

TR17-205-209

R.646. Tin concentration, Ringarooma River.

Mr. K. Kerrison, who produces tin concentrates from the Ringarooma River at Derby, stated that he was experiencing difficulty in visually distinguishing between various tin concentrate grades within the range 64-73% tin. He consequently submitted four tin concentrate samples for sizing analysis, tin distribution and magnetic separation.

SAMPLES		
The four samples submitted were as follows:		
Reg. No.	Sample No.	Description
722613	1	Top of river lease
722614	2	3 km downstream
722615	4	6 km downstream
722616	3	Mixture

METHOD

The following method was adopted due to low sample weight.

- (1) Magnetic separation on a Rapid high intensity magnetic separator.
- (2) Magnetic and non-magnetic fractions were sized on the following sieves; 600, 425, 300, 212 and 150 μ m.
- (3) Sized fractions were ground, mixed and assayed for tin.

Table 1. RESULTS OF MAGNETIC SEPARATION, SIZING ANALYSIS AND TIN DISTRIBUTION

Registered No. 722613						
Screen size (μ m)	Fraction	% Wt	% Sn	Sn Distn		M/S % Sn Recovery Individual fractions
				%	% Cum.	
+600	M/S M/A	1.43	2.89	0.06		
	M/S N	27.50	75.6	30.87		99.8
	Head	28.93	(72.0)	30.93	30.93	
+425	M/S M/A	4.54	1.27	0.08		
	M/S N	29.24	75.3	32.69		99.8
	Head	33.78	(65.4)	32.77	63.70	
+300	M/S M/A	2.62	1.22	0.05		
	M/S N	16.64	73.2	18.08		99.7
	Head	19.26	(63.4)	18.13	81.83	
+212	M/S M/A	1.12	1.96	0.03		
	M/S N	11.44	72.1	12.25		99.8
	Head	12.56	(65.8)	12.28	94.11	
+150	M/S M/A	0.15	3.12	0.01		
	M/S N	3.93	75.6	4.41		99.8
	Head	4.08	(72.9)	4.42	98.53	

Table 1. (continued)

Screen size (μm)	Fraction	% Wt	% Sn	Sn Distn		M/S % Sn Recovery Individual fractions
				%	% Cum.	
-150	M/S M/A	0.08	1.53	Trace		99.9
	M/S N	1.31	75.6	1.47		
	Head	1.39	(71.3)	1.47	100.00	
ΣM/S M/A		9.94	(1.59)	0.23		
ΣM/S N		90.06	(74.6)	99.77		
Head		100.00	(67.4)	100.00		

Registered No. 722614

Screen size (μm)	Fraction	% Wt	% Sn	Sn Distn		M/S % Sn Recovery Individual fractions
				%	% Cum.	
+600	M/S M/A	1.09	1.79	0.05		99.5
	M/S N	5.78	70.5	9.30		
	Head	6.87	(59.6)	9.35	9.35	
+425	M/S M/A	8.49	0.45	0.08		99.5
	M/S N	11.44	68.9	18.00		
	Head	19.93	(39.7)	18.08	27.43	
+300	M/S M/A	13.87	0.26	0.08		99.6
	M/S N	12.61	67.6	19.46		
	Head	26.48	(32.3)	19.54	46.97	
+212	M/S M/A	10.79	0.68	0.17		99.3
	M/S N	15.48	64.9	22.94		
	Head	26.27	(38.5)	23.11	70.08	
+150	M/S M/A	2.42	1.42	0.08		99.5
	M/S N	9.22	73.9	15.56		
	Head	11.64	(58.8)	15.64	85.72	
-150	M/S M/A	0.48	4.62	0.05		99.6
	M/S N	8.33	74.8	14.23		
	Head	8.81	(71.0)	14.28	100.00	
ΣM/S M/A		37.14	(0.60)	0.51		
ΣM/S N		62.86	(69.3)	99.49		
Head		100.00	(43.8)	100.00		

Table 1. (continued)

Registered No. 722615

Screen size (μm)	Fraction	% Wt	% Sn	Sn Distn		M/S % Sn Recovery Individual fractions
				%	% Cum.	
+600	M/S M/A	0.08	10.5	0.01		
	M/S N	3.60	76.6	3.73		99.7
	Head	3.68	(75.2)	3.74	3.74	
+425	M/S M/A	0.70	11.0	0.10		
	M/S N	18.13	76.5	18.75		99.5
	Head	18.83	(74.1)	18.85	22.59	
+300	M/S M/A	1.35	7.44	0.14		
	M/S N	25.46	76.8	26.43		99.5
	Head	26.81	(73.3)	26.57	49.16	
+212	M/S M/A	1.52	8.92	0.18		
	M/S N	32.95	76.5	34.07		99.5
	Head	34.47	(73.5)	34.25	83.41	
+150	M/S M/A	0.28	9.98	0.04		
	M/S N	12.12	77.5	12.69		99.7
	Head	12.40	(76.0)	12.73	96.14	
-150	M/S M/A	0.08	5.56	0.01		
	M/S N	3.73	76.4	3.85		99.7
	Head	3.81	(74.9)	3.86	100.00	
	Σ M/S M/A	4.01	(8.82)	0.48		
	Σ M/S N	95.99	(76.7)	99.52		
	Head	100.00	(74.0)	100.00		

Registered No. 722616

Screen size (μm)	Fraction	% Wt	% Sn	Sn Distn		M/S % Sn Recovery Individual fractions
				%	% Cum.	
+600	M/S M/A	0.30	11.2	0.05		
	M/S N	15.20	76.8	16.31		99.7
	Head	15.50	(75.5)	16.36	16.36	
+425	M/S M/A	1.30	6.66	0.12		
	M/S N	31.48	76.3	33.57		99.6
	Head	32.78	(73.5)	33.69	50.05	

Table 1. (continued)

Screen size (μm)	Fraction	% Wt	% Sn	Sn Distn		M/S % Sn Recovery Individual fractions
				%	% Cum.	
+300	M/S M/A	1.51	4.69	0.10		
	M/S N	25.58	74.0	26.45	80.0	99.6
	Head	27.09	(70.1)	26.55	76.60	
+212	M/S M/A	1.21	3.67	0.06		
	M/S N	17.41	72.1	17.54	87.0	99.7
	Head	18.62	(67.7)	17.60	94.20	
+150	M/S M/A	0.32	3.1*	0.01		
	M/S N	4.18	74.1	4.33	25.1	99.7
	Head	4.50	(69.1)	4.34	98.54	
-150	M/S M/A	0.11	2.20	0.01		
	M/S N	1.40	74.1	1.45	82.1	99.8
	Head	1.51	(68.9)	1.46	100.00	
	Σ M/S M/A	4.75	(5.22)	0.35		
	Σ M/S N	95.25	(74.9)	99.65	85.0	
	Head	100.00	(71.6)	100.00		

* Estimated

RESULTS

The results of the tests on each sample are shown in Table 1. From the results several observations can be made. The minerals present in all samples can be described as follows:

- (1) Magnetics - composed mainly of ilmenite with minor amounts of chromite and also minor amounts of composite cassiterite.
- (2) Non-magnetics - composed mainly of cassiterite and what is visually thought to be topaz. Minor amounts of zircon are also present.

The cassiterite in all samples was very dark black in appearance and, as has been experienced previously, is very hard to visually distinguish from ilmenite.

Lack of sample quantity prevented any attempt at further gravity concentration. However the samples are in a very closely sized condition.

Magnetic separation has up-graded the four concentrates as follows:

Reg. No.	% Sn		% Wt		% Recovery
	Head	Magnetics	Non-magnetics	% Sn	
722613	67.4	9.94	74.6	99.77	
722614	43.8	37.14	69.3	99.49	
722615	74.0	4.01	76.7	99.52	
722616	71.6	4.75	74.9	99.65	

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CONCLUSION

The variations in grade being experienced are due to the presence of ilmenite in the tin concentrate. This ilmenite can be removed from the concentrate with a minimal loss of tin by magnetic separation. Grains of ilmenite and cassiterite in the samples submitted could not be distinguished visually.

Some free gold had been observed in the sample and it was desired to ascertain the total gold content and what proportion of the gold occurred in the free state.

SAMPLE

A visual examination indicated that the sample consisted of a mixture of quartz and pyrite, generally individual grains, but with some composites in the coarsest sizes. Free gold was abundantly present (<0.5%), but no distinct evidence of other heavy minerals were observed.

The total sample weight was 434.4 g.

TREATMENT METHOD

The total sample was screened on a series of screens in the range 75 to 1.304 mm. The fraction finer than 1.304 mm was concentrated on the equipment to produce a concentrate containing the free gold, pyrite fraction and a quartz fraction.

The +1.304 mm fraction was examined visually for the presence of free gold with negative results, and then separated by hand into pyrite and quartz fractions. All fractions so produced were weighed.

The pyrite fractions were then roasted and retested on the separator with hand grinding of tailings to produce a further quantity of free gold concentrate and a roasted pyrite tailing.

All end products were assayed for gold and the free gold concentrates were also assayed for silver.

A small amount of superannated concentrate from the +300 and +150 mm fractions was tested qualitatively for the presence of heavy minerals.

TEST RESULTS

The results of the sample treatment are given in Tables 1-4 below:

Table 1. WEIGHT DISTRIBUTION OF THE VARIOUS PRODUCTS

Size Fraction	GOLD		Total
	Free Gold	Pyrite	
+1.304 mm	Nil	7.3	10.9
+600 μm	Tr.	6.9	7.6
+300 μm	1.6	17.5	23.1
+150 μm	0.7	32.3	43.7
+100 μm	0.1	6.6	10.4
+75 μm	0.5	2.1	3.9
-75 μm	0.1	0.7	1.4
Total	2.7	73.4	100.0