TR17-201-203

R.644 Flotation of chromite, Barnes Hill

It was recommended in Investigation R.632 that the influence of mine water on flotation should be established and the materials supplied were basically for this purpose.

A sample of chromite bearing material, 14.5 kg in weight, from the Barnes Hill deposit was submitted by Northern Chromite N.L., together with a quantity of water from Andersons Creek, which will supply water for the concentration process if a commercial operation is undertaken.

Samples of "Distillate" and Shell Wetting Agent 'A' were also supplied with a request that these two substances be checked as possible replacements for the fuel oil and "Calgon" used in the flotation tests to date. The reason for replacing fuel oil with distillate is somewhat obscure, but the Shell product was stated to be about half the price of "Calgon". The use of wetting agent 'A', if suitable, could affect a considerable saving in reagent costs.

THE SAMPLE

The sample was stated to be similar to some of those received previously for Investigation R.632. It consisted essentially of quartz with an extended size range from 2.5 cm gravel to extremely find sand. Very little clay was observed and in general the sample did appear to be similar to several of those previously submitted.

FLOTATION FEED PREPARATION

Since the aim of these tests was to establish the influence of certain factors in chromite flotation, maximum recovery of chromite during screening was not of prime importance. The most convenient way of preparing a suitable flotation feed was therefore adopted. The method was to dry the total sample and screen on a Sweco vibratory screen fitted with a 22# cloth. The -22# material was used as feed for comparative flotation tests and all recovery and head figures are based on this material, neglecting the probably minor amount of chromite remaining in the screen oversize. The result of screening was, oversize (+22#) 43.7% and undersize (-22#) 56.3%.

FLOTATION TESTS

The procedure for flotation tests was the same as that used for tests reported in Investigation R.632. *i.e.*

Scrub: 5 minutes with dispersant at 60-70% solids. Dilute and decant slimes.

Condition: One minute with reagents at 60-70% solids. Rougher and cleaner flotation of chromite after suitable dilution.

Andersons Creek water was used in all tests reported.

Test Conditions

The conditions in each test are given on the following page.

Test No.	Stage	Reagents (kg/t) 3035	F.O.	H_2SO_4	Calgon	'D'	'A'	C.A.	pH	Flot. (min.)
N1	Scrub				0.9					
	Condition	0.45	1.35	0.9						
	Flot. 1				0.45				2.5	4
	2								3.5	3
N2	Scrub						0.04			
	Condition	0.45		0.9		1.35				
	Flot. 1						0.02		2.5	4
	2								3.5	4
N3	Scrub				0.45					
	Condition	0.45		0.9		1.35				
	Flot. 1				1.8			0.04	2.5	3
	2								3.5	3
N4	Scrub				0.22					
	Condition	0.22		0.9		1.1				
	Flot. 1				0.9			0.04	2.4	4
	2								3.6	3
	3								3.9	3

Abbreviations for reagents

3035 :	Aeromine 3035	'D' :	Distillate
F.O. :	Light fuel oil	'A' :	Shell Wetting Agent 'A'
H_2SO_4:	Sulphuric acid	C.A.:	Cresylic acid (frother)

TEST RESULTS

The results of the tests are as follows.

Test No. & Product		% W	% Cr_2O_3	% Cr_2O_3 Distn
N1	F2C	13.9	57.6	94.1
	FT	70.2	0.22	1.8
	Slime	14.9	2.34	4.1
	H	100.0	8.5	100.0
N2	F2C	13.3	49.3	77.2
	FT	72.0	2.21	18.7
	Slime	14.7	2.34	4.1
	H	100.0	8.5	100.0
N3	F2C	13.7	58.9	92.8
	FT	67.0	0.27	2.1
	Slime	19.3	2.34	5.2
	H	100.0	8.7	100.0
N4	F3C	14.3	58.8	93.8
	FT	73.0	0.35	2.9
	Slime	12.7	2.34	3.3
	H	100.0	9.0	100.0

Remarks, test conditions and results

Tests N1 is similar to Investigation R.632, Test N23, except for usage of mine water instead of water from the Launceston water supply. The grade and recovery of concentrate is unaffected and therefore mine water has no influence on flotation.

Use of Shell Wetting Agent 'A' in Test N2 results in excessive foaming and lack of selectivity and is not an effective substitute for Calgon.

Substitution of distillate for fuel oil in Test N3 resulted in increased Calgon consumption, although not affecting the metallurgical results. The distillate is more difficult to emulsify during conditioning and an oil scum is left at the end of this operation requiring excessive Calgon for its dispersion.

In Test N4, halving the amount of distillate and amine has not affected the metallurgy and has halved the Calgon required for Test N3, although the requirement is still double that needed when fuel oil is used. The combined effect of distillate and lower amine addition has reduced frothing capacity and an auxiliary frother was required. Cresylic acid was used for this. The same considerations applied in a lesser degree to Test N3.

SUMMARY

The tests have shown that Andersons Creek water has no influence on the flotation of Barnes Hill chromite, using the conditions employed successfully in Investigation R.632, Test N23.

The influence of Shell Wetting Agent 'A' is adverse. Excessive amounts of foam were produced in the test and both grade and recovery in concentrate showed a marked decrease.

Substitution of distillate for fuel oil does not seem justified. The substance was found more difficult to emulsify than fuel oil even in smaller addition. Frothing was reduced and Calgon consumption increased although the metallurgical results remained good.

Generally the tests have reinforced the results of Investigation R.632 and there are indications that amine, fuel oil and Calgon usage can all be reduced below the figures quoted in that report without loss of metallurgical performance. An auxiliary frother such as cresylic acid would probably be necessary contingent on amine reduction to a point where insufficient froth was generated.

Optimum reagent usage can of course, only be determined in actual plant operation.