III. OPERATING PROCEDURES (CONTINUED)

D. Recovery

General Information

The recovery system is designed to remove unreacted vinyl chloride monomer from a reactor batch that has reached a stage of polymerization where product quality is satisfactory. The objective is to remove as much of the remaining VCM as is possible from the reactor within as short a time as the recovery system can remove the VCM. Government regulations require that less than 400 ppm VCM can be left in the resin (averaged over all batches dumped in 24 hours) and a sample must be taken when the batch is dumped to verify compliance with the regulation. The lead operator must start the recovery and monitor its progress from the control room. He must follow the given procedure closely to make sure that each batch is recovered to below the regulation limits. The reactor "A" operator will assist from the field and solve problems as they arise during recovery to keep the recovery system operating smoothly. It is essential that the "A" operator have a very thorough knowledge of the recovery equipment and how it works. This was described in detail in the General Process Description beginning on page XX of this manual. Refer to Figure 5 in the Appendix for a sketch of the recovery system as needed.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery

General Information (Continued)

The steam stripping parameters to be reached and followed are posted on the control panel. Generally, for each product a different temperature and hold time is specified. The reactor must reach the specified temperature and have a vacuum (below 0 psig) on it before the hold time can begin. Full cooling is put on the condenser at the specified temperature to keep from discoloring the resin. For 5385 in the old unit, 220°F and a vacuum must be reached. Then full cooling is put on the condenser and the reactor is held for 25 more minutes on recovery with steam continuing to be put into the reactor. These parametes vary with weather, recovery system operation, and production requirements.

Procedure

The normal recovery procedure will be given below, assuming that all systems work as they are supposed to. Abnormalities in recovery operations and troubleshooting will be given in the "Troubleshooting" section following the normal procedures.

1. The reactor is ready to be recovered when the "A" operator has finished killing the reactor and radios the lead operator that the reactor is killed. The following conditions must be met prior to starting recovery on a reactor:

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Procedure (Continued)

a. The reactor to be recovered must be killed.

NOTE: Recovery must not be started until the reactor is killed. This will prevent getting excessive amounts of initiated monomer into the recovery system which will cause polymer buildup in vessels and equipment.

b. The recovery system must not be in use on another reactor. If one reactor is recovering, the recovery on other reactors will have to wait until the recovery is ~~flushed~~ finished on the reactor that was recovering first.

c. There must be adequate room in the RVCM receiver that is set up to collect the monomer removed from the reactor. If the level in the RVCM receiver is high, contact the Shift Supervisor who may give word to charge some 50% RVCM charges to lower the levels in the receivers, or to return to the RVCM receiver not being used.

d. The recovery system must not be in use recovering a batch water stripper. The emission recovery system normally is used on the batch water strippers but if it is not working properly, the large reactor recovery system must be used.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Procedure (Continued)

Reactors must not be recovered while a batch water stripper is being recovered with the large system.

e. The steam stripping and recovery system must be operational with no maintenance work going on that will prohibit using the systems.

f. A water stripper must be available to collect recovery system water drains. If both strippers are almost full, one must be stripped and emptied prior to recovering a reactor.

g. The pressure on the water stripper collecting the liquid drains should be 10 psig or less.

h. The recovery system should be ready to start up from the field. The following items should be given particular attention:

(1) The level in the knockout tanks should be at about the midpoint of the sight glass. If the level is abnormally low or high, the recovery system cannot operate properly and the procedures given ~~on page XX~~ for troubleshooting must be followed to correct the level.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Procedure (Continued)

(2) The manual valves on the knockout tanks should be set up to have the recovery vapors enter the north knockout tank first, then the south knockout tank. For efficient recovery system operation, both knockout tanks must be in service and must be used.

(3) The knockout tank water flow should be routed through the recirculation cooler and cooling water flow should be set up on the cooler as needed. In winter operation, the recirculation cooler flow may need to be throttled down to prevent condensation of VCM in the knockout tanks.

(4) Seal flush flows on the vacuum pump and compressor seals should be ~~showing~~ about half of the flow meter and the pressures should be about 100 psig.

(5) The level in the seal water separators should be high. (The automatic drains are not operational at the present time). Low levels in the separators must be corrected prior to compressor startup. At least one separator and pump must be operational. ~~and~~ Both pumps ~~are preferred and~~ must be used for most efficient operation of the system. One pump will not supply enough water for both compressors to run at the same time.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Procedure (Continued)

(6) All recovery vacuum pumps and compressors must be operational for best results in recovering. If any of the machines are not operable, the lead operator should be notified and a tag put on the switch on the panel so that it will not be started up.

NOTE: Any vacuum pump or compressor that is not operating must be repaired and returned to on-stream operation as soon as possible, on a call-in or emergency work order maintenance basis. Both vacuum pumps and compressors are required or extensive downtime will be suffered waiting on recovery and/or residual VCM results will generally be higher than normal.

NOTE: If either vacuum pump, A or B, is inoperable, the corresponding compressor ~~will have to~~ MUST be shut off when the pressure switch diverts flow from the compressors to the vacuum pumps and the vacuum pumps start. The compressor can be used only until the point where vacuum pump is supposes to come on, then it must be shut down because it will lose suction and seal water flow when the valves are switched.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Procedure (Continued)

(7) At least one collect tank pump must be operating and set up to one of the RVCM receivers.

(8) The hydroquione system should be operational. This is checked once per shift by the chief operator.

(9) The knockout tank level pot flush should be operating.

2. The lead operator will record the time on the batch sheet and start the recovery system by turning on the equipment as follows:

a. Turn on both recirculation knockout pumps.

NOTE: These may be left running all the time in cold weather conditions to prevent freezeup. The recovery compressors or vacuum pumps do not have to be running to keep the recirculation pumps running.

b. Turn on both seal water pumps and then push the ~~run~~ RUN button on the switches for the compressors to be started. The compressor RUN run button opens the compressor discharge and seal water valves and will open the vacuum pump bypass valve on the suction of the compressor, allowing vapors to be pulled directly from the knockout tanks into the compressor suction. The "AUTO" button on the recovery compressor switch does not work.

III. OPERATING PROCEDURE (CONTINUED)

D. Recovery (Continued)

Procedure (Continued)

The seal water must be flowing for the compressor to work.

NOTE: Do not run the seal water pumps without running at least one compressor. The seal water pumps are dead-headed when the compressors are not running.

3. The lead operator will notify the "A" operator that he is starting recovery on the reactor. The "A" operator will proceed to the second deck of the recovery system to watch for foaming from the reactor when recovery on the reactor is started.

4. The lead operator will put the recovery automatic pressure control valve in manual and will close the valve. The setpoint should be at 30 psig.

NOTE: If the recovery system was already running on another reactor or the batch water strippers, this will be the first step to recovering a reactor following completion of the prior recovery or batch water stripping.

The automatic pressure control valve must be closed prior to opening the reactor recovery and condenser valves to prevent foaming and to keep from "slugging" the recovery system with high pressure.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Procedure (Continued)

5. The "A" operator will notify the lead operator via radio when he is positioned to watch recovery startup. The reactor recovery valves are not to be opened until the "A" operator notifies the lead to start the recovery, i.e. "You Can Start Recovery on D-300".

6. The lead operator will perform the following when the "A" operator notifies him that recovery can be studied on the reactor:

   a. Push the mode advance button on the reactor panel to put the reactor in the "RECOVERY" mode.

   b. Set the setpoint on the reactor temperature controller at 200°F.

   c. Lock out the cooling water automatic flow controller. This prevents cooling water leaking through and cooling off the the reactor during stripping.

   d. Open the reactor condenser valve.

   e. Open the reactor recovery valve.

7. The lead operator will put the recovery automatic pressure control valve in automatic and watch the pressure indicator as it rises.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Procedure (Continued)

The valve should slowly open until the setpoint is reached, and the controller should not let the pressure overshoot the setpoint. If the controller does not work properly, it should be repaired as soon as possible (contact the Shift Supervisor).

8. The "A" operator will listen for foaming at the knockout tanks and will watch the bullseye. If any foaming occurs, he will immediately notify the lead operator and steps must be taken until the foaming is stopped (see "Troubleshooting", page XX). The "A" operator will observe the recovery for a few minutes and then notify the lead operator via radio that the recovery is OK, for example "Recovery Looks Good on D-300".

NOTE: The "A" operator should take the opportunity to check the water levels, flows and flushes of the equipment while on the second recovery deck and make sure that all systems are operating properly. Troubleshooting and early detection of problems by the "A" operator are crucial to smooth recovery system operation and good reactor recoveries.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Procedure (Continued)

9. When the pressure starts decreasing on the reactor to the point where steam can be put on the reactor without rapidly increasing the pressure, the lead operator will open the reactor steam stripping valve. This should occur about 10 minutes after recovery has started, if the system is pulling efficiently. If steam is turned on and the pressure is caused to increase rapidly on the reactor, it will take longer to recover the batch. The steam should be turned on by the time the reactor pressure has dropped to 60 psig. The steam flow controller will control the rate of steam put into the reactor. It is normally set at 5 roots of flow which is 14,000 lbs/hr. Settings higher than this will cause excessive reactor vibration during recovery.

10. The lead operator will check the steam flow after opening the reactor steam stripping valve to make sure it holds at the setpoint.

11. At 170°F, the cooling water flow indicator should come up to 1-2 roots of flow and a small flow will stay on the condenser for the rest of the recovery.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Procedure (Continued)

12. As the reactor temperature approaches 200°F, the pressure should be low enough that the vacuum pumps will come on. The vacuum pumps for each compressor running will come on at 8 psig and the vacuum pump inlet, discharge, and seal water valve opens. The vacuum pump bypass valve on the compressor suction and the compressor seal water valve closes (seal ~~dis-~~ water is fed to the compressor through the vacuum pump discharge).

The lead operator will watch and make sure the steam does not heat the reactor above 200°F before the vacuum pumps come on. If the reactor temperature gets to 200°F before the vacuum pumps come on, the steam stripping valve may have to be closed. On the other hand, if the vacuum pump should come on prior to the reactor reaching 200°F, the recovery valve may need to be closed to allow the reactor to heat up.

13. When the reactor has reached 200°F and the vacuum pumps have come on, the lead will move the temperature controller set-point to 230°F. Do not move the temperature controller until both conditions are met.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Procedure (Continued)

14. The reactor will continue to heat up and the pressure will drop. The specified temperature and a vacuum must be reached. If the reactor will not heat up to the specified temperature, the lead operator may ahve (have) to shut the reactor recovery valve. More often, the temperature will rise but the vacuum pumps will not pull the pressure off of the reactor. In this case the lead will shut the steam stripping valve until the pressure drops below 0 psig.

NOTE: The lead operator must be careful not to leave the reactor at a high temperature for a very long period of time (more than 10-15 minutes). This will degrade product quality by discoloring the resin. If the vacuum pumps are not operating correctly, follow the procedures given in the Recovery Troubleshooting section of this manual.

15. When the specified temperature is reached and the pressure is below 0 psig, the lead operator will put full cooling on the reactor condenser by opening the emergency cooling water valve. He will then record the time and the temperature reached in the appropriate space on the batch sheet. The reactor is to be held for the specified hold time after the time is recorded.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Procedure (Continued)

16. The lead will monitor the reactor temperature and pressure throughout the hold time. If the reactor temperatue does not begin to fall when full cooling is put on the reactor, the steam must be shut off until the temperature starts to drop. This must be watched closely becuase often the temperature will continue rising even after full cooling is put on the condenser. When the temperature starts dropping, resume the steam flow. If the reactor should come back above 0 psig, a problem with the recovery system is usually indicated. ~~The~~ The problem must be solved as soon as possible and the reactor should be held at least 10 minutes beyond the normal hold time after a ~~good~~ vacuum is ~~reached~~ regained.

17. If another reactor must be vented during the vacuum hold time of the recovery, the following procedure must be followed:

    a. Close the recovery, condenser, steam stripping, and emergency cooling water valves on the reactor being recovered.

    b. Close the automatic recovery pressure control valve and vent the reactor that needs venting per the procedure starting on page XX in this manual.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Procedure (Continued)

c. When the reactor has vented, pull the recovery system header back to the pressure of the reactor being re-recovered.

d. Reopen the valves closed in (a) above.

e. Do not count the time another reactor was vented as part of the hold time on a recovering reactor.

18. Five minutes ~~beofre~~ before the hold time has expired, the lead operator will open the main dump valve to recovery any VCM out of the reactor manifold (except on D-700, where VCM does not tie into the manifold), If a spike of pressure is noticed when the manifold was opened, leaky VCM valves may be indicated. The reactor should be pulled back to the vacuum and held for 10 minutes extra after the normal hold time has expired.

19. Steam stripping is complete after holding the reactor for the specified time below a vacuum or after pulling to a ~~good~~ vacuum and holding for extra time if problems occurred. The reactor recovery should be stopped as follows:

a. Advance the reactor mode switch to "DUMP". This should close the reactor valves, and the lead will verify that all valves close.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Procedure (Continued)

b. Shut down the recovery compressors (if the system is not needed to recover something else) by pushing the "OFF" button that is next to the "RUN" button on the compressor switches.

c. Shut down the seal water and recirculation pumps by pushing the motor stop switches.

The reactor is now ready to be dumped to the slurry blend tanks.

Troubleshooting

Troubleshooting is very important concerning the recovery system. The "A" operator should keep a regular check on the equipment and solve any problems as soon as possible before they become major. He should inform the lead operator, chief lead, and supervisor of any major problems that are beyond his ability to repair. Good communication and prompt action is very important, and information about potential problems should be passed on to the next shift at shift change times. The safety of plant personnel is of primary concern, and banning any ~~personal~~ personnel hazards, the protection of the equipment is the next concern.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Troubleshooting (Continued)

The first indication of recovery system problems is usually that the recovery system "won't pull" or will not reduce the reactor pressure. This can be caused by one or more of several problems with the recovery system. The "A" operator should first check the valve line-ups and flows for the system and check the items as given for startup conditions under ~~the section Recovery Procedure, No. 1b~~ recovery procedures, Step 1h. He should respond to problems that he finds according to procedures given in this section. In any ~~one~~ case where the "A" operator cannot solve the problem after taking the recommended approaches, he should contact the ~~shift~~ chief operator or Shift Supervisor for assistance and/or further instructions.

NOTE: Pressure readings are very important to diagnosing recovery system problems. It is the "A" operator's responsibility to keep pressure gauges changed out and in good operating condition on all the equipment.

1. General Upset Conditions - The recovery sequence can be halted at any time during reactor recovery by isolating reactor using any or all of the following valves:

   a. Reactor condenser valve.

   b. Reactor recovery valve.

   c. Reactor steam stripping valve.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Troubleshooting (Continued)

The recovery system may also be shutdown and no personnel or equipment hazards result and a fairly long-term stable condition is obtained (water flushes may eventually fill up equipment and cause a hazard). This is the best option to take under any upset condition if the result of any other action is questionable.

2. Actuated Valve Malfunctions - The recovery system equipment will not operate and recovery cannot be accomplished if the actuated valves do not open and close properly and in sequence. For instance, a recovery compressor or vacuum pump will not start if the discharge valve does not open. When problems arise during recovery such that the system is not pulling correctly, every piece of equipment should be checked and the flo to and from it verified by checking the valve set-ups. Then the valve can be over-ridden, ~~or~~ opened, or closed per the procedures given in Section Q of this manual.

3. Foaming (Resin Carryover) - Resin carryover ([redacted]) into the recovery system during recovery is very serious and can shut the system down in a hurry. It will also foul the condenser tubes and cause extensive reactor maintenance downtime because the resin will "bake" onto the tubes during steam stripping. Some of the things that will cause foaming are listed below. These should be closely

III. OPERATING PROCEDURES (CONTINUED

D. Recovery (Continued)

Troubleshooting (Continued)

checked when a foaming problem is discovered.

a. Recovering too fast - This is why it is important to go to one recovery compressor operation and to close down on the pressure control valve when foaming is discovered.

b. Lip seal flush flow too high.

c. Sprayhead flush flow too high.

d. Lip seal flowmeter bypass open - ~~these~~ This should only be opened upon the supervisor's approval.

e. Reactor seal blown. - This can cause water or DOP to enter the reactor, causing it to fill up.

f. Reactor batch size too big.

g. Excessive venting during polymerization.

h. Bumping during polymerization.

i. Change meter malfunctions - This should be exhibited by the reactor quality results. If the reactor was mischarged, the quality will probably be bad. Reactor ~~calculations~~ calibrations or ~~receiver~~ VCM receiver calibrations may be taken to verify that the meters are correct.

j. Reactor not empty prior to charge.

The following steps should be taken when the "A" operator notices that a batch is foaming:

a. The "A" operator will immediately notify the lead operator that the batch is foaming.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Troubleshooting (Continued)

b. The "A" operator will check the position of the automatic recovery pressure control valve and make sure it is not more than half open. If it is more than half open, he will notify the lead operator and shift supervisor and the valve will need to be manually operated until it is repaired (a maintenance work order must be written).

c. Upon notification that the batch is foaming, the lead operator will shut down one compressor.

d. If this does not stop the foaming (check by radio with the "A" operator), the lead operator will put the automatic recovery pressure controller in manual and close down on the valve until foaming is stopped.

e. The lead operator will notify the shift supervisor of the problem and will note on the batch sheet that the ~~bath~~ batch foamed and what steps were taken to prevent it. The shift supervisor will note in this logbook that the batch foamed and give recovery details, also.

f. If closing down on the automatic recovery valve from the control panel does not stop the foaming, the lead operator will have the "A" operator partially close the manual valve going into the knockout tank, until foaming is stopped.

g. The "A" operator will flush the recovery knockout tanks

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Troubleshooting (Continued)

as needed to keep the pumps running and pumping and the tanks draining. The tank should be thoroughly flushed after foaming is detected and corrected. Add water to the tanks using the HPSW connection on the pump filter pack.

NOTE: When flushing water into the tank be careful not to overfill the tank. Monitor the tank closely. When foaming is a problem, the lead operator should leave the knockout tank pumps running all the time to prevent resin settling.

h. If none of the above steps stop the foaming, the shift supervisor will advise what steps to take. The reactor may have to be equalized with another reactor. For the reactor equalization procedure see Section II of this manual.

i. After the reactor is equalized, be sure to give the reactor condenser a short rinse prior to restarting recovery. This will flush resin off of the condenser tubes and prevent condenser fouling. The rinse should be only 15-30 seconds long to prevent re-filling the reactor. Reactor foaming must be corrected as soon as possible when ~~deleted~~ detected. Steps must be taken by the "A"

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Contineud)

Troubleshooting (Continued)

operator to identify the source of the foaming. This may include:

a. Coming back to the second ~~clock~~ deck of the recovery system frequently to check for foaming and to listen for foaming.

b. Watching and/or listening for foaming when the vacuum pumps come on.

c. Watching and/or listening for foaming when a reactor is vented.

4. Recovering a Reactor Killed Early - Special recovery procedures should be followed when a batch is killed early. When a batch is killed prematurely there is a much greater possibility that foaming will occur during recovery. This may require equalization into another reactor. Follow the troubleshooting steps given in Number 3 (above) for foaming problems. Since the reactor may have a higher than normal pressure when recovery is ~~stated~~ started on an early kill batch, some special precautions must be taken when starting the recovery systems as follows:

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Troubleshooting (Continued)

a. Only use one compressor when recovery is started on the "early killed" batch.

b. Follow normal recovery system and recovery start up procedures. Remind the "A" operator that the batch was killed early and that foaming will likely be a problem.

c. Close the recovery pressure control valve before recovery is started, per normal operating procedures.

d. After recovery is started and it the recovery lines out without foaming, start the other compressor. Have the "A" operator check for foaming when it is started.

e. Steam may need to be periodically added to the early killed batch if it cools off. The lead operator must be careful when adding steam adn should watch the reactor pressure closely while adding the steam. Most of the recovery should proceed without steam on until the reactor pressure drops to about 50 psig or below and stays ~~there~~ with the steam on.

f. Recovery the batch per normal operating procedures just as if ~~like~~ a full batch of resin was made. A residual sample on any PVC made must still be taken and the result will affect the daily residual average.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Troubleshooting (Continued)

g. If the lead operator needs to "get off" of recovering the early killed batch to use the recovery sytem elsewhere, the steps a.-d. above must again be followed prior to returning to recovering the early killed batch. This includes if another reactor is vented, recovered, or if the batch water stripper pressure is lowered using the big recovery system.

5. Knockout Tank High Level - The recovery system will not operate as efficiently if it has to pull the vapors through a large head of liquid in the knockout tanks. A high level should be automatically drained by the pumps to the Batch Water Stripper. THe level should normally be halfway in the sight glass. Reasons for the tanks not draining and giving a high level may include:

a. Pump drain lines plugged - Flush the lines with HPSW or, if necessary, have maintenance pull and clean the line.

b. High pressure on the Batch Water Stripper - This will especially affect knockout tank draining if the pressure on the knockout tank is very low, during the vacuum part of recovery. It may become necessary to stop recovery of the reactor long enough to pull the Batch Water Stripper pressure down so the pumps will drain the knockout tanks.

Knockout Tank

III. OPERATING PROCEURES (CONTINUED

D. Recovery (Contined)

Troubleshooting (Continued)

c. Pump suction line ~~on the pump itself being~~ plugged - try to flush the line and/or pump and have maintenance pull and clean these if necessary. This can be isolated as the problem if the pump will not pump either back to the tank or to the low pressure Batch Water Stripper.

d. Flush the knockout pot level controls on the side of the tank. These may be hung, keeping the drain valve from opening. The tank may need to be drained manually by opening the manual drain valve to the Batch Water Strippers, but the knockout tank pressure must be greater than stripper pressure for the level to drop.

6. Knockout Tank Low Level - A low level in the knockout tank will cause the pump to lose suction and there will be no cooling in the tank. This will heat up the recovery vacuum pumps and compressors to the point where they kick the breakers. Once the level is lost in the tank, it must be manually ~~respired~~ regained because there will be no cooling to condense anything into the tank. Water should be added to the tank to keep the level showing in the sight glass (~~and~~ preferably about halfway in the sight glass). Possible causes of low level in the tanks include:

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Troubleshooting

a. Automatic drian valve not closing on low level - Flush the level controls on the side of the tank. The level pot may be plugged or the floats may be hung.

b. Manual drains leaking through to the sewer or to the batch water stripper - This should be evidenced by VCM readings in the area or high pressure on the strippers. Have the leaking valve changed out or repaired as soon as possible.

c. Pump discharge or recirculation cooler pluggage - This will prevent water flow to the spray nozzles and condensation in the tank will cease. The level could be low due to evaporation of liquid from the tank due to high temperature. Have maintenance pull and clean the lines or bypass the recirculation cooler until it is cleaned and returned to service.

7. Knockout Tank High Temperature - This will cause problems as mentioned in item 6 (above). The causes could include:

a. Pump discharge or recirculation cooler pluggage - Follow steps given in 6c (above).

b. Not enough cooling water on the recirculation cooler - These valves are manually cut back at times to prevent VCM condensation in the tank.

c. Low level in the knockout tank - See item 6 (above).

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Troubleshooting (Continued)

d. Excessive overheating of a reactor batch - Temperature controllers and indicators may need checking.

During the high temperature part of recovery in the old unit, a high knockout tank temperature is normal because there is not enough heat removal capacity at the present time.

8. Liquid VCM in the Knockout Tanks - VCM condensing in the knockout tanks will cause slow recoveries because the compressors have to do extra work to "re-vaporize" the VCM. This condition is evidenced by "frosting" or "sweating" on the knockout tanks. Heat must be added to the tanks to expedite vaporization of the VCM. This usually must be done by hooking up a steam hose to the tank. This should be performed very carefully and must be monitored the entire time the steam hose is removed. The cooling water to the recirculation cooler should be partially closed to the point where the tanks will not get too hot but VCM will not condense in the tanks.

9. Knockout Tank Pumps Will Not Pump - This is a serious situation that will greatly hamper recovery system efficiency. The pump and/or suction and discharge lines should be given immediate attention to get the knockout tank pump back into proper operation. When the "A" operator is aware of this problem, he should contact the lead operator and the shift supervisor should be informed. The situation should also

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Troubleshooting (Continued)

be noted in the Supervisor's logbook and should be corrected on a high priority basis. The basic problem is usually reactor foaming which should be watched closely to solve the problem.

10. High Compressor Discharge Pressure - The machines are rated for a 80 psig maximum discharge. At 80 psig on the discharge the compressors will ~~not~~ recovery vapors from the reactor very ~~efficiently~~ slowly and may cause the vacuum pumps and/or compressors to kick the breakers because of high amperage. Common causes of hig compressor discharge pressure include:

a. High receiver pressure - Inerts should be vented from the receiver to keep the pressure at or below 80 psig on the compressor discharge.

b. Collect tank pumps not pumping - It may be necessary to switch pumps and/or discharge lines to get the VCM to flow to the receivers. Pluggage would be indicated by high pressure on the collectg tank or pumps and lower pressure in the receivers. It may also become necessary to switch receivers being pumped to.

c. Not enough cooling water on the condensers - Check the inlet and outlet valves. They should normally stay wide open.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Troubleshooting (Continued)

d. Lines plugged between condensers and collect tank - Pressures on each side of the plug will indicate this condition. The affected section of line can be carefully flushed with HPSW to try to break the plug. Do not exceed rupture disc pressures on the collect tank or recovered condensers. Maintenance may be required to clean the line ~~on~~ a temporary connection made with a flexible stainless steel hose.

e. Plugged condensers - This may be indicated by pressures or by the temperature of the VCM leaving the condensers (it should normally be cool). The condensers can be flushed carefully as indicated in d (above) but may have to be drilled out by maintenance.

11. High Amps on Vacuum Pumps/Compressors - Vacuum pump and compressor amperage can be monitored from the control panel and should normally run about 150 amps for the compressors ~~on~~ and 100-~~175~~ 125 amps for the vacuum pumps. Extended time at levels above these will cause the machines to kick the electrical breakers. Causes may included:

a. High compressor discharge pressure - (See item 10 above).

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Troubleshooting (Continued)

b. High vacuum pump discharge process - Indicates a problem with the compressors not pulling properly. Check pressures, temperatures, and seal water flows for the compressors.

c. Seal Water flows not correct - seal water flow should be 40 gpm. Move the setpoint to make sure the control vavle is working and check the seal water valves to make sure they are open or closed as they should be.

12. Compressors/Vacuum Pumps Kicking the Breaker - This may be caused by:

a. The machines pulling high amps for an extended period (2-5 minutes or longer) of time - See item 11 (above).

b. Malfunction of breakers or heaters.

c. Mechanical problems with the equipment causing high amps. ~~The~~ A machine should be thoroughly flushed to make sure it is not plugged with foam or resin before a mechanical work order is made out.

13. Seal Water Flow Abonrmal - This will cause the vacuum pumps and compressors to run inefficiently and may cause them to run hot or kick the breaker. Seal water flow should be 40 gpm.

a. Low seal water separator levels - If these are low, the flow will be low. HPSW can be added to make-up the level.

III. OPERATING PROCEURES (CONTINEUD)

D. Recovery (Continued)

Troubleshooting (Continued)

b. The flow control valve positions should also be checked to make sure the valves are open. The flow indicator will not always give the correct flow and may show 30 gpm when the valve is closed. The setpoint may have to be adjusted to get the flow control valve open.

c. Seal water pumps kicked out - reset the breaker and watch for problems causing the pump to kick out.

d. Seal water filter plugged - this would be indicated by pressure gauges around the filter. Change out the filter element if needed.

e. Seal water subcoolers not working - if the seal water gets too hot, it may try to vaporize and will cause flow problems. If the seal water temperature gets too low, VCM will condense and cause problems in the compressor as it tries to act like seal water. The temperature out of the subcoolers should be 100-150°F to keep the machines running efficiently.

f. Actuated valves not properly lined up - when the compressors are on, flow should go to each compressor. When the vacuum pumps come on, the valves to the compressors close and all the flow is fed through the vacuum pumps.

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Troubleshooting (Continued)

13. Seal Water Separator Low Level - This will cause the seal water flow to the recovery machines to be abnormal and the machines will not do their job. The tanks should be maintained at least half full. HPSW may be added to the tanks if the level is low. Causes for the low level may include:

a. Automatic drain valve stuck open - Flush the level controls to get valve to operate properly. Maintenance on the level controls may be required. These are disconnected in the old unit and the valves stay closed.

b. Manual or automatic drains leaking through to the sewer or batch water stripper - This should be evidenced by VCM readings in the drain area or high pressure on the strippers. Have maintenance repairs made as soon as possible.

c. Tubes leaking in subcoolers - The process pressure is ~~typically~~ normally greater than the cooling water pressure in the subcoolers. Water may be lost to the cooling water return header, causing a low separator level.

d. Leaking seal on a machine and no seal flush water - This would most likely give high VCM readings in the area and the water loss would probably be very slow.

14. Vacuum Pump or Compressor Seal Blows Out - This will be evidenced by large amounts of water leaking from the machine

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Troubleshooting (Continued)

seal area and from VCM readings in the area. The "A" operator will:

a. Have the lead operator immediately shut down the piece of equipment and notify the Shift Supervisor.

b. Secure proper respiratory protection at and an HNU to monitor readings. upwind while checking the readings Enter the area to isolate the equipment.

c. Isolate the piece of equipment and properly depressurize it with hoses or piping to a vacuum source.

15. No Seal Flush Flow - The seal flush flow will be checked regularly by the "A" operator. If the seal flush water will not flow to or from the seal he should check the piping and try to "slug" it to break the plug loose. If this is not successful he must notify the Shift Supervisor and an appropriate work order must be written if the flow cannot be regained. Seal flush flow is essential to long seal life and to keeping VCM readings in the area down.

16. No Steam Flow to Reactor - If there is no steam flow to the reactor being recovered according to the flow indicator, the following problems may be involved:

III. OPERATING PROCEDURES (CONTINUED)

D. Recovery (Continued)

Troubleshooting (Continued)

a. The instrument may have malfunctioned and steam is getting into the reactor. However, there may not be any control over the flow so this should be monitored by the "A" operator until the instrument is repaired. It may be necessary to bypass the controller manually and regulate the flow with the bypass valve.

b. The actuated steam valve on the reactor may not be open. Have the "A" operator override the valve and have it repaired if necessary.

c. The line may be plugged - Pressure is normally kept on the line that is higher than reactor pressure so that if a valve leaks, slurry will not get into the steam header. Check the stem bleed that pressurizes the header after having the line cleared.

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17. Winter Operation - In severe cold weather (below 32°F), it is best to keep the recovery system running all the time. This will keep the water in the system from freezing and will keep the system warm. The system can be put on the batch water strippers to recover them if not needed elsewhere, or can run on the feedback RVCM. This may necessitate running only one compressor and vacuum pump, because the feedback RVCM volume is not large enough for both recovery machines. ~~but~~ The ~~the~~ seal water pumps and knockout tank pumps can remain running.

18. Pressure Spike When Manifold was Opened - This may indicate a leaking VCM valve on the manifold. Notify the Shift Supervisor and have the "A" operator check the valve for leakage on the next

during evacuation and have the "A" operator check the values for leakage, one at a time. Frosting on the outside of the value ~~indicates that~~ and just downstream of the value indicates valve leakage. ~~Have a work order~~ Notify the Shift Supervisor of the leakage and he will have a work order written on the value.