

MEMORANDUM

To A.R. Campbell; D.J. Emery

Date February 12, 1974

From H.E. Pawson

Ref Fe

Subject Utilization of Mine Water in Arsenic Suppression

With regulations controlling water usage and wastage becoming of more concern, a research program was instituted in March 1972 to improve arsenic suppression. As you may recall, this program was inaugurated following my observations of a curious precipitate formation in #3 thickener after it had been used to replace #8 agitator (waste) to facilitate repairs. The yellowish-brown precipitate was indicative of iron.

The test series was centered, at that time, on the use of iron salts to form ferrous arsenates and calcium ferrous complexes. Results appeared favourable but there was fear of increasing iron content of wastes. This, coupled with cost of ferrous salts convinced M.E. Lane of the futility of the project and it was abandoned.

In October 1973 water sampling of various streams and heavy metal ion determinations revealed a high incidence of iron in the mine water. Since this was a readily available iron source for possible arsenic suppression, a new program was recommended to A. Cheng for study. His detailed report is attached along with a summary of findings.

In summary then:

1. Iron is mainly evolved in the mine water by corrosive and/or abrasive forces and exists as minute solids.
2. All mill pulps were filtered prior to test to remove solids since only soluble arsenic suppression was sought after.
3. In the tables, total arsenic depression % takes all factors affecting suppression into consideration i.e. dilution.
4. Net arsenic depression % considers only the effect of iron.
5. Combining mine water with various mill solutions has, in fact, some suppressing qualities but it is mainly due to dilution rather than iron content of mine water.
6. Combination of mine water and various mill solutions revealed that pH of the resultant solution played a significant role in arsenic suppression.
7. Mine water added to #8 agitator solution produced a significant increase in net arsenic suppression (iron effect) when pH was above 10.3.
8. Mine water added to #5 agitator (carbon waste) increases net arsenic suppression at a pH above 11.3.
9. A dilution ratio of 2 parts mine water to 1 part #8 agitator or #5 agitator produces the best effect. This is contingent upon iron present and pH.

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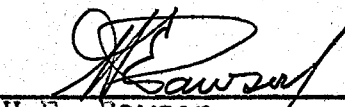
10. Since iron content of mine water is an uncontrollable factor, it will be a variable about which nothing can be done although its effect will be great.

11. Arsenic suppression is most noteworthy at 5 minutes of agitation.

12. Although arsenic suppression increases as pH decreases, precipitate formed during suppression will break down with arsenic becoming soluble once again if, the pH remains low and dilution lowers the iron values. i.e. tailings pond.

13. Since stability of precipitate is fragile and contingent on uncontrollable variables which would exist in the tailings retention area, it would be best to remove the precipitate soon after formation for separate impounding.

Although the work to-date has been very detailed, several factors require further investigation. Chief among these is whether pH or low iron is the main contributor to re-dissolving of the arsenic-iron precipitate.


H.E. Pawson
Mill Superintendent