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I. General Description


The H₂S Environment Graphic Screen shows the schematic diagram of the plant site where the gas detectors and analyzers are reflected and actual values are displayed for environmental monitoring.

The gas detectors and analyzers are equipped with process alarms that will activate once the low (L), high (H) and high high (HH) set values on parameter settings are reached. Each gas detectors and analyzers have corresponding locations around the plant area to immediately determine the source of the gas leak. Upon activation of the alarms actual values displayed on the DCS screen will turn to red color. At the same time an audible alarm will sound inside the control room to notify the DCS operator about environmental troubles. Likewise, a flashing beacon and audible horn are activated at the field to warn all operators working near the area about possible gas leak.

Acknowledge and Reset buttons for the process alarms are also provided in this graphic screen. The acknowledge (ACK) button is used by the DCS operator to acknowledge the alarm and silence the audible alarms/horns in the DCS room and at the field. However, the alarm beacon shall remain lighted at field until the alarm has been reset by reset (RESET) button. The reset button will only function when the normal parameter value has been restored.

Wind velocity and direction which is measured by the wind vane and anemometer installed in the roof of Central Building is also displayed in this graphic screen. Also shortcut link to the Graphics Overview, MS Environment, and Environment Monitoring graphics are provided in this screen.

Shortcut link buttons for Graphics Overview, Environmental Monitoring and MS Environment are provided for easy access and browsing. These shortcut link buttons can be clicked to jump from the present H₂S Environment screen to the above-mentioned DCS graphics screen.

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II. Important Monitoring Items

1. Controllers Description

None

2. Instruments Descriptions

1) Scrubber Exhaust H₂S Gas Detectors and Analyzers

(1) 109AI083ABC - Emergency Gas Scrubber (109SR02) Exhaust Gas H₂S Detectors

These gas detectors show the H₂S gas concentration in the exhaust gas discharge of 109SR02 (Emergency Gas Scrubber).
(Operating Range: PVHI: 2ppm; PVHH: 5ppm)

If any of the detectors reaches H₂S gas concentration of 5 ppm an audible horn, 109XA246, can be heard at the field to warn the operators near the area of the presence of H₂S gas in the atmosphere.

Refer to **TNH-209-103(5)** H₂S Waste Gas Treatment DCS Manual for the interlocks associated with these gas detectors.

(2) 109AI085AB - Emergency Gas Scrubber (109SR02) Exhaust Gas H₂S Analyzers

These gas analyzers show the concentration of H₂S gas in the exhaust gas discharge of 109SR02 (Emergency Gas Scrubber).
(Operating Range: PVHI: 2ppm; PVHH: 5ppm)

Once H₂S gas concentration reading reaches 5 ppm from any of the analyzers an audible horn, 109XA246, can be heard at the field to warn the operators near the area of the presence of H₂S gas in the atmosphere.

Refer to **TNH-209-103(5)** H₂S Waste Gas Treatment DCS Manual for the interlocks associated with these gas analyzers.

(3) 109AI108ABC - Gas Leak Scrubber (109SR03) Exhaust Gas H₂S Detectors


These gas detectors show the H₂S gas concentration in the exhaust gas discharge of the 109SR03 (Gas Leak Scrubber).
(Operating Range: PVHI: 2ppm; PVHH: 5ppm)

If any of the detectors reaches H₂S gas concentration of 5 ppm an audible horn, 109XA246, can be heard at the field to warn the operators near the area of the presence of H₂S gas in the atmosphere.

Refer to **TNH-209-103(5)** H₂S Waste Gas Treatment DCS Manual for the interlocks associated with these gas detectors.

(4) 109AI110AB - Gas Leak Scrubber (109SR03) Exhaust Gas H₂S Analyzers

These gas analyzers show the concentration of H₂S gas in the exhaust gas discharge of 109SR03 (Gas Leak Scrubber).
(Operating Range: PVHI: 2ppm; PVHH: 5ppm)

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Once H₂S gas concentration reading reaches 5 ppm from any of the analyzers an audible horn, 109XA246, can be heard at the field to warn the operators near the area of the presence of H₂S gas in the atmosphere.

Refer to **TNH-209-103(5)** H₂S Waste Gas Treatment DCS Manual for the interlocks associated with these gas analyzers.

(5) 109AI503 - Tank Vents Scrubber Exhaust Gas H₂S Analyzer

This analyzer measures the H₂S gas concentration in the exhaust gas discharge from 109SR04 (Tank Vents Scrubber).
(Operating Range: PVHI: 2ppm)

Refer to **H₂S Waste Gas Treatment DCS Manual [TNH-209-103(5)]** for the interlocks associated with these gas detectors.

2) Containment Rooms and Blowers' Discharge H₂S Gas Detectors

(1) 109/209AI623 - Quench Column (109/209QC01) Containment Room H₂ Gas Detector

These gas detectors show the H₂ gas concentration at the topmost level of the 109/209QC01 (Quench Column) inside the 109/209ST11 (Quench Column Containment Room).
(Operating Range: PVHI: 200ppm; PVHH: 500ppm)

They are equipped with a flashing beacon (109/209XA647 and 109/209XA648) and audible horn (109/209XA641) system which will activate if high high (HH) level of H₂ gas is detected. This will warn all operators about H₂ gas leak at the area.


Refer to **TNH-209-103(5)** H₂S Waste Gas Treatment DCS Manual for the interlocks associated with these gas detectors.

(2) 109/209AI620A - H₂S Gas Detector inside the Quench Column (109/209QC01) Containment Room

These gas detectors show the concentration of H₂S gas present at the Level 6 of Reactor tower inside the 109/209ST11 (Quench Column Containment Room).
(Operating Range: PVHI: 4ppm; PVHH: 10ppm)

These detectors are equipped with one flashing beacon (109/209XA640) outside the containment room, and another flashing beacon (109/209XA642) inside the containment room. Once high high (HH) H₂S gas is detected these beacons will activate. Likewise, an audible horn (109XA641) can also be heard at the field to warn all operators about the H₂S gas leak near the area. The alarm can only be reset once there is no more H₂S gas detected around the area.

Refer to **TNH-209-103(5)** H₂S Waste Gas Treatment DCS Manual for the interlocks associated with these gas detectors.

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- (3) 109/209AI621 - H₂S Gas Detector inside the Quench Column (109/209QC01) Containment Room

These gas detectors show the concentration of H₂S gas present at the Level 5 of Reactor tower inside the 109/209ST11 (Quench Column Containment Room).
(Operating Range: PVHI: 4ppm; PVHH: 10ppm)

These detectors are equipped with one flashing beacon (109/209XA643) outside the containment room, and another flashing beacon (109/209XA644) inside the containment room. Once high high (HH) H₂S gas is detected these beacons will activate. Likewise, an audible horn (109XA641) can also be heard at the field to warn all operators about the H₂S gas leak near the area. The alarm can only be reset once there is no more H₂S gas detected around the area.

Refer to **TNH-209-103(5)** H₂S Waste Gas Treatment DCS Manual for the interlocks associated with these gas detectors.

- (4) 109/209AI622 - H₂S Gas Detector inside the Quench Column (109/209QC01) Containment Room

These gas detectors show the concentration of H₂S gas present at the Level 4 of Reactor tower inside the 109/209ST11 (Quench Column Containment Room).
(Operating Range: PVHI: 4ppm; PVHH: 10ppm)

These detectors are equipped with one flashing beacon (109/209XA645) outside the containment room, and another flashing beacon (109/209XA646) inside the containment room. Once high high (HH) H₂S gas is detected these beacons will activate. Likewise, an audible horn (109XA641) can also be heard at the field to warn all operators about the H₂S gas leak near the area. The alarm can only be reset once there is no more H₂S gas detected around the area.

Refer to **TNH-209-103(5)** H₂S Waste Gas Treatment DCS Manual for the interlocks associated with these gas detectors.

- (5) 109/209AI620B - H₂S Gas Detector in 109/209BW01 discharge pipe.


These gas detectors show the concentration of H₂S gas passing through the extraction pipe outside the 109/209ST11 (Quench Column Containment Room).
(Operating Range: PVHI: 4ppm; PVHH: 10ppm)

It is equipped with an audible horn (109/209XA641) system which will activate if high high (HH) level of H₂S gas is detected. This will warn all operators about H₂S gas leak at the area. The alarm can only be reset once there is no more H₂S gas detected around the area.

Refer to **TNH-209-103(5)** H₂S Waste Gas Treatment DCS Manual for the interlocks associated with these gas detectors.

- (6) 109/209AI601A - H₂S Gas Detector inside the Gas Coolers (109/209HX11AB) Containment Room

These gas detectors show the concentration of H₂S gas present inside the 109/209ST12 (Gas Coolers Containment Room).
(Operating Range: PVHI: 4ppm; PVHH: 10ppm)

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These detectors are equipped with one flashing beacon (109/209XA631) outside the containment room, and another flashing beacon (109/209XA633) inside the containment room. Once high high (HH) H₂S gas is detected these beacons will activate. Likewise, an audible horn (109XA641) can also be heard at the field to warn all operators about the H₂S gas leak near the area. The alarm can only be reset once there is no more H₂S gas detected around the area.

Refer to **TNH-209-103(5)** H₂S Waste Gas Treatment DCS Manual for the interlocks associated with these gas detectors.

- (7) 109/209AI601B - H₂S Gas Detector outside the Gas Coolers (109/209HX11AB) Containment Room

These gas detectors show the concentration of H₂S gas passing through the extraction pipe outside the 109/209ST12 (Gas Coolers Containment Room).
(Operating Range: PVHI: 4ppm; PVHH: 10ppm)

They are equipped with an audible horn (109/209XA641) system which will activate if high high (HH) level of H₂S gas is detected. This will warn all operators about H₂S gas leak at the area. The alarm can only be reset once there is no more H₂S gas detected around the area.

Refer to **TNH-209-103(5)** H₂S Waste Gas Treatment DCS Manual for the interlocks associated with these gas detectors.

- (8) 109/209AI602A - H₂S Gas Detector inside the Knock Out Drum (109/209VE02) Containment Room

These gas detectors show the concentration of H₂S gas present inside the 109/209ST12 (Gas Coolers Containment Room).
(Operating Range: PVHI: 4ppm; PVHH: 10ppm)


These detectors are equipped with two flashing beacons (109/209XA634 and 109/209XA637) outside the containment room, and another two flashing beacons (109/209XA638 and 109/209XA641) inside the containment room. Once high high (HH) H₂S gas is detected these beacons will activate. Likewise, an audible horn (109XA641) can also be heard at the field to warn all operators about the H₂S gas leak near the area. The alarm can only be reset once there is no more H₂S gas detected around the area

Refer to **TNH-209-103(5)** H₂S Waste Gas Treatment DCS Manual for the interlocks associated with these gas detectors.

- (9) 109/209AI602B - H₂S Gas Detector in 109/209BW03 discharge pipe.

These gas detectors show the concentration of H₂S gas passing through the extraction pipe outside the 109/209ST12 (Gas Coolers Containment Room).
(Operating Range: PVHI: 4ppm; PVHH: 10ppm)

They are equipped with an audible horn (109/209XA641) system which will activate if high high (HH) level of H₂S gas is detected. This will warn all operators about H₂S gas leak at the area. The alarm can only be reset once there is no more H₂S gas detected around the area.

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Refer to **TNH-209-103(5)** H₂S Waste Gas Treatment DCS Manual for the interlocks associated with these gas detectors.

- (10) 109/209AI615 and 109/209AI616 - H₂S Gas Detectors in 109/209BW04 discharge pipe.

These gas detectors show the concentration of H₂S gas passing through the extraction pipe outside the flange boxes of 109/209VE01 (H₂S Reactor) and 109/209QC01 (Quench Column).

(Operating Range: PVHI: 4ppm; PVHH: 10ppm)

It is equipped with four flashing beacons (109/209XA640, 109/209XA642, 109/209XA6445, and 109/209XA646) and an audible horn (109/209XA641) system which will activate if high high (HH) level of H₂S gas is detected. This will warn all operators about H₂S gas leak at the flange boxes. The alarm can only be reset once there is no more H₂S gas detected around the area.

Refer to **TNH-209-103(5)** H₂S Waste Gas Treatment DCS Manual for the interlocks associated with these gas detectors.

3) H₂S Plant Ground – H₂S Detectors

- (1) 109/209AI212 - H₂S Gas Detector Ground Floor Reactor Steam Outlet

These gas detectors measure H₂S gas concentration of ambient air at ground floor of 109/209VE01 (H₂S Reactor) Steam Outlet.

(Operating Range: PVHI: 4ppm; PVHH: 10ppm)

These gas detectors are equipped with beacons (109/209XA235 and 109/209XA236) and horn (109/209XA641) system that will activate in case of high high (HH) level of H₂S gas detected. This will warn all operators about H₂S gas leak at the area. The alarm can only be reset once there is no more H₂S gas detected around the area.

- (2) 109/209AI213 - H₂S Gas Detector Ground Floor Gas Coolers Cooling Water Drain

These gas detectors measure H₂S gas concentration of ambient air at ground floor of 109/209HX11 (Gas Coolers) Cooling Water Drain.

(Operating Range: PVHI: 4ppm; PVHH: 10ppm)


These gas detectors are equipped with beacons (109/209XA235 and 109/209XA236) and horn (109/209XA641) system that will activate in case of high high (HH) level of H₂S gas detected. This will warn all operators about H₂S gas leak at the area. The alarm can only be reset once there is no more H₂S gas detected around the area.

- (3) 109AI214 - H₂S Gas Detector North East Corner Bund

These gas detectors measure H₂S gas concentration of ambient air at North East Corner Bund.

(Operating Range: PVHI: 4ppm; PVHH: 10ppm)

These gas detectors are equipped with beacons (109/209XA235 and 109/209XA236) and horn (109/209XA641) system that will activate in case of high high (HH) level of

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H₂S gas detected. This will warn all operators about H₂S gas presence at the area. The alarm can only be reset once there is no more H₂S gas detected around the area.

(4) 109AI215 - H₂S Gas Detector South East Corner Bund

These gas detectors measure H₂S gas concentration of ambient air at South East Corner Bund.
(Operating Range: PVHI: 4ppm; PVHH: 10ppm)

These gas detectors are equipped with beacons (109/209XA235 and 109/209XA236) and horn (109/209XA641) system that will activate in case of high high (HH) level of H₂S gas detected. This will warn all operators about H₂S gas presence at the area. The alarm can only be reset once there is no more H₂S gas detected around the area.

(5) 109AI216 - H₂S Gas Detector North West Corner Bund

These gas detectors measure H₂S gas concentration of ambient air at North West Corner Bund.
(Operating Range: PVHI: 4ppm; PVHH: 10ppm)

These gas detectors are equipped with beacons (109/209XA235 and 109/209XA236) and horn (109/209XA246) system that will activate in case of high high (HH) level of H₂S gas detected. This will warn all operators about H₂S gas presence at the area. The alarm can only be reset once there is no more H₂S gas detected around the area.

(6) 109AI217 - H₂S Gas Detector South West Corner Bund


This gas detector measures H₂S gas concentration of ambient air at South West Corner Bund.
(Operating Range: PVHI: 4ppm; PVHH: 10ppm)

This gas detector is equipped with beacons (109/209XA235 and 109/209XA236) and horn (109/209XA641) system that will activate in case of high high (HH) level of H₂S gas detected. This will warn all operators about H₂S gas presence at the area. The alarm can only be reset once there is no more H₂S gas detected around the area.

(7) 109AI115 - H₂S Gas Detector Sulfur Shelter Second Floor

This gas detector measures H₂S gas concentration of ambient air at second floor of Sulfur Shelter.
(Operating Range: PVHI: 4ppm; PVHH: 10ppm)

This gas detector is equipped with beacons (109XA019B) and horn (109XA019C) system that will activate in case of high high (HH) level of H₂S gas detected. This will warn all operators about H₂S gas presence at the area. The alarm can only be reset once there is no more H₂S gas detected around the area.

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(8) 109AI116 - H₂S Gas Detector Sulfur Shelter Ground Floor

This gas detector measures H₂S gas concentration of ambient air at the ground floor of Sulfur Shelter.

(Operating Range: PVHI: 4ppm; PVHH: 10ppm)

This gas detector is equipped with beacons (109XA019B) and horn (109XA019C) system that will activate in case of high high (HH) level of H₂S gas detected. This will warn all operators about H₂S gas presence at the area. The alarm can only be reset once there is no more H₂S gas detected around the area.

4) H₂S Plant – O₂ Gas Detectors

(1) 109AI001 - O₂ Gas Detectors at Sulfur Loading Chutes (109CH01A)

These gas detectors measure the concentration of O₂ gas around the sulfur loading chutes.

(Operating Range: PVL: 19.5%)

These gas detectors are equipped with beacons (109XA20B) and horn (109XA020C) system that will activate in case of low low (LL) level of O₂ gas detected. This indicates oxygen gas depletion around the area causing suffocation.

(2) 109AI002 - O₂ Gas Detectors at Sulfur Loading Chutes (109CH01B)

These gas detectors measure the concentration of O₂ gas around the sulfur loading chutes.

(Operating Range: PVL: 19.5%)

These gas detectors are equipped with beacons (109XA20B) and horn (109XA020C) system that will activate in case of low low (LL) level of O₂ gas detected. This indicates oxygen gas depletion around the area causing suffocation.

(3) 422AI001 - O₂ Gas Analyzer at Methanol Tank

This gas analyzer measures the O₂ gas concentration at the vapour space of 422TK01 (Methanol Tank).

(Operating Range: PVHI: 8 %)

Once a high (H) level of O₂ gas is detected DCS operator must inform the supervisor and warn all field operators about O₂ gas presence inside the Methanol tank.


5) H₂S Plant – H₂ Gas Detector

(1) 421AI901 - H₂ Gas Detector at H₂ Plant Reactor

This gas detector measures H₂ gas concentration of ambient air at the H₂ Plant Reactor.

(Operating Range: PVHI: 200 ppm; PVHH: 500 ppm)

This gas detector is equipped with beacons (421XA921/923) and horn (421XA922) system that will activate in case of high high (HH) level of H₂ gas detected. This will warn all operators about H₂ gas leak at the area.

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(2) 421AI902 - H₂ Gas Detector at H₂ Plant HX Skid

This gas detector measures H₂ gas concentration of ambient air at the H₂ Plant HX Skid.

(Operating Range: PVHI: 200 ppm; PVHH: 500 ppm)

This gas detector is equipped with beacons (421XA921/923) and horn (421XA922) system that will activate in case of high high (HH) level of H₂ gas detected. This will warn all operators about H₂ gas leak at the area.

(3) 421AI903 - H₂ Gas Detectors at H₂ Plant PSA Valve Skid (421VE10A)

These gas detectors measure H₂ gas concentration of ambient air at the H₂ Plant Pressure Swing Adsorption (PSA) Valve Skid.

(Operating Range: PVHI: 200 ppm; PVHH: 500 ppm)

These gas detectors are equipped with beacons (421XA921/923) and horn (421XA922) system that will activate in case of high high (HH) level of H₂ gas detected. This will warn all operators about H₂ gas leak at the area

(4) 421AI904 - H₂ Gas Detectors at H₂ Plant PSA Valve Skid (421VE10B)

These gas detectors measure H₂ gas concentration of ambient air at the H₂ Plant Pressure Swing Adsorption (PSA) Valve Skid.

(Operating Range: PVHI: 200 ppm; PVHH: 500 ppm)

These gas detectors are equipped with beacons (421XA921/923) and horn (421XA922) system that will activate in case of high high (HH) level of H₂ gas detected. This will warn all operators about H₂ gas leak at the area

6) H₂S Plant – Methanol Gas Detectors

(1) 422AI905 - Methanol Gas Concentration East Side of Methanol Tank

This gas detector measures the methanol vapor or gas concentration of ambient air at the east side of 422TK01 (Methanol Tank).

(Operating Range: PVHI: 600 ppm)


Once a high (H) level of methanol vapor/gas is detected DCS operator must inform the supervisor and warn all field operators about possible methanol vapor/gas leak around the Methanol tank.

(2) 422AI906 - Methanol Gas Concentration West Side of Methanol Tank

This gas detector measures the methanol vapor or gas concentration of ambient air at the west side of 422TK01 (Methanol Tank).

(Operating Range: PVHI: 600 ppm)

Once a high (H) level of methanol vapor/gas is detected DCS operator must inform the supervisor and warn all field operators about possible methanol vapor/gas leak around the Methanol tank.

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7) 002SI001 - Wind Speed Indicator

This indicator shows the actual wind speed read by the anemometer installed at top of Central Building. The wind speed value gives DCS operator the idea how strong the wind inside the Plant.

8) 002SI001 - Wind Direction Indicator

This indicator shows the actual wind direction read by the wind vane installed at top of Central Building. The wind direction is very useful in determining the source of gas leakages.

3. Motors

None

4. Actuated Valves

None

5. Switches

1) 000HS901: DCS Common Acknowledge Switch

The common acknowledge (ACK) button (000HS901) is used by the DCS operator to acknowledge the alarm and silence the audible alarms/horns in the DCS room and in the field. However, the alarm beacon shall remain lighted until the alarm has been reset.



Figure 2-1: 000HS901 – Common Acknowledge Switch

2) 000HS902: DCS Common Reset Switch


The common reset (RESET) button (000HS902) is used by the DCS operator to reset all the alarms in the DCS. This switch will only function when the alarm value has been restored to normal.



Figure 2-2: 000HS902 – Common Reset Switch

III. Interlocks

None

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IV. Control Sequences

None

V. Alarms

None

VI. DCS Emergency Shutdown

None

VII. Troubleshooting Guide

None

VIII. Trend Graphs Grouping

None

