

FROM (NAME & LOCATION): Walter B. Howard (4-6029) - Corporate Engineering, St. Louis F4EA

DATE August 28, 1974

RESEARCH AND PROJECT LOSS
PREVENTION & ENVIRONMENTAL
CONTROL REVIEW REPT. #74-47
CEA 2908, Monomer Removal,
Texas City

K. M. Kettler - F3WA
R. J. Kozacka - G2WD
Russell L. Miller - F4EA
~~Project File (CEA 2908)~~
S&PP Location File (TEXAS CITY)

D. H. Bolliger, Project Mgr.

G 2 W C

COPIES TO THOSE PRESENT

R. L. Bauer - F4WE
R. A. Bell - F2EC
D. H. Bolliger - G2WC
B. W. Eley - A2SA
J. E. Fox - 1890, Tex.City
M. E. Gibbs - W1A

W. B. Howard - F4EA
M. L. Mullins - E1SF
W. J. Raiff - W1A
W. R. Richard - T3A
J. R. Savage - B2SL
R. F. Seifert - F2EC
A. K. Shadensack - 1890, Tex.City

DATE AND PLACE OF MEETING
Missouri.

August 15, 1974, Creve Coeur,

The capital of this project will be approximately \$1.1M; completion target will be the last quarter of 1974. This is a non-earnings project; equipment is designed only to handle present capacity.

This review was conducted primarily on the basis of process and engineering flow diagrams available at the time of the review. The equipment to be installed is intended to remove residual vinyl chloride monomer from the EVC slurry down to a concentration of 1 ppm.

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PROCESSEngineering Flow Diagram D6

1. Vents on Surge Tanks The plant is concerned about possible plugging of the 1-inch nitrogen bleed lines and valves off of the tanks. It was agreed that the project will go to 3-inch lines.

In this connection Research noted that, as long as the gas phase is humid, crusting over of material in tanks or in gas lines (from material blurping into the lines) will not occur. In this connection it was noted that presently the plant does not have any program for checking vents off of similar tanks for potential pluggage. It is recommended that the plant institute a program to do this, particularly on vent lines which, if plugged or partially plugged, could lead to breakage of the protected vessels.

2. Water Seal It was recommended that, for freezing weather protection, the water to the water seal, 1-130, be fed on a constant flow basis rather than on the basis of level control.

3. Protection of Latex in Piping According to the plant's practice, all piping handling latex will be insulated and electrically traced. The pumps will not be traced.

4. High Level Interlock It was agreed that the project will install interlocks to shut down upstream pumps if downstream high levels should develop.

5. Drain Pads for Pumps It was agreed that pumps will be installed on a curbed pad. The pads will drain to the process sewer as do other drains at present. It was also agreed that water lines will be needed to the Frymas and related equipment for washing for decontamination. This pertains to the evaporator as well.

6. Equipment Inerting It was agreed that nitrogen lines will be needed to supply nitrogen to the Frymas and to the evaporator, as well as to related equipment, to prevent the presence of air when the equipment is washed with THF. In fact, the design will need to incorporate means

to ensure the complete purging of oxygen down to a concentration well below the lower oxygen flammable limit throughout the equipment before THF is added.

7. Pressure Transmitters on Frymas It was noted that the pressure transmitters on the Frymas need to be designed to prevent plugging of the transmitters.

8. Prevention of Ignition of Flammable Mixtures The existing vacuum pumps in the polymer manufacturing operation are connected to the gas holder, which rides the line off of a tee. The discharge line then continues to the incinerator, which constitutes a continuous ignition source. For the vacuum pump discharges from equipment to be provided by this project, there will be a line directly to the incinerator. Here the gas will enter the intake of the air blower for the incinerator, where it will become highly diluted. This will prevent the potential problem of ignition by the incinerator flame. It is significant that a large air purge cannot be used in this case because polymer must not be allowed to dry out.

9. Liquid Seal on Vent Gas Line If a liquid seal be used, it is recommended that caution be exercised in choice of liquid seal design. The failure of the proprietary John Zink bubble screen (liquid seal device) was described.

10. Slurry Heating by Steam Injection In discussion it was noted that, for operating dependability, the steam injection method and location will need special attention in design.

11. Material Transfer Upstream It was agreed that the project will need to make provisions to permit transfer of material from surge tanks 1-101 and 1-201 to upstream equipment.

12. Water Ring Vacuum Pumps It was noted that, if latex gets into a water ring vacuum pump, operation can be severely hampered.

13. Dependability of Frymas In the scope statement on project risk it is clear that the principal project risk is in the scale-up of the devolatilizing units. This particularly applies to the Frymas, which are new to Monsanto

in terms of predicting performance. The Frymas to be used on this project will represent a considerable scale-up from the largest unit tested on a laboratory basis. The vendor's unit which was stated to be nominally capable of 4 gpm could not be operated above 2.5 gpm without excess entrainment. Even on the 2.5 gpm basis, however, the plant unit size represents an extrapolation factor less than the nominal ratio rating between the two sized units. Nevertheless, entrainment possibility remains the primary foreseeable operating risk in the project. As pointed out in the scope, a further related risk is operating time of the units.

Downstream of the two Frymas will be a Luwa. Scale-up for Luwas is better understood in Monsanto on the basis of a number of these presently in operation in the company.

Relative to dependability of the Fryma degassers, there was extensive discussion in the meeting concerning other degassers which have been tested. Research had tested some other degassers. A primary requirement for such equipment on this project is that it contribute as little as possible to the inherent foaming problem. From the testing which had been done by Research, and from its paper evaluation of some other devolatilizer-type devices, Research has concluded that the Frymas represent the best available equipment for the purpose.

14. Oxygen Analyzers It was concluded that, in view of the mode of disposal of the stripped VCM plus leakage air (into incinerator air blower intake), oxygen analyzers will not be needed in the system.

15. Equipment Spares A problem still to be resolved on the project is provision of spares for certain of the European equipment, e.g., shaft seals on the Frymas.

16. Steam and Water Connections to Frymas Research recommended steam and water connections to the tops of both Frymas.

17. Prevention of Excess Pressure in Equipment The major equipment items, Frymas and evaporator, will need provisions to prevent build-up of excessive pressure inside the equipment.

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18. Liquid Sample Taps It was noted that liquid sample taps will be needed for each processing unit. These might be located at the discharge of each pump.

Engineering Flow Diagram D7

19. Pressure Equalizing Line The adequacy of the 2-inch line between the bottom of the evaporator, 1-119, and the level control tank, 1-137, was questioned. This line needs to serve both for liquid flow and for pressure equalization. It was agreed that this line will be increased to three inches and that flanges will be installed to permit later incorporation of an equalization line.

20. Formaldehyde and Ammonia Feeds Interlock It was agreed that the project will make provisions to prevent feed of formaldehyde and ammonia if the product flow in the line should stop.

21. Prevention of Formation of Hexamethylenetetramine In order to prevent possible formation of hexamethylenetetramine from the addition of formaldehyde and ammonia, it was agreed that the project will design to ensure that one of these is fully mixed into the process stream before the other is added. This might be done by introduction of one of the materials on the suction side of Pump 1-124 and introduction of the other downstream of the pump.

22. Testing of Evaporators Research is still testing evaporator units. Presently the Luwa and Votator units seem to give comparable performance. By way of dependability, lab tests indicate that the evaporator can tolerate about four times the amount of VCM that the design material balance shows. The limit on tolerable amount of VCM is that which will produce excessive trouble with foaming in the evaporator.

FIRE PROTECTION

On account of the use of substantial quantities of THF for equipment washing, Mr. Damon Snow of the S&PP staff recommends deluge protection of the equipment.

MECHANICAL

Pump Selection The plant has had trouble with pumps handling the slurry involved in the process. Shaft sealing seems to be a particular problem. Pump maintenance is a

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significant plant problem. It is noteworthy that pumps to be supplied by this project will be serving a continuous train instead of a batch train as is the case in the other part of the unit. Good dependability is needed, which probably implies spares in some fashion. The project had been planning centrifugal pumps on the basis of plant information, but this is not yet definite. Possible use of other types of pumps, such as diaphragm pumps, was discussed. The project will try to resolve this.

PERSONNEL

1. Radioactive Sources - There will be a radioactive source on each of the Frymas. There may be others at other locations. Mr. J.E. Fox requests that the person ordering the equipment check first with him before placing orders. By plant requirement Mr. Fox must also approve the orders.

2. Exits from the Structure The project will provide an elevated walkway to the existing structure to the south. It was noted that this walkway must avoid any congested area in that structure to the south in order to make it useful for an emergency escapeway. The project will also provide an escape ladder at the other end of the structure.

LOSS EXPOSURE

The maximum loss incident was assumed to be loss of the evaporator. If this should occur, the production of the products would be shut down. It was assumed that repairs to the evaporator could be done within a month and that repairs might cost \$25K. On the basis of a BI loss at 10¢ per pound, the BI loss would be \$200K.

MEDICAL (information supplied by B. W. Eley)

Removal of residual VCM from the EVCL lattices will beneficially reduce personnel exposure to VCM in the operating and canning areas at Texas City and hopefully lower atmospheric VCM levels in customer plants below the limit of detection. No new toxicity or personnel hazard problems are anticipated in this project.

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ENVIRONMENTAL CONTROL

(Information supplied by R.A. Bell)

This project will provide facilities for removal of residual Vinyl Chloride Monomers from E-VCl latices manufactured at Texas City. This latex product is presently going to storage and has approximately 3500 ppm VCM. Two Fryma demonomerization units will be connected in series to reduce levels of VCM to 1 ppm based on laboratory demonstrations. There is some question as to the risk involved in scale-up to plant-size units, and therefore predicting performance of full scale units. Even if performance is as good as expected, it is possible that later regulations will require further VCM removal. However, this project is necessitated by recent indications that VCM may be carcinogenic.

Approximately 24 pounds per hour of VCM plus small amounts of ethylene and water vapor will be sent to the existing incinerator. Surge tank vents, presently vented to the atmosphere will also be piped to the incinerator. Excess vacuum pump seal water will be steam stripped to remove all VCM before being sewerred. The tetrahydrofuran wash stream, used to dissolve polymer film out of the equipment and piping will be returned to the existing THF wash tanks. There will be very little VCM in the sewer stream or the final latex product, greatly reducing personnel exposure in the operating and canning procedures.

The project will necessitate adding a small amount of aqua-ammonia for pH control and formalin as a preservative to the final product. These additions are not considered significant.

A suggestion was made at the meeting by J. E. Fox to provide curbed pads around pumps for washdown during maintenance. These are to be drained via process sewer to treatment facilities.

CHECK LISTS

Attached to Mr. Bolliger's copy of this report are copies of Form G-1425 Loss Prevention Review Check List, and EC-27 Environmental Control Check List, which should be used in connection with this project.

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LOSS PREVENTION REVIEW BY PLANT

The S&PP Branch of CED cannot review design prints and construction steps in detail as this project progresses. S&PP requests plant personnel, including plant safety personnel, to hold additional safety reviews at the plant, to follow the development of design prints, and to check the progress of construction in order to make maximum contributions from their experience with these operations to the CED personnel involved in execution of this project.

SAFETY MANAGER

W. B. Howard will be Safety Manager for this project. Please contact him for additional safety reviews needed during design.

The Project Manager should arrange a Loss Prevention Design review, including plant safety personnel, as soon as sufficient details are available.


Walter B. Howard

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