طرح نگهداشت و افزایش تولید 27 مخزن

ESD/BMS PHILOSOPHY

نگهداشت و افزایش تولید میدان نفتی بینک

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1. INTRODUCTION

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also, PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV. As a part of the Project, a New Gas Compressor Station (adjacent to existing Binak GCS) shall be constructed to gather of 15 MMSCFD (approx.) associated gases and compress & transfer them to Siahmakan GIS.

2. SCOPE

The scope of this document is to outline the control philosophy for the Burner Management System relevant to TEG reboiler of the Glycol Regeneration Section.

3. NORMATIVE REFERENCES

3.1. REFERENCE DOCUMENTS

- BK-GCS-PEDCO-120-PR-SP-0001-D05 “Duty Specification for Gas Dehydration Package (PK-2101)”.
- BK-GNRAL-PEDCO-000-PR-DB-0001 “Process Basis of Design”
- BK-GNRAL-PEDCO-000-PR-DC-0001 “Process Design Criteria”

4. ABBREVIATIONS

Abbreviation	Description
NISOC	National Iranian South Oil Company
API	American Petroleum Institute
IPS	Iranian Petroleum Standard
ASME	American Society of Mechanical Engineers
BBL	US Barrel
MMSCFD	Million Standard Cubic Foot per Day
STBOD	Standard Barrel Oil per Day
P&ID	Piping & Instrumentation Diagram
PFD	Process Flow Diagram
PPM	Part per million
UCP	Unit Control Package
BMS	Burner Management System
ESD	Emergency Shut Down System

5. SYSTEM CONFIGURATION

The Control System of the Gas Dehydration Package shall include:

- An UCP, managing all signals related to control loops, i.e. control valves and monitoring signals related to the package.
- A BMS/ESD managing all signals related to the burners, to the fuel gas line feeding the burners, including startup and shutdown automatic procedures of the reboiler, and all the safety functions related to the reboiler and to the other equipment of the package (including flash drum and contactor).
- A local control panel, where all commands, selectors, signals of status and alarms are provided and implemented.

Moreover, the UCP and BMS/ESD systems will exchange signals / alarms with DCS by a Modbus network.

This document is dedicated to the BMS control philosophy description, including interlock functions related to burners/reboiler protection.

5.1. BMS FRONT CONTROL PANEL.

The BMS Front Control Panel shall be provided with the following commands / selectors / signals:

- REBOILER EMERGENCY SHUTDOWN(CHAIN I-1) HS-2101 (*)
- RESET HS-2102
- PILOT BURNER START HS-2103
- MAIN BURNER START HS-2104
- REBOILER STOP HS-2105
- LAMP TEST HS-2106
- ALARM ACKNOWLEDGMENT HS-2107
- ALARM RESET HS-2108

(*) Red Colour Mushroom type pushbutton

Note 1: The alarm acknowledgment does not delete the alarm description even if the alarm cause is no more active. The alarm reset deletes the no more active alarms.

In addition, the BMS panel is provided of the following lamps:

- READY TO START XL-2101
- PURGING XL-2102
- PILOT BURNER ON XL-2103
- MAIN BURNER ON XL-2104
- PILOT F.GAS ESDV-2105A VALVE OPEN EZSO-2105A
- PILOT F.GAS ESDV-2105B VALVE OPEN EZSO-2105B
- PILOT F.GAS BLEED VALVE ESDV-2105C OPEN EZSO-2105C
- MAIN BURNER F.GAS ESDV-2104A VALVE OPEN EZSO-2104A
- MAIN BURNER F.GAS ESDV-2104B VALVE OPEN EZSO-2104B
- MAIN BURNER F.GAS BLEED VALVE ESDV-2104C OPEN EZSO-2104C
- PILOT F.GAS ESDV-2105A VALVE CLOSE EZSC-2105A
- PILOT F.GAS ESDV-2105B VALVE CLOSE EZSC-2105B
- PILOT F.GAS BLEED VALVE ESDV-2105C CLOSE EZSC-2105C
- MAIN BURNER F.GAS ESDV-2104A VALVE CLOSE EZSC-2104A
- MAIN BURNER F.GAS ESDV-2104B VALVE CLOSE EZSC-2104B
- MAIN BURNER F.GAS BLEED VALVE ESDV-2104C CLOSE EZSC-2104C
- FUEL GAS MAIN VALVE ESDV-2106 OPEN EZSC-2106
- FUEL GAS MAIN VALVE ESDV-2106 CLOSE EZSO-2106

Finally, the following alarms are provided:

- MAIN BURNER SHUT DOWN ON XA-2105
- GENERAL SHUT DOWN ON XA-2106
- REBOILER LOW LEVEL LAL-2111
- REBOILER LOW LOW LEVEL LALL-2112
- SURGE DRUM HIGH LEVEL LAH-2114
- SURGE DRUM HIGH HIGH LEVEL LAHH-2115
- SURGE DRUM LOW LEVEL LAL-2114
- SURGE DRUM LOW LOW LEVEL LALL-2116
- REBOILER HIGH TEMPERATURE TAH-2109
- REBOILER LOW TEMPERATURE TAL-2109
- REBOILER HIGH HIGH TEMPERATURE TAHH-2106
- STACK HIGH HIGH TEMPERATURE TAHH-2108
- REBOILER HIGH HIGH PRESSURE PAHH-2102
- FUEL GAS TO BURNER LOW LOW PRESSURE PALL-2103
- FUEL GAS TO BURNER HIGH HIGH PRESSURE PAHH-2103
- FUEL GAS TO PILOT LOW LOW PRESSURE PALL-2104
- FUEL GAS TO PILOT HIGH HIGH PRESSURE PAHH-2104
- PILOT FLAME FAILURE BALL-2101
- BURNER FLAME FAILURE BALL-2102

Note: One flame detector (UV type) provided for main burner flame detection(BS-2102). A second detector (IR type) provided for pilot flame detection(BS-2101).

6. INTERLOCK CHAINS

The BMS manages the following interlock functions protecting the reboiler in case of process upsets and/or emergency events.

6.1. REBOILER GENERAL SHUT DOWN (CHAIN I-1)

The reboiler general shut down (chain I-1) is activated by the following causes:

- Reboiler low low level LALL-2112
- Reboiler high high pressure PAHH-2102
- Reboiler high high temperature TAHH-2106
- Surge drum high high level LAHH-2115
- Stack high high temperature TAHH-2108
- Fuel gas to pilot high high pressure PAHH-2104
- Fuel gas to pilot low low pressure PALL-2104
- Pilot flame failure BALL-2101
- Manual activation from BMS front panel HS-2101

When one of the above listed signals is active, the reboiler general shut down is performed according to the automatic sequence reported at paragraph 8.2.

6.2. MAIN BURNER SHUT DOWN.

The reboiler main burner shut down (chain I-2) is activated by the following causes:

- Main Burner flame failure BALL-2102
- Flue gas to main burner high high pressure PAHH-2103
- Flue gas to main burner low low-pressure PALL 2103

The main burner shut down is performed according to the automatic sequence reported at paragraph 8.3.

7. START UP.

Operator can start up the reboiler by the BMS front control panel, according to the following sequence.

- Push the “LAMP TEST” command, HS-2106, to check if all the lamps of the panel are in operation.
- Verify if the lamp “READY TO START” is active (XL-2101 green colour).

  Note: the status “READY TO START” is verified if no shutdown causes are in active (see paragraphs 6.1 and 6.2). However, before start up, the following shut down causes are automatically overridden:

  - Main Burner flame failure BALL-2102
  - Pilot flame failure BALL-2101

  In addition, the condition “READY TO START” is active if the system verified the correct open/close status of the valves, i.e.:

  - Fuel gas main valve close (signal from EZSC-2106 limit switch)
  - Fuel gas to main burner valves close (signals from EZSC-2104A/B limit switches)
  - Fuel gas to main burner bleed valve open (signal from EZSO-2104C limit switch)
  - Fuel gas to pilot valves close (signals from EZSC-2105A/B limit switches)
  - Fuel gas to pilot bleed valve open (signal from EZSO-2105C limit switch)

  In case the condition “READY TO START” is not verified, the operator must identify the cause of the shutdown, overcome it and push the “RESET” command (HS-2102).

- If the condition “READY TO START” is achieved (XL-2101 green colour), push the pilot “PILOT START” command, HS-2103

  Note: before package start-up, all interlock (except I-7) shall be deactivated.

7.1. PURGING

Once activated the “PILOT START” command HS-2103, the BMS performs the following actions:

- Start the air blower K-100 (out of MFS scope)
- When the BMS acquires the blower running status (from MCC), the lamp XL-2101 “PURGING” starts blinking (green colour)
- A timer of 5 minutes (adjustable) starts.
- When the purging time (5 minutes, adjustable) is expired, the XL-2101 stops blinking and remain green colour. The fan blower K-100 is stopped by BMS (HSP-2101).
- The sequence continues with the pilot lighting on (XL-2103).

Note1: Purge step has the scope of removing potential fuel gas/air mixture from the firetube/smoke tube and chimney system.

Note2: since the fan blower (K-100) is not in MFS scope and in case purchaser do not supply such a fan, before start-up, the operator shall make sure there is no Fuel gas/air mixture inside fire box and smoke tube.

7.2. PILOT LIGHTING ON

Once completed the purge step (XL-2102 is green), the command “Pilot Start” HS-2103 is active (before it was inhibited). Therefore, the operator can command by means of HS-2103 to continue the start-up sequence (by BMS logic) with the pilot lighting on, as follows:

The operator must push “pilot start” through push bottom HS-2103 to continue the start-up sequence (by BMS logic) with the pilot lighting on, as follows:

- Close the manual valve on stripping gas line.
- Open the ESDV-2106. Within 10 seconds maximum (adjustable) the system must acquire the open status by the EZSO-2106 limit switch. In case the valve open status is not acquired, an alarm of “valve malfunction” is activated and the startup sequence is interrupted. The system commands again the closure of ESDV-2106 valve.
- Close the pilot bleed valve ESDV-2105C. Within 10 seconds maximum (adjustable), the system must acquire the close status by the EZSC-2105C limit switch. In case the valve close status is not acquired, an alarm of “valve malfunction” is activated and the startup sequence is interrupted. The valve ESDV-2106 is closed and the bleed valve ESDV-2105C open again.
- Open the pilot valves ESDV-2105A/B. Within 10 seconds maximum (adjustable), the system must acquire the open status by the EZSO-2105A/B limit switches. In case the valves open status is not acquired, an alarm of “valve malfunction” is activated and the startup sequence is interrupted. The valve ESDV-2106 and ESDV-2105A/B are closed

again and the bleed valve ESDV-2105C open again.

- The BMS energizes the ignition transformer for about 5 seconds (adjustable). The ignition sparkling shall ignite the pilot.
- Once expired the ignition time (5 seconds) the BMS de-energize the ignition transformer.
- Within 10 seconds maximum (adjustable), the BMS must acquire the pilot on status by the flame detector (IR type) BS-2101.
- If the "pilot on" status is not acquired, the ignition step can be repeated for other two times(adjustable). Between each ignition step there should be a stop around one minutes(adjustable)
- In case also the third trial fails, the sequence is interrupted, all valves come back to the initial conditions and the startup must be repeated from the purging step.
- In case the BMS acquires the "pilot on" status by the flame detector BS-2101, the lamp XL-2103 "PILOT ON" is lighted on. The pilot flame failure shut down (BALL-2101) is activated. The startup can continue with the main burner startup.

7.3. MAIN BURNER STARTUP

Once acquired the "Pilot On" status, the command "Main Burner Start" HS-2104 is active (before it was inhibited).

Therefore, the operator can command the main burner startup by means HS-2104. The sequence continues as follows:

- Close the main burner bleed valve ESDV-2104C. Within 10 seconds maximum (adjustable), the system must acquire the close status by the EZSC-2104C limit switch. In case the valve close status is not acquired, an alarm of "valve malfunction" is activated and the startup sequence is interrupted. The bleed valve ESDV-2104C is open again (operator must verify the cause of the valve malfunction and then try again by pushing the command HS-2104 "Main Burner Start")
- Open the main burner fuel gas valves ESDV-2104A/B. Within 10 seconds maximum (adjustable), the system must acquire the open status by the EZSO-003A/B limit switches. In case the valves open status is not acquired, an alarm of "valve malfunction" is activated and the startup sequence is interrupted. The bleed valve ESDV-2104C is open and ESDV-2104A/B are closed again. As already said, operator must verify the cause of the valve malfunction and then try again by pushing the command HS-2104 "Main Burner Start).
- Once acquired the correct open/close configuration of main burner fuel gas valves, the BMS within 10 seconds (adjustable) must acquire the flame presence by the detector BS-2102. If the flame is not detected within 10 seconds, the system commands the stop of the main burner by closing the valves ESDV-2104A/B and open again the bleed valve ESDV-2104C. However, it will be possible to try again the main burner startup, by the command HS-2104.
  Note: the pilot should easily light on the main burner. Therefore, if the main burner flame is not detected, the problem can be due to a malfunction of the flame detector or its malposition.
- Once detected the main burner flame, the lamp XL-2104 "MAIN BURNER ON" is switched on. After 10 seconds the

shutdown for main burner failure BALL-2102 is again activated.

- In case “MAIN BURNER ON” is not activated after 30 minutes after “purging completed” the whole start-up sequence will be interrupted and all sequence include purging shall be start again.

8. REBOILER STOP/SHUTDOWN

8.1. REBOILER STOP.

The reboiler “STOP” (not emergency shutdown) can be performed by operator by means the command HS-2105 on the local panel. The following actions are automatically performed by the BMS logic.

- The flame failure shutdown causes are automatically inhibited.
- The fuel gas main valve ESDV-2106 is closed.
- The main burner fuel gas valves ESDV-2104A/B are closed.
- When the system acquires the limit switches EZSC-2106 and EZSC-2104A/B, the bleed valve ESDV-2104C is open.
- The pilot fuel gas valves ESDV-2105A/B are closed.
- When the system acquires the limit switches EZSC-2105A/B, the bleed valve ESDV-2105C is open.
- The lamps XL-2103 (“Pilot on”) and XL-2104 (“Main Burner on”) are switched off.
- The alarm XA-2107 (red colour) of “REBOILER STOP” is activated on the BMS front panel
- The air blower K-100 is started for the post-purge step (having the scope of removing flue gas from the firetube/smoke tube and chimney system, because flue gas, containing CO_2 and H_2O, become corrosive with cooling). The lamp XL-2102 (purging) is blinking on the BMS front panel.
- The post-purge lasts 5 minutes (adjustable). When the time is expired, the blower K-100 is stopped again. The lamp XL-2102 is switched off.

8.2. REBOILER EMERGENCY SHUTDOWN

The reboiler emergency shutdown is activated by one of the causes listed at para 6.1 (chain I-1).

The effects are as follows:

- The fuel gas main valve ESDV-2106 is closed.
- The main burner fuel gas valves ESDV-2104A/B are closed.
- When the system acquires the limit switches EZSC-2106 and EZSC-2104 A/B, the bleed valve ESDV-2104 C is open.
- The pilot fuel gas valves ESDV-2105 A/B are closed.
- When the system acquires the limit switches EZSC-2105 A/B, the bleed valve ESDV-2105 C is open.
- The lamps XL-2103 (“Pilot on”) and XL-2104 (“Main Burner on”) are switched off.
- The alarm XA-2106 (red colour) of “REBOILER GENERAL SHUT DOWN) is activated on the BMS front panel.
- The air blower K-100 is started for the post-purge step (having the scope of removing flue gas from the firetube/smoke tube and chimney system, because flue gas, containing CO_2 and H_2O, become corrosive with cooling). The lamp XL-2102 (purging) is blinking on the BMS front panel.
- The post-purge lasts 5 minutes (adjustable). When the time is expired, the blower K-100 is stopped again. The lamp XL-2102 is switched off.
- Once completed the post-purge step, the flame failure alarms BALL-2101/2102 are inhibited to allow the system restart.
- Pushing the “Reboiler Emergency Shutdown” command, HS-2101

For the reboiler restart, it is necessary to:

- Identify the emergency cause and solve it.
- To reset the system by HS-2102.

8.3. MAIN BURNER SHUTDOWN.

The main burner shutdown is activated by one of the causes listed at para 6.2 (chain I-2).

The effects are as follows:

- The main burner fuel gas valves ESDV-2104A/B are closed and the bleed valve ESDV-2104C is open.
- When the system acquires the limit switches EZSC-006 and EZSC-004A/B, the bleed valve ESDV-004 C is open.
- XL-2104 (“Main Burner on”) is switched off.
- The alarm XA-2105 (red colour) of “MAIN BURNER SHUT DOWN) is activated on the BMS front panel.
- the flame failure alarms BALL-2102 is inhibited to allow the system restart.

For the main burner restart, it is necessary to:

- Identify the emergency cause and solve it.
- To reset the system by HS-2102.