

MEMO TO: Don Cooper

\*COPY TO: Doug Bartlett

FROM: Bryan Cross

DATE: November 4, 1988

SUBJECT: TRP RECOVERY IMPROVEMENT ACTIVITIES TO DATE.

1 DRB Comments

The following is a summary of the status to date of the improvement program initiated at the TRP as a result of the recommendations of John Bartrum following his site visit and memo of August 22nd, this year. The format here will be to address each item listed in the action plan schedule that was generated and issued August 25th.

ACTIVITY

STATUS

1. Improve Agitation Via Aeration: Done, rented a 1200 cfm compressor August 22nd and ran it for the duration of the operating season. Pressure was not considered adequate and capital expenditure request for an 1800 cfm unit has been applied for.

2. Carbon Transfer Rate: a) Pump Suctions - All complete August 24th 5 foot extensions to each placing the suction intakes 8 feet below the slurry surface. This is still not adequate for transferring carbon from tank to tank as the slurry percentage solids falls below approximately 35%, the transfer rate gets progressively slower as the slurry density falls.

b) Loaded Carbon Screen - 28 mesh screen replaced 35 mesh screen panels September 1st, and we found that we still could not open pinch valve on the feed line for full flow as too much slurry and woodchips remained with the carbon. A DSM Screen was installed ahead of the Simplicity Screen September 14th and the time to transfer a carbon batch was cut to about 4 hours from approximately 24. Carbon received in the Acid Wash Vessel remained contaminated with woodchips and sand. On October 14th a 6 inch cyclone was installed on the Acid Wash Feed Line and woodchips were selectively removed from the carbon. The woodchip removal efficiency is about 70% with the cyclone and no carbon has been seen in the overflow. The woodchips are now a fairly minor problem however the sand is still clogging the Strip Vessel Internal Carbon Retention Screens, this results in batches being dumped on the floor when the lower screens have to be cleaned. Then the mess gets slowly washed into retrieval sump where it then can be pumped back to the Strip Vessel. To alleviate this problem a capital expenditure request has been made for a second Simplicity Loaded Carbon Screen. The plan for 1989 is to continue pre-screening with the DSM, pass the pulp over the existing Simplicity unit, then repulp the overflow with the existing eductor and pass the flow over a second Simplicity Screen to wash away the sand adhering to the recovered carbon. The cyclone will continue to treat the overflow product from this screen for chip removal prior to acid washing.

c) Speed Up Eduction: The above listed remedies for carbon contamination should solve our remaining eduction problems. Instead of taking about two hours, eduction from the Strip Vessels was taking about six because of clogging screens.

The eductor for the Loaded Carbon oversize required frequent clearing as it was clogging frequently with garbage. A double layer of expanded metal over the eductor feed hopper solved the problem.

d) Speed Up Stripping: The previously described solutions to the carbon contamination should give the major contribution to speeding up the strip. A second solution is in the 1989 capital expenditure request for a heat exchanger system to allow maintaining 150 degree F barren solution between batches to be processed. This will eliminate about seven (7) hours waiting presently required for cooling and bringing the boiler back up to operating temperature.

3. Lengthening Downcomers: This is not recommended if increased aeration is to be continued. There is also a problem existing periodically of getting the downcomers to accept full flow. This phenomenon occurs it seems when there is a significant difference in a tank's content slurry density and the tank feed slurry density. If there is a high solids content in a tank, light feed slurry will overflow the feed box. It is not able to get down the downcomer and in overflowing the feed box sands out the tank's internal launder screens.

4. a) Trash Screen Finer Mesh - These machines were supplied with each having 3 - 0.85 mm urethane screen panels, these could not handle the flow and failed to adequately remove the woodchips. The first attempt with different screens was made September 18th when a 40 mesh, a 50 mesh and a 60 mesh, wire mesh screen panels were installed. They were placed so that the openings got larger as the flow approached the overflow launder. These panels worked well in taking out the wood however, they had to be replaced after 12 operating hours because of blinding with sand. The next change was made on October 5th when two 0.5 mm urethane screen panels were placed on the feed end of one machine followed by a 40 mesh wire panel. This combination worked when the feed split to each of the two screening machines was even (which was seldom). The west screen got the new panels as the splitter usually sent the majority of flow to the east unit where the 0.85 mm panels were retained to minimize spillage with the larger open area. The capital request to replace the radial feed splitters with a splitter boxes and for a third Derrick Screening Machine for trash removal if approved should solve the screening problems. Another type of 0.5 mm screen panel with a design for more open area per panel is also on hand for evaluation but the plant shutdown for the season before we could run a test.

b) Modify Sprays - This was done in September and to the end of the season washing was much improved. These new nozzels did not cut the screen panels which the original ones did.

5. CIL vs. Pilot Plant - A full report on this has not been completed. Examination of Lakefield data has shown that the best gold recovery obtained in lab tests was from near surface stored tailings. The Pilot Plant ran on a blend of surface recovered tailings from the Polishing Pond and the Central Pond. The Polishing Pond material being of higher gold grade was mixed in with the lower grade Central Pond tails to simulate the expected overall grade the TRP will treat. The surface if not deeply (>6feet) submerged in water is an active freeze - thaw zone. This weathering activity is suspected of enhancing gold recovery as water freezing in partical pores enlarges the pores cracking them open a little more with each freeze - thaw cycle. The depth of source of the treated material is thought to be the primary difference from the Pilot Plant affecting gold recovery at the TRP. Other differences of significance include agitation, carbon distribution, and tank carbon retention. The Pilot Plant had too much air, so much so that a good part of the supply had to be bled to atmspere. Agitation in the tanks there was visibly much more violent at the surface than it has yet to be in the TRP.

} Agitation effect  
Needs to be  
quantified.  
No. Lakefield  
Lab tests  
showed no diff.

The TRP launder screens leaked carbon from tank to tank virtually the whole operating season. In the Pilot Plant no such leakage was noted. A tank to tank gradation increasing towards the CIL feed end in gold concentration was maintained in the TRP by frequently running the Carbon Advance Pumps and at times some of these ran continuously. This should have led to substantially more carbon fines than in the Pilot Plant where little transferring took place. We will not be able to quantify the amount of fine carbon loss until we complete the processing through Strip & Regeneration of the total amount of carbon in the tanks yet.

6. Attrition all Carbon: Have done this with all the carbon used since August 25th and will continue to do so.

7. Low Return Barren Carbon Levels: Year to date 40 batches of carbon have been stripped with the YTD assay of the stripped carbon having a weighted average assay of 2.376 oz Au / ton. The October MTD value was 1.345, Septemer was 2.71 and August was 3.508. As the numbers show there is an improving trend although some regression ocured with the last few batches processed. Values as low as 0.6 oz Au / ton have been obtained and it is the batches processed at low flowrates due to clogged screens that have been worse. Strip times have been cut short because of the need to clean clogged screens or more time has not been given to compensate for low flowrates. Operators skill and craft have definately improved with experience and the proposed carbon contamination remedies should yield good barrens in future.

- 1) 'Agitation Evaluation': Phone Roger Sawyer on get him to FAX all mixing questions.
- 2) Contact Gus Van Weert for an independent investigation.

8. This item was a repeat of the aforementioned Carbon Transfer Pump Suction extensions of Item 2a.

9. a) Organic/Inorganic Analysis: This has been done but it was not until October 24th that we received the correct results. We questioned some results on the original September 19th "Final Report" and found sulphur was analysed for not the requested sulphide. Also, wrong results had been originally released. A separate report will be prepared and distributed soon.

Action  
Schedule

b) Carbon Fines: Here we were unable to collect sufficient sample for an assay. S. Waller of Kilborn attempted this without success on August 24th. At that point in time the Carbon Fines Dewatering Screen had been taken out of service. The problem was too much flow for the 100 mesh screen cloth to handle in combination with blinding resulting in splashing of the tails pump motor. The screen panel was removed from the machine and the water directed to the tails box without screening.

c) Assay Wood Fibre: August 24th samples of woodchips taken from the Trommel Screen assayed 0.10 ozs Au / ton, samples of woodchips from the Safety Screens assayed 0.19 ozs Au / ton. The woodchips have been stockpiled and this winter the tonnage and grade will determine if ashing and cyanidation are economic.

Suggested  
Action

d) Tracer Salts: Lithium Chloride was added to CIL tank #6 on September 14th and the tank discharge sampled at 1/2 intervals for 6 hrs with all of the results coming back from the lab as either 0.2 or 0.3 ppm lithium. Subsequent investigation proved that the analytic procedure was inadequate at this level of detection and about three times as much lithium must be added to have any confidence in the results. The Engineering Department performed soundings on the leach vessels which convinced us that the tanks were not settled out however there is no accurate proof of the solids retention time. Pumping out CIL tank #6 to #1 did give physical evidence that there definately is settling occurring in the leach vessels. Tank #1 at 26% solids at surface had an increase to 55% when the bottom material from tank #6 which had 23% solids surface slurry was transferred.

e) Lead Salt Lab Test: This subject requires more work. A set of four bottle cyanidation tests was reported on Sept. 7th with somewhat ambiguous results. The 2 bottles without lead additions gave slightly lower residue gold assays while the two with lead gave higher calculated head assay grades and percentage overall dissolution. No firm conclusions could be drawn from this testwork and it will be repeated on stored plant feed samples before the next operating season.

Schedule  
Must do.  
Considering.  
25 ppm S.

10. Load Carbon Tank 6: This was an ongoing practice with all of the regenerated carbon plus an additional 60 tons of carbon that was purchased, pre-attributed and added to tank #6 after the Recovery Improvement Plan was implemented. CIL operators made daily carbon concentration profiles for all the CIL tanks available from September 1st. These were attached as part of the daily Metallurgical Balance Report. Carbon gold assays on the carbon in each tank were only supposed to be available for Tuesdays and Thursdays each week. Actual results proved somewhat irregular but assays were performed at least weekly when tank densities were sufficient to suspend the carbon in the slurry to the tank surfaces.

Schedule  
Suspension  
Mixing  
Must be  
solved.

11. Control Tonnage 6,000 - 8,000 stpd: This was done pretty much of September. There was a period when the on hand cyanide supply was short and consequentially the tonnage was reduced. Also, in October the plant was ran to maximize tonnage to increase the total ounces of gold recovered from the plant for the year, over 10,000 stpd was acheived on a number of days. There was no clear indication of the residence time effect on recovery percentage as some days it appeared better other times worse.

12. This item was addressed as 9 (b) above.

13. Acid Wash and Regenerate Carbon: Carbon activity testwork showing lower adsorption efficiencies on partially loaded carbon prompted the continuation of thermal regeneration and plant tests showed a need for acid washing. All extra material left over from the assay samples for carbon have been saved and further adsorption testwork is planned. The strips ran in the plant without acid washing were very difficult to perform as slurry clung to the carbon making solution flow difficult. Water washing alone did not clean the carbon sufficiently.

*Objectives.  
Schedule*

14. Aeration Prior to Cyanidation: On September 3rd four air lines were installed in the Surge Tank extending to about 5 feet from the bottom of the tank. These were left on for the duration of the operating season. No quantification of the benefit has been done.

*Schedule.*

15. Electron Microscopy: Past work of this nature on mill flotation and calcine tails was reviewed and Doug Bartlett is arranging to have some weekly composites of TRP tailings examined. Also, AARL diagnostic leaching to determine the deportment of tailings gold or which minerals this gold resistant to a cyanide leach is associated, will be performed over the winter.

*Schedule*

16. This item was addressed in 9 (b) above.

17. Check Agitator Design: This was done with our conclusion that the design is inadequate. A 1200 cfm compressor was rented to augment the supply from our 400 Hp Ingersoll-Rand unit. A capital expenditure request has been made for an 1800 cfm compressor.

*Air does not  
give good solids  
profile. Solids  
retention time.  
Density affects  
on gold diss.  
Prag tank limit?*

18. Replacement Metallurgist: Giant Yellowknife hired Doug Bartlett as Senior Project Metallurgist on October 3rd. Doug has a Masters degree and considerable experience with laboratory gold metallurgy. D. Kilvari of Kilborn replaced S. Waller also of Kilborn in a consultative and laboratory diagnostic capacity.

19. Reexamine Cyanide Levels: This was done and 1.0 pounds of sodium cyanide per ton of dry tons of tailings treated is the budget number for 1989. TRP final tailings run about 0.3 pounds of free cyanide ion per ton of solution. There remains a question as to the effect of free cyanide ion effect on gold adsorption. A reference has recently been found stating "if you drop below a certain minimum free cyanide content in your adsorption vessels, the gold just doesn't adsorb properly." The reference goes on to further state that at Homestake they kept levels above 0.015% which works out to 0.3 lbs/ton. Regarding the dissolution optimum concentration all indications are that this value is lower than 1.0 lb/ton total cyanide consumption.

*X*

20. Optimize Retention Time: Data has been collected but it has not yet been collated nor interpreted. Sample data on the gold concentrations in the liquid and solid phases in each tank are tabulated on the last page of the Daily Metallurgical Reports for those days that assay results are available, generally from about one data set per week starting at the beginning of September. There also were some earlier results which have to be sorted from assay records. This will be done soon. D. Kivari performed 24 hour lab bottle cyanidation tests on 10 TRP tailings composites with mixed results. Based on residue assays alone five samples showed greater than 5% further gold dissolution with a high of 12.2%. Two samples had zero leaching and the last three had a further 2.5% leached. Similar testwork performed early in the operating season when tank slurry densities were low and carbon distributions poor gave recovery improvements of greater than 20%.

*High flow rate*

*Should have  
no effect.*

*— Should have  
run a null  
case with H<sub>2</sub>O.*

21. Justify Installation of ~~Delkor Screens~~: A 45 gallon drum of tailings was sent out for screen design testwork and no report has been received. Delkor Screens definitely have the reputation as the solution for solving woodchip problems however our capital expenditure requests for 1989 do not include one.

22. Test Carbon: Other priorities have minimized the amount of time spent on carbon activity testwork and only a few tests were ran. In some of those regenerated carbon performed better than virgin carbon and regeneration seemed necessary. Samples of loaded, stripped and regenerated carbon have been saved so further work can be done.

*Action  
Schedule.*

23. CIL Tank No. 1 to be Loaded with Carbon: This was done starting August 22nd.

*Follow-up on report.*