Harvest Energy, Inc.
618 Windsor Terrace SE
Grand Rapids, MI 49503
phone: 269.838.4595

Control Philosophy For
1 MMGY Methanol Recovery from Crude Glycerin

1.1 SUMMARY

Water and excess methanol need to be recovered from crude glycerin stream before glycerin is sent to storage tanks as finished product. Harvest Energy, Inc. uses a skid mounted flash system to recover excess water and methanol from the crude glycerin steam. System operates on a principal of distillation by vaporizing the methanol and water, then condensing it in a series of heat exchangers. Condensed methanol is held in a full vacuum vessel and pumped out via a rotary gear pump. Entire system operates under extreme vacuum conditions 25 – 30" Hg. Full vacuum affords process advantage by lowering vaporization temperature of methanol and providing carrier motive to pull vaporized methanol from glycerin and force it into condensers.

A circulation pump brings methylated glycerin from bottom of flash vessel and pumps it into a shell and tube reboiler. Reboiler heats glycerin and methanol to temperatures between 160 – 180°F to vaporize excess methanol. Glycerin and vaporized methanol mixture is then pumped into top of flash vessel where it is sprayed through an atomization and distribution nozzle. Methanol vapors rise and separate from liquid phase oil and are pulled into condensing system. Liquid methanol is then pumped to an impure methanol buffer tank (SRXC-T-901).

1.2 DESCRIPTION

The following are brief descriptions of the equipment, instruments, & controls in the methanol recovery unit.

1. Glycerin Feed Pump (GMRU-PU-2306)
    a. Motor shall be speed controlled with a VFD to regulate pump flow rate.
    b. User to input desired flow rate in GPM.
    c. Provide manual start / stop on HMI screen.
2. Glycerin Flow Meter (GMRU-FIT-23001)
    a. Display the amount of glycerin being fed into the new flash vessel both in gallons and pounds per minute.
    b. Control speed of glycerin feed pump (GMRU-PU-2306) based on flow rate input by user.
3. Glycerin Feed Temperature Transmitter (GMRU-TT-2301
    a. Display the temperature of the glycerin being fed into flash vessel V-2301.
4. Reboiler Circulation Pump (GMRU-PU-2301)
    a. Pump will be on/off control, enable pump to operate if level is between 25 – 80%.
    b. Provide manual start / stop on HMI screen.

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5. Flash Vessel Level Transmitter (GMRU-LIT-2301)
    a. The level in the flash vessel (GMRU-V-2301) will be controlled by a wave guided radar level transmitter.
        i. Level in vessel below 25% - Display Low Level Alarm
        ii. Level in vessel below 20% - Stop GMRU-PU-2301, Stop GMRU-PU-2302.
        iii. Level in vessel above 80% - Display High Level Alarm.
6. Flash Vessel High Level Switch (GMRU-LSH-2301)
    a. If switch is made, stop GMRU-PU-2301, GMRU-PU-2306, GMUR-PU-2304, & GMRU-PU-2305.
    b. Display high level alarm.
7. Flash Vessel Temperature Control Valve (GMRU-TCV-2301)
    a. Temperature control valve to modulate steam flow into heat exchanger based on temperature of flash vessel (GMRU-V-2301)
    b. User to input desired temperature of glycerin in flash vessel (GMRU-V-2301), modulate GMRU-TCV-2301 to maintain desired temperature.
8. Reboiler Inlet Temperature Transmitter (GMRU-TT-2301)
    a. Display temperature of product in °F or °C, match current facility standard.
9. Reboiler Discharge Temperature Transmitter (GMRU-TT-2302)
    a. Display temperature of product in °F or °C, match current facility standard.
10. Flash Vessel Temperature (GMRU-TT-2303)
    a. Display temperature of product in °F or °C, match current facility standard.
    b. If temperature exceeds user specified set point by greater than 10°, display high temperature alarm.
11. Flash Vessel Vapor Discharge Pressure Transmitter (GMRU-PIT-2301)
    a. Display pressure in PSIA.
    b. If pressure exceeds 12 PSIA, display low vacuum alarm.
12. Flash Vessel Vapor Discharge Temperature Transmitter (GMRU-TT-2304)
    a. Display temperature of product in °F or °C, match current facility standard.
13. MeOH Receiver Level Transmitter (GMRU-LIT-2302)
    a. The level in the MeOH Receiver (GMRU-V-2302) will be controlled by a wave guided radar level transmitter.
        i. Level in vessel below 15% - Display Low Level Alarm
        ii. Level in vessel below 10% - Stop GMRU-PU-2303.
        iii. Level in vessel above 80% - Display High Level Alarm.
14. MeOH Receiver High Level Switch (GMRU-LSH-2302)
    a. If switch is made, stop GMRU-PU-2304, stop GMRU-PU-2305.
    b. Display high level alarm.

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15. Eductor Sump Inlet Temperature Transmitter (GMRU-TT-2305)
    a. Display temperature of product in °F or °C, match current facility standard.
16. Eductor Sump Inlet Pressure Transmitter (GMRU-PIT-2302)
    a. Display pressure in PSIA.
    b. If pressure exceeds 12 PSIA, display low vacuum alarm.
17. Methanol Transfer Pump (GMRU-PU-2303)
    a. Methanol transfer pump GMRU-PU-2303 will transfer recovered methanol from MeOH receiver (GMRU-V-2302) to SRXC-T-901.
    b. Flash vessel level transmitter (GMRU-LIT-2302) shall control speed of Methanol Transfer Pump (GMRU-PU-2303) to maintain level in MeOH Receiver (GMRU-V-2302) between 20 – 80%.
    c. Provide manual start / stop on HMI screen.
18. Glycerin Transfer Pump (GMRU-PU-2302)
    a. Glycerin transfer pump GMRU-PU-2302 will transfer de-methylated glycerin from GMRU-V-2301 to SRXCG column feed tank (SRXCG-T-1001).
    b. Enable pump if temperature of flash vessel (GMRU-V-2301) is greater than user temperature set point.
    c. GMRU-PU-2302 to maintain level in flash vessel (GMRU-V-2301) between 40 – 60%.
19. Methanol Transfer Pump Inlet Valve (GMRU-AV-2303)
    a. Methanol transfer pump inlet valve GMRU-AV-2303 shall isolate the suction of GMRU-PU-2303 from vacuum when not in use.
    b. GMRU-AV-2302 to open upon a start signal to GMRU-PU-2303, and close on a signal to stop GMRU-PU-2303.
20. Eductor Motive Pump (GMRU-PU-2304)
    a. Eductor motive pump GMRU-PU-2304 will circulate water though an educator to create process vacuum.
    b. Pump to start on a general system start up.
    c. Stop pump upon a high level alarm from GMRU-LT-231, GMRU-LSH-2301, GMRU-LT-2302, or GMRU-LSH-2302.
    d. Stop pump upon a low level alarm from GMRU-LSL-2301.
    e. Provide manual start / stop on HMI screen.
21. Eductor Motive Pump (GMRU-PU-2304)
    a. Eductor motive pump GMRU-PU-2304 will circulate water though an educator to create process vacuum.
    b. Pump to start on a general system start up.
    c. Stop pump upon a high level alarm from GMRU-LT-2301, GMRU-LSH-2301, GMRU-LT-2302, or GMRU-LSH-2302.
    d. Stop pump upon a low level alarm from GMRU-LSL-2301.
    e. Provide manual start / stop on HMI screen.

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22. Eductor Sump Low Level Switch (GMRU-LSL-2301)
    a. If switch is NOT made, stop GMRU-PU-2304, stop GMRU-UP-2305.
    b. Display low level alarm.
23. Eductor Sump Temperature Transmitter (GMRU-TT-2306)
    a. Display temperature of product in °F or °C, match current facility standard.
    b. If temperature exceeds 160°F, display high water temperature alarm.