

GRAVITY + FLOTATION TEST: GF-1

Feb 22, 1992

CLIENT: Ottarasko PROJECT: Mt. Skinner

SAMPLE: Compo C-1, equal volumes of each of samples SKS-1 to
-5 / anticipated grade 2.0 oz/t Au.

Sample	Au oz/t
SKS-1	1.47
-2	2.19
-3	3.33
-4	1.26
-5	1.67

OBJECTIVE: Perform a gravity + flotation concentration test to
evaluate the response to these operations.PROCEDURE: Grind: 1,000 gm / 8 min / 67 % solids.
Pan: K = + 200:1
Float: Bulk rougher flotation only.
Wet/dry screen rougher tailing to 325 mesh.

TEST CONDITIONS: - Flotation

Time	Event	DF250	PAX	3418A	CuSO4	Na2S	pH
0 min	Float 1	75	20				8.8
1		50					
3			20				
8	Finish	125	40				

All reagent consumptions in g/t of feed.

METALLURGICAL CALCULATIONS: Flotation

Product	Wt %	Assay		Distribution - %	
		Au oz/t		Au	Ag
Pan conc	0.24	37.9		4.9	
F-1 RC	1.27	102.1		70.0	
Total RC	1.5	(91.9)		74.9	
RT	98.5	0.474		25.1	
Feed (calc) assay	100.0	(1.85) 1.99		100.0	

Note: (CC) - cleaner conc
 (CT) - cleaner tailing
 (RC) - rougher concentrate
 (RT) - rougher tailing

SCREEN ANALYSIS: Rougher tailing

Mesh	Micron	Wt %	Au oz/t	Dist - Au %
		43.2	0.208	19.0
100		10.1	0.268	5.7
150		12.2	0.313	8.0
200		11.6	0.415	10.3
325		22.9	1.184	57.0
		100.0	(0.474)	100.0

34.5 % - 200 mesh

OBSERVATIONS:

- There was only a modest amount of fairly fine VG in the pan concentrate.
- The sample contains only a very small proportion of sulphides.
- The flotation concentrate contained a reddish mineral(?).
- The products settled only very slowly, but did respond reasonably well to SF 127.
- The test products filtered quite slowly.
- The rougher flotation concentrate would benefit from cleaning to reduce the slimes content.

CONCLUSIONS:

- Note the unusual distribution of gold in the tailing fractions, in which the highest losses occur in the finest fractions.
- The overall gold recovery, at 74.9 %, was very low for this high grade feed.

RECOMMENDATIONS:

- Repeat the test using higher additions of PAX, a sulphidizing agent, and Cu as activator.

(4240-41)

CYANIDATION TEST: GL-2

Feb 22, 1991

CLIENT: Ottarasko PROJECT: Mt. Skinner

SAMPLE: C-1 / see W-92010.

OBJECTIVE: Initial gravity + cyanidation test to evaluate the sample response.

PROCEDURE: Grind: 500 gm / 5 min / 50 % solids.
 Pan: K = + 200:1
 Preaerate: no
 Cyanide: 24 hr < 1 g/l NaCN and 10.5 pH.
 Wet/dry screen: leach tailing to 325 mesh.

TEST CONDITIONS: - Cyanidation

Time hr	Addition - gm		NaCN g/l	pH	
	NaCN	Ca(OH) ₂		Initial	Final
L-0	1.0	0.4			
-28	2.0	-	< 0.1	11.2	
-52	-	-	0.65	11.8	

REAGENT CONSUMPTION: Cyanidation

Reagent	gm	kg/t
NaCN	2.4	4.7
Ca(OH) ₂	0.4	0.8 - excessive addition
Pb(NO ₃) ₂	-	-

METALLURGICAL CALCULATIONS: Cyanidation

Product	gm	Assay - oz/t	Distribution - %	
		Au	Au	Ag
Pan conc	1.83	63.6	11.9	
Preg sol'n	1,016	note	69.7	
Subtotal			81.6	
Tailing	489.2	0.367	18.4	
Feed (calc) assay	491.0 (	1.99 note 1.99	)	100.0

Note: The pregnant solution sample was contaminated, so the metallurgy was calculated based upon the assayed head grade which was in good agreement with the calculated grade in test W-92010.

SCREEN ANALYSIS: Leach tailing

Mesh	Micron	Wt %	Au oz/t	Au - dist %
		36.6	0.196	19.6
100		19.0	0.184	9.5
150		9.6	0.180	4.6
200		13.6	0.184	6.8
325		21.2	1.028	59.5
		100.0	(0.367)	100.0

34.8 % - 200 mesh

PREGNANT SOLUTION ANALYSIS: (ppm)

	Au	Ag	Cu	Fe	Zn
52 hr	salted		12	19	

REMARKS / OBSERVATIONS:

- Only minor VG in the pan concentrate.
- The tailing slimes were slow to filter, but did respond well to the addition of SF 127, perhaps benefited by SF 330.
- The 28 hr pregnant solution was yellow, and contained fine particulate, so was difficult to titrate using silver nitrate / pot. iodide. An arbitrary 2.0 gm of NaCN was added and the leach was permitted to proceed for a further 24 hr, then titrated twice using both KI and Rhodanine as indicators. Both gave satisfactory results, but rhodanine is probably the preferred choice since the end point colour change is to pink, rather than yellow as with KI.

CONCLUSIONS:

- Note the unusual gold distribution in the leached tailing. This is consistent with the flotation tailing in W-92010.
- The low overall gold recovery, at 81.6 % is only modestly higher than that obtained in W-92010 (gravity + flotation).

- The gold recovery in gravity concentration, at 11.9 % was low, although it was somewhat higher than in the previous test, at 4.9 %. Gravity concentration will not play much of a role, if any, in the processing of this ore.
- The consumption of NaCN is relatively high, at 4.7 kg/t, equivalent to about \$ 6.50 / tonne, but considering the high grade of the sample, will have only a modest effect upon the overall economics.
- The 52 hr pregnant solution contained only a modest amount of Cu and Fe, which does not explain the 4.7 kg/t cyanide consumption.
- The unusual gold distribution in the tailing and the apparent salting of the pregnant solution, suggest that reprecipitation may have occurred, in spite of a low Cu content in the pregnant solution. This can be checked by way of 2 parallel cyanidation tests, with and without carbon.

RECOMMENDATIONS:

- Evaluate flotation concentration followed by cyanidation of the flotation rougher tailing. See W-92010.
- Perform two parallel whole ore cyanidation tests, both with relatively high initial cyanide additions (2 gm NaCN in 500 gm solids), one with carbon, one without. Possibly evaluate preaeration as well, since the cyanide consumption was relatively high.

(4246-48)

FLOTATION + CYANIDATION TEST: FL-3

Feb 29, 1992

CLIENT: Ottarasko PROJECT: Mt Skinner

SAMPLE: See W-92-10.

OBJECTIVE: Evaluate flotation concentration using a higher addition of PAX than in the previous test, at incremental evaluate the addition of sulphidizer and activation with Cu. Leach the flotation tailing.

PROCEDURE: Grind: 1,000 gm / 8 min / 67 % solids.
 Pan: K = no
 Float: Staged rougher flotation to completion.
 Wet/dry screen rougher tailing to - mesh.
 Cyanide: flotation rougher tailing 24 hr / 1 g/l NaCN and 10.5 pH.
 Wet/dry screen the leach tailing.

TEST CONDITIONS: - Flotation

Time	Event	DF250	PAX	3418A	Na2S	CuSO4	pH
0 min	Float 1	75	25				
2		50					
3			25				
5		50	25				
7	" 2	50	25		500		
8			25			500	
10			50				
12	Finish	250	175		500	500	

All reagent consumptions in g/t of original feed.

TEST CONDITIONS: - Rougher tailing cyanidation

Time	Addition - gm		NaCN g/l	pH	
	NaCN	Ca(OH)2		Initial	Final
0	2.0	0.3			
24	-	-	0.7	11.5	

REAGENT CONSUMPTION: Cyanidation

Reagent	gm	kg/t flot tlg
NaCN	1.18	3.0
Ca(OH)2	0.3	0.8

METALLURGICAL CALCULATIONS: Flotation

Product	Wt %	Assay oz/t		Distribution - %		
		Au		Au		
F-1 RC	1.09	119.9		71.1		
F-2 RC	1.00	13.0		7.1		
Total RC	2.09	(68.8		) 78.2		
RT	97.91	0.409		21.8		
Feed (calc) assay	100.0	(1.84		) 100.0	100.0	100.0
		1.99				

Note: CC - cleaner concentrate
 CT - cleaner tailing
 RC - rougher concentrate
 RT - rougher tailing

METALLURGICAL CALCULATIONS: Cyanidation

Product	gm	Assay - oz/t		Distribution - %	
		Au	Ag	Au	Ag
Carbon	19.7	6.67		80.5	
Barren sol'n	1,167	0.006		4.4	
Tailing	393	0.062		15.1	
Feed (calc) assay	393	(0.409		) 100.0	100.0

METALLURGICAL CALCULATIONS: Combined circuit

Product	Wt %	Assay			Distribution - %		
		Au	Ag	As	Au	Ag	As
Flot conc	2.09	68.8	-		78.2		
Carbon					17.5		
Subtotal	2.09				95.7		
Leach tailing	97.91	0.062			4.3	(1)	
Feed (calc) assay	100.0	(1.84		) 100.0	100.0	100.0	
		1.99					

Note: (1) Includes barren solution.

SCREEN ANALYSIS: Leach tailing

Mesh	Micron	Wt %	Au oz/t	Ag oz/t
200		68.0	0.066	
325		12.7	0.050	
		19.3	0.056	
		100.0	(0.062)

32.0 % - 200 mesh

PREGNANT SOLUTION ANALYSIS: ppm

Solution	Au	Ag	Cu	Fe	Zn
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24 hr preg.

OBSERVATIONS:

-- There was no apparent additional sulphide flotation concentrate production on the addition of Na₂S and CuSO₄.

CONCLUSIONS:

- The overall response to flotation concentration followed by tailing cyanidation, was very good with a overall gold recovery of 95.7 %.
- As in the previous flotation test, the ore has not yielded a satisfactory flotation recovery, with a flotation tailing grading 0.409 oz/t Au, and flotation recovery of only 78.2 %.
- The leached tailing fractional analysis indicates that the grind need not be as fine as the achieved very coarse 32.0 % - 200 mesh.

RECOMMENDATIONS

- Although the potential exists to independently improve the response to either flotation or cyanidation, the testing has indicated that flotation followed by tailing cyanidation will provide excellent gold recovery.

The only plant which is economically accessible and has such a flowsheet is the Equity mill, at Houston.

(4254-58)