

TR17-196-200

R.643. Tin recovery test on ore from Queen Hill, Zeehan.

A 180 kg sample of Queen Hill ore was submitted by Gippsland Minerals N.L. for concentration tests on behalf of Aberfoyle Management Pty. Ltd. The sample was stated to have been taken from along a 15 m length of the adit at the Queen mine.

The concentration tests were conducted along lines suggested by Mr L. Bollen of Aberfoyle Management Pty Ltd who desired an early assessment of the ore dressing problems in order to decide on a possible mine exploration programme.

TEST WORK

The ore was crushed in the 'Chipmunk' laboratory jaw crusher and then roll crushed in closed circuit with a 14# screen until all the material passed the screen.

The sample was thoroughly mixed by repeated coning and quartering operations.

The sample was halved by riffing and about 90 kg of the sample was set aside for test work. The remaining part was again halved by riffing and about 45 kg was set aside for test work. The remainder was further reduced by riffing to provide a head sample for assay at the Department of Mines and three separate 0.45 kg samples for Mr Bollen.

The 90 kg that was set aside was ground in the Denver 12 inch x 12 inch ball mill in closed circuit with an 18 inch Sweco three deck screen fitted with 100#, 200# and 300# screens. The oversize from the 100# screen was returned to the ball mill, the -100# +200#, -200# +300#, and -300# products were separately stored.

Two flotation charges for the 10 kg Agitair flotation cell were taken from each size fraction and the sulphides were floated off using 0.4 kg/t potassium amyl xanthate and 0.04 kg/t of M.I.B.C. The natural pH was 5.2. In the case of the -200# +300# fraction, all of the fraction was subjected to flotation.

The sulphide rougher concentrates for each size fraction were respectively bulked, and then refloatated in a cleaning operation. The rougher tails together with the tail from the cleaning operation in each size fraction, were respectively bulked. The three sulphide concentrates so produced and the -100# +200#, and -200# +300# flotation tails were dried, weighed and sampled. The -300# flotation tail was settled and decanted, and not dried as requested by Mr Bollen. A sample of pulp was taken from the thickened -300# flotation tail for assay purposes.

A 2 kg flotation test with -300# feed was conducted in the Denver D-1 flotation cell using similar reagent conditions, and in a similar fashion to the test in the Agitair cell, to produce a sulphide concentrate and a tail. These were dried and weighed, and the proportion of the two products were used to estimate the weight of -300# flotation tail produced from the Agitair cell, knowing the weight of -300# sulphide concentrate produced.

A weighted composite of the sulphide concentrates from each size fraction was made and from this composite, two separate samples were taken and forwarded to Mr Bollen.

The non-sulphide product from each size fraction was concentrated on the Deister table to produce a concentrate assaying about 20% Sn. The middling and tailing were then retabled to produce a concentrate assaying about 20% Sn. The two concentrates so produced were bulked for each size fraction, dried, and sampled. No free cassiterite was noticed while retabling the initial table tailing from each size fraction, but some free cassiterite was detected when retabling the middlings. The final table tailings for the -100# +200#, -200# +300# size fractions and the middlings for each size fraction were dried and sampled. The final table tailing for the -300# fraction was settled, decanted, and a sample of pulp taken from the thickened -300# table tail for assay purposes. The remainder of the thickened -300# table tail was set aside.

During tabling it became evident that sulphide elimination had not been completely successful in the -100# +200#, and -300# fractions.

A weighted composite was made of the table concentrates from each of the size fractions, and was subjected to flotation in the Denver D-1 flotation cell using 0.7 kg/t of potassium amyl xanthate, 0.5 kg/t of sulphuric acid, 0.5 kg/t of copper sulphate and 0.05 kg/t of M.I.B.C. The flotation concentrate produced was cleaned by refloating and the cleaner concentrate dried and sampled. The rougher tail and the cleaner tail were bulked and concentrated on the Deister table to produce a concentrate assaying about 50% Sn. The middling and tail were combined, dried, and magnetically separated. The table concentrate was dried, halved by riffing, one half being retained for assay purposes, while the other half was forwarded to Mr Bollen.

In an attempt to recover more tin, the following additional treatment to that suggested by Mr L. Bollen was adopted. The table middlings from each size fraction were retreated. In the case of the -200#, +300# middlings where sulphide elimination had been good, the middling was magnetically separated and the non-magnetics were concentrated by panning on a vaning plaque. The middlings from the -100# +200# and -300# fractions were subjected to flotation in the Denver D-1 flotation cell with reagent additions as used in removing sulphides from the table concentrate. The potassium amyl xanthate was added in stages until flotation response of the sulphides ceased. The flotation tail was then dried and magnetically separated. The non-magnetics were concentrated on the Deister table.

The quarter part of the -14# sample that was set aside, was ground in the 12 inch x 12 inch Denver ball mill in closed circuit with the 18 inch Sweco screen fitted only with the 300# screen. The undersize was allowed to settle and was decanted. The thickened -300# feed sample and the thickened -300# table tail were collected by Mr Bollen for cassiterite flotation tests at Cleveland Tin N.L.

RESULTS

The head sample assayed as follows:

	%		%
T.Sn	2.17	S.Sn	0.05
Fe	33.3	CO ₂	4.4
S	28.1	B	Nil
Cu	0.05	Pb	0.20
Zn	0.21	Ag	Trace

Grinding in closed circuit with the Sweco screen fitted with 100#, 200# and 300# screens resulted in a size distribution as follows:

Size fraction	% Wt
-100 +200#	40.7
-200 +300#	14.5
-300#	44.8

The -300# ground product settled very rapidly, leaving clear water to decant.

Flotation of the sulphides in the size fractions in the Agitair cell with 0.4 kg/t of potassium amyl xanthate appeared to be satisfactory. Subsequent work showed that sulphide elimination could have been better in the -100# -200# and -300# fractions. From the response in the retreatment of the middlings it is felt that further potassium amyl xanthate additions would be sufficient to adequately float the sulphides in these fractions. The results of the flotation of the size fractions are as follows:

Product	% Wt	Assay %		% Distn	
		Sn	S	Sn	S
-100# +200# FC	24.2	1.06	43.0	12.3	37.2
FT	16.5	3.05	9.13	24.0	5.4
-200# +300# FC	10.1	1.22	41.3	5.9	14.9
FT	4.4	2.74	1.83	5.8	0.3
-300# FC	24.1	0.93	45.0	10.7	38.7
FT	20.7	4.17	4.69	41.3	3.5
Total FC	58.4	1.03	43.5	28.9	90.9
Total FT	41.6	3.57	6.15	71.1	9.1

The assay of the weighted composite of the respective sulphide flotation concentrates is as follows:

Cu	0.06%	Pb	0.33%
Zn	0.20%	Ag	36.8 g/t

Table concentration of the respective flotation tails was at some disadvantage because there was no clear distinction between concentrate and middling, and middling and tailing on the table. In spite of the close sizing given by screening of the initial feed, the concentrate, middling and tailing merged into each other on the table.

The results of the table concentration tests are as follows:

Product	% Wt	Assay %		% Distn	
		Sn	S	Sn	S
-100# +200# TC	0.8	13.5	23.60	5.3	0.7
TM	6.6	3.5	12.60	11.0	3.0
TT	9.0	1.8	5.20	7.7	1.7
-200# +300# TC	0.2	23.3	2.04	2.3	Trace
TM	1.8	2.4	1.41	2.0	0.1
TT	2.4	1.3	2.01	1.5	0.2
-300# TC	0.9	23.1	21.00	9.6	0.5
TM	8.1	4.55	8.16	17.5	1.9
TT	11.8	2.55	3.20	14.2	1.0
Total TC	1.9	19.0	20.10	17.2	1.2
Total TM	16.5	3.90	9.22	30.5	5.0
Total TT	23.2	2.13	3.85	23.4	2.9

A weighted composite was made of the table concentrates. The results of the sulphide flotation of the composite followed by tabling of the flotation tail are given below:

Product	% Wt	Assay %		% Distn	
		Sn	S	Sn	S
FC	1.09	9.4	32.8	4.9	1.2
FT TC	0.26	57.7	1.27	7.1	Trace
TT	0.56	(19.7)	(1.60)	5.3	Trace

Further assays on the final tin concentrate are as follows:

	%		%
Fe	11.0	As	Nil
Cu	Trace	Sb	Nil
Pb	0.05	Zn	0.03
Bi	Trace		

The table tail from the concentrate cleaning operation was magnetically separated with the following result:

Product	% Wt	Assay %		% Distn	
		Sn	S	Sn	S
TT M/A	0.54	18.0	1.63	4.6	Trace
N	0.02	53.8	0.93	0.7	Trace

The results of the middling retreatment in which the -100# +200#, and -300# middlings were floated, the flotation tail was magnetically separated and the non-magnetics were concentrated by tabling, appear below. In the case of the -200# +300# middling, this product was subjected to magnetic separation and the non-magnetics were panned on a vaning plaque.

Product	% Wt	Assay %		% Distn		
		Sn	S	Sn	S	
-100# +200#	FC	4.4	3.6	18.6	7.5	3.0
	FT	2.2	(3.38)	(0.57)	3.5	Trace
	FT M/A	1.4	3.8	0.68	2.6	Trace
	N	0.8	(2.56)	(0.35)	0.9	Trace
	NTC	0.1	17.5	0.98	0.6	Trace
-200# +300#	TT	0.7	0.81	0.28	0.3	Trace
	M/A	1.2	2.4	1.62	1.4	0.1
	N	0.6	2.1	1.09	0.5	Trace
	NPC	Trace	17.1	4.09	0.1	Trace
-300#	PT	0.6	2.1	1.09	0.5	Trace
	FC	3.1	4.5	19.9	6.8	3.3
	FT	5.0	(4.37)	(0.55)	10.6	0.1
	FT M/A	4.3	4.1	0.59	8.5	0.1
	N	0.7	(5.97)	(0.33)	2.1	Trace
	NTC	0.2	18.0	0.47	1.5	Trace
TT	0.5	2.3	0.29	0.6	Trace	
Total conc. from middling retreatment		0.3	(17.8)	(0.77)	2.2	Trace

A summary of the concentrates produced is as follows:

