6542 - MELIADINE
Nunavut

AGNICO EAGLE

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FUNCTIONAL DESCRIPTION

Fuel Tank Farm – Meliadine

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1. INTRODUCTION

The following functional description covers the fuel farm at the Meliadine site. The fuel farm houses the diesel storage tank and the diesel day tank, as well the associated filling and distribution circuits. It also includes diesel and urea dispensers. In this document, the storage tank filling sequence, the day tank feeding sequence, and the dispenser protections will be described. Alarms and interlocks will be also explained.

The functional description covers areas and mechanical equipment as the following:

- One (1) 75 m^3 fuel storage tank
- One (1) 100 usgal (378.5 L) fuel day tank
- One (1) diesel supply pump
- Two (2) diesel distribution pumps
- One (1) diesel dispenser
- One (1) urea dispenser
- Two (2) 1000 L urea tote tanks

For better understanding, the reader shall refer to the following reference drawings:

- 65-PUM-416-205-000-001 & 002 & 003 : P&ID for Fuel Tank Farm
- 65-PUM-441-205-000-002 : P&ID for Portal Service Building
- 65-PUM-416-280-510 to 519 : Remote IO Panel 65IOP41601

2. ENGINEERING UNITS

The following engineering units are used throughout this document and must be used for value display on the HMI:

Table 2-1: Engineering Units List

Measure	Units
Temperature	°C
Pressure (relative)	kPa
Weight	kg
Volume	m^3, L
Relative Density – Liquid	Sp.Gr. 15.6°C/15.6°C
Absolute Density – Liquid	kg/m^3 at 15.6 °C
Speed	m/s
Volume Flow – Liquid	L/s, m^3/h
Volume Flow – Gas	m^3/h
Mass Flow	kg/h
Power	kW
Motor Current (amperage)	% (of FLA), A

3. EQUIPMENT NAME LIST

Table 3-2: Major Equipment List

Description	Number
Fuel Pumping Station	65PST41601
Remote IO Panel (Pumping Station)	65IOP41602
Remote IO Panel (Service Building)	TBD
PLC Panel (Fuel Farm)	65PLC43402
Central HMI Panel	TBD

4. CONTROL SYSTEM

The control system for the fuel storage and distribution system includes a main PLC panel (65PLC43402) located in an electrical room, a remote IO panel (65IOP41602) in the fuel pumping station (65PST41601) and a remote IO panel in the service building. This system allows for filling fuel tanks and distributing fuel to various end users.

A central HMI panel dedicated to the entire fuel farm allows monitoring of the filling and distribution sequences. A local push-button station (located at fuel pumping station) is used for the filling sequence. The distribution sequence functions automatically.

The control system also includes sensors such as pressure, level transmitters, level switches and temperature transmitter to ensure the safe operation of the fuel farm and prevent tank overfilling.

5. STORAGE TANK FILLING SEQUENCE

This section describes the operation for filling fuel storage tanks from the tanker truck.

In the filling sequence, the following equipment is used:

Table 5-1: Storage Tank Filling Equipment List

Qty	Description	Number
1	Fuel Storage Tank (75 m^3)	65TNK41620
1	Diesel Supply Pump (filling pump)	65POD41607
1	Pressure Transmitter	65PIT4160107
1	Flowmeter with Transmitter (temperature compensated)	65FIT4160108 (65TE4160108)
1	Filling Valve (with limit switches)	65FV4160201
1	Tank Level Transmitter	65LIT4160207
1	Tank High-High Level Switch	65LSHH4160206
1	Static Ground Detection Switch	65XS4160101
1	Buttons Station	65HS4160105A 65HS4160105B 65HSS4160102 65YL4160105A

- One (1) Supply Pump Kit with:
  - (1) Pump
  - (1) Flow meter (with temperature compensation)
  - (1) Pressure transmitter
- One (1) 75 m^3 Storage Tank with:
  - (1) Filling valve
  - (1) Level transmitter
  - (1) High-high level switch
- One (1) Control panel with:
  - (1) Buttons station (**Light *"Filling in progress"***, **START**, **STOP, E-STOP**)
  - (1) Static Ground Verification System (Scully)

A. Filling Sequence

1) The operator must check storage tank volume availability with the central HMI before the unloading operation.
2) The operator must check with the central HMI that there is no active alarm before the unloading operation. The sequence will not start if there is an active alarm.
3) The operator must validate that all required equipment is in **AUTO** mode.
4) The operator connects the ground clip to the fuel tanker. A confirmation is sent to the PLC to authorize the filling of the tank. The **green light** (**GROUND ALARM**) located on the **ground clip module** should be **ON** if the ground check is OK. If the **red light** is **ON**, the ground check is not OK. An alarm is also sent to central HMI if the ground is not OK.
5) The operator connects the tanker to the filling system.
6) When above conditions are met, the **light "Filling in progress"** flashes to indicate to the operator that the filling sequence is ready.
7) The operator pushes the **START** button.
8) The **light "Filling in progress"** turns **ON** steadily to indicate to the operator that the filling sequence has started.
9) The motorized filling valve (65FV4160201) opens.
10) After the filling valve is confirmed open, the diesel supply pump starts (65POD41607).
11) The sequence stops when the storage tank high level **setpoint** is reached. It can also be stopped by the operator.

B. Storage Tank Availability

The storage tank is considered available for filling if all the following conditions are met:

a) The filling valve is in AUTO.
b) There is no **fault** on the valve.
c) There is no **interlock** on the valve.
d) The storage tank has reasonable available volume (level is below the low setpoint).
e) The storage tank level transmitter is functional (no open loop condition).

C. Storage Tank Overfill Protection

1) If the storage tank high-high level **threshold** is reached, the filling sequence is blocked.
2) If the storage tank high-high level **switch** is reached, the filling sequence is blocked.

This protection will avoid any overfilling of the tank. The filling sequence is only allowed to start after clearing each high-high level **alarm**.

D. Operating Conditions

1) **Stop** conditions:
   a. Fuel truck unloading area emergency stop (65HSS4160102).
   b. Fuel pumping station emergency stop (65HSS4160130).
   c. Fuel pumping station fire alarm (65YS4160191).
   d. Filling pump (65POD41607) in FAULT.
   e. Filling pump (65POD41607) in **MANUAL** mode.
   f. Filling pump (65POD41607) interlocked.
   g. Filling valve (65FV4160201) in **MANUAL** mode.
   h. **STOP** button.
   i. Storage tank full (above high level **setpoint**).
2) **Start** condition:
   a. **START** button.
   b. Storage tank level below low **setpoint**.
   c. Static ground verification system is **VALIDATED**.

E. Interlocks

1) Filling valve (65FV4160201) closes if any of the following conditions is met:
   a. Storage tank high-high level threshold is reached (65LIT4160207).
   b. Storage tank high-high level switch is reached (65LSHH4160206).
2) Diesel supply pump (65POD41607) stops if any of the following conditions is met:
   a. Low-low line pressure while pump is running (65PIT4160107) for more than 10 seconds.
   b. High-high line pressure (65PIT4160107).
   c. Storage tank high-high level threshold is reached (65LIT4160207).
   d. Storage tank high-high level switch is reached (65LSHH4160206).
   e. Ground check not in place (65XS4160101).
   f. Filling valve not open.
   g. Emergency stop activated (65HSS4160102 or 65HSS4160130).
   h. Fire alarm received from fuel pumping station fire panel (65YS4160191).
   i. High spill level on fuel pumping station floor (65LSH4160111).

F. Alarms

a. Storage Tank Level Transmitter (65LIT4160207) Thresholds:
   i. Low-Low: 10%
   ii. High-High: 90%
   iii. Open loop

b. Storage Tank High-High Level Switch (65LSHH4160206):
   i. Open Contact (fail safe operation)

c. Filling Pressure (65PIT4160107) Thresholds:
   i. Low-Low: 69 kPag
   ii. High-High: 300 kPag

d. Emergency Stop:
   i. Open Contact (fail safe operation) for unloading area (65HSS4160102)
   ii. Open Contact (fail safe operation) for pumping station (65HSS4160130)

e. Diesel Supply Pump (65POD41607):
   i. General Variable Speed Drive Fault

f. Other:
   i. Fuel Pumping Station Fire Alarm (65YS4160191).
   ii. Fuel Pumping Station Floor High Spill Level (65LSH4160111).

G. Setpoints

a. Storage Tank Level Transmitter (65LIT4160207) Setpoints:
   i. Low: 20%
   ii. High: 80%

H. Information to Display on HMI

The following information shall be available on the central HMI screen:

1) Sequence fault status.
2) Valve state and alarms.
3) Pump state, motor current and alarms.
4) Storage tank level (%), alarms and estimated liquid volume (m^3 or L).
5) Line pressure.
6) Ground check state.
7) Flow meter (compensated flow) with totalizer.
8) All other alarms (all alarms defined in this section not already appearing in this list).

6. DAY TANK FILLING SEQUENCE

This section describes the operation of filling the fuel day tank from the fuel storage tank.

In the fuel day tank filling sequence, the following equipment is used:

Table 6-1: Distribution Equipment List

Qty	Description	Number
2	Diesel Distribution Pumps	65POD41608 65POD41609
1	Distribution Valve (with limit switches)	65FV4160210
1	Pressure Transmitter	65PIT4160126
1	Fuel Day Tank (100 usgal)	65TNK44101
1	Day Tank Feed Valve (with limit switches)	65FV4410223
1	Tank Level Transmitter	65LIT4410222
1	Tank High-High Level Switch	65LSHH4410221

- One (1) Distribution Pump Kit with:
  - (2) Pumps
  - (1) Pressure transmitter
- One (1) 100 usgal Day Tank with:
  - (1) Feed Valve
  - (1) Level transmitter
  - (1) High-high level switch
- One (1) Distribution Valve (associated to storage tank)

A. Filling Sequence

1) When the fuel day tank level reaches the low level **setpoint**, main PLC (65PLC43402) triggers the day tank filling sequence.
2) The day tank feed valve opens.
3) The distribution valve opens.
4) After both valve are confirmed open, the selected diesel distribution pump starts (65POD41608 / 65POD41609).
5) When the fuel day tank level reaches the high level **setpoint**, the filling sequence stops.

B. Storage Tank Availability

The storage tank is considered available for distribution if all the following conditions are met:

a) The distribution valve is in AUTO.
b) There are no **faults** on the distribution valve.
c) There are no **interlocks** on distribution the valve.
d) The tank is not empty (lower than low-low **threshold** + 2%).
e) Its level transmitter is functional (no open loop condition).

C. Day Tank Overfill Protection

1) If the storage tank high-high level **threshold** is reached, the filling sequence is blocked.
2) If the storage tank high-high level **switch** is reached, the filling sequence is blocked.

D. Operating Conditions

The distribution sequence will operate under these conditions:

1) **Stop** conditions:
    a. Fuel truck unloading area emergency stop (65HSS4160102).
    b. Fuel pumping station emergency stop (65HSS4160130).
    c. Fuel pumping station fire alarm (65YS4160191).
    d. Storage tank empty (low-low level **threshold** is reached).
    e. Diesel distribution pump (65POD41608/9) in FAULT.
    f. Diesel distribution pump (65POD41608/9) in **MANUAL** mode.
    g. Diesel distribution pump (65POD41608/9) interlocked.
    h. Distribution valve in **MANUAL** mode.
    i. Day tank valve in **MANUAL** mode.
    j. **STOP** button.
    k. Day tank full (above high level **setpoint**).
2) **Start** conditions:
    a. Day tank low level **setpoint** reached.
    b. Day tank feed valve in **AUTO** mode.
    c. At least one diesel distribution pump in **AUTO** mode (65POD41608/9):
        i. No interlock on the selected diesel distribution pump.
    d. Distribution valve in **AUTO** mode.
    e. Storage tank not empty (higher than low-low **threshold** + 2%) for 1 minute.

E. Filling Sequence Major Fault Conditions

These conditions will require a **reset** before allowing the distribution sequence to proceed. Since there is no manual start command for this sequence, an HMI **RESET** will be used to ensure everything is operational and safe before distributing fuel again:

1) **Interlock** on **both** distribution pumps (65POD41608/9).
2) Emergency stop **activated** (65HSS4160102, 65HSS4160130).
3) Fuel storage tank empty.
4) Fuel day tank high-high level.
5) Power failure.

F. Interlocks

1) Distribution valve (65FV4160210) closes if any of the following conditions is met:
    a. Emergency stop is activated.
2) Each diesel distribution pump (65POD41608, 65POD41609) stops if any of the following conditions is met:
    a. The pumps must operate alternately and not simultaneously.
    b. Low-low line pressure threshold is reached (65PIT4160126) while pump is running, for more than 10 seconds.
    c. High-high distribution pressure (65PIT4160126).
    d. Storage tank low-low level threshold is reached (65LIT4160207).
    e. Emergency stop is activated (65HSS4160102 or 65HSS4160130).
    f. Day tank high-high level threshold is reached.
    g. Day tank high-high level switch is reached.
    h. Storage tank low-low level threshold is reached.
    i. Distribution valve is not open (65FV4160210).
    j. Day tank feed valve is not open (65FV4410223).
    k. High spill level on fuel pumping station floor (65LSH4160111).
3) Day tank feed valve (65FV4410223) closes if any of the following conditions is met:
    a. Day tank high-high level threshold is reached (65LIT4410222).
    b. Day tank high-high level switch is reached (65LSHH4410221).

G. Alarms

a. Day Tank Level Transmitter (65LIT4410222) Thresholds:
   i. Low-Low: 10%
   ii. High-High: 90%
   iii. Open loop

b. Day Tank High-High Level Switch (65LSHH4410221):
   i. Open Contact (fail safe operation)

c. Distribution Pressure (65PIT4160126) Thresholds:
   i. Low-Low: 241 Kpag
   ii. High-High: 448 kPag

d. Emergency Stop:
   i. Open Contact (fail safe operation) for unloading area (65HSS4160102)
   ii. Open Contact (fail safe operation) for pumping station (65HSS4160130)

e. Diesel Distribution Pumps (65POD41608/9):
   iii. General Variable Speed Drive Fault

f. Other:
   i. Fuel Pumping Station Fire Alarm (65YS4160191).
   ii. Fuel Pumping Station Floor High Spill Level (65LSH4160111).

H. Setpoints

a. Day Tank Level Transmitter (65LIT4410222) Setpoints:
   i. Low: 50%
   ii. High: 80%

I. Information to display on HMI

The following information shall be available on the central HMI screen:

1) Sequence fault status.
2) All valves state and alarms.
3) All pumps state, motor current and alarms.
4) Day tank level (%), alarms, and estimated liquid volume (m^3 or L).
5) Distribution pressure.
6) All other alarms (all alarms defined in this section not already appearing in this list).

7. FUEL DISPENSER AREA

This section describes the operation in the fuel dispenser area.

In the fuel dispenser area, the following equipment is used:

Table 7-1: Fuel Dispenser Equipment List

Qty	Description	Number
1	Diesel Dispenser	65FDS41601
1	Urea Dispenser	65DS41601

The diesel dispenser allows the manual distribution of diesel from the fuel storage tank.

The urea dispenser can be connected to either of two (2) urea tote tanks each having a capacity of 1000 L.

A. Normal Operation

The diesel fuel dispenser and the urea dispenser are manually operated when needed.

B. Interlocks

1) Supply power to the diesel dispenser is disconnected if any of the following conditions is met:
    a. Fuel dispenser emergency stop is activated (65HSS4160304).
    b. Fire alarm is received from the fuel dispenser area fire panel (65YS4160391).
    c. High spill level on fuel dispenser area floor (65LSH4160302).

2) Supply power to the urea dispenser is disconnected if any of the following conditions is met:
    a. Fuel dispenser emergency stop is activated (65HSS4160304).
    b. Fire alarm is received from the fuel dispenser area fire panel (65YS4160391).
    c. High spill level on fuel dispenser area floor (65LSH4160302).

C. Alarms

1. Fuel Dispenser Emergency Stop (65HSS4160304) Open Contact (fail safe operation).
2. Fuel Dispenser Area Fire Alarm (65YS4160391).
3. Fuel Dispenser Area High Spill Level (65LSH4160302).

D. Information to Display on HMI

The following information shall be available on the central HMI screen:

1) Emergency Stop Alarm.
2) Fire Alarm.

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