INTER-OFFICE MEMO **TENNECO CHEMICALS, INC.**

TO W. Miringoff AT Burlington DATE June 30, 1975

FROM F. D. Richardson AT Burlington COPY TO H.B. Carr
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SUBJECT PROCESS ENGINEERING REPORT
JUNE, 1975

VINYL ACETATE RECOVERY FROM WASTE WATER (DEI-548)

A process design was developed for the recovery of vinyl acetate from the waste water phase from the copolymer recovery system barometric sump at Burlington. The purpose of the system would be both to recover usable monomer and to reduce the BOD load on the waste treatment system. Calculations and the flow sheet were complete June 30; the package is being assembled for issue to Project Engineering on July 3.

Design water rate was based on data collected and reported in March. That data indicated a rate of 60 - 160 gallons per batch, depending on stripping conditions -- the higher value was used for design. At this rate, and assuming a full production schedule, the amount of vinyl acetate recovered would be about 430 pounds per day.

REACTOR WATER FILL - BURLINGTON (DEI-508)

Design for a reactor water fill system for the Burlington Copolymer Plant was expected to be complete on June 2. A review at that time, however, revealed errors in some critical elevation measurements made in the field. This necessitated major reworking of the design. The revised design was complete as of June 10 but has not been released due to review of simpler alternative methods of removing VCM from the reactors.

ALTERNATIVES TO WATER FILL SYSTEMS

The approach of forcing VCM vapors into the recovery system by filling the reactor with water is simple in concept. In practice it would require large and expensive equipment and it would provide many new opportunities for operating errors. For these reasons a review of the data on the effectiveness of the water fill method and a consideration of the alternatives is in order.

Data on the water fill tests was summarized by L. Medieros in his monthly report for November, 1974. Results for the three tests ranged from 1070 to 3400 ppm concentrations in the reactor after breaking vacuum, with a value of 1470 ppm being most likely for water fill systems which have been designed. This is only marginal with respect to proposed EPA standards now under consideration, but changes in water temperature and increased hold time under recovery should make the system acceptable.

Included in the same report were results on tests where consecutive dilutions with nitrogen were used to reduce the residual VCM in the reactor. These tests gave results of 437 - 996 ppm. The problem with this method is that extra non-condensible gas must be handled by the recovery system and this would lead to higher VCM losses from the recovery condensers.

One method of purging VCM from the reactor, which immediately comes to mind, would be to sweep the reactor with steam while keeping the reactor walls hot to prevent condensation. This has been proposed in the past but has not been tried because of concern about a safety problem which involves static electricity generated by the steam flow. This question has not been thoroughly investigated and should be pursued. A memo will be issued shortly on this subject. The position will be taken that a steam sweep can be safely utilized; comments will be obtained from interested parties.

In the meantime,we have tested a substitute method proposed by W. Miringoff and R. Mathis. A small quantity (300 gallons) of hot water is added to the reactor and the jacket water is brought to about 180°F. The reactor is then put on recovery and when the pressure has been reduced enough the water starts to boil thus creating a steam sweep. The test procedure and results are attached. The first two results were not encouraging. Then it was realized that, since the reactor temperature is constantly increasing during all the experiment, active boiling would not be indicated until the system pressure had gone through a minimum and started to rise again. Thus, during the first two tests an actual steam flow existed for only 3 minutes. For the third test, therefore, the reactor was held on recovery for 25 minutes after minimum pressure had been attained. The result was a VCM concentration of 755 ppm after breaking vacuum. Further tests of this method will be run after we determine how to deal with two problem areas:

(a) We need to devise a method for charging hotter water. If water could be charged at 180°F. (instead of about 140°F°) , boiling would start much sooner.

(b) The reactor recovery line is only 2 inches in diameter and the piping arrangement is quite complex. The high pressure drop which results limits gas flow and prolongs the time required for an effective steam sweep.

F. D. Richardson

FDR:km

TEST PROCEDURE FOR PURGING OF

VCM FROM REACTORS BY WATER EVAPORATION

All operations up until the start of transferring the batch to the stripper remain unchanged.

1. After starting the transfer to the stripper, and after making sure that the batch is actually moving, switch the jacket control system to steam, set reactor temperature controller at 200°F and set jacket water temperature controller at 180°F.

2. At end of transfer, keep agitator on at low speed.

3. At end of transfer, and after bottom valve on reactor is closed, charge 300 gallons of hot demineralized water.

4. Put reactor on recovery with controls set for maximum vacuum. The length of time on recovery will vary according to conditions observed. Currently, we would expect it to be ten to twenty minutes. A Process Engineering representative will be on the floor and will advise when the reactor should be taken off recovery.

5. After the recovery valve has been closed, switch jacket and reactor temperature control systems back to normal settings and then pressure reactor to 5 psig with nitrogen.

6. Wait for five minutes. During this time the agitator should remain on slow speed. After five minutes, Process Engineering will take two gas samples from the nitrogen connection.

7. After the above samples have been taken, vent the reactor. Then open the manhole and put in exhaust hose as usual.

8. Drain water from reactor to floor. Process Engineering will sample water as it drains.

This concludes the test.

F.D. Richardson
6/18/75

TEST RESULTS FOR PURGING OF VCM FROM REACTORS BY WATER EVAPORATION

Run No.	Jacket Temp., °F	Reactor Temp., °F	Time to Minimum Abs Pressure, Min.	Holding Time After Minimum Abs. Pressure, Min.	Minimum Pressure mm Hg.	VCM Conc. After Breaking Vacuum, ppm
1	178	118-138	22	3	61	4170
2	178	125-148	20	3	41	4600
3	183	140-154	19	25	55	755

(1) Values not considered accurate.

F. D. Richardson
6/30/75

PROCESS ENGINEERING TIME SHEET

Name F. D. Richardson From June 1 To June 30, 1975

Project	Account Number	Job Description	1st Week	2nd Week	3rd Week	4th Week	5th Week	Totals
DEI - 508		Reactor Water Fill	40	12				52
		Burlington Copolymer						
		Review & Testing of		24	40	12		76
		Alternate Water fill Method						
DEI-458		Vinyl Acetate Recovery				28	8	36
		from Waste Water						
		Engineering Dept. Mtg.		4				4
		Piscataway, 6/10						
		Totals	40	40	40	40	8	168

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