

MEMORANDUM

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

Date September 5/75

From C.C. Olesen

Ref. _____

Subject Arsenic Suppression

ABSTRACT: To analyze the 3 streams (thickeners 6, 11, & 13) that are being pumped into #6 Agitator and to establish what reactions take place during the combination of these streams. Lime was also added to the streams and their combinations. (N.B. All samples analyzed by atomic absorption)

PART I: The three streams (thickeners 6, 11, 13) were treated ^{separately} with lime and were analyzed for pH and arsenic over a 24 hour period.

<u>0%CaO</u>				<u>1%CaO</u>			
<u>pH</u>	<u>pH24</u>	<u>As</u>	<u>As24</u>	<u>pH</u>	<u>pH24</u>	<u>As</u>	<u>As24</u>
6 - 7.4	7.9	46	42	11.6	11.9	12.5	10.5
11 - 4.0	3.9	74	52	10.3	11.7	3.5	5.0
13 - 6.9	7.4	1400	775	8.7	9.0	1130	590
<u>2%CaO</u>				<u>5%CaO</u>			
<u>pH</u>	<u>pH24</u>	<u>As</u>	<u>As24</u>	<u>pH</u>	<u>pH24</u>	<u>As</u>	<u>As24</u>
6 - 11.9	12.1	13.0	10.0	12.1	12.3	14.8	5.0
11 - 11.0	11.6	3.5	6.0	12.4	12.4	6.0	3.0
13 - 9.2	10.0	740	245	8.9	9.2	970	585

PART I OBSERVATIONS

#6 thickener - a grey tinge and a fine precipitate (ppt) is noticed in original solution, but with the addition of lime a white gelatinous ppt occurs and a white colloidal suspension is noticed.

#11 thickener - original solution is slightly opaque, but with the addition of lime a blue-green gelatinous ppt evolved, and settled quickly, and left a slightly colloidal suspension.

#13 thickener - the only noticeable ppt was from the original mass of brown solids and the solids seemed to trap the lime.

PART II: From the calculated water balance the 3 streams were mixed in pairs, and analyzed for their pH and Arsenic content. The theoretical arsenic for the following: 6 + 11 (55 ppm's), 11 + 13 (571 ppm's) and 13 + 6 (385 ppm's).

To

Date Sept 5/75

From

Ref.

Subject Arsenic Suppression - page 2

0%CaO				1%CaO			
pH	pH24	As	As24	pH	pH24	As	As24
6.4	6.4	46.0	23.7	10.9	11.5	16.0	6.8 6 + 11
6.0	6.5	435	287	7.0	9.2	260	165 11 + 13
7.2	7.8	255	225	10.2	11.0	190	47 13 + 6

2%CaO				5%CaO			
pH	pH24	As	As24	pH	pH24	As	As24
11.5	12.1	6.8	5.0	12.1	12.3	12.0	4.5 6 + 11
13.8	11.9	110	22.0	11.6	12.2	42.0	4.5 11 + 13
10.9	11.9	110	23.7	12.1	12.4	13.5	3.0 13 + 6

PART II OBSERVATIONS:

6 + 11 thickeners - upon addition without lime solution becomes very opaque, then with 1%CaO added a gelatinous ppte was formed with a blue-green tinge through the ppte. The rest of the samples 2% and 5% of CaO show a green-grey ppte plus a white gelatinous ppte on top. After a 24 hour wait period the sample without lime showed a yellow brown ppte with large particulate size.

11 + 13 thickeners - upon addition without lime slightly opaque, brown in color. With the addition 1%CaO/ton you will obtain an opaque yellow liquid, with a colloidal suspension and a brown ppte on bottom with a fine yellow particulate covering.

13 + 6 thickeners - no noticeable ppte in sample without lime except the brown ppte originating from #13 thickener. Whereas, in the solutions with lime a fine white ppte settles above the brown, and becomes gelatinous upon the addition of higher concentrations of lime.

PART III: All the solutions were combined as in Part II but with the addition of OTB (carbon plant barren). The theoretical arsenic for the following: 6 + 11 (178 ppmAs), 11 + 13 (741 ppmAs), and 13 + 6 (430 ppmAs).

MEMORANDUM

To

Date Sept 5/75

From

Ref.

Subject..... Arsenic Suppression - page 3

0.0% CaO				1.0% CaO			
pH	pH24	As	As24	pH	pH24	As	As24
6.7	7.5	135	75	10.4	10.2	90	45.6
6.5	7.2	515	370	9.2	8.2	490	250
7.7	8.0	405	300	9.2	9.9	325	185

2"CaO				5"CaO			
pH	pH24	As	As24	pH	pH24	As	As24
10.8	11.2	60	25.7	12.3	12.4	15.4	3.0
9.1	9.9	360	180	11.9	12.0	120	6.8
10.4	11.4	208	59	11.5	12.1	102	8.0

PART III OBSERVATIONS:

6 + 11 thickeners + DTE - a colloidal suspension plus a yellow gelatinous ppte occurred upon additions of the streams with no lime added. Whereas, in the samples when lime was added you obtained a yellow gelatinous ppte with a clear solution.

11 + 13 thickeners + BTB - a fine gelatinous ppte covering the normal brown ppte from #13 thickener in all samples except the last sample (5% CaO) a white gelatinous ppte was covering the brown ppte.

13 + 6 thickeners + DTB - the first two samples (0" + 1"CaO) showed no ppt except for the predominant brown ppt from "13 thickener. Thereess, the third sample (2"CaO) showed a fine white ppt covering over the brown ppt and the fourth sample had a white gelatinous ppt covering.

PART IV: Taking all three streams and adding them together, filtered and unfiltered plus the addition of DTB. Assays for:
DTB - 2300 ppmAs, #13 - 500 ppmAs, #11 - 40 ppmAs, #6 - 36 ppmAs.

0%CaO				1%CaO			
pH	pH24	As	As24	pH	pH24	As	As24
6.7	7.5	165	165	10.4	10.8	75	28.0
6.9	7.7	268	228	10.0	9.7	173	65
6.8	7.1	170	119	9.9	9.5	89	39
6.9	7.7	268	175	7.1	9.6	198	95

6+13+11
6+13+11
+DTB
6+13+11
Filtered
6+13+11
+DTB filtered

To

Date Sent 5/75

From

Ref.

Subject..... Arsenic Suppression - page 4

2#CaO				5#CaO			
pH	pH24	As	As24	pH	pH24	As	As24
12.1	12.2	35	3.5	12.4	12.4	11	ND 6+13+11
11.7	12.2	60	5	12.3	12.5	11.5	ND 6+13+11+DTB
10.9	11.6	46	6	12.4	12.4	16	3 6+13+11
11.3	12.2	60.5	9.5	12.3	12.5	13	3.5 filtered 6+13+11+DTB filtered

The theoretical arsenic for the above in descending order 114, 215, 114, and 215 ppmAs.

PART IV OBSERVATIONS:

6+13+11 thickeners - the first two samples (0" + 1"CaO) showed the same ppte as in 13 thickener but in the last two the lime yielded a brown gelatinous ppte with a white gelatinous ppte as a covering.

6+13+11 thickeners +DTB - same observations as above.

6+13+11 thickeners (filtered) - the mixture of these 4 components yielded an opaque solution and upon addition of 1"CaO supernate cleared slightly but held the yellow color in the supernate. Whereas upon the addition of lime a white ppte occurred and the solution lost its yellow color and cleared.

6+13+11 thickeners +DTB (all filtered) - produce the same results as in the above, but the first sample contained an opaque yellow solution.

CONCLUSIONS: (to all parts I through IV)

- In all the samples there shows a definite increase in the pH if held over a 24 hr. period. In all probability to alleviate the 24 hr wait, agitation could be the answer, as this would tend to dissolve the lime more readily.
- Also there seems to be a decrease in the arsenic concentration, during the addition of paired streams, but what causes this is still unknown. Unless, the noted colloidal suspensions and ppte's in Part II and III contain the lost arsenic.
- With only combining two streams (11+6, 11+13, 6+13) or the addition of DTB (Part II and III) to these paired streams with a concentration of up to 2#CaO/ton, no marked decrease in the concentration of arsenic is noted. (Based on the amount of arsenic that is already being emitted by the mill? Whereas, at a concentration of 5" CaO/ton a definite decrease is shown.

MEMORANDUM

To

Date..... Sept 5/75

From

Ref.

Subject..... Arsenic Suppression - page 5

CONCLUSIONS CONT.:

- With all the streams combined plus the addition of DTB (Part IV) a marked decrease in the concentration of arsenic was noted, especially at the concentration of 5%CaO/ton.
- Since there was an increase in the arsenic concentration in Part IV from the theoretical to the actual another set of samples will be run.