

MEMORANDUM

To

Date June 5, 1978

From

Ref.

Subject FERRIC SULFATE TREATMENT OF WASTE STREAMS.

From February 14-22, 1978 an in plant scale test program was initiated to determine the feasibility of the addition of lime and ferric sulfate for arsenic suppression. The streams involved were the carbon plant thickener overflow and the two calcine wash thickener overflows.

DATA

Carbon plant thickener overflow = #13 thickener
1st Calcine wash thickener overflow = #11 thickener
2nd Calcine wash thickener overflow = #5 thickener
Waste agitator = #8 agitator

Run A - no ferric sulfate

Run 1 - 3 Fe: 1 As

Run 2 - 5 Fe: 1 As

Run 3 - 4 Fe: 1 As

Run 4 - 2 Fe: 1 As

N.B. Refer to page 2 for numerical data.

NUMERICAL DATA

	Pd	# 13 As lbs/shift	#11 As lbs/shift	# 5 As lbs/shift	Total As lbs/shift	# 8 Ag As lbs/shift	#8 Ag ppm As	Mill Waste ppm As	% As Reduct.
	1	21.07	6.44	8.25	35.76	30.22	59.0	22.0	15.5
RUN A	2	18.61	8.37	6.93	33.91	32.87	64.8	9.72	3.1
*	3	28.10	8.91	5.29	42.30	28.12	65.0	15.0	33.5
	1	16.24	12.94	8.25	37.43	14.78	27.8	10.16	60.5
RUN 1	2	10.17	12.72	5.61	28.50	2.44	4.71	14.5	91.4
*	3	10.00	9.29	5.34	24.63	2.08	5.01	10.2	95.6
	1	42.69	5.86	6.35	54.90	4.67	8.0	14.0	91.5
RUN 2	2	27.21	6.80	4.98	38.99	4.31	7.4	4.6	88.9
	3	18.90	10.18	3.86	32.94	1.16	2.0	9.5	96.5
	1	44.80	10.21	6.53	61.54	7.67	13.14	48.0	87.5
RUN 3	2	47.38	11.05	6.23	64.66	8.18	14.0	8.5	87.3
a*	3	16.59	11.02	3.85	31.46	5.35	11.0	6.15	83.0
	b 1	91.4	12.80	6.88	111.08	26.53	45.4	43.0	76.1
RUN 4	2	50.98	13.47	8.54	72.99	15.09	25.6	9.0	79.3
*	3	26.67	11.22	4.22	42.11	3.88	8.35	7.25	90.8

*-Denotes a 6 hour shift all other shifts 8 hours.

a-Power failure

b-No lime added

Decant from Sludge Samples (April 7, 1978)

	ppm As
Run 1	61.7
" 2	22.0
" 3	3.4
" 4	12.0

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CONCLUSIONS

- During the four major runs sludge samples were taken. Almost 2 months after the completion of the in plant scale test the supernate from these sludges were analyzed for arsenic. It was feared that resolubilization of arsenic into the supernate would occur and it did, which now shows that this type of treatment is slightly dubious. During the DPAT project chlorination of the waste streams was initiated before the addition of Lime and Ferric Sulfate. The reasoning would be to oxidize the As +3 to an As +5 state and when the iron-lime addition was complete a more highly stabilized sludge was produced, thereby, minimizing resolubilization.
- From the data a 3:1 Fe/As ratio shows the BEST recovery and the lowest feed rate attainable at the present time.

RECOMMENDATIONS

This test should be ran again with the addition of Calcium Hypochlorite before iron-lime addition, to establish if oxidation of arsenic would enhance our waste treatment system.

Ferric Sulfate treatment of Waste Streams

From February 14 - 22 1978 an in plant SCALE test program was initiated to determine the feasibility of the addition of lime and ferric Sulfate for arsenic suppression. The streams involved were the CARBON plant thickener overflow and the two calcine wash thickener overflows

DATA

Carbon plant thickener overflow = #13 thickener
1st Calcine wash thickener overflow = #11 thickener
2nd Calcine wash thickener overflow = #5 thickener
Waste agitator = #8 agitator

Run A - no ferric Sulfate

Run 1 - 3 Fe : 1 As

Run 2 - 5 Fe : 1 As

Run 3 - 4 Fe : 1 As

Run 4 - 2 Fe : 1 As

N.B. Refer to page 2 for numerical data.

Numerical data

	Pa	#13 As lbs/s/hr	#11 As lbs/s/hr	#5 As lbs/s/hr	Total As lbs/s/hr	#8 Ag As lbs/s/hr	#8 Ag ppm As	Milk waste ppm As	% As Reduct.
Run A	1	21.07	6.44	8.25	35.76	30.22	59.0	22.0	15.5
	2	18.61	8.37	6.93	33.91	32.87	64.8	9.72	3.1
	* 3	28.10	8.91	5.29	42.30	28.12	65.0	15.0	33.5
Run 1	1	16.24	12.94	8.25	37.43	14.79	27.8	10.46	60.5
	2	10.17	12.72	5.61	28.50	2.44	41.71	14.5	91.4
	* 3	10.00	9.29	5.34	24.63	2.08	50.1	10.2	95.6
Run 2	1	42.39	5.86	6.35	54.60	4.67	8.0	14.0	96.5
	2	21.21	6.80	4.98	32.99	4.31	7.4	4.6	88.9
	3	18.90	10.18	3.66	32.74	1.16	22.0	9.5	96.5
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	2	50.98	13.47	8.54	72.99	15.09	25.6	9.0	79.3
	* 3	26.67	11.22	4.22	42.11	3.88	18.35	7.25	90.8

#- Denotes a 6 hr shift all other shifts 8 hrs.
a - power failure
b - No lime added

Decant from Sludge Concentrator (April 7, 1978)

ppm As

Run 1

61.7
22.0
3.4
12.0

Conclusions

- During the four major runs sludge samples were taken. Almost 2 months after the completion of the in-plant scale test the supernate from these sludges were analyzed for arsenic. It was feared that resolubilization of arsenic into the supernate would occur and it did, which now shows that this type of treatment is slightly dubious. During the DPAT project chlorination of the waste streams was initiated before the addition of lime and ferric sulfate. The reasoning would be to oxidize the As^{+3} to an As^{+5} state and when the iron-lime addition was complete a more highly stabilized sludge was produced, thereby, minimizing resolubilization.
- From the data a 3:1 Fe/As ratio shows the best recovery and the lowest feed rate obtainable at the present time.

Recommendations

This test should be run again with the addition of calcium hypochlorite BEFORE iron-lime addition, to establish if oxidation of arsenic would enhance our waste treatment system.