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OTTAWA

MINES BRANCH INVESTIGATION REPORT IR 62-43

INVESTIGATION OF A MILL TAILING FOR HYDRAULIC BACKFILL AT NEW CALUMET MINES LIMITED, CALUMET ISLAND, QUEBEC

by

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MINERAL PROCESSING DIVISION

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SUMMARY OF RESULTS

To be suitable for hydraulic backfill at this mine, the material must have a minimum percolation rate of 6 in./hr.

The investigation showed that single stage cyclone classification of the lead-zinc flotation tailing recovered 50 to 70 per cent of the tailing in a sand fraction having percolation rates between 6.2 and 14.7 in./hr.

The percolation rate was not adversely affected by the mica in the tailing which reported in both the spigot discharge and in the cyclone overflow.

The mica could not be concentrated by cyclone classification.

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INTRODUCTION

In a letter dated April 27, 1962, Mr. C. J. Cunningham-Dunlop, Mine Manager of New Calumet Mines Limited, Calumet Island, Quebec, asked the Mines Branch to investigate the possibility of producing hydraulic backfill from the zinc flotation tailing now being discarded at the mine. In addition, the Mines Branch was asked to ascertain whether or not the mica which was present in large quantities could be successfully concentrated by cyclone classification.

Location of Property

New Calumet Mines Limited is a lead-zinc producer located on Calumet Island in the Ottawa River, 70 miles west of Ottawa.

Shipments

On May 3, 1962, four partly filled drums of wet flotation tailing weighing an aggregate of 834 lb was received at the Mines Branch in Ottawa.

Nature of Investigation Requested

In his letter, Mr. Cunningham-Dunlop asked the Mines Branch to seek answers to questions dealing with whether one or two stages of cyclone classification will be necessary, whether the mica is the cause of low percolation rates and whether the mica can be concentrated by cyclone classification. Because of the nearly flat lying nature of the orebody a percolation rate of at least 6 in./hr was considered essential.

DETAILS OF INVESTIGATION

A screen test on a pipe sample taken from the four drums gave the following results:

TABLE 1

Results of Screen Test on Pipe Sample

Mesh Size	Weight %	Cumulative % Retained
+48m	3.2	3.2
-48m+65m	9.4	12.6
-65m+100m	20.6	33.2
-100m+150m	21.2	54.4
-150m+200m	15.4	69.8
-200m+325m	14.9	84.7
-325m	15.3	-
Total	100.0	-

Procedure for Determining Percolation Rates

In the percolation tests, a piece of glass tubing having a diameter of 1-5/8 in. and being approximately 15 in. long was used. To retain the sand in the tube a piece of ordinary twill filter cloth was fastened across the bottom of the tube. The sample to be tested was poured into the tube in a thick slurry until a 12 in. column of settled wet sand was obtained. During the tests a 1/2 in. head of water was maintained above the sand, and the test was continued until a constant measured volume of water discharged through the filter cloth. This volume of water was then converted into the percolation rate measured in in./hr.

Test 1

In the preliminary test which was designed to determine whether the mica and/or the talcose minerals were responsible for the low percolation rate obtained at the mine, a sample of the mill tailing was carefully riffled out. Percolation tests were carried out on the straight head sample and on the material remaining after the -325m, the -200m, the -150m and the -100m fractions had been carefully removed by wet screening.

The results which were obtained would be difficult to reproduce using cyclone classification, but they do indicate that adequate removal of the -325m material will give a high percolation rate, and that mica, which was quite coarse and was for the most part in the +150 and +100 mesh fractions, did not adversely affect the percolation rate.

TABLE 2

Percolation Rates on Wet Screened Head Sample Fractions

Product	Percolation Rate - in./hr
Straight head sample	2.33
All +325m	20.60
All +200m	29.20
All +150m	43.40
All +100m	75.20

Test 2

After considerable experimentation in the use of a 50 mm porcelain cyclone from which results were rather poor, a small four-compartment, rubber-lined M-30 cyclone was used for the tests.

The results of four tests using the M-30 cyclone may be seen in Table 3. The feed dilution remained unchanged since the lead-zinc tailing is at present being discharged from the mill at 20% solids. A rope discharge was obtained from the cyclone in each test before the samples of the spigot discharge and the cyclone overflow were cut.

TABLE 3

Results of M-30 Cyclone Classification Tests

Test No.	2A	2B	2C	2D
Feed, % solids	20	20	20	20
Feed rate, g/min (dry wt)	7604	7788	9202	9892
Pressure, psi	5	10	15	20
Spigot discharge, % of feed	69.4	70.1	60.0	63.6
Cyclone overflow, % of feed	30.6	29.9	40.0	36.4
Spigot discharge, % -200m	25.8	23.9	28.1	31.7
Percolation rate, in./hr	6.2	8.2	8.7	7.4

An additional test was done in which, at a pressure of 12.5 psi, 52.3% of the feed to the cyclone was recovered in a spigot discharge. Only 12.1% of this spigot discharge was -200m. A percolation rate on the sand from this test was 14.7 in./hr.

CONCLUSIONS

The results of the tests show that no difficulty should be experienced in producing an acceptable hydraulic backfill from the mill flotation tailing using one stage of cyclone classification. Between 50 and 70 per cent of the feed to the cyclone was recovered in a sand fraction. It was not necessary to completely remove the -325m fraction in order to obtain good percolation rates.

Of secondary importance in the investigation was the concentration of the mica in the tailing by cyclone classification. A visual examination of the spigot discharge and the cyclone overflow in the tests showed that mica was present in varying amounts in each fraction. The writer believes that gravity concentrating equipment, such as tables and/or spirals, would be required to produce a mica concentrate from this tailing.

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