition: 1.0 gpL NaCN
0.50 gpL $Ca(OH)_2$

Grind: 10 minutes/500 g at 66 % solids in a lab rod mill.

Reagent Balance:

Time Hours	Added, grams				Residual		Consumed		pH	R.P.*
	Actual		Equivalent		Grams		Grams			
	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO		
Pre-aeration										
0-1	-	0.25	-	0.19	-	0.00	-	0.19	9.6-8.2	-
1st Stage										
0-2	0.50	0.25	0.48	0.19	0.09	0.02	0.39	0.17	11.0-10.0	-
2-18	0.41	0.22	0.39	0.17	0.22	0.00	0.16	0.19	11.1-9.9	-
18-24	0.17	0.25	0.16	0.19	0.42	0.04	0.06	0.15	11.1-10.5	176
2nd Stage										
0-1½	0.50	0.25	0.48	0.19	0.42	0.04	0.06	0.15	11.2-10.8	-
1½-17½	0.06	0.20	0.06	0.15	0.41	0.01	0.07	0.18	11.2-10.4	-
17½-24	0.07	0.24	0.07	0.18	0.43	0.10	0.05	0.09	11.2-10.9	58
Total	1.71	1.58	1.64	1.20	0.85	0.14	0.79	1.06	-	-

*Reducing Power: mL 0.1 N $KMnO_4$/L pregnant solution

Reagent Consumption (kg/t of cyanide feed)

Preaeration	24 hours	48 hours
NaCN : -	NaCN : 1.24	NaCN : 1.61
CaO : 0.38	CaO : 1.40	CaO : 2.24

Metallurgical Results

Product	Amount	Assays, mg/L,g/t Au	% Distribution Au
24 h Preg. Solution	440 mL	4.48	61.0
24 h Wash Solution	780 mL	0.49	11.8
48 h Preg. + Wash	1380 mL	0.074	3.1
48 h Residue	491.5 g	1.58	24.1
Head (Calc.)	491.5 g	6.57	100.0