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CONSULTING SERVICES IN MINERAL PROCESSING

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TO: Mr. R. L. Haffner

FROM: H. Lyall Ames

SUBJECT: Anvil Corporation Mill

c.c.: Messrs. P. J. Brown, N. G. Cornish, J. F. Olk, P. Taggart and R. E. Thurmond

This report supplements my last two reports (Jan. 31 and Feb. 18, 1974) dealing with ammonia mill tests and covers my visit March 6 - 11 when this chemical was again tested as a substitute for soda ash. Operation of the mill, during five continuous days of the test, was particularly stable and the metallurgy was comparable to that normally obtained with soda ash on this type of non-refractory ore. Unfortunately the ammonia concentration in the tailing pond effluent was higher than acceptable pollution standards and some corrective measures will be required before it can be accepted as a regular mill reagent.

1. ORE

The ore tested came directly from the pit, mostly the 3870 bench. It was classed as good ore amenable to flotation.

In general the milling ore for 1974 (plan B - 2,362,000 tons from the pit and 1,200,000 tons from stockpiles) may be classified as follows according to its relative refractoriness to treatment.

(1) Type A - Pit Ore - Less than 6% barium and 6% pyrrhotite and a pyrite/pyrrhotite ratio over 4, with a total iron content of probably 35%. This is the type of ore milled during the test. It is relatively easy to treat and can be milled with ammonia replacing soda ash entirely. Overall lead recovery is in the order of 85% with a 67% Pb concentrate and the overall zinc recovery 80% with a 51.5% Zn concentrate.

(2) Type B - Pit Ore - High barite and pyrrhotite with a low pyrite/pyrrhotite ratio and a total iron content of probably 25%. We think that this ore can be milled with a little more ammonia than type A and likely with no soda ash or only with a small amount. Lead and zinc recoveries will be lower by about 2% and 5%, respectively, and concentrate grades by 4% and 1%.

(3) Type C - Stockpile Ore - Lightly oxidized such as the ore tested with ammonia Feb. 6 - 11, 1974. This ore yields fairly good metallurgy, probably varying between that obtained on Type A and Type B. It will likely require 2 - 3 lb. of soda ash per ton.

(4) Type D - Stockpile Ore - Highly oxidized such as that tested Aug. 30 - Sept. 3, 1973. Recoveries of both the lead and zinc could be in the 70% - 75% range. It will require up to 7 lb. of soda ash and 5 lb. of sodium sulphite per ton.

2. TEST METALLURGY

The assays of the main mill products and the overall recoveries for the four middle days of the test are listed in the following table.

	Mar. 7	Mar. 8	Mar. 9	Mar. 10
Lead				
Heads	2.60	2.67	2.96	3.96
Selective Concentrate	67.74	70.36	69.8	71.55
Final Tailing	.47	.37	.36	.42
Overall Recovery	78.8%	86.3%	87.6%	89.4%
Zinc				
Heads	4.18	4.50	4.79	5.66
Selective Concentrate	51.14	51.88	51.75	52.53
Final Tailing	.88	.80	.75	.74
Overall Recovery	77.4%	80.5%	82.9%	84.8%

3. REAGENTS

Ammonia was kept constant at about 0.4 lb. per ton of NH_3 equivalent. This compares with 1.5 lb. of soda ash, the normal consumption on this type of ore. The regular dosage of lime was added to the zinc conditioners until March 11 when it was cut off entirely as in the Feb. 6 - 11 test. More testing will be required to establish the optimum amounts and points of addition of lime to all the zinc circuits.

4. FUTURE AMMONIA TESTS

The next test schedule for ammonia is to be carried out on type B pit ore which will be more refractory than the current ore tested. It will likely be run within the next month when core analysis indicate that the required type of ore is available and the ammonia storage tanks have been refilled.

5. LEAD CONCENTRATE GRADE

The grade of the final lead concentrate has always fluctuated excessively from hour to hour. During this test particular attention was given to the pH control on the first and third cleaners as it has become increasingly evident that pH is very critical to grade.

A flowsheet revision is planned for the near future to permit regrinding of the rougher concentrate prior to any cleaning. Laboratory tests indicate that this is beneficial and hopefully it will improve cleaning efficiency in the mill particularly on occasions when pyrite rejection is abnormally difficult.

6. TAILING EFFLUENT

Preliminary analysis of tailing pond effluent during the ammonia test showed that it contained a higher concentration of NH_3 than permissible by pollution standards. This could seriously affect the usage of ammonia as a flotation reagent. It is being carefully studied by the mill and analytical staffs. This time of year the retention time in the pond is small which tends to aggravate the condition. Also the samples were taken at the point of overflow and I would think some distance downstream would be acceptable. Ultimately Anvil may be required to recycle tailing pond water and of course this would reduce the quantity of pond effluent.

H. L. Ames