

CONDITIONS AND PROCEDURES IN EMERGENCIES
INVOLVING UTILITY AND FEED LOSSES,
FIRE OR GAS BREAKS

INTRODUCTION

Unusual or unexpected operating problems in the Per-Tri plant have developed in the past and, of course, will occur in the future. Each emergency situation such as a loss of one of the utilities or reactor feeds allows us a better knowledge of operations through experience. To summarize some of the previous problems, and consider other possible emergencies, this report is being compiled. Prior thought to loss of feeds or utilities, or other adverse conditions may avoid major damages or a disaster within the plant. Additions and corrections to the following discussions by any of the Per-Tri personnel are encouraged. This information should be kept up to date and could be especially beneficial for personnel newly assigned to the Per-Tri plant.

ABSTRACT

Conditions and operating procedures are discussed in this report for the following:

1. Loss of O₂.
2. Loss of N₂.
3. Loss of both O₂ and N₂.
4. Loss of instrument air.
5. Loss of Cl₂.
6. Power loss to the Per-Tri plant.
7. Total power loss.
8. Panel board power loss.
9. Loss of 400 lb. steam.
10. Loss of well water.
11. Gas break.
12. Fire.
13. Gas break in other area.

DISCUSSION

1. O₂ Loss

An oxygen loss can cause two problems. One, if no flow passes through the ring, catalyst will enter the ring and plug it. The result would be maldistributed feeds and poor yields and possible tube wall damage.

Secondly, if an oxygen loss occurs, and the oxygen header is allowed to bleed down to less than 20 psig, mixed feed would start blowing into the ring and into the oxygen header. The carbon content of the

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mixed feed combined with the pure oxygen forms an explosive mixture and a spontaneous explosion would occur.

Emergency Procedures:

Control Room

- a) Set 6500 SCFH N₂ on N₂ to O₂ ring loading station.
- b) If O₂ flow goes to zero close each O₂ auto FCV and close O₂ PCV.
- c) Contact Big-3 and find out duration of loss.
- d) Clear reactor area of maint. and construction people.
- e) Start all reactors to atmospheric pressure.

Field

- a) Open N₂ block valves to ring.
- b) Open N₂ block valves to mixed feed header.
- c) Block off O₂ automatic valves.

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If the oxygen loss is going to be just for a short time, i.e., 15 minutes, leave mixed feeds going to reactor and when oxygen is re-stored, start feeding the reactors again. Put O₂ to reactors one at a time so you can watch each tube's performance.

If the oxygen loss is permanent, or you feel that during the shutdown EDC and Cl₂ backed up in the header, proceed to shut down all reactors. In this case ask Big-Three to supply all the N₂ that is called for.

2. N₂ Loss

Nitrogen (N₂) entering the Per-Tri plant divides into two streams at the rack north of the control building. The smallest (2") of the two lines is for field instrumentation only, while the large (4") line provides N₂ for reactor fluidization, pads for tanks, condensers, stills, etc., utility drops, and on the Dowtherm pressure system.

A loss of nitrogen pressure could wreck the plant if corrective measures are not taken. The procedure to follow is:

Control Room

- a) Do not lower reactor rates. You have no N₂ to pad the Dowtherm.

Field

- a) Open the 4" air header into the 2" N₂ header and block the 2" N₂ header from the 4"

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2. N₂ Loss (Continued)

Control Room

If a reactor must be shut down during a N₂ loss, do not cut the oxygen off the ring. Leave 4000 SCFH of O₂ to the ring and before you switch from mixed feed to blower air (no N₂) purge the mixed feed header well with Cl₂. Then add blower air. After 1" air block valves are open, reduce O₂ flow to ring until normal fluidization pressure (6 psig) is reached. Do not worry about bed temperature during shutdown, it should cool off due to low Dowtherm pressure.

Field

- N₂ header. A special valve arrangement is provided to open one valve and shut another. The system is double valved. The block valves will also have to be opened.
- b) Cut N₂ off the product drier that is on reactivation.
 - c) Reduce all unnecessary air users to zero to hold air pressure.
 - d) If the Joy compressors do not load and the air pressure falls below 40 psig have EDC (or yourself) put on Joy compressors until the air pressure is 40 to 60 psig.
 - e) If a reactor has to be shut down open 1" air block valves to O₂ ring.
 - f. Block off N₂ line to the Dowtherm pressure system where the N₂ booster compressor had been.

3. Loss of N₂ and O₂

This would be a mess and only proper planning on your part will prevent a disaster.

On loss of either N₂ and/or O₂ you will have a minute or two before you have to make any drastic decisions. The first logical thing that should be done is to contact Big-Three as soon as a low pressure alarm sounds and find out the severity of the situation.

If the N₂ and O₂ loss will only be for a short while, get air into the O₂ rings and get the reactor rates lowered. The bed temperature will fall as the Dowtherm pressure cannot be increased and because of the loss of oxygen.

3. Loss of N₂ and O₂ (Continued)

Emergency procedure would be:

Board

- a) Close O₂ valves.
- b) Close air to reactors, air will be needed for oxygen ring fluidization.
- c) Lower reactor rates to atmospheric rates.

Field

- a) Open 1" air valves to oxygen ring.
- b) Switch air into nitrogen header for instruments.
- c) Isolate N₂ to Dowtherm pad system.
- d) Block oxygen at FCV's.
- e) Check for proper fluidization on oxygen rings.
- f) Cut N₂ off product driers.

If oxygen pressure is brought back up and the reactors are not too cold, i.e., below 520°F, start adding oxygen to the reactors.

If the N₂ and O₂ loss will be permanent, follow the above steps for temporary loss but proceed to shut down the reactors and put them on air fluidization. Purge the reactors with chlorine before adding blower air.

It should be pointed out that loss of N₂ and O₂ is remote. Big-Three has two back-up systems to supply us in case their plant equipment fails.

4. Loss of Instrument Air

Instrument air is used for control room instruments and air feed to reactors. If this air source is lost, block off the air to each reactor and open the N₂ to air header valve behind the condenser panel board and close the normal air valve behind the reactor control board. Open all downstairs doors in the control room as N₂ is being bled from every instrument and would soon replace the air in the building.

Board

- a) Put N₂ into air header for instruments.
- b) Open control room door.
- c) Close air FCV to reactor.
- d) Adjust reactor feeds to compensate for oxygen loss due to air shut off.

Field

Block air to reactors.

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5. Loss of Cl₂

Loss of Cl₂ will be our most frequent emergency.

The catalyst in an operating reactor is a large chlorine sink and if the rates are adjusted properly, a reactor can operate safely for at least 15 minutes without chlorine feed. If chlorine cannot be restored in 15 minutes, the reactors should be shut down.

Emergency procedure:

Board

- a) If Cl₂ flow goes to zero, close Cl₂ FCV to reactors.
- b) Cut oxygen by one-half.
- c) Cut reactor pressure by one-half.
- d) Call liquefaction and find out what happened and when Cl₂ pressure will be restored. (Assumes liquid loss.)
- e. Stand by to shut down reactors if pressure cannot be brought up in 15 minutes.
- f. If pressure starts up, adjust main PCV on Cl₂ to prevent any sudden surge in Cl₂ pressure.

Field

- a) Make sure liquid is not passing through the vaporizer unvaporized. This would cause low Cl₂ pressures.
- b) Open N₂ block valves to O₂ on each reactor.
- c) Stand by to shut down reactors.
- d) Make any non-operational people leave area.

6. Power Loss (Air not Affected)

A power loss can do more damage to the equipment in the plant than any other utility or feed loss.

If normal power is lost, the following will happen:

- 1. The emergency power breaker will come on providing emergency lighting and instrument board power.
- 2. The holding coils will drop out and all motors will shut down.

Rapid action and quick decisions on your part will be required to minimize plant damage and maximize personnel safety.

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6. Power Loss (Continued)

The most probable thing that would occur would be a short power interruption. Here we would lose 440 v. power for a few seconds and get it back. All motors would quit during a power interruption and all would have to be restarted by pushing the "On" button on each motor. No need to reset the breaker.

The most important pumps to get going are the well water booster pump, the cooling tower pumps and the condensate feed pumps. If you cannot get these pumps going within one or two minutes after a power failure, cut all feeds out of the reactor and allow it to defluidize. Do not add N₂ or air for fluidization. The reason behind this is we would rather rebuild the reactor than break the primary condenser. Reworking a reactor would take about five days, getting a new primary condenser would take over six months.

Emergency action for a short power interruption:

Board

- a) Push flush water valve and open valve 100%.
- b) Cut O₂ by one-half, cut reactor pressure one-half.
- c) Reduce steam to all stills by one-half of original flow.
- d) Go to cooling tower and help get cooling tower pumps running.
- e) After cooling tower and all other pumps are running, try to keep stills from dumping.
- f) Line reactors out at one-half original pressure.

Field

- a) On the way to the cooling tower push "On" button on condensate feed pump and well water booster pump.
- b) Get cooling tower pumps going (at least two pumps).
- c) Get cooling tower fans running.
- d) Restart all pumps in plant.
- e) Restart Carrier.

If the power failure lasts over two minutes, take the following action:

Board

- a) Sound siren - a lot of gas is going to be let loose.
- b) Cut all feeds out of reactor and open reactor PCV wide open.
- c) Trip fire water deluge valve on reactor end of plant. This

Field

- a) Clear out all non-operational people.
- b) Cut steam tracing off liquid Cl₂ line.
- c) As soon as power is restored, get the well water booster pump and condensate feed pump running.

6. Power Loss (Continued)

Board

- may cool off the re-actors and prevent condenser damage and also prevent broken rupture disk.
- d) Cut all steam off stills.

Field

- d) Open N₂ block valves for reactor fluidization. Open Centrifix blow-down valves and catalyst charge valves.

If power is lost and it affects the whole Organics area, the air compressors are lost. Switch N₂ into the air header behind the control board and follow the above mentioned steps. The only extra thing to remember is the EDC feed pumps will have to be restarted.

7. Total Power Loss

(Includes emergency lighting, board power, air compressor, EDC feed pumps, Cl₂ feed pump, and all Per/Tri equipment.)

Board

- a) Put N₂ into air header and open control room doors.
- b) Same as for above mentioned power failure.

Field

- a) Close 400 → 250 # steam reducing station.
- b) Block off Cl₂ vaporizer to prevent back flow into Cl₂ line.
- c) Same as for above mentioned power failure.

8. Panel Board Power Failure

Board

- a) Only stills will be affected and they will be hit hard. All valves fail to open.
- b) Leave board and start adjusting block valves in field.

Field

- a) Partially close all feed valves, reflux valves and steam valves.
- b) Adjust steam valves according to reboiler pressure.
- c) Adjust bottoms valves by reboiler level.

9. Loss of 400# Steam

Board

- a) Shut down all stills except DH still.
- b) Continue to operate reactors normally.

Field

- a) Shut down all stills except DH still.
- b) Close 400 → 250# steam station.
- c) Open steam bleed off points to keep 125# header below 140#.

10. Well Water Loss

The main concern here is cooling tower make-up water (100 gal/min.). The Carrier would also shut down due to high condenser pressure.

Board

None

Field

- a) Put fire water in tower to maintain basin level.
- b) Cut off acid to tower and add extra chromate.

11. Major Gas Break

Sound the siren and if necessary trip the Area "B" evacuation alarm (we will get an evacuation alarm switch).

Exit the control room from the door away from the break. If the gas gets to the South end of the control building and the blower starts pulling gas into the building, shutdown the blower. The switch is located on the wall behind the North end of the reactor board. The carbon filter will not remove enough gas in case of a major break. If the blower is shut off, open the air valves behind the control board and let air escape into the room. This would tend to keep a slight pressure on the building.

If the gas break is Cl₂ and you cannot get to the liquid Cl₂ valve, close the valve on the main rack. The rack valve has a chain operator so there will be no need to crawl up into the rack.

12. Fire

Trip both fire water systems in the reactor area. Valve off lines leading to fire area. Call for assistance by dialing 216. If the fire is uncontrollable; cut all feeds off to reactors, put Dowtherm at atmospheric pressure and evacuate the area. Close 400 → 250# steam control station and block off oxygen pressure control station on your way out of the plant.

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13. Gas Break in Other Area

If EDC, VC or EC has a major gas break and the fumes are drifting towards the Per/Tri unit, all gasoline driven equipment, welding equipment, etc., should be shut down.

If the Dowtherm furnace is running it should be shut down and steam injected into the heater to cool the bricks.

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