Recent Investigations of Prospective Technologies

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RECENT INVESTIGATIONS OF PROSPECTIVE AMD TECHNOLOGIES

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During the presentations on economic evaluations and closure planning, several of the Workshop participants asked about, or referred to, a number of possible alternative techniques. Because many of the audience are, or will be, developing or applying AMD technology, it may be useful to briefly recap some recent work. Except as noted, the work was sponsored by MEND. Further details are available from the MEND office or myself.

The following are off-the-cuff summaries of nine such topics. (The last item is a very brief overview of biological treatment, which may serve as a humble sample of the presentation that Rick Lawrence had hoped to make on 17 February).

1. **Sequential precipitation of metals from AMD.** Considerable work was done by McGill and Noranda Technology, using pH adjustments and sulphide injection. The three major problems were that the separations were not clean, the process would involve many solid/liquid separations, and the economics were very unfavourable.

2. **Selective IX removal of metals from AMD.** In two separate New Ideas studies, Zenon investigated existing IX resins , and McGill synthesized several novel chelating resins. Unfortunately the desired selectivity (e.g. for Zn) was not achieved.

3. **Froth flotation of metal ions in AMD.** A New Ideas project is now underway by Dr. K Mori of Tohoku National Industrial Research Centre (Japan) to investigate ion flotation of Zn from AMD, based on his prior work in the mid-70's.

4. **Electro-osmosis technologies.** Noranda Technology sponsored evaluations of both sludge dewatering and also rapid dewatering of tailings ponds. In the first case, dewatering was less successful than by freeze/thaw or mechanical filtration. In the second case, there was an unfortunate tendency to increase tailings water contamination due to enhanced leaching. NTC has released this research to MEND.

5. **Utilization of high-iron AMD.** Noranda Horne Division has been able to use AMD seepage from an open pit as the source of iron for precipitation of arsenic during the treatment of weak acid bleed from their sulphuric acid plant. There is a saving of reagent cost, but this is a site-specific situation. Heavy metal levels are probably too high to permit use as a municipal sewage treatment reagent.

6. **Smelting of sludge for metal recovery.** This is apparently a relatively rare practise, due to the material handling costs and difficulties, and the lack of economic incentives. Noranda has on occasion included some sludge with concentrate feed to a copper and a zinc smelter. An assessment of this option might be warranted if sludge disposal becomes a larger problem.

7. **Addition of sludge or acid-generating tailings or waste rock to backfill.** A major operator objection to sludge addition is the adverse effect of sulphates in cemented backfill. There have been cases of in-mine fires due to auto-ignition of high sulphide waste rock backfill . Such applications would require careful evaluation from many points of view, particularly safety.

8. **Sulphide mineral passivation.** There have been several MEND projects as well as work by others, aimed at creating a protective layer on the pyrite or pyrrhotite mineral surface. None of the work to date has indicated a prospect of technical, economic and practicability success.

9. **Biological treatment.** The use of passive wetlands for biological sulphide precipitation of heavy metals has been investigated within and outside the MEND program on a small scale. (The numerous oxidative wetlands used in the US coal industry for control of low levels of iron are not relevant). The leading outside work is probably that by Tom Wildeman (Colorado School of Mines). The major problems relate to the very large areas/volumes of active organic materials required, as well as the challenges of flow distribution and plugging avoidance. Wide seasonal variation in temperature and flow rates are also serious concerns. These wetland systems however may have an auxiliary role, for example as a solids settling area or as a protective layer over submerged tailings. Also, combined systems (e.g. anoxic limestone drains plus anaerobic bacterial beds) might serve as temporary treatment systems for remote low-flow seeps.

ATTACHMENT C