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5605-071.SOP
OPERATING THE VCM-II CRACKING FURNACES

The purpose of this SOP is to offer guidelines for the safe operation of the EDC furnace. These are prompted by specific problems which have been encountered within the recent months, but are applicable to normal operating conditions as well.

The integrity of the last three tubes of No.2 pass No.2 furnace is the main source of concern (since their replacement in 7/90), although all of the VCM II radiant tubes are approaching the useful life limit. PPG's primary concern is the safety and health of our employees. The furnaces must be closely monitored and safely operated. Should a failure occur, your response as an operator is very important and determines the environmental and safety impact as well as the amount of loss to PPG. Your job is to minimize the effect of any leak by closely monitoring furnace operation and by responding properly if a leak occurs.

The SOP is divided into four situations:

- A. Normal operation and routine rounds
- B. Response to detection of a small leak
- C. Response to a large leak
- D. Response to a major tube rupture.

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A. NORMAL OPERATION AND ROUTINE ROUNDS.

1. LEAD OPERATOR AND VINYL OPERATOR INSPECT FURNACE TUBES THROUGH ALL OF THE PORTHOLES TWICE PER SHIFT.

- a. Due to the possibility of the furnace firebox being pressurized during a leak, it is important to not open the portholes with your face directly behind them. A blow-out could cause facial burns. Stand to one side of the porthole and confirm that the furnace draft is OK before you place your face in front of the porthole.
- b. Look for dark or discolored areas on the tubes or any evidence of a flame coming from the tubes. The inspection should include as many of the tubes as can be seen from the porthole. You should try to see as much of the tube-bank as possible (height-wise), because some of the heavy carburization spots are 13' up from the floor.

WATCH THE FURNACE STACK FOR EVIDENCES OF AN HCL TAIL.

- a. All operators should check the furnace stack on every trip outside.

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- b. Under normal conditions the furnace stack gases will have no discoloration. An HCl tail will appear to be a slightly light blue or white haze coming from the stack. This haze can be seen best with a dark background such as clouds or at night.
- 3. REPORT ANY ABNORMAL OR UNSAFE CONDITION IMMEDIATELY.
 - a. Any abnormal situation could be a problem. These should be reported as soon as possible to the lead operator and other supervision.
- 4. SHUT DOWN THE FURNACE IF AN UNSAFE CONDITION EXISTS.
 - a. If, in your opinion, any situation exists that will present an unreasonable safety or environmental hazard, you should shut down the furnace.

B. RESPONSE TO DETECTION OF A SMALL LEAK.

- 1. REPORT ANY SUSPECTED LEAKS TO SUPERVISION IMMEDIATELY.
 - a. If a small discolored area (restricted to a small area of no more than 1-2 inches in diameter) on a tube is discovered, further inspection and the shut-down decision should be made by supervision. This statement in no way restricts the operator's authority to decide to shut down the unit if deemed prudent; this is a guideline to allow for further evaluation of the situation if no obvious immediate dangers exist.
 - b. Small leaks are the most likely problems that we will run into in the future (based on experience at TE-II). Such leaks must be watched closely, and response made to prevent damage to adjacent tubes or to the furnace walls.
 - c. If the leaks are so small that you cannot be certain if they are actually leaks or not, then shutting down several of the burners in the area of the suspected leak will help to darken the background and give a better view of the suspected EDC/VCM flame.
 - d. Any leaks of EDC or VCM will be burned to HCl, water, and CO₂. Small leaks will probably not create a visible HCl emission from the furnace stack. The concentration of HCl in the stack gases is too low.
- 2. SHUT DOWN THE FURNACE IF AN UNSAFE CONDITION EXISTS.
 - a. If, in your opinion, any situation exists that will present an unreasonable safety or environmental hazard, then you should shut down the furnace and parts of the unit as required to insure safety.

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C. RESPONSE TO DETECTION OF A LARGE LEAK

1. IF A LARGE LEAK IS FOUND, SHUT DOWN THE FURNACE IMMEDIATELY.
 - a. Another possibility exists in which a large leak (in the range of 5-25 gpm) occurs within the furnace but no reverse flow from the Quench Tower takes place. From inside the control room, this will look like an increase in conversion. The outlet temperature will go up as feeds are lost from the leaking pass. Since the loss of furnace feed takes place downstream of the flow orifices the flow control valves will not compensate for this change. Also the Low Flow/High TMT shut down system may "arm" but will not shut down the furnace. Another indication of this situation may be the drop in the stack O2 analysis and a black stack with an HCl tail.
2. SHUT OFF THE FURNACE FEEDS AND BLOCK THE SUPERVALVES TO ELIMINATE THE SOURCES OF FUEL.
3. TRIP THE SNUFFING STEAM INTO THE FURNACE.
4. NOTIFY SUPERVISION.

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D. RESPONSE TO A MAJOR TUBE RUPTURE

1. IF A MAJOR TUBE RUPTURE TAKES PLACE, SHUT DOWN THE FURNACES IMMEDIATELY.
 - a. Based on internal inspections (which have included x-rays, ultrasonic tube metal thickness readings, and visual inspections) and hydro-testing of the tubes at 1000 psig, this is a highly unlikely and "worst case" situation. This could be the result of a massive internal tube rupture in which the tube would split in half. The furnace firebox will be fed from two directions: furnace feed going into the furnace, and reverse flow from the Quench Tower which will back up into the furnace firebox. In effect we could have two six inch lines with high pressure both feeding the inside of the furnace with flammable organics. It is difficult to predict the size or intensity of such an occurrence. Calculations show that the furnace box will be subjected to an internal pressure in the range of 35 psig even with the explosion doors all fully opened. Structural damage and a large fire will be almost certain in this situation.
- Tripping the furnace will relieve some of the internal pressure in the furnace firebox by removing the gas fuel from the fire. The furnace will quickly be filled with tons of flammable organics and the fire will be snuffed out or displaced outside

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the furnace. In this situation, the introduction of snuffing steam will probably not do any good and could in fact put more pressure into the furnace.

- c. A massive tube failure will undoubtedly result in a black cloud coming from the stack. Inside indications on the control board will be an instantaneous spike in the furnace feed flow on the pass that ruptures and probably a loss in flow on the other pass. The temperatures inside the furnace firebox will not necessarily go up since the furnace is now fuel rich. The furnace outlet temperature on the ruptured pass will probably go down as the much cooler Quench Tower material backs into the furnace. Low flow on the other pass may result in a temperature increase on it. The furnace Low Flow/High TMT shut down system will probably trip the furnace as the unruptured pass sees low flow. Do not wait or count on this happening; manually trip the furnace.

2. SOUND THE UNIT SIREN.

3. SOUND THE PLANT B EVACUATION SIREN.

4. TRIP THE DELUGE VALVES AND HYDROSHIELD IN THE FURNACE AREA.

5. NOTIFY LEAD OPERATOR AND SUPERVISION OF THE PROBLEM.

6. NOTIFY THE EMERGENCY SQUAD (CALL 2700).

7. KILL THE SOURCES OF FLAMMABLE FEEDS TO THE FURNACE.

- a. Close the furnace feed flow control valves. As soon as possible, have someone shut down the furnace feed pumps and double block the feed lines.
- b. Block the natural gas to the unit at the valve south of the furnace area (will lose gas to LP-EDC and incinerator).
- c. Block the Absorber pressure control valve to prevent a back flow from the HCl system.
- d. Attempt to isolate the Quench Liquor Drum from the Quench Tower by closing the manual valves on it.
- e. Shut the reflux flow control valve to the Quench Tower. Manually block it and kill the pump as time permits.
- f. Block the seal flush going to the furnace area.
- g. Close the automatic Dopp kettle dump valves.
- h. Block off the quench dopp return if lined up to the Quench Tower.

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