

MEMORANDUM

To H.E. Pawson

Date November 20, 1973

From A. Cheng

Ref. Memo from H.E.P./Oct. 30

Subject The Utilization of Mine Water in Arsenic Suppression

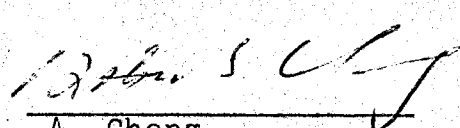
Earlier work by W. Richardson and M. Lane indicated that improved arsenic reduction can be achieved by using soluble iron salts in conjunction with lime. It is noted that the effective and economical combination is the addition of 1 lb./ton of Ferrous Chloride (550 p.p.m. Ferrous ions in the solution) with the presence of 1 lb/ton of lime. Due to the high iron content of Mine Water, it was hoped that the Mine Water could be utilized to dilute the arsenic content and to supply part of the ferrous irons for arsenic suppression.

A survey was conducted to see after adding 1 lb./ton of lime (0.1 gm. of lime/200 c.c. solu.) what the effect of mixing waste solutions and Mine Water in different volume ratio had on the reduction of arsenic.

The table attached shows the results of the tests. The results are not satisfactory, however, from the trend of the results, the method is not encouraging. If the dilution factors is taken into consideration, the mine water not only doesn't provide any addition suppression of arsenic, but it brings down the pH of the whole mixture, and this may lead to the less degree of arsenic depression.

It is believed that only the soluble iron salts have effect on the suppression of arsenic. Therefore, no appreciation effect was made by mine water due to the existence of molecular form of iron which probably comes from the scale and/or the rust of the pipe lines.

However, the results are not satisfactory. One more survey should be done to ensure this conclusion.


A. Cheng
Mill Engineer

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Experimental Results:

1. Mine Water was collected on October 31, 1973 and was sent to the Assay Office for assaying of iron.

<u>DATA</u>	<u>pH</u>	<u>As. p.p.m.</u>	<u>Fe</u>
Filtered Mine Water			1.0 p.p.m.
Unfiltered Mine Water	7.9	4.79	57.3 p.p.m.

It is believed that the iron content of the mine water is attributed to some insoluble iron particles which cannot pass through the No. 1 Whatman Filter Paper.

Results of tests on the individual solutions (the two wash thickener overflow, Carbon Plant barren solution, Carbon Plant thickener overflow and #8 Agitator Discharge) are tabulated follows: Those solutions were sampled on October 31, 1973.

Handwritten notes:
The following shows that if iron
is added to the effluent, the
pH is raised, it will be higher.
as the pH is raised, the iron
content will be higher.

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<u>SAMPLE</u>	<u>pH</u>	<u>As. p.p.m.</u>	<u>As. Reduction %</u>
<u>(2) #11 Thickener O'Flow (D.W.T.O.)</u>			
2A. D.W.T.O.	4.0	128.00	
*+ 2B. 200 c.c. D.W.T.O. + 0.1 gm lime	10.6	86.31	32.57%
2C. 200 c.c. D.W.T.O. + 0.1 gm lime + 200 c.c. mine water	9.8	78.00	—
2D. 300 c.c. D.W.T.O. + 0.15 gm lime + 900 c.c. mine water	9.8	30.86	13.68%
<u>(3) #5 Thickener O'Flow (M.W.T.O.)</u>			
3A. M.W.T.O.	4.1	29.26	
3B* 200 c.c. M.W.T.O + 0.1 gm lime	11.7	24.5	16.27%
3C. 200 c.c. M.W.T.O + 0.1 gm lime + 200 c.c. mine water	11.0	18.0	—
3D. 300 c.c. M.W.T.O + 0.15 gm lime + 900 c.c. mine water	9.75	9.0	—

* The percentage of Arsenic suppression is not satisfactory in comparison with the former work by Lane. The arsenic of both D.W.T.O and M.W.T.O. was suppressed 79% after 1 lb/ton lime (1 gm lime/200 c.c. solution) addition.

The D.W.T.O. is light brown and cloudy. After adding lime, it turns out to be clear solution with dark green suspending and precipitating solids

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October 31, 1973 Sample

(4) Carbon Plant Thickener O'Flow (C.P.T.O.)*

	<u>SAMPLE</u>	<u>pH</u>	<u>As p.p.m.</u>	<u>As Reduction</u> %
4A.	C.P.T.O.	6.4	1750	
4B.	200 c.c. C.P.T.O.	8.1	N.R.	
4C.	200 c.c. C.P.T.O. + 0.1 gm lime + 200 c.c. mine water	7.9	635	27.7%
4D.	200 c.c. C.P.T.O. + 0.1 gm lime + 600 c.c. mine water	8.0	390	11.62%

(5) Dust Treatment Barren Solution (DTB)*

5A.	D.T.B.	8.5	1262.4	
5B.	300 c.c. DTB + 0.15 gm lime	8.8	1058	16.17%
5C.	200 c.c. DTB + 0.1 gm lime + 200 c.c. mine water	8.7	574.6	9.6%

* Both C.P.T.O. and DTB cannot dissolve lime completely, especially DTB. It only dissolves about half the amount of the addition of lime. This may be the reason of low arsenic reduction by lime either in Lane's work (12.0%) and mine (16.17%).

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(6) #8 Agitator Discharge

	<u>SAMPLE</u>	<u>pH</u>	<u>As.p.p.m.</u>	<u>As. Reduction</u> [%]
6A.	#8 Agitator Discharge	11.95	11.5	
6B.	200 c.c. A.D. + 200 c.c. mine water	11.45	7.82	—
6C.	100 c.c. A.D. + 300 c.c. mine water	10.7	4.79	—
6D.	50 c.c. A.D. + 350 c.c. mine water	8.72	3.45	—

From the above results, it is concluded that mine water has no value in treatment of #8 Agitator Discharge regardless of the dilution effect. If the dilution factor is taken into consideration, the percentage of Arsenic reduction is decreased with the increasing amount of mine water. It is probably due to the mine water bringing down the pH of the mixture.

An attempt also had been made by W. Richardson on October 31, 1973.

DTB - 1397.4 p.p.m.

DTB iron ppt. - 1241.5 p.p.m.

Therefore, solid particles of iron has no effect on the arsenic reduction.