

LAUNCESTON. April 20th. 1944.

No 113.

ORE DRESSING INVESTIGATION NO. 94/44.TIN ORE / CLEVELAND MINE. WARATAH.Table Concentration.Sample.

A sample weighing one cwt. and stated to be obtained from Luck's Lode and Khaki deposit was received from Mr. C. E. Gray. Gravity concentration tests were desired. The ore is of a siliceous nature containing some clay-like material. The tin is present as cassiterite, the majority being of small grain size. A sample was obtained after reduction to minus $\frac{1}{4}$ inch size and assayed with the following results:-

	<u>Percent.</u>
Tin	1.45
Acid Insoluble	81.62
Sulphur	0.04
Iron	5.97
Arsenic	0.17
Copper	under 0.10
(Lead)	
(Zinc)	
(Bismuth)	Nil
(Antimony)	

Procedure.

Preliminary examinations showed that a proportion of the cassiterite was free at relatively coarse sizings but fine grinding and concentration of tailings from primary concentrations resulted in the production of additional cassiterite concentrates. These examinations indicated a treatment consisting of primary reduction classification and table concentration followed by fine grinding and concentration of the re-ground tailings.

Tests Nos. 1 and 2 show recoveries at reductions to minus 12 mesh battery screen (aperture .013 inch) and 36 B.S. test screen (aperture .0166 inch) respectively. Test 3 consists of primary reduction to 36 mesh test screen classification and concentration with secondary concentration after reduction to approximately minus 150 mesh B. S. screen size. The degree of grinding desired for secondary reduction was determined from data obtained in sizing analysis of Test 2 tailings. Preliminary reduction of one sample consisted of jaw crusher to minus $\frac{1}{4}$ " and roll reduction to minus 10 mesh B.S. screen. Concentration was performed on a No. 13 Wilfley Table.

Concentration Tests.Test 1.

Roll reduction to minus 12 mesh battery screen (aperture 0.013 inch) sizing by screening to plus and minus 60 mesh B.S. screen and concentration of each sizing separately.

Results.Table 1.

<u>Product</u>	<u>Weight</u>	<u>Percent.</u>		<u>Percent Tin.</u> <u>Distribution</u>
			<u>Tin</u>	
Concentrate + 60 mesh	4.02		6.53	18.45
" - 60 "	2.26		27.66	<u>43.95</u> <u>62.4</u>
Middling + 60 "	8.68		0.94	5.74
" - 60 "	5.41		1.04	3.96
Tailing + 60 "	30.10		0.66	13.97
" - 60 "	49.53		0.40	13.93
Composite	100.00		1.42	100.00
Composite Concentrate	6.28		14.13	Ratio of Concentration 15.9. Recovery 62.4 percent.

Test 2.

Reduction to minus 36 mesh B.S screen by stage Ball Mill grinding, hydraulic classification to approximately plus and minus 85 mesh sizes and concentration of each product separately.

(Sp. and C/O abbreviations in the tables refer to products from Spigot and Classifier overflow respectively)

Results.Table 2.

<u>Product.</u>	<u>Weight.</u>	<u>Percent</u>		<u>Percent Tin.</u> <u>Distribution.</u>
			<u>Tin.</u>	
Concentrate (Sp.)	2.40		26.97	44.76
" (C/O)	1.71		21.54	<u>25.47</u> <u>70.23</u>
Middling (S.p)	3.93		0.96	2.61
" (C/O)	4.41		0.88	2.68
Tailing (Sp.)	16.37		0.51	5.77
" (C/O)	71.18		0.38	18.71
Composite	100.00		1.44	100.00
Composite Concentrate	4.11		24.7	Ratio of concentration 24.3 Recovery 70.23 percent.

Table 3.
Sizing Analysis of Table Feed and Tailing of Test 2.

<u>Screen Size.</u> <u>Product.</u>	<u>Feed</u>		<u>Tailing.</u>		<u>Percent Feed.</u>	<u>Feed Distribution Tailing.</u>
	<u>Percent. Weight.</u>	<u>Tin.</u>	<u>Percent. Weight.</u>	<u>Tin.</u>		
+44	0.5)		0.6)			
-44 + 60	10.2)	1.62	9.3)	0.64	11.65	14.37
-60 + 85	13.9	1.85	13.3	0.52	17.29	15.71
-85 +100	3.5	1.85	3.0	0.39	4.35	2.66
-100+120	3.7	2.10	3.0	0.36	5.22	2.45
-120 +150	7.9	2.02	7.2	0.39	10.72	6.38
-150 +200	8.0	1.99	8.3	0.37	10.70	6.97
- 200	52.3	1.14	55.3	0.41	40.07	51.46

Test 3.

Reduction to minus 36 mesh B.S. screen by stage Ball Mill grinding, hydraulic classification to approximately plus and minus 85 mesh sizes and concentration of each product separately. Stage ball mill grinding of primary middlings and tailings sizing by classification to approximately minus 150 mesh screen size and concentration of the minus 150 mesh product. Finally concentration by vanning of the composite table concentrate to a marketable grade.

Results.Table 4.

<u>Product.</u>	<u>Weight</u>	<u>Percent Tin</u>	<u>Percent Distribution</u>	<u>Tin.</u>
Concentrate (Spigot)	1.57	37.68	42.25	
" (Class. Overflow)	0.97	33.61	23.28	
" (Secondary)	0.51	27.38	9.98	75.51
Middling	1.14	1.50	1.22	
Tailing	95.81	0.34	23.27	
Composite	100.00	1.40	100.00	
Composite Concentrate	3.05	34.67	Ratio of Concentration 32.8 Recovery 75.51 percent.	

Vanning of the composite table concentrate resulted in a concentrate assaying 65.2 percent tin with a recovery of 95 percent. Thus the overall recovery to a marketable concentrate amounted to 71.73 percent.

Summary.

Concentration tests after reduction to 12 mesh battery screen and 36 mesh B.S. screen resulted in recoveries of 62.4 and 70.23 per cent respectively. Information obtained from test No.2 and examination of products showed that fine grinding was essential for optimum recovery. Substantial recovery of the cassiterite is practical at relatively coarse reduction and the indicated treatment is: reduction to a sizing between 0.043 and 0.0166 inch, classification and table concentration, regrind of primary tailings and middlings to approximately 150 mesh screen size and concentration of the ground products.

Test 3 is such a treatment and resulted in a recovery of 75.51 percent of the tin in concentrates with an average tin

content of 34.67 percent tin. Of this recovery 9.98 percent was obtained from the secondary concentration. Vanning of the table concentrates to 65.2% Tin resulted in an over-all recovery to this grade of 71.73 per cent.

Sizing analysis of the vanned concentrate referred to above showed that 91.4 percent of the concentrate was plus 325 mesh screen size.

CHIEF CHEMIST AND METALLURGIST.