

Preventative Maintenance and Malfunction Abatement Plan

The purpose of this plan is to describe preventative maintenance activities of equipment at the Frederic 15 Gas Sweetening Plant. If a malfunction occurs, this plan also describes actions to be taken to maximize safety, minimize environmental impacts, and to ensure the facility operations do not lead to a violation of permit conditions. A spare parts list is included.

In this document, the term "shut-in the facility" means to automatically close the inlet valve to the sweetening plant thereby shutting-off the flow of gas into the sweetening plant from the pipeline.

1. H2S Detection System

1. Maintenance Procedures
 - a. Calibrate H2S sensors
 - b. Walk through facility
 - c. Patrol ground in vehicle
2. Maintenance Schedules
 - a. Quarterly
 - b. Daily
 - c. Daily
3. Maintenance Record Method
 - a. Check list
 - b. Check list
 - c. Check list

Spare parts available for repairs:

1. Calibration gas

A malfunction of the H2S detection system means that either the system

1. inadvertently shuts in the facility when there has been no release of hydrogen sulfide, or
2. fails to shut in the facility when there has been a release of hydrogen sulfide in the buildings.

If the H2S detection system malfunctions, then all inflow streams to the facility shall be shut off immediately. Operation of the facility may be resumed only after successful corrective measures have been applied, and the H2S system is once again operating properly.

2. Gasket or seal (including flange gaskets, pump seals, valve stem seals)

1. Maintenance Procedures

- a. Walk through plant
 - b. Clean or replace faulty seals
2. Maintenance Schedules
 - a. Daily
 - b. As needed
 3. Maintenance Record Method
 - a. Check list
 - b. Check list

Spare parts available for repairs:

1. Misc. 2 inch through 4 inch ANSI 150 and ANSI 600 flange gaskets
2. Valve stem packing material
3. Pump seals
4. Misc. ¼ inch through ½ inch size valves

Malfunction of gasket or seal means gas is leaking from the system.

A malfunction of a gasket or seal that results in sour gas leaking to the atmosphere requires immediate attention as described below:

1. The leaking device shall be immediately isolated by closing the appropriate valves and depressurizing the appropriate piping section.
2. If a pump seal is leaking, switch operation over to the spare pump while the faulty seal is replaced.
3. If a flange gasket or valve packing is leaking, repair or replace the defective part. Depending upon the location of the leak, it may be necessary to shut-in the plant.

3. Pipe or vessel

1. Maintenance/Inspection Procedures
 - a. Examine external surface of all pipes and vessels
 - b. Replace any steel pipe that is badly pitted
 - c. Clean, prime, and paint any mildly corroded areas of pipe
 - d. Perform cathodic protection survey of all underground flowline from wells to facility
 - e. Add sacrificial anodes and isolating insulators to correct any deficiencies in cathode protection system
 - f. Conduct a thickness survey of above ground piping and vessels
 - g. Replace significantly corroded steel
 - h. Examine any steel removed from service for signs of corrosion
2. Maintenance Schedules
 - a. Annually
 - b. As needed

- c. As needed
- d. Annually
- e. As needed
- f. Every three years
- g. As needed
- h. Ongoing

3. Maintenance Record Method

- a. Checklist
- b. Checklist
- c. Checklist
- d. Checklist
- e. Checklist
- f. Checklist
- g. Checklist
- h. Checklist

Spare parts available for repairs:

- 1. Inventory of small diameter pipe and pipe nipples

Malfunction of pipe or vessel means a pipe or vessel is leaking, as determined by sensors, or by sense of smell, sight or hearing.

If a pipe or vessel malfunctions, then that particular pipe or vessel shall be isolated by closing the appropriate valves, depressurized, and replaced or repaired promptly. Depending upon the location of the leak, it may be necessary to shut-in the facility while the repair is being made. The shut-in of the facility shall commence immediately if the malfunction results in an H2S leak to atmosphere.

4. Pilot flame at incinerator

- 1. Maintenance Procedures
 - a. Inspect incinerator pilot
 - b. Clean or replace incinerator pilot
 - c. Adjust pilot wind shields as applicable

- 2. Maintenance Schedules
 - a. Quarterly
 - b. As necessary
 - c. As necessary

- 2. Maintenance Record Method
 - a. Check list
 - b. Check list

c. Check list

Spare parts available for repairs:

1. Pilot igniter

Malfunction of pilot flame at incinerator means the flame fails to light or remain lit.

If the pilot flame at incinerator malfunctions, then shut-in of all wells feeding the facility shall commence automatically within one second. The flow of gas from the wells feeding the facility shall not be restarted unless the malfunction is corrected.

5. Back pressure on vent system

1. Maintenance/Inspection Procedures
 - a. check pressure on the vent system gauge
 - b. clean if pressure is higher than 1 psig
2. Maintenance/Inspection Schedules
 - a. Daily
 - b. As needed
3. Maintenance/Inspection Record Method
 - a. Check list
 - b. Check list

Spare parts available for repairs:

1. Spare pressure gauge

Malfunction of back pressure on vent system means a plugged or backed-up vent system. The gas dehydrator reboiler pressure would increase in the event of a plugged vent line. This would indicate a back up in the system.

If a vent system malfunction is observed, then the facility shall be shut-in and the vent line cleaned and/or repaired as necessary.

6. Release

1. Maintenance Procedures
 - a. Do not deliberately blow down or otherwise release sour gas to the atmosphere without flaring or other equivalent control.
2. Maintenance Schedules
 - a. On going
3. Maintenance Record Method

- a. Check list

7. H2S detection monitoring system

1. Maintenance/Inspection Procedures
 - a. Calibrate H2S sensor to signal an audible and visual alarm if the H2S concentration in the atmosphere reaches 10 PPM, and trigger a shut-in of the facility if the concentration reaches 50 PPM
 - b. Test controller for proper set points and proper operation of the alarm/shut down feature
2. Maintenance/Inspection Schedules
 - a. Inspection
 - b. Every four months (Feb, June, Oct)
 - c. Every four months (Feb, June, Oct)
3. Maintenance Record Method
 - a. Check list
 - b. Check list

Spare parts available for repairs:

1. One bottle of calibration gas

Malfunction of H2S detection system means the system fails to accurately read H2S in the atmosphere, and fails to trigger a shut-in of the facility if the concentration of H2S reaches 50PPM in the plant.

If the H2S detection system malfunctions, to the shut-in of the facility shall commence immediately. Restarting the facility may be resumed only after successful corrective measures have been applied, and the H2S detection system is once again operating properly.

8. Flare pilot flame failure sensor

1. Maintenance/Inspection Procedures
 - a. Check for proper operation of thermocouple (thermocouple measures the temperature at a point near the pilot)
 - b. Check alarm/shutdown function of the controller
 - c. Re-calibrate alarm/shut down function of the controller
2. Maintenance/Inspection Schedules
 - a. Quarterly
 - b. Quarterly
 - c. As required
3. Maintenance/Inspection Record Method

- a. Check list
- b. Check list
- c. Check list

Spare parts available for repairs:

1. Spare thermo couple

Malfunction of flare pilot flame sensor means the thermocouple fails to measure the temperature at a point near the pilot. Odors may be detected during daily walk through.

If the flare pilot flame sensor malfunctions or detects a flare pilot outage, then an alarm and call-out system will activate. Shut-in of all wells feeding the facility shall commence automatically if the sensor is not repaired and/or the pilot flame is not re-established within 60 minutes.

9. Incinerator temperature

1. Maintenance/Inspection Procedures
 - a. Inspect thermocouple to assure continuous temperature monitoring and recording. A thermocouple is used to measure temperature and is connected electrically to a controller/recorder. The controller will alarm if the temperature falls to 1400 degrees Fahrenheit (F) and trigger a shutdown if temperature falls to 1300 degrees F or stays below 1400 degrees F for 15 minutes.
 - b. Test controller for proper alarm/shutdown function
 - c. Recalibrate controller
2. Maintenance/Inspection Schedules
 - a. Quarterly
 - b. Quarterly
 - c. As necessary
3. Maintenance/Inspection Record Method
 - a. Check list
 - b. Check list
 - c. Check list

Spare parts available for repairs:

1. One thermocouple
2. One box of recording charts

Malfunction means: 1. the thermocouple fails to measure the temperature of the incinerator; 2. the electronic recording system fails to record temperature.

If the thermocouple monitoring system malfunctions then the facility shall be shut-in immediately. If the recording system malfunctions then the recording system will be repaired within 8 hours or the plant will be shut-in.

10. Incinerator exhaust oxygen content

1. Maintenance/Inspection Procedures

- a. Check oxygen sensor for proper operation. Proper operation consists of the oxygen sensor continuously sending a signal to a controller that displays and records the oxygen concentration. The controller will trigger a shutdown if the oxygen content falls below 5%.
- b. Replace oxygen sensor
- c. Calibrate oxygen sensor
- d. Check alarm/shutdown function of the controller for proper operation
- e. Write date on recording chart

2. Maintenance/Inspection Schedules

- a. Monthly
- b. As necessary
- c. Monthly
- d. Monthly
- e. Daily

3. Maintenance/Inspection Record Method

- a. Check list
- b. Check list
- c. Check list
- d. Checklist
- e. Recording chart

Spare parts available for repairs:

1. Spare oxygen sensor
2. Extra box of recording charts
3. Oxygen calibration gas

Malfunction of incinerator exhaust oxygen content means the oxygen sensor fails to continuously send a signal to the controller/recorder that displays and continuously records the oxygen concentration.

If incinerator exhaust oxygen content system malfunctions, then shut-in of the facility shall commence immediately and corrective action taken.

11. Gas piping hi-lo pressure

1. Maintenance Procedures
 - a. Test pressure switch for proper test points. A pressure switch triggers an alarm if the pressure on the plant high pressure gas piping is too high or too low.
2. Maintenance Schedules
 - a. Quarterly
3. Maintenance Record Method
 - a. Check list

Spare parts available for repairs:

1. Switch

Malfunction of gas piping hi-lo pressure system means the system fails to trigger an alarm if the pressure on the plant high pressure gas piping is too high or too low.

If the gas piping hi-lo pressure system malfunctions, then the cause of the high or low pressure condition will be determined within 2 hours of the malfunction and the necessary repairs will be made to those components first. Then the pressure switch will be tested for proper operation and replaced if necessary utilizing the spare switch that is kept in inventory. If there is nothing wrong except a defective pressure switch, then it may not be necessary to shutdown the plant while the switch replacement work is taking place.

12. Amine Reboiler high pressure

1. Maintenance Procedures
 - a. Test pressure switch. A pressure switch triggers an alarm if the pressure on the amine reboiler is either too high or too low.
2. Maintenance Schedules
 - a. Quarterly
3. Maintenance Record Method
 - a. Check list

Spare parts available for repairs:

1. Switch

Malfunction of reboiler high pressure means system fails to trigger an alarm if the pressure on the amine reboiler is too high. An alarm will sound.

If the reboiler high pressure system malfunctions, then the cause of the high pressure condition will be determined within 2 hours of the malfunction and the necessary repairs will be made to those components first. Then the pressure switch will be tested for proper operation and replaced if necessary utilizing the spare switch that is kept in inventory. If there is nothing wrong except a defective pressure switch, then it may not be necessary to shutdown the plant while the switch replacement work is taking place.

13. Safety shut down valves

1. Maintenance Procedures
 - a. Test safety shutdown valves. There are safety shutdown valves at the well-head, and at the inlet to the sweetening plant. These are air to open, spring to close valves (actually, sweet gas is used in lieu of instrument air). Monitoring devices within the plant can trigger a shutdown by tripping a solenoid that vents the instrument gas from the valve actuator thereby allowing the spring to close the valve.
2. Maintenance Schedules
 - a. Quarterly
3. Maintenance Record Method
 - a. Check list

Spare parts available for repairs:

1. Solenoid

Malfunction of the safety shut down valve system means the system fails to properly shut-in the facility. If the safety shutdown valve system malfunctions, then the plant will be shutdown manually immediately. It will then be necessary to determine the cause of the attempted shutdown and make whatever repairs are necessary to those components first. Then the safety valve system will be repaired and/or replaced as required.

14. H2S Concentration Check
 1. Maintenance Procedures
 - a. Determine the hydrogen sulfide concentration using a colorimetric detector tube or equivalent.
 2. Maintenance Schedules
 - a. Monthly
 3. Maintenance Record Method
 - a. Check list

15. Spare Parts List
 1. Maintenance Procedures
 - a. Develop and keep a spare parts list, and keep spare parts available on site
 2. Maintenance Schedules
 - a. When changes are needed
 3. Maintenance Record Method
 - a. List

All records shall be maintained by the Permittee for a period of five (5) years and made available to the MDEQ-AQD upon request.

This Preventative Maintenance and Malfunction Abatement Plan shall be evaluated and updated, then submitted for Air Quality Division District Supervisor for review and approval as required in the Permittee's Renewable Operating Permit.

Malfunctions of the equipment shall be reported to AQD in accordance to Rule 912

If a Rule 901 violation is confirmed this Preventative Maintenance, and Malfunction Abatement Plan shall be evaluated and updated by the permittee as requested by Air Quality Division.