

MEMORANDUM

To H.E. Pawson; R.J. Tucker

Date Dec 4/75

From C.Q. Olesen

Ref.

Subject The use of Ferric Chloride as a means of suppressing arsenic

Procedure: 500 ml samples of thickeners 6, 11 and a combination of 6 + 11 + 13 and one liter samples of thickener 13 were treated with varying quantities of ferric chloride and then later treated with 7 drops of NH_4OH .

Data:

Part I - #6 thickener pH 6.9 PPMAs (20.3) ppmCu 0.17 ppmFe 8.0

FeCl_3 (g)	FeCl_3 pH	NH_4OH pH _{OH}	FeCl_3 ppmAs	NH_4OH ppmAsOH	FeCl_3 ppmCu	NH_4OH ppmCuOH	FeCl_3 ppmFe	NH_4OH ppmFeOH
.090	3.1	9.6	17.0	3.2	.90	ND	48	5.0
.180	3.2	9.4	17.0	2.1	.30	ND	100	ND
.270	3.1	9.1	17.0	2.1	.14	ND	204	0.6

Part II - #11 thickener pH 5.3 ppmAs (62.0) ppmCu 0.17 ppmFe 320

FeCl_3 (g)	pH	pH _{OH}	ppmAs	ppmAsOH	ppmCu	ppmCuOH	ppmFe	ppmFeOH
.400	2.8	7.8	102	4.6	.6	ND	600	.6
.550	2.8	9.6	90	1.8	.5	ND	650	.2
.700	2.7	9.1	100	3.0	1.6	.05	830	.1

Part III - #13 thickener pH 6.5 ppmAs (430) ppmCu 0.25 ppmFe 74

FeCl_3 (g)	pH	pH _{OH}	ppmAs	ppmAsOH	ppmCu	ppmCuOH	ppmFe	ppmFeOH
3.00	5.6	6.95	200	280	.44	ND	127	.3
3.50	5.5	6.9	203	280	.70	ND	154	.6
4.00	5.3	6.55	170	240	1.07	.05	200	12.4

Part IV - Combination (13+6+11) pH 6.0 ppmAs 92 ppmCu 4.80 ppmFe 100

FeCl_3 (g)	pH	pH _{OH}	ppmAs	ppmAsOH	ppmCu	ppmCuOH	ppmFe	ppmFeOH
.50	5.3	8.25	81	43.8	.93	ND	139	1.5
.55	5.1	8.2	81	34.0	2.47	ND	150	2.8
.60	4.6	6.7	81	38.2	4.10	.20	172	17.4

Calculations:

Part I

Available Fe from FeCl_3 mg Fe	Consumed As mg As	Fe/As Ratio	Total Avail Fe mg Fe	Fe/As Ratio
18.9	8.6	2.20	22.9	2.66
37.8	9.1	4.15	41.8	4.59
56.7	9.1	6.23	60.7	6.67

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Part II

<u>mg Fe</u>	<u>mg As</u>	<u>Fe/As</u>	<u>T.A. Fe</u>	<u>Fe/As</u>
84.0	28.7	2.93	244	8.50
115.5	30.1	3.84	275.5	9.15
147.0	29.5	4.98	307	10.41

Part III

<u>mg Fe</u>	<u>mg As</u>	<u>Fe/As</u>	<u>T.A. Fe</u>	<u>Fe/As</u>
630	150	4.20	704	4.69
735	150	4.90	809	5.39
840	190	4.40	914	4.81

Part IV

<u>mg Fe</u>	<u>mg As</u>	<u>Fe/As</u>	<u>T.A. Fe</u>	<u>Fe/As</u>
105	24.1	4.36	155	6.43
115.5	39.0	2.96	165.5	4.24
126	26.9	4.68	176	6.54

Conclusions:

- as mentioned before, pH is a critical factor in the suppression of arsenic, as noted in parts I and II to parts III and IV
- upon the addition of the ferric chloride, copper has the tendency to appear in the solution, but this probably comes from the solids themselves. Then with the addition of NH_4OH the copper drops out
- Using Mr. La Clare's assumption that 5 moles of iron is used for 1 mole of arsenic, the weight ratio would be 3.72. Now, compare the above figure to the calculated ratio of the iron available from the ferric chloride to the consumed amount of arsenic, it comes close to this theoretical ratio. Then in the final comparison of the ratio's for the total amount of iron available exceeds way beyond Mr. La Clare's statement of 5 to 1.
- therefore in the next series of tests a larger amount of FeCl_3 should be used and a higher pH obtained. As this may rectify the problems.