CONFIDENTIAL

VCM RELEASES WHICH OCCURRED JANUARY 19, 1980 AND JANUARY 13, 1983 DUE TO HYDROSTATICALLY OVERFILLED REACTOR CONDITIONS

Summary:

On January 19, 1980 and January 13, 1983, the plant experienced emergency relief valve discharges on PVC reactors due to hydrostatically overfilled conditions. Response to relevant questions is provided on both discharges in this section since the incidents are closely interrelated. The corrective action taken since these discharges include changes in procedures, operator training, installation of additional instrumentation and additional reactor charge interlocks. These actions are believed to be adequate as no further releases have occured.

QUESTION 1: FOR EACH RELIEF VALVE OR MANUAL VENT VALVE DISCHARGE OF VINYL CHLORIDE ("VC") WHICH OCCURRED FOR THE PERIOD FROM JANUARY 1, 1979 TO JANUARY 1, 1985, A DESCRIPTION OF THE NATURE AND CAUSE OF THE DISCHARGE, INCLUDING PRIMARY AND/OR RELATED CAUSES(S).

Response:

Descriptions giving the nature and cause of the discharges have been submitted and are listed below:

1. The initial discharge report for the January 19, 1980 release was submitted to EPA Region IV in a letter dated January 24, 1980 which is attached as reference C-1, Appendix C.

2. On March 4, 1980 a copy of the reactor strip chart for the January 19, 1980 release was sent to Mr. Wayne Aronson, EPA Region IV, per his phone request which is attached as reference C-2, Appendix C.

3. The initial discharge report for the January 13, 1983 release was submitted to the Mississippi Bureau of Pollution Control in a letter dated January 21, 1983 and is attached as reference C-3, Appendix C.

Subsequent to the initial discharge report submitted to EPA on January 24, 1980 concerning the January 19, 1980 release, it was determined that the agitator amperage indicator on D-400 reactor, the reactor on which the release occurred, was not functioning properly at the time of the release. A more detailed description of the January 19, 1980 release and the effect of the agitator amperage indicator not working properly follows.

All reactors were equipped with agitator amperage indicators at the time of the release. These amperage indicators show different amperages for different levels of liquid in the reactors. Although the differences in amperage cannot be used to accurately measure the level inside the reactor, it is a good indication of the presence or absence of material in the reactor. When a reactor contains material, amperage will be higher than when it is empty and it should return to approximately the same amperage after the reactor is empty again. However, the amperage indicator for reactor D-400 was not functioning correctly at the time of the release.

The reactor batch previous to the one on which the release occurred took a little longer than usual to dump. This was a sign to the panel operator that there could be a small amount of plugging in the dump lines, so he proceeded cautiously with the pre-charge procedures. Upon finishing reactor rinsing after dumping the slurry, the panel operator radioed to the outside operator and asked him to check the bullseye on the line to the sewer.

The bullseye is used to check flow from the reactor to determine if it is empty or if there is pluggage in the dump manifold. If the reactor is empty and there is no pluggage, there will be a large flow indicated at the bullseye when the reactor is rinsed and this flow will almost stop when the reactor drains empty. The outside operator said that "nothing was coming out of the reactor except the usual small amount of water from reactor flushes". Two reactor flushes normally add about 0.8 gallons per minute to the reactor. The outside operator saw an amount of water flowing through the bullseye and it looked to be like the normal reactor flush water which would indicate that the reactor was empty. If there had been more or less water flowing, the outside operator would have suspected pluggage problems. The amount of water flowing through the bullseye appeared normal. The panel operator then checked the agitator amperage indicator and it was showing a little less than 100 amps. Since this was the normal amperage for this reactor at the time, the panel opertor thought the reactor was empty.

The panel operator then proceeded to evacuate the reactor for the next charge. Another indicator of liquid in the reactor is usually inability to obtain a vacuum quickly. However, evacuation proceeded normally so there was no warning of a problem.

When the required vacuum was reached in the reactor, the outside operator, who reads the mercury manometer on the reactor, informed the panel operator to proceed with the charge. The first step in the charge sequence is to "break vacuum". This procedure opens up one vinyl chloride charge valve, allowing a small amount of vinyl chloride in the charge manifold to enter the reactor and pressurize the reactor to about 30 pounds per square inch gauge. The outside operator can then check the reactor for leaks and ensure rupture discs are intact. When the VCM charge valve was opened to break vacuum, both the outside operator and the chief lead operator, who was near the reactor, noticed unusual vibration. The chief lead operator is normally the most experienced person on the shift besides the shift supervisor. The chief lead operator suspected something was wrong and went to the control room to check the amperage indicator. The amperage indicator showed less than 100 amps. Because this was normal for this reactor and because of the other checks done previously, the chief lead operator thought everything was normal. The charge then proceeded as normal until the reactor charge was about 87% complete. The panel operator noticed that the pressure in the reactor was 110 psig and increasing rapidly. He immediately shut off the VCM and water charge pumps. Before the panel operator could put the reactor on the recovery system, the pressure in the reactor reached 182 psig as indicated by the reactor strip chart. At this time, there was a momentary release through the relief valve.

Description - continued

After the release, a new amperage meter was ordered and installed on reactor D-400 agitator. On January 22, 1980 all reactor batch sheets were modified to include a space for reactor agitator pre-charge amperage. The operator must record this amperage before each batch is charged. The problem with the D-400 amperage indicator is not fully understood. However, to reduce the possibility of obtaining misleading information from these indicators, reactor empty pre-charge amperages have been established. If the panel operator does not get a reading equal to the established empty amperage, the reactor is not to be charged until the problem is resolved.

QUESTION 2: FOR EACH DISCHARGE DESCRIBED IN RESPONSE TO III.A.1. A DETAILED DESCRIPTION OF ALL RELEVANT CORRECTIVE STEPS TAKEN BEFORE AND DURING EACH DISCHARGE TO PREVENT AND/OR MINIMIZE THE RELEASE OF VC TO THE ATMOSPHERE INCLUDING, BUT NOT LIMITED TO, SUCH STEPS AS REROUTING VCM EMISSION VENTS TO A COLLECTION VESSEL OR INCINERATOR.

Response:

The correspondence mentioned in Question 1 above contains information on relevant preventative steps taken before and after the January 20, 1980 and the January 13, 1983 releases to minimize the release of VC to the atmosphere. The following additional information is submitted.

PREVENTIVE MEASURES

I. Introduction

The causes of hydrostatically overpressuring a reactor have been studied and preventive measures have been taken. Both of the incidents which have resulted in releases due to hydrostatically overfilling a reactor and other causes or incidents which have not resulted in releases but were potential causes for a release have been analyzed. The following information shows proper preventive measures have been taken to reduce the possibility of hydrostatically overpressuring a reactor.

II. Possible Hydrostatic Overpressure Conditions

A. Reactor Not Completely Drained

If a reactor is not completely drained, a discharge can occur because of hydrostatically overpressuring the reactor during the charge of the next batch. This condition resulted in releases on January 19, 1980 and January 13, 1983. Listed below are the preventive measures taken to reduce the possibility of a similar occurrence.

1. Prior to January 19, 1980

Prior to January 19, 1980, the following procedures and instrumentation were available to reduce the possibility of a vinyl chloride release due to charging a reactor that was not completely drained.

a. The reactors were equipped with agitator amperage indicators. A no-load agitator amperage is an indication that the reactor is empty. The operators had been trained to check this parameter before charging. Although documentation of this specific training has not been located, the fact that checks were performed immediately prior to the January 19, 1980 release show that the operators had been taught and understood the significance of the no-load amperage

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b. The reactor sewer line was equipped with a bullseye for watching flow from the reactor to the sewer. A flow larger than the normal 0.8 gallons per minute flow would be an indication that the piping is partially plugged. A flow lower than normal or no flow would indicate that piping is likely plugged.

2. Between January 19, 1980 and January 13, 1983

a. Reactor emptying procedures were issued on January 21, 1980. These are attached as references C-4 and C-5, Appendix C. These procedures specify checking the reactor amperage before charge, posting no-load amperage for each reactor and rinsing through the reactor with flow that is not hindered by pluggage in the lines. Specific training on these procedures was given to the operators in January, 1980. Plant records showing that formal training was given are attached as references C-6 and C-7, Appendix C.

b. The reactor batch sheets were revised on January 22, 1980 to include the pre-charge agitator amperage. The no-load agitator amperage was established for each reactor. Operators were instructed not to charge reactors unless there is a no-load amperage showing for the reactor agitator.

c. The amperage indicator that read incorrect no-load amperage on reactor D-400 was replaced.

d. Reactor agitator amperage recorders were installed for all reactors. This recording of amperage helps operators see trends in the agitator amperage and spot possible problems.

e. Remote controlled cameras were installed to enable the panel operator to also inspect the bullseye to check that the reactor is empty according to the procedure.

f. Reactor emptying procedures were again reemphasized to vinyl employees on January 31, 1981. Plant records are attached as references C-8 and C-9, Appendix C. The importance of following procedures to make sure reactors are empty was stressed.

3. Since January 13, 1983

a. An interlock was added to the reactors that will not allow automatic reactor charge if the agitator amperage is above a certain setting or below a certain setting. This interlock reduces the possibility of charging the reactor with high amperage that would indicate liquid in the reactor or charging the reactor with the agitator off.

b. Robert E. (Bob) Morgan was the panel operator whose failure to follow established procedures caused the January 13, 1983 relief valve discharge. The specific errors that were made are as follows:

1) The low agitator amperage panel alarm was ignored during rinse of the reactor.

2) The proper procedure for checking for an empty reactor was not followed. According to the reactor emptying procedures issued January 21, 1980, the operator should have checked for water being able to flow through the reactor. The operator checked the manifold below the reactor for pluggage. This procedure did not check for pluggage in the reactor or in the sewer piping.

3) The panel operator recorded incorrect information on the reactor batch sheet. Instead of checking the amperage on the reactor before recording the amperage, the panel operator recorded what the pre-charge amperage should have been. A copy of the batch sheet and the amperage recording are attached as references C-10 and C-11, Appendix C. On the amperage strip chart, the reading on the right is the dumping of the previous batch. Note that the amperage starts at 54-59 amps (5.4 x 10, etc.) and drops as the batch is dumped to about 32 amps. Then the amperage drops to zero indicating that the agitator is off. When the agitator is again turned on, the reading was 53-58 amps. The panel operator turned on the agitator during evacuation before the charge started, but failed to look at the indicator or the recorder.

As a result of these errors, Bob Morgan, was given a two-day disciplinary suspension. Documentation of this suspension is attached as reference C-12, Appendix C.

It should also be noted that Bob Morgan had been trained in the proper emptying procedures. Bob Morgan signed his name on the training sheet for training given January 27, 1980 which is attached as reference C-7, Appendix C.

It should also be noted that recording of incorrect information on batch sheets receives appropriate attention. One such incident involving recording erroneous amperage is attached as reference C-13, Appendix C. A written warning to panel operator J. D. Sims was given in a letter dated July 13, 1981.

c. On January 25, 1983, the empty reactor checkout procedures were again reemphasized to all vinyl operators. A copy of this memo is attached as reference C-14, Appendix C.

B. <u>Catalyst Injection Water Overpressure</u>

Since the catalyst injection water could hydrostatically overfill a reactor, measures have been taken to reduce the possibility of a relief valve discharge for this reason. These measures are listed below:

1. Training has been given to operators stressing the importance of only adding the proper amount of catalyst water to the reactor. Operators have also been instructed they must be in the immediate area when catalyst flush water is being added to the reactor. This procedure cannot take place unattended. If for some reason the operator must leave the area, the flow of flush water must be stopped.

   Formal and documented training of this fact has been given on at least seven different occasions. Training records are attached as references C-15 through C-21. More training was no doubt given, but these are the only documented specific training sessions for which records are still available. However, in extensive training given to outside vinyl operators in 1982, this fact was stressed as noted on Question 2 of the attached operator quiz as referenced C-22, Appendix C.

   The note at the top of the July 8, 1982 training session shows the type of attention given by management to environmental programs. The note from the plant manager, John Friend, asks the vinyl superintendent, Pete Markey, if this training has already been given. The reply by Pete Markey is that the shift supervisors are going through the training again to emphasize its importance.

2. When the catalyst injection bombs are pressurized, a light is illuminated in the control room so that the panel operator can tell that there is water entering the reactor. If the catalyst injection bomb remains pressurized due to water flowing into the reactor for a specific length of time, an alarm will sound in the control room. The panel operator can then communicate with the vinyl outside operator to stop the flow of water into the reactor.

C. Excessive Flush Water Rates

There are two small constant water flushes that enter the reactor. The agitator lip seal flush water and the spray nozzle flush. These combined flows amount to about 0.8 gallons per minute. Because of the small volume of these streams and the large capacity of the reactor vapor space, it is unlikely that these flushes would overpressure a reactor. To reduce the possibility of these flushes causing problems, the following measures are taken:

1) If the reactor must contain liquid or slurry for any long period of time, the flow rates to these flushes are reduced to a minimum.

2) Under normal circumstances, the flush water is checked every batch to make sure they are at the proper settings. There is a flow meter available at each flush to facilitate monitoring.

D. Reactor Overcharge

If the reactor was overfilled due to excessive charge ingredients, a relief valve discharge could occur. In order to reduce the possibility of this occurrence, the following measures are taken:

1) Since the product quality is highly dependent on following a specific formula for each product, careful attention is given to the addition of material to the reactor. The addition of major volume ingredients is controlled by a programmable controller which starts and stops pumps and opens and closes valves. Dual flow meters exist for the water and the vinyl chloride monomer so that if one meter were to malfuntion, another meter would be available for use. These flow meters have readouts in the control room. During charge, the panel operator constantly monitors the progress of the charge since addition of the proper type and quantity of ingredients is critical to the product quality and to the prevention of overfilling.

2) There is an interlock which will not allow the charge of a larger reactor volume in a smaller reactor. The larger reactor formula cannot be entered in the charge mode for a smaller reactor.

3) There is also an interlock that limits the total charge quantity to each reactor. The programmable controller will prevent charge to a specific reactor if it exceeds a preset volume.