

TR1-73-76
R. 301 to R. 304

ORE AND MILL SAMPLES

MOINA TUNGSTEN—TIN MINING CO., MOINA

Investigation

On the 25th and 26th of October tests were undertaken at the mill in an attempt to reduce losses by flotation, &c. The samples used for the investigation were:—

R301—Ore sample obtained from 10 a.m. to 1 p.m. on the 26th October, 1956 ex-feeder to mill.

R302—Cleaner flotation products by current and amended methods.

R303—Ground non-magnetic material representing flotation cell feed.

R304—Mill table concentrate.

R301, 302 and 303 were used to investigate losses of tin in the flotation product.

R304 was obtained to investigate comparative losses by dry (existing) and wet magnetic separation for removal of magnetite.

Summary

1. A sample of stored floated sulphides was received on the 1st August, 1956, for assay for bismuth and it was also found to contain a substantial quantity of tin. Investigation showed that this tin present as cassiterite was readily floated. Ore sample (R301), together with cleaner flotation mill concentrates produced by the mill foreman and the writer, were tested to assess and reduce losses of tin.

2. Existing treatment was tested on the 26th October, 1956, and the sulphide float after cleaning showed a tin content of 19.6 per cent, and after refotation in the laboratory still contained 18.1 per cent of tin. Amended treatment showed a comparable loss of tin in the sulphide froth and amounted to 16.2 per cent of tin. After refotation in the laboratory the froth still contained 15.2 per cent of tin.

3. Valuable minerals in the ore sample (R301) were concentrated by jigging and tabling after reduction to minus 5 mesh B.S. The total concentrate amounted to 2.8 per cent by weight. The non-magnetic fraction amounted to 46.2 per cent of the concentrate and after grinding to minus 60 mesh B.S. size, was submitted to flotation to reject the sulphides and examine same for loss of tin. The non-magnetic fraction contained 29.5 per cent of tin and 37.27 per cent was floated and contained 2.8 per cent of tin or only 3.5 per cent of the tin in the non-magnetic fraction.

4. The sample of mill cell feed (R303) contained 43.3 per cent of tin, and cleaner sulphide test floats in the laboratory contained from 8.6 to 20 per cent of tin, which amounted to losses of 5 to 17.6 per cent of the tin in the non-magnetic concentrate (cell feed).

5. No evidence was obtained in the examinations to ascertain the cause or causes of high tin loss, but it is strongly suspected that lubricants containing such compounds as soap or fatty acids contribute to these losses. Further checking on ore samples are desirable, and in the meantime it is recommended that all lubricants used in mining and milling be checked. Worn bearings could be troublesome due to excessive consumption of lubricant. Until the problem is solved the sulphide float could be tabled to recover much of the floated tin as a complex concentrate as shown under results. The use of sulphuric acid resulted in lowest tin loss on the ground mill feed, and although the loss is still high, this reagent combination could be given a trial. The method of flotation is considerably faster than that used at present in the mill.

6. Samples of separated magnetite assayed during October showed 15 per cent of tin plus tungstic oxide. Tests show that the dry magnetic separation results in higher losses than wet magnetic separation. The table concentrate (R304) was submitted to both dry and wet separation, resulting in a magnetite product containing 3.2 per cent of tin by dry separation as compared with 1.3 per cent by wet separation. Wet separation was performed in a Crockett unit which rolls the magnetic material during its passage through the unit, allowing the non-magnetic tin and feebly magnetic wolfram to be separated from the magnetite.

Results

Laboratory examination of mill floated sulphides (26.10.56).

R 302B—Existing treatment.

R 302M—Amended test.

Material non-magnetic concentrate, ball mill ground to about minus 100 mesh size.

	Flotation Conditions			
	Existing Treatment		Amended Treatment	
	Reagents lbs. ton/minutes			
	Rougher	Cleaner	Rougher	Cleaner
Copper Sulphate	1½	1½	0.75/5	0.25/5
Soda Ash	6			
Cresylic Acid	1¾/10	1¾	0.2	
Ethyl Xanthate	½	½	0.5	0.25
Amyl Xanthate	½	½	0.25	0.25
pH value	+ 11		9	
Flotation time	150 minutes		75 minutes	

Amended Treatment

	Per cent		Per cent	
	Wght.	Tin	Tin Dist.	
Recleaner Float	95.3	15.2	89.6	
Recleaner Sink	4.7	35.9	10.4	
Composite Mill Float	100.0	16.2	100.0	

Existing Treatment

Recleaner Float	90.8	18.1	84.0
Recleaner Sink	9.2	34.1	16.0
Composite Mill Float	100.0	19.6	100.0

Both flotation treatments resulted in voluminous froths, particularly the latter.

Sizing analysis shows 99 per cent of the tin in the test float to be in the minus 200 mesh fraction. The minus 200 mesh fraction amounted to 65.8 per cent with a tin content of 22.3 per cent.

Examination of Mill Cell Feed

R303—Cleaner Flotation Tests.

Test 1. Natural pH value using copper sulphate, mixed xanthates and cresylic acid.

Test 2. Sulphuric acid to a pH value of 5.7-6, otherwise similar to Test 1.

Test 3. Lime to a pH value of 11.5, otherwise similar to Test 1.

Flotation time ranged from 18 to 50 minutes. Test 2 shows reduction in losses and with only 12 and six minutes for rougher and cleaner flotation. The amount of acid used was 2.3 lbs. per ton in the rougher, and 0.2 lbs. in the cleaner float.

	Per cent		Per cent	
	Wght.	Tin	Tin Dist.	
Test 1 Cleaner Float	37.4	17.46	15.1	
Test 2 Cleaner Float	25.9	8.63	5.0	
Test 3 Cleaner Float	37.7	20.2	17.6	

R303 Sizing Analysis

Fraction	Per cent		Per cent	
	Wght.	Tin	Tin Dist.	
B.S. Screen				
+ 100	11.8	21.7	5.9	
+ 200	36.9	46.6	39.7	
- 200	51.3	46.0	54.4	

Ore Sample

Fifty-five pounds of ore ex the mill fine ore bin was obtained at half-hourly intervals from 10 a.m. to 1 p.m. on the 26th October, 1956. The sample was roll crushed to minus 5 mesh B.S (aperture 0.132 inch) sized, concentrated by jigging and tabling. The crude concentrate was reduced to minus 22 mesh, magnetically separated, and the non-magnetic fraction containing the cassiterite and sulphides was ball mill ground to minus 60 mesh and sulphides were removed by cleaner flotation using similar reagents to Test 303/1. Loss of tin in the sulphides was considerably lower than shown in the examination of mill cell sulphide floats and test flotation of mill cell feed. This could indicate a variation in the nature of the ore only, or suggest that lubricants have contaminated the ore and caused the cassiterite to float readily.

Product	Per cent		Per cent
	Wgt.	Tin	Tin Dist.
Cleaner Float	37.27	2.8	3.54
Cleaner Sink	1.67	19.6	1.11
Rougher Tailing	61.06	46.0	95.35
Composite Concentrate ..	100.0	29.5	100.0