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TO: Mr. R. E. Thurmond

FROM: H. Lyall Ames

SUBJECT: Visit to the Anvil Corporation Mill July 11 - 14, 1972

C.C.: Mr. R. L. Haffner, Mr. N. G. Cornish, Mr. H. H. Cox
MR. P. Taggart, and Mr. P. J. Brown

The main purpose of this visit was to be present when four representatives of Wright Engineers Limited were at the mine site to discuss the proposed mill expansion.

Those present at the first meeting held July 12 were Messrs. Willis, Mueller, Andrews and Curtriss of W - E; Mr. McKay and Mr. Stocks of Dominion Engeneering Limited; and Peter Taggart, Peter Brown and myself. On July 13 we discussed further details of the expansion with the W - E personnel and on July 14 Taggart, Brown and I had several discussions with Mr. Haffner concerning various milling projects and problems, the most important being barium reduction in the bulk concentrate and zinc recovery.

1. MILL EXPANSION LAYOUT

Preliminary general arrangement drawings prepared by W - E were discussed in sufficient detail for this stage of the capital cost estimate. We made a number of revisions which will be incorporated

into the next set of drawings and these will be submitted for review in one or two weeks. The main points were as follows.

(1) The zinc-scavenging circuit to be increased to give a retention time of 20 minutes instead of 15 minutes. This will be done by making each of the three rows of large Denver DR cells to consist of a 5-5-5 combination instead of 3-4-4. Some extra cells will be added to each end of the originally proposed rows. This will necessitate changing the location of the retreatment cells to the end of the first cleaner banks, a more logical location anyway which will likely eliminate one set of pumps. These and other changes are of course subject to further revision if detail drawings show that for some reason they are impractical.

(2) Install double launders on the middle sections of both the lead and zinc rougher-scavenger rows so that any portion of the concentrate may be directed to the respective cleaner circuits or returned to the head of the roughers as middlings.

(3) Coincident with the double launders it was decided to make an acceptable space of four feet between the main rows of cells even at the expense of losing one spare space left originally for a future row of cells. In the event that this becomes necessary some small cells will be replaced with larger units.

(4) Wherever possible simple pressure type distributors as used at Craigmont ~~Endako~~ will be installed. This will save considerable space particularly in regard to the cross-walks of the original layouts.

2. GRINDING POWER

Original calculations indicated that about 1500 HP would be sufficient additional power to treat the increased tonnage of ore as well as produce the finer grinding required for better metallurgy. During the recent visit ~~of~~ the Dominion Engineering representatives calculated that nearly 2000 HP would be necessary. All the foregoing calculations were based on a Work Index of 9.44 (original test work by Galigher and Allis Chalmers). I have recently received from Dan Brimhall the latest, and hopefully accurate, power drafts on the Anvil grinding mills. These powers together with the corresponding sizing analyses of the rod mill feed and product, and the flotation feed indicate a Work Index of 8.49 for rod milling and 3.25 for ball milling (making a weighted average of 8.33 overall). At this time, July 18, the flotation feed was 56% - 200 mesh. In order to increase this to 70% -200 mesh and at the same time increase the tonnage rates from 333 TPH (8000 TPD) to 438 TPH (10,500 TPD) the theoretical additional power required is 1600 HP to 1700 HP. However for the present I suggest that the design be based on a 13½ ft by 18 ft. ball mill with a 2000 HP motor. Other companies beside Dominion Engineering will be asked to bit on this size mill

3. GRIND - RECOVERY TESTS

Two series of laboratory tests have been completed since my last visit to check previous test work carried out to show the effect of of finer grinding on metal recoveries, particularly for the zinc. In one series the lead scavenger tailing from the mill was reground

from 55.4% - 200 mesh to 64.5% - 200 mesh and the zinc recovery was improved by 2.2% with slightly higher grade concentrate. In the latest series of tests samples of rod mill feed were ground for different periods of time and both the lead and zinc floated along standard test procedures. When the fineness of grind was increased from 53.5% to 64.4% - 200 mesh the recovery of lead increased 2.9% and of zinc 2.1% with slightly higher grade concentrates in both cases. These appear to be the respective fineness limits for maximum flotation recovery of the minerals of these metals.

4. ON-STREAM ANALYZER

There is no doubt an On-Stream Analyzer such as the Courier or A.R.L. would be extremely useful in helping to maintain concentrate grades and more stable recoveries on Anvil ore. However I do not think it is an opportune time to make the decision for purchasing one. I think that there are a number of more fundamental control systems that should be incorporated first into the flotation circuits before going to something as "sophisticated" as an X-Ray Analyzer. More pH controllors, better sampling systems, thickener discharge controllors or at least spare pumps, better launders (which the new circuits of course will have) are examples of a few of the items needed at this time.

However some action is justified and is being taken. Samples of many different products are being prepared for testing by the Outokumpu Research Laboratory in Finland. A space is being designated in the expansion particularly for the installation of an On-Stream Analyzer.

Sampling methods are being discussed with Adrian Molinari, Product Manager, Outokumpu Instruments, of Mississauga, and he will be given a plan of the expansion for comments regarding sampling locations and types of samplers.

5. PARTICLE SIZER

I agree with Peter Brown that an On-Stream Particle Sizer (Autometrics, Boulder, Colorado) would be useful tool in stabilizing the grinding circuits but I recommend not giving it too serious consideration until we are advised of the results of a test being carried out with one of these units at Brenda Mines and probably not even until an On-Stream Analyzer is installed sometime in the future.

6. BARIUM

Laboratory tests to reduce the barium content of the bulk concentrate have been particularly encouraging. They have shown that the barium in the fourth zinc cleaner tailing (the zinc portion of the bulk concentrate) can be materially reduced by water cleaning. Acid might reduce the number of steps but is very doubtful that it would be econamic. Details of the test results will be given in regular metallurgical reports. In one series using three water cleanings the barium rejection was 85% with a loss of 2.1% zinc.

A mill test was started July 4 in which the second zinc cleaner concentrate was sent directly to the fourth cleaner and the fourth cleaner tailing then routed to the the third cleaner for barium rejection as developed in the laboratory. The third cleaner tailing was returned to the retreatment circuit for recovery of its zinc

conent. At this time we do not know how much of the zinc can be recovered in this circuit or is lost in the tailing. Unfortunately the zinc recovery and production has been abnormally low lately and it was decided to terminate the test as for some reason it appeared to complicate the zinc circuit operation and possibly contributed to the poor metallurgy. When the circuit becomes normal again the barium test will be restarted if the barium penalty remains serious.

Mr. Thurmond has advised that it is unlikely there will be any change in the bulk concentrate contract at this time but that the rate of production might be reduced by 25% in six to twelve months time, and probably more some years later. Under these circumstances with the severe penalty (75¢ per 0.10% BaO over 0.10% BaO) it could amount to a very high yearly loss. Therefore if the next mill test confirms laboratory test results I would recommen installing one or two banks of new flotation cells for barium rejection. The conversion of a couple of small retreatment circuit conditioners into Maxwell type flotation cells for this purpose is under consideration. I think that the seriousness of the barium penalty warrants more definite corrective measures.

7. CURRENT ZINC METALLURGY

Peter Brown advised me by telephone July 21 that the zinc metallurgy continued to be unsatisfactory both in recovery and grade. It was apparent from his description of the circuit that something was definitely wrong with the flotation differential. We discussed several corrective measures to try. The first was increasing the soda ash dosage from 3.5 lb. per ton to

5.0 lb. per ton, try different level of pH in the zinc circuit, try returning part or all of the retreatment circuit tailing to the head of the roughing circuit. I also suggest doing standard laboratory tests to determine whether or not the poor metallurgy is due to a radical ore change or to unsatisfactory mill operation. Also, these standard laboratory tests and techniques that have been developed over the past year should now be applied extensively in an attempt to find the basic cause of the trouble so that it may be corrected.

8. REAGENT MIXING AND REPAIR SPACE

I have left these two important items with Peter Taggert and Peter Brown as they are more familiar with the present mill shortcomings than I am. We discussed some aspects of the reagent storage which might save some space but it is questionable whether or not they are advisable in the long term.

W. A. Cameron