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September 24, 1971

TO: Mr. R. E. Thurmond

FROM H. Lyall Ames

SUBJECT: Comments on Recent Anvil Metallurgical Reports and Current Mill Operations

c.c. Mr. N. G. Cornish and Mr. Herbert H. Cox

This memorandum concerns particularly the following Anvil reports on which I was asked to comment.

August Metallurgical Report

Pre-aeration Test, P. Dyas, August 9, 1971

Metallurgical Test Program, P. J. Brown, August 13, 1971

Proposed Zinc Circuit Modifications, P. J. Brown September 3, 1971

(1) Proposed Zinc Circuit Modifications

Optimum flowsheets on massive sulphide ores can seldom be developed entirely from laboratory or even pilot plant testing. Trial and error methods during the first few years are the rule rather than the exception. As such flowsheet changes are costly they should be limited to those which appear logical on the basis of mill observations, laboratory testing of mill products or on the experience of other similar mill operations.

It must be remembered that each new circuit requires a different operating technique which must be learned by the operators and sometimes pumping or other mechanical alterations are required.

In general I agree with Peter Brown's conclusions regarding the zinc circuit alterations on a test basis. Certainly recycling the zinc scavenger concentrate to the head of the circuit is a simpler and more standard flowsheet. Whether or not the rougher cells will have enough capacity can only be determined by trial.

For a comparison study the following criteria are for the new Mattabi mill. The milling rate is 3000 TPD of ore averaging 9% zinc with a peak of 15%. The zinc roughing and scavenging circuit consists of four rows of 18 No. 60 Agitair cells each. The concentrate from the last six cells of each row will always return to the head as will any portion of the middle six cells.

As for a parallel or series first zinc cleaning test at Anvil, I agree it is worth trying but there may not be sufficient cell capacity. I suggest that this test be deferred for a while anyway. Again considering the Mattabi circuit, the primary zinc cleaning will be done in three rows of 16 No. 60 Agitair cells each. The concentrate from the last 6 cells in each row (scavenger section of

this cleaning circuit) will be returned to the head of the same circuit and the tailing will be discarded along with the rougher scavenger tailing.

The final two stages of cleaning at Mattabi will be done in four rows of 8 No. 24 Denver Sub A cells each. These cells are double laundered to permit a final concentrate being taken from one to five cells in each row as grade dictates. The above design is for a peak final zinc concentrate tonnage of 750 TPD, not too different from Anvil's.

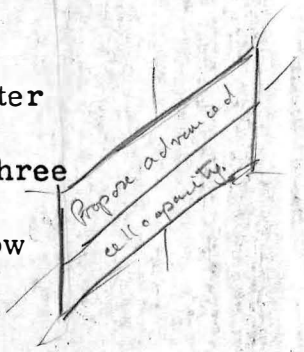
Some of the questions raised above may be answered in the laboratory but most will likely have to be answered by mill tests, complicated as they may be and requiring the utmost cooperation between the metallurgical and operating staff. Regrinding of true middling products may of course be required. If recycling the scavenger concentrate, which I understand was commenced on Sept. 13, can be maintained the next step is the fourth stage of zinc cleaning and we can take it from there.

(2) Regrinding Zinc Scavenger Tailing

This would improve recovery at a cost but I would prefer leaving it and also finer primary grinding until the optimum flowsheets have been developed.

(3) Pulp Densities

I agree that higher pulp densities sometimes aid the "crowding effect" for better grades in roughing circuits but I have never heard of it in cleaning circuits. My experience with the latter has always been that densities are too high. The reason for the three and four row cleaning circuits in the Mattabi mill is to permit as low densities as desired without flooding the cells.



(4) Aeration

This continues to be a controversial subject. The test results are inconsistent to say the least. It must be remembered that aeration does not show up in laboratory ground samples to nearly the same extent as in the mill. In the laboratory pulp aeration is accomplished fairly well during the relatively long grinding period compared to that in the mill. I would say that aeration is beneficial economically on 50% of heavy sulphide ores and essential to good metallurgy on 10% - 25%. It is not essential and probably of no value on Brunswick ore. On the other hand no satisfactory differential between the different sulphide minerals can be obtained without aeration on ores of Noranda, Quemont, Mattagami Lake and Mattabi. When in doubt our practice is to install aerators in the initial mill circuits and not use them if not required. If Anvil enlarges the mill in the future there would be no question in my mind but that aeration should

be incorporated in the flowsheet. At this time, as I have said before, I would not recommend such an installation unless all the technical staff at Anvil were convinced it would be worthwhile, a supposition that appears extremely unlikely.

(5) Zinc Conditioners OK as it is to handle.

It is of paramount importance that these conditioners be made to work satisfactorily all the time. Drastic measures should be taken to make them do so. I thought last year that "down comers" could be made to discharge the tanks from the bottom and thereby prevent them from sanding. This together with larger motors and small amounts of air through lances has not proved nearly sufficient to maintain satisfactory operation. I suggest as an experiment that a pump be installed on the drain line of one tank. This would pump one-third to one-half the flow into the next tank or circulate some and bypass some. The pump size could be calculated but might be a 4-inch and as it would be connected directly to the conditioner the operating static head would be only a few feet and the power correspondingly low. Admittedly the intake pipe would wear out rather quickly so if the idea worked it could be replaced by a rubber lined one with an insert into the tank. Provision should also be made to inject air into the pulp as it must be kept alive.

GRIND — SANDS —

(6) Soda Ash

I suggested to Peter Brown some time ago that the soda ash be raised by about a pound. Corwin Likins advised me a few days ago that this had been done and that the pH in the lead roughing circuit was over 10.0 probably 10.5. These seem a little high. If there is lime returning via retreatment tailing or any other way to the head of the circuit I suggest reducing this gradually. In other words substitute some soda ash for some lime. I appreciate that soda ash costs more per pound but this could easily be more than offset by improved metallurgy.

(7) Copper Sulphate

I still think that some means should be found to permit the use of more copper sulphate. I agree definitely with Peter Brown's comment on the subject. (See his report August 31, 1971, page 4 paragraph B (1). I appreciate that right now extra copper sulphate flattens the circuit critically. That is why I said to find some other variable that could be altered so that more soda ash could be used without physically upsetting the froth condition. To me this is very important when fighting zinc recovery. We hope of course that with the fourth cleaning stage it may be permissible to remove a heavier rougher froth without jeopardizing grade.

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(8) Steaming and SO_2 Treatment of Lead Concentrate

This is very costly and complicated. I doubt if it is worth the effort at this stage of circuit development.

(9) Bulk Float

Any circuit which will permit discarding an intermediate product such as the lead retreatment tailing following a bulk float is worth investigating.

In conclusion I concur in general with the test programs suggested by Peter Brown and Peter Dyas other than those specifically noted above. I think that most of the projects are important and I think that they know by now my feelings regarding the different degrees of importance I place on them. Anyway, if I am kept advised of the current testing I will be pleased to comment. Also I hope to be able to visit Faro not later than the first part of November.