TR6_190_195

R. 391

TREATMENT OF SLIME TABLE SECTION FEED

Sample

Approximately 200 lbs. (dry weight) of slime table feed was supplied as a thick pulp by Aberfoyle Tin Mining Company N.L. The sample was obtained from the plant on 19th, 20th and 21st September, 1961.

Investigation

An earlier investigation R.379, examined tin and wolfram losses in the Aberfoyle slime table tailings. In this investigation it was suggested that consideration be given to desliming and desulphidizing the feed to the slime tables. In September, 1961, the company requested a pilot plant scale test on slime table feed involving—

(1) desliming the feed by cycloning;

(2) desulphidizing the cyclone spigot discharge;

(3) sizing the desulphidized feed (by recycloning) into two fractions;

(4) treatment of the two fractions by separate concentration by tabling.

Summary

A pilot plant test was carried out on a sample of slime table feed from Aberfoyle Tin Mining Co. N.L. Mill at the request of the company. Treatment involved prior desliming by cycloning, desulphidizing by flotation, followed by tabling of the deslimed and desulphidized tailing.

It is difficult to compare the results of the pilot plant with plant performance, particularly as the sample received contained considerably less true slimes than expected.

The test indicates—

(1) the feed may be deslimed by cycloning with negligible loss of recoverable tin;

(2) the deslimed feed is readily desulphidized by flotation, with negligible loss of recoverable tin;

(3) the overall pilot plant test tailing was considerably lower than normal practice, but this is probably not wholly due to the difference in treatment;

(4) the sulphides contained 8.65% copper and 25.4 ounces silver per ton. This is possibly a saleable product. It may be practicable to increase the copper and silver content of a sulphide product by differential flotation to give increased economic returns.

Pilot Plant Scale Test

Mr. Musgrove verbally informed us that the density of the thickened pulp feed was approximately 5% solids.

The thickened pulp sample was accordingly diluted to approximately 5% solids, and cycloned in a 30 mm cyclone at 25 pounds per square inch pressure.

The cyclone products were as follows:—

Product	Density of Pulp Percent Solids	Percent Distribution of Solids from Original Sample
Cyclone overflow	1	6.4
Cyclone underflow	40	93.6
Cyclone feed	5	100.0

The cyclone overflow "slimes" were not concentrated, being regarded as part of the final tailing.

The sulphides were removed from the cyclone underflow by flotation.

No attempt was made to determine optimum flotation conditions. The following reagents were used in the test, and appeared to be effective.

Reagent	Usage, Pounds Per Ton of Flotation Feed
Sulphuric acid	1
Copper sulphate	1
Sodium ethyl xanthate	0.2
Sodium amyl xanthate	0.3
Cresylic acid	0.1

The sulphides removed by flotation amounted to 4.55% by weight of the original sample, and were considered to be portion of the final tailing.

The desulphidized pulp at 35% solids was recycloned at a pressure of 20 pounds per square inch in the 30mm cyclone.

Product	Density of Pulp Percent Solids	Percent Distribution of Solids from Original Sample
Cyclone overflow	5	9.6
Cyclone underflow	55	79.4
Cyclone feed	35	89.0

The two cyclone products were tabled separately to give a concentrate and tailing for each product.

The assays and recoveries of tin and wolfram in the various products were:—

Product	Weight	Percent Tin	Percent Wolfram	Percent Distribution Tin	Percent Distribution Wolfram
Coarse Conc.	4.39	28.9	12.3	69.2	66.3
Fines Conc.	0.15	20.0	8.5	1.6	1.6
Combined	4.54	28.6	12.2	70.8	67.9
Coarse Tailings	75.02	0.50	0.24	20.4	22.1
Fines	9.49	0.88	0.42	4.6	4.9
"Slimes"	6.40	0.90	0.52	3.1	4.1
Sulphides	4.55	0.43	0.17	1.1	1.0
Combined Tailings	95.46	0.56	0.27	29.2	32.1
Composite Feed	100.0	1.83	0.81	100.0	100.0

Infrasizer Analyses of the Tailings

Infrasizer analyses were carried out to determine the nature of the losses of tin in the tailings.

Coarse Tailings

Fraction	Weight	Percent	Tin	Percent Distribution Tin
Plus 60 mesh	Trace			
Plus 85 mesh	0.1			
Plus 100 mesh	0.5	19.8	0.05	2.1
Plus 120 mesh	0.7			
Plus 150 mesh	3.7			
Plus 200 mesh	14.8			
Infrasizer 1		4.8	0.16	1.7
Infrasizer 2		30.2	0.13	8.5
Infrasizer 3		22.4	0.38	18.4
Infrasizer 4		12.4	1.06	28.4
Infrasizer 5		6.1	1.64	21.6
Infrasizer 6	2.8	4.3	2.08	19.8
Infrasizer 7	1.5	....	....	....
Composite		100.0	0.46	100.0

About 30% of the tin in this tailing is coarser than 20 microns, and should be recoverable by gravity concentration if in the free state. However, the average tin content of the material coarser than (and including) infrasizer fraction 3 is only 0.07%.

Fine Tailings

Fraction	Weight	Percent	Tin	Percent Distribution Tin
Plus 60 mesh	Trace			
Plus 85 mesh	Trace			
Plus 100 mesh	0.1	2.0	0.06	0.1
Plus 120 mesh	0.1			
Plus 150 mesh	0.1			
Plus 200 mesh	1.7			
Infrasizer 1	0.2	8.0	0.20	1.9
Infrasizer 2	7.8			
Infrasizer 3		14.0	0.21	3.4
Infrasizer 4		16.0	0.68	12.7
Infrasizer 5		14.8	1.13	19.6
Infrasizer 6		13.8	1.33	21.5
Infrasizer 7		31.4	1.11	40.8
Composite		100.0	0.85	100.0

Only 5.4% of the tin in this tailing is coarser than 20 microns, and should be recoverable by gravity concentration if present in the free state. The average tin content of the material coarser than (and including) infrasizer fraction 3 is only 0.19%.

" Slime " Tailings

Fraction	Weight	Percent Tin	Percent Distribution Tin
Plus 200 mesh	0.3		
Infrasizer 1	0.2		
Infrasizer 2	0.9		
Infrasizer 3	4.3		
Plus 150 mesh	0.2	6.3	1.06	7.6
Plus 60 mesh	Trace		
Plus 80 mesh	0.1		
Plus 100 mesh	0.1		
Plus 120 mesh	0.2		
Infrasizer 4	4.4	9.9	1.37	15.4
Infrasizer 5	5.5		
Infrasizer 6		7.7	1.30	11.4
Infrasizer 7		76.1	0.76	65.6
Composite		100.0	0.88	100.0

Only 6.3% by weight of the " slimes " tailings is coarser than infrasizer fraction 3. Seven point six percent of the tin is coarser than 20 microns, and should be recoverable if present in the free state.

Sulphides

The sulphides removed by flotation amounted to 4.55% by weight of the total sample. The sulphides assayed 0.43% tin, 8.6% copper, and 25.4 ounces silver per ton. This may be an economic concentrate. In a continuous plant, it should be practicable to differentially float off a sulphide concentrate with increased copper and silver content, followed by the bulk of the iron sulphides. Such practice could result in increased economic return, and it seems that an investigation into this aspect is warranted.

Overall Gravity Tailing

The overall gravity tailing (coarse tailings, fine tailings plus " slime " tailings) has the following sizing.

Fraction	Percent Weight
Plus 60 mesh	Trace
Plus 85 mesh	0.1
Plus 100 mesh	0.4
Plus 120 mesh	0.6
Plus 150 mesh	3.0
Plus 200 mesh	12.4
Infrasizer 1	4.0
Infrasizer 2	25.9
Infrasizer 3	20.2
Infrasizer 4	12.2
Infrasizer 5	7.1
Infrasizer 6	4.3
Infrasizer 7	9.8
	100.0

This sizing is much coarser than samples of slime table tailings received from the company for Investigation R.379. For example compare the infrasizer 7 fraction of 9.8% above with the 29.30% by weight from the four samples R.379/1-4.

The reason for this difference is not known, unless the thickener ahead of the slime tables was overloaded and overflowing considerable slimes at the time of sampling.

Discussion

It is difficult to compare some of the results obtained with actual plant performance.

As mentioned above, the sample tested was much coarser than plant tailings tested in Investigation R.379. Slimes lost from the head sample R. 391 may have had a relatively high tin content, but this tin would probably not be recoverable by gravity concentration.

Also the grade of concentrate obtained in the Investigation R.391 is a little lower than anticipated at 28.6% tin and 12.2% wolfram. A plant slime table concentrate examined in Investigation R.382 assayed 36.1% tin and 15.5% wolfram.

The test indicates that the test procedure suggested by the company is soundly based. The slimes discarded by cycloning contain negligible recoverable tin.

The deslimed feed was readily desulphidized by flotation. The prior desliming probably assisted flotation, but we have no direct data relating to this.

The subsequent table concentration of the deslimed and desulphidized feed was characterized by the absence of the slimes, which normally tends to mask the table operation. Due to the prior desulphidizing, the normal appreciable sulphide band which tends to mask fine tin was virtually absent. Negligible tin was lost by the desulphidizing by flotation—the sulphides contained 0.43% tin, or 1.1% of the total tin in the sample.

The overall tin content of the combined tailing was 0.56%. This is appreciably lower than expected, and is much lower than normal plant operation tailings.

Recent related investigations are—

R.374: a preliminary examination of a sample of slime table tailings;

R.382: an infrasizer analysis of a slime table concentrate.