TR20_378-380

R.707. Recovery of pyrite from Savage River Mines waste by means of jig and spirals.

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A waste product from the milling of Savage River ore contains significant amounts of pyrite. This product was seen as a potential source of pyrite for the North West Acid Works and beneficiation tests were requested by Savage River Mines to assess the prospects of recovering the pyrite by gravity concentration methods.

A sample mass of approximately 120 kg, described as Rougher Magnetic Separator Tailing - Cyclone underflow, was used. Maximum size was about 5 mm and the sample contained a considerable amount of very fine tailing material, less than 20 µm. The sample assayed 10.6% sulphur.

The samples were screened to break down the numerous aggregates of fine material and mixed by hand shovelling into a cone. Samples for test work and assay were then cut out by riffling.

TEST WORK

JIG CONCENTRATION N1

Approximately 32 kg of the sample were fed onto a Sweco vibrating screen fitted with 653 µm and 315 µm screens.

The feed was admitted dry by a vibrating feeder and an appropriate amount of water for wet screening was added to the top deck of the screen.

The plus 653 µm fraction was not further treated.

The minus 653 µm fraction plus 315 µm fraction was concentrated by jigging in a 6 cm x 4 cm Denver Mineral Jig using steel shot ragging.

The minus 315 µm fraction was deslimed by hydraulic cycloning in a 76 mm Warman Cyclone.

The cyclone underflow was collected, dried and sampled. A sample of this fraction was concentrated by two stages of jigging.

All products were collected dried, weighed and assayed for sulphur.

FLOWSHEET N1

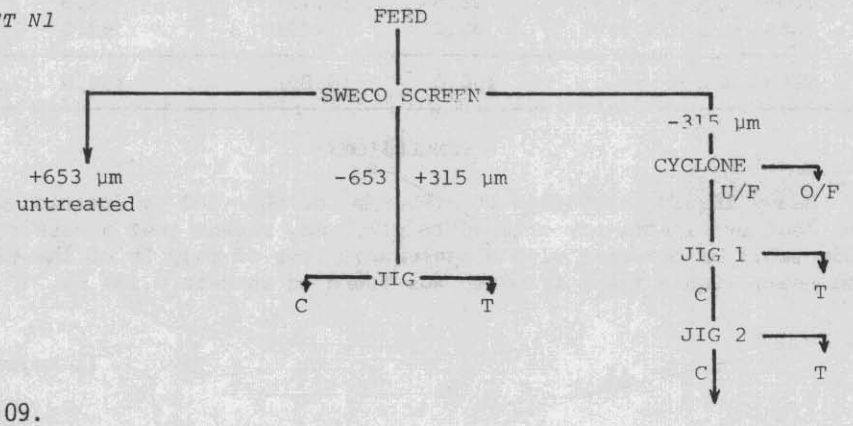

Figure 109.

Screening during the continuous operation was observed to be inefficient. The products were rescreened by hand and the hand screened products appropriately distributed.

The presence of magnetite was noted in the concentrates. The -653 +315 µm jig concentrate contains 6.8% HCl soluble Fe. If this is all present as magnetite it is equivalent to 9.3%.

TEST RESULTS N1

Products		*% Mass*	*% S*	*% S distn*
-653 µm untreated		21.4	1.4	2.7
-653 µm +315 µm	JC	1.8	42.7	7.0
-653 µm +315 µm	JT	9.9	5.5	5.0
-653 µm +315 µm	Composite	11.7	11.2	12.0
-315 µm C U/F	J2C	3.0	36.3	9.9
-315 µm C U/F	J2T	10.3	20.9	19.6
-315 µm C U/F	J1T	33.1	12.5	37.7
-315 µm C U/F	Composite	46.4	15.9	67.2
-315 µm C O/F		20.5	9.7	18.1
Composite Head		100.0	11.0	100.0
Calculated -3.5 µm C U/F	J1C	13.3	24.4	29.5

SPIRAL CONCENTRATION N2

Initial sizing of the feed for the Humphreys Spiral tests followed the same procedure as N1. In this case both fractions coarser than 315 µm were not further treated. The minus 3.5 µm cyclone underflow was used as spiral feed.

The spiral was rigged in the closed circuit, or batch configuration which allows for adjustments to concentrate splitlers to be made under full operating conditions while the feed constantly circulates over the apparatus.

Run No. 1 did not give a satisfactory composite head value and is not reported.

In Run No. 2 the standard right angle concentrate splitlers were used to remove concentrates.

In Run No. 3 slotted discs were used to remove concentrates in the hope that lighter gangue minerals in the concentrate band would pass over the slots and not report to the concentrate pipe.

In both runs, when adjustments were deemed to be satisfactory, the products were sampled simultaneously over a 5 second interval.

The test conditions were:

Feed density: approximately 16% solids
Feed rate: (average 2 runs) 0.54 tonnes/hour
Pulp throughput: approximately 90 litres/min

TEST RESULTS N2

Products		*% Mass*	*% S*	*% S Distn*
+653 µm untreated		26.4	4.6	11.5
-653 µm +315 µm untreated		7.5	10.4	7.3
-315 C U/F (Spiral feed)		56.8	14.6*	78.1
-315 C O/F		9.3	3.5	3.1
Composite Head		100.0	10.6	
Run No. 2	Spiral C	22.4	24.6	53.2
	Spiral M	8.8	13.9	11.8
	Spiral T	25.6	5.3	13.1
Composite -315 µm C U/F		56.8	14.2	78.1
Run No. 3	Spiral C	15.7	26.0	44.1
	Spiral M	9.2	12.8	12.7
	Spiral T	31.9	6.2	21.3
Composite -3.5 µm C U/F		56.8	12.7	78.1

*Derived using head assay: S = 10.6%

The different distribution of mass and sulphur in the feed sizing from N1 are attributed to screening inefficiency which was eliminated by hand screening in the case of N1.

The presence of magnetite was noted in all concentrates.

SUMMARY

The results indicate that the necessary grades and recoveries of pyrite would be difficult to achieve using the relatively simple procedures examined. In gravity concentration procedures, it is necessary that feed presented to a machine is fairly closely and accurately sized to achieve efficient performance. Where this condition was satisfied, *i.e.* jigging of the -653 µm +315 µm fraction in Test N1, the best result was obtained.

The size range of the -315 µm cyclone underflow was too great for either the jig or spiral to operate as desired. On this product, spiral performance was superior to that of the jig. Tables would be preferred to jigs in this size range and performance would be greatly improved by adequate sizing or classification.

Lower feed rates to the spiral may have resulted in improved performance as the feed (14% sulphur) was extremely rich in heavy mineral.

The magnetite present in the feed will mostly be recovered in the gravity concentrates and its removal would necessitate a stage of magnetic separation.

Savage River Mines have indicated a preference for gravity concentration methods rather than flotation and the programme was therefore limited to the work shown. The reasons given for this preference were that less operator attention would be needed, and that maintenance costs would be lower than with a flotation plant. As appropriate sizing devices would be necessary before gravity concentration, it is doubtful whether either of these considerations is valid.

[22 September 1975]