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| **طرح نگهداشت و افزایش تولید 27 مخزن** | | | | | | | |
| **CONTROL PHILOSOPHY**  **نگهداشت و افزایش تولید میدان نفتی بینک** | | | | | | | |
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| **Status:** | **IFA: Issued For Approval**  **IFI: Issued For Information**  **AFC: Approved For Construction** | | | | | |

**REVISION RECORD SHEET**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PAGE** | **V00** | **V01** | **V02** | **V03** | **V04** |  | **PAGE** | **V00** | **V01** | **V02** | **V03** | **V04** |
| **1** | X |  |  |  |  | **66** |  |  |  |  |  |
| **2** | X |  |  |  |  | **67** |  |  |  |  |  |
| **3** | X |  |  |  |  | **68** |  |  |  |  |  |
| **4** | X |  |  |  |  | **69** |  |  |  |  |  |
| **5** | X |  |  |  |  | **70** |  |  |  |  |  |
| **6** | X |  |  |  |  | **71** |  |  |  |  |  |
| **7** | X |  |  |  |  | **72** |  |  |  |  |  |
| **8** | X |  |  |  |  | **73** |  |  |  |  |  |
| **9** | X |  |  |  |  | **74** |  |  |  |  |  |
| **10** | X |  |  |  |  | **75** |  |  |  |  |  |
| **11** | X |  |  |  |  | **76** |  |  |  |  |  |
| **12** | X |  |  |  |  | **77** |  |  |  |  |  |
| **13** | X |  |  |  |  | **78** |  |  |  |  |  |
| **14** | X |  |  |  |  | **79** |  |  |  |  |  |
| **15** | X |  |  |  |  | **80** |  |  |  |  |  |
| **16** | X |  |  |  |  | **81** |  |  |  |  |  |
| **17** | X |  |  |  |  | **82** |  |  |  |  |  |
| **18** | X |  |  |  |  | **83** |  |  |  |  |  |
| **19** | X |  |  |  |  | **84** |  |  |  |  |  |
| **20** | X |  |  |  |  | **85** |  |  |  |  |  |
| **21** | X |  |  |  |  | **86** |  |  |  |  |  |
| **22** |  |  |  |  |  | **87** |  |  |  |  |  |
| **23** |  |  |  |  |  | **88** |  |  |  |  |  |
| **24** |  |  |  |  |  | **89** |  |  |  |  |  |
| **25** |  |  |  |  |  | **90** |  |  |  |  |  |
| **26** |  |  |  |  |  | **91** |  |  |  |  |  |
| **27** |  |  |  |  |  | **92** |  |  |  |  |  |
| **28** |  |  |  |  |  | **93** |  |  |  |  |  |
| **29** |  |  |  |  |  | **94** |  |  |  |  |  |
| **30** |  |  |  |  |  | **95** |  |  |  |  |  |
| **31** |  |  |  |  |  | **96** |  |  |  |  |  |
| **32** |  |  |  |  |  | **97** |  |  |  |  |  |
| **33** |  |  |  |  |  | **98** |  |  |  |  |  |
| **34** |  |  |  |  |  | **99** |  |  |  |  |  |
| **35** |  |  |  |  |  | **100** |  |  |  |  |  |
| **36** |  |  |  |  |  | **101** |  |  |  |  |  |
| **37** |  |  |  |  |  | **102** |  |  |  |  |  |
| **38** |  |  |  |  |  | **103** |  |  |  |  |  |
| **39** |  |  |  |  |  | **104** |  |  |  |  |  |
| **40** |  |  |  |  |  | **105** |  |  |  |  |  |
| **41** |  |  |  |  |  | **106** |  |  |  |  |  |
| **42** |  |  |  |  |  | **107** |  |  |  |  |  |
| **43** |  |  |  |  |  | **108** |  |  |  |  |  |
| **44** |  |  |  |  |  | **109** |  |  |  |  |  |
| **45** |  |  |  |  |  | **110** |  |  |  |  |  |
| **46** |  |  |  |  |  | **111** |  |  |  |  |  |
| **47** |  |  |  |  |  | **112** |  |  |  |  |  |
| **48** |  |  |  |  |  | **113** |  |  |  |  |  |
| **49** |  |  |  |  |  | **114** |  |  |  |  |  |
| **50** |  |  |  |  |  | **115** |  |  |  |  |  |
| **51** |  |  |  |  |  | **116** |  |  |  |  |  |
| **52** |  |  |  |  |  | **117** |  |  |  |  |  |
| **53** |  |  |  |  |  | **118** |  |  |  |  |  |
| **54** |  |  |  |  |  | **119** |  |  |  |  |  |
| **55** |  |  |  |  |  | **120** |  |  |  |  |  |
| **56** |  |  |  |  |  | **121** |  |  |  |  |  |
| **57** |  |  |  |  |  | **122** |  |  |  |  |  |
| **58** |  |  |  |  |  | **123** |  |  |  |  |  |
| **59** |  |  |  |  |  | **124** |  |  |  |  |  |
| **60** |  |  |  |  |  | **125** |  |  |  |  |  |
| **61** |  |  |  |  |  | **126** |  |  |  |  |  |
| **62** |  |  |  |  |  | **127** |  |  |  |  |  |
| **63** |  |  |  |  |  | **128** |  |  |  |  |  |
| **64** |  |  |  |  |  | **129** |  |  |  |  |  |
| **65** |  |  |  |  |  | **130** |  |  |  |  |  |

**Table of Contents**

[**1.** **INTRODUCTION 4**](#_Toc161908092)

[**2.** **SCOPE 4**](#_Toc161908093)

[**3.** **NORMATIVE REFERENCES 4**](#_Toc161908094)

[**3.1.** **REFERENCE DOCUMENTS** 4](#_Toc161908095)

[**4.** **ABBREVIATIONS 5**](#_Toc161908096)

[**5.** **CONTROL SYSTEM CONFIGURATION. 6**](#_Toc161908097)

[**6.** **CONTROL OF PROCESS VARIABLES 6**](#_Toc161908098)

[**6.1.** **LEAN GLYCOL TO CONTACTOR FLOW RATE.** 7](#_Toc161908099)

[**6.2.** **LEAN GLYCOL TEMPERATURE.** 7](#_Toc161908100)

[**6.3.** **DRY GAS WATER CONTENT.** 8](#_Toc161908101)

[**6.4.** **FLASH DRUM PRESSURE.** 8](#_Toc161908102)

[**6.5.** **FLASH DRUM TEMPERATURE.** 9](#_Toc161908103)

[**6.6.** **REBOILER TEMPERATURE.** 10](#_Toc161908104)

[**6.7.** **STRIPPING GAS FLOW RATE.** 10](#_Toc161908105)

[**6.8.** **SURGE DRUM LIQUID LEVEL.** 11](#_Toc161908106)

[**7.** **GLYCOL DEHYDRATION UNIT INTERLOCK SYSTEM** 12](#_Toc161908107)

[**7.1.** **CONTACTOR**  12](#_Toc161908108)

[**7.2.** **FLASH DRUM**  15](#_Toc161908109)

[**7.3.** **FILTERS**  16](#_Toc161908110)

[**7.4.** **STILL COLUMN**  17](#_Toc161908111)

[**7.5.** **REBOILER**  18](#_Toc161908112)

[**7.6.** **SURGE DRUM**  19](#_Toc161908113)

[**8.** **PUMPS CONTROL LOGIC**  19](#_Toc161908114)

[**8.1.** **GLYCOL CIRCULATION PUMPS** 19](#_Toc161908115)

[**8.2.** **ANTIFOAM INJECTION PUMP / pH CONTROLLER INJECTION PUMP** 21](#_Toc161908116)

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.

1. **SCOPE**

The scope of this document is to outline the control philosophy and the safety functions protecting the Gas Dehydration and Glycol Regeneration Section.

1. **NORMATIVE REFERENCES**
   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”

1. **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 |

1. **CONTROL 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 describes the UCP control philosophy, and the interlock functions related to package, except those related to burners/reboiler protection which are discussed in detailed in the document Burner Management System Philosophy.

1. **CONTROL OF PROCESS VARIABLES**

The main variables of TEG dehydration unit are:

* Lean glycol to contactor flow rate monitored & controlled by FIT & FIC/FV-2101, respectively.
* Lean Glycol temperature at the contactor inlet, monitored by TIT-2102 and relevant alarm and interlock functions.
* Dry gas water content, monitored by AIT-2101
* Pressure in flash drum monitored & controlled by PIT & PIC/PCV-2101 A/B, respectively.
* Flash drum temperature, monitored by TIT-2105
* Reboiler temperature monitored & controlled by TIT &TIC-2109/TCV-2101, respectively.
* Flow of stripping gas to stripping column monitored by FIT-2103
* Surge Drum liquid level, monitored by LT-2114

The above listed process variables are discussed in detail in the following paragraphs.

Other process controls are discussed in the paragraphs 6.0 and subsequent dedicated to different equipment.

* 1. **LEAN GLYCOL TO CONTACTOR FLOW RATE.**

An adequate lean glycol flow rate is required order to assure the desired dehydration in the contactor. The glycol flow rate should be adjusted in relationship to the wet gas flow rate, pressure, and temperature, as well as of the required dry gas dew point. Wet gas pressure and temperature are important since they affect the wet gas water content, which increases at lower pressure and/or higher temperature.

At design more severe conditions, the maximum required lean glycol flow rate is of 775 kg/h, anyway, if necessary, a 15% overdesign has been foreseen for the pumps. At less severe conditions, the lean glycol flow rate can be adjusted by operators acting on the set point of controller FT/FIC/FV-2101. Since the circulation pumps are reciprocating constant flow rate type, the controller acts on the glycol flow rate recycled back to the suction of the pumps.

Finally, it must be underlined that an excess of lean glycol flow to contactor has not a negative impact on the dehydration process, nevertheless at low wet gas rate is necessary to reduce the lean glycol flow to assure an adequate glycol cooling in the gas/TEG exchanger and to limit the dry gas temperature at the heat exchanger outlet. At the minimum gas rate (35 % of design), the lean glycol flow should be lowered at about 300 kg/h.

* 1. **LEAN GLYCOL TEMPERATURE.**

The TEG temperature at the contactor inlet should be as low as possible in order to increase the dehydration process efficiency and minimise the glycol vaporisation losses, but should be kept at 5-10 °C above the wet gas temperature in order to prevent gasoline condensation from the gas and consequent high foaming phenomena. The temperature difference between the inlet wet gas and lean glycol to contactor is indicated by the TDI-2101. In our case, glycol is cooled by the dry gas, therefore it cannot reach a temperature too low.

The temperature is monitored by TT-2102, and, in case of E-300 (glycol cooler by dry gas) malfunction, the upset activates the alarm:

* TAH-2102: high temperature of lean glycol at contactor inlet

Or

* TAHH-2102: high high temperature of lean glycol at contactor inlet, also activating the interlock chain I-3 (see paragraph 7.1)
  1. **DRY GAS WATER CONTENT.**

The water content in the dry gas from the contactor is probably the most important process variable, representing the scope of the dehydration process.

If all the other variables are correctly kept within their normal range, the dry gas dew point will be below the specified value of + 5°C, corresponding to about 11.4 lbs water / MMSCF of gas.

It’s possible to verify this value by water analyser (AIT-2101) provided on the dry gas line downstream the E-300 heat exchanger and checking the water content by laboratory analysis.

In case of results out of specification, all the process variables shall be accurately verified. The possible causes of process upset can be:

* no adequate lean glycol flow
* low lean glycol purity (inefficient glycol regeneration)
* excessive lean TEG temperature at the contactor inlet
* excessive wet gas inlet temperature (above the design)
* low wet gas inlet pressure (lower than the design)
* low contactor efficiency, due to foaming operation
* If the low lean glycol purity is confirmed by the laboratory analysis, check the reboiler temperature, pressure and eventually increase the stripping gas rate.
* In case of wet gas conditions worse than design, try to improve the operation by increasing the lean TEG flow rate above the maximum design (pumps have a 15% overdesign).

Excessive foaming in the contactor can be due to:

* no adequate anti foam chemical injection.
* charcoal filters no efficient operation.
* High gasoline content in the wet gas.

It is possible to verify the wet gas inlet composition, by the sample connection SC-001 (upstream the contactor)(Out side MFS B.L)

* 1. **FLASH DRUM PRESSURE.**

The rich TEG outgoing from the contactor is preheated in the reflux condenser, then it is flashed to 4.5 bar g in the flash drum.

The flash drum function is:

- to remove part of the dissolved gases from the rich TEG stream

- to remove most of the liquid hydrocarbons from the TEG stream.

In normal operation, the pressure is maintained at the working value of 4.5 barg through PIT/PIC -2101 by a controlled release of developed gas from valve PCV-2101 A to flare header. At the start-up, being the rich TEG still cold, the developed gas can be no sufficient to achieve an adequate pressure to assure the liquid flowing from the flash drum to the still column; therefore, the flash drum pressurisation is reached by means the inlet of fuel gas under the control of valve PCV-2101B. The PIC-2101 operates in split range mode, with two different set points, 4.0 and 4.5 bar g, as follows:

* If the pressure is below 4.0 bar g, the controller opens the PCV-2101B: the fuel gas pressurizes the flash drum up to 4.0 bar g.
* If the pressure is equal or higher than 4.5 bar g, the controller opens the PCV-2101A, so that the pressure is kept around 4.5 bar g by realising gas to the LP flare.
* For pressure within the range 4.0 and 4.5 bar g, both the control valves PCV-2101 A and PCV-2101 B, are close.

During normal operation, due to the net production of flashed gas, the system operates with the PCV-2101 A slightly open, relieving about 15 kg/h of gas.

Note that the gas flashing is favoured by lower pressure, but the flash drum pressure cannot be lowered too much, since a minimum pressure is required to assure the proper rich TEG flowing from flash drum to the downstream still column.

* 1. **FLASH DRUM TEMPERATURE.**

High temperatures favour the removal of dissolved gas and decrease the glycol viscosity, thus improving the flash drum performance in terms of separation of gas and hydrocarbon phases. On the other hand an excessive temperature can increase the TEG vaporisation losses and lowers the char coal filter efficiency. On this basis the optimal operating temperatures are in the range 60-95 °C. In our case, the rich glycol exits at about 60 °C from the chimney tray of the contactor and reaches about 74 °C in the reflux condenser on the top of the still column, where acts as cooling medium of the glycol/water vapours rising from the random packing of the still column.

The temperature inside the flash drum is monitored by:

* TT/TI-2105 with relevant alarm TAL-2105 and TAH-2105 of low and high temperature.
  1. **REBOILER TEMPERATURE.**

It is controlled by TIC-2109, which reset TV-2109 (fuel gas to main burner). Being the burner natural draft type, no dedicated control device is provided for combustion air flow rate.

The normal operating temperature is 204 °C (400 °F). This temperature together with the amount of stripping gas and reboiler pressure, determines the concentration of regenerated TEG (99.7 % minimum).

The concentration of lean TEG is very sensitive to temperature, but it is not advisable to run at temperatures higher than 204 °C (400 °F) since at 210 °C (410 °F) TEG starts to decompose (thermal degradation). The process is activated if H2S is present. If oxygen is present, it combines readily with TEG.

Glycol degradation must be avoided since the resulting products are corrosive and tend to clog the packing and the filters.

For the above reasons if higher concentration TEG is required it is necessary to make use of more stripping gas to help the removal of water.

For the same reasons the heating elements should have the minimum temperature gradient and should be run as smoothly as possible.

High temperature in reboiler is signalled by TAH-2109 set at 207 °C.

Excessive temperature in reboiler is signalled by TAHH-2106 set at 210 °C, activating the reboiler general shut down, according to the interlock chain I-1.

* TIT-2109 with relevant alarm TAL-2109 and TAH-2109 of low and high temperature.
  1. **STRIPPING GAS FLOW RATE.**

The flow has shown at FIT-2103 and controlled though related manual valve.

According to the lean glycol concentration operator will adjust the stripping gas rate.

The stripping gas before injection in the sparge in the bottom of the surge drum, is heated by a coil submerged in the reboiler so that the temperature will increase to about 100 °C.

The stripping gas causes the final removal of water from the glycol by bubbling inside the surge drum, enhancing the evaporation of water by decreasing the H2O partial pressure.

The flow rate of stripping gas is in relationship with the lean TEG flow. At low unit feed rate, it can be convenient to reduce the stripping gas rate to reduce the consumption.

At high reboiler operating pressure (up to 0.5 bar g) with 50% of TEG package capacity, it will be necessary to adjust the stripping gas rate (up to 40 kg/h at 0.5 bar g in still column). At normal operation, the stripping gas rate should be adjusted (for example at normal condition about 60 kg/h at 0.2 bar g in still column).

* 1. **SURGE DRUM LIQUID LEVEL.**

The lean glycol outgoing the surge drum is under flow control. Therefore, the liquid level cannot be controlled but only monitored, by:

* LIT-2114, providing level indication (normal level at +750 mm from vessel bottom) and relevant alarms LAL-2114 and LAH-2114 (set at +350 and +850 mm respectively from vessel bottom).

During operation, the liquid level inside the surge drum will slowly but progressively decrease, due to the glycol losses in the unit, due to:

* Glycol vaporization losses (about 1.2 kg/day)
* Losses due liquid droplets carryover (about 7 kg/day, mainly in the contactor).
* Other losses (thermal degradation, leakages, spillage, draining etc); normally, these losses should be negligible for a well operated unit.

When the liquid level in the surge drum reaches the low-level alarm, operators shall provide to make up fresh glycol up to a level slightly higher than normal.

The level should not be lower than LAL-2114, to provide an adequate hold up time upstream the pumps and the required NPSH.

Very low and very high liquid level activate the relevant alarms and interlock chains, as follows:

* LAHH-2115, (set at + 980 mm) activates the reboiler general shut down (I-1 and I-5 chain)
* LALL-2116 (set at + 250 mm), activates the pump shut down (I-4 chain).

1. **GLYCOL DEHYDRATION UNIT INTERLOCK SYSTEM**

The Dehydration Unit control and safety functions are managed by:

* Burner Management System (dedicated to Reboiler)
* PLC System (managing all the other equipment)

These systems are connected and exchange signals with the DCS and ESD system controlling the overall Binak plant.

In the following paragraphs control functions, alarms and interlock logics related to each equipment will be discussed in detail.

* 1. **CONTACTOR**

The rich glycol level at the chimney tray is controlled by the:

LIT/LIC/LCV-2101 control loop (normal level set at + 600 mm from the chimney tray bottom)

and monitored by:

LAH-2101 high level alarm (set at + 950 mm from the chimney tray bottom)

LAL-2101 low level alarm (set at + 250 mm from the chimney tray bottom).

The very high-level interlock is performed by:

LIT/LAHH-2103 device (set at + 1050 mm from the chimney tray bottom)

Activating the interlock chain, I-3 having the following effects:

* Glycol circulation pumps P-100 A/B shut down.

To restart the pumps, it will be necessary to lower the glycol level and reset the system.

The very low-level interlock is performed by:

LlT/LALL-2104 device (set at + 150 mm from the chimney tray bottom).

Activating the interlock chain, I-5 having the following effects:

* Closure of the valve ESDV-2101 on the rich glycol outlet line.

To open again the valve, it’s necessary to increase the glycol level and reset the system.

The condensate level at the contactor bottom (scrubber section) is controlled by the:

LT/LIC/LCV-2102 control loop (normal level set at + 400 mm from the contactor bottom)

monitored by:

LAH-2102 high level alarm (set at + 550 mm from the contactor bottom)

LAL-2102 low level alarm (set at + 250 mm from the contactor bottom).

The very high level interlock is performed by:

LIT/LAHH-2105 device (set at + 650 mm from the contactor bottom)

Activating the interlock chain I-6 having the following effects:

* Close the ESDV-2142 (out of Dehydration Unit battery limits) on the wet gas inlet line.

To open again the valve, it will be necessary to lower the condensate level and reset the system.

The very low-level interlock is performed by:

LIT/LALL-2106 device (set at + 150 mm from the contactor bottom).

Activating the interlock chain, I-7 having the following effects:

* Closure of the valve ESDV-2102 on the condensate outlet line.

To open again the valve, it’s necessary to increase the condensate level and reset the system.

The wet gas inlet temperature is indicated by:

TIT-2101. Normal temperature is 59.9 °C.

and monitored by TAH-2101 alarm (set 65 °C)

The lean glycol inlet temperature is indicated by:

TIT-2102. Normal temperature is about 68 °C.

monitored by TAH-2102 alarm (set 73 °C).

The lean TEG very high temperature interlock is performed by

TIT/TAHH-2102 device set at + 78 °C.

Activating the interlock chain, I-3 having the following effects:

* Glycol circulation pumps P-100 A/B shut down.

To restart the pumps, it will be necessary to lower the glycol temperature and reset the system.

The temperature difference between the inlet wet gas and lean glycol to contactor is indicated by:

TDI-2101. Normal temperature is 8.1 °C.

The temperature inside the contactor at the structured packing bottom is indicated by:

* TIT-2104

The dry gas temperature downstream the E-300 lean glycol cooler is indicated by:

* TIT-2103. Normal temperature is 66 °C.

The pressure drop across the structured packing is indicated by:

PDIT-2102. Normal pressure drop is quite low (about 0.01 bar).

and monitored by:

* PDAH-2102 the relevant alarm PDIAH-2102 set at 0.1 bar.

The pressure drop across the Demister pad is indicated by:

PDIT-2101. Normal pressure drop is quite low (about 0.01 bar).

and monitored by:

* PDAH-2101 with the relevant alarm PDIAH-2101 set at 0.1 bar.
  1. **FLASH DRUM**

The rich glycol level in the flash drum (downstream the weir) is controlled by the:

LIT-2110 and LCV-2104 control loop (normal level set at + 390 mm from the vessel bottom)

and monitored by:

LAH-2110 high level alarm (set at + 465 mm from the vessel bottom)

LAL-2110 low level alarm (set at + 340 mm from the vessel bottom).

The very high-level interlock is performed by:

LIT/LAHH-2108 device (set at + 550 mm from the vessel bottom)

Activating the interlock chain I-5 having the following effects:

* Closure of the valve ESDV-2101 on the rich glycol outlet line from the contactor.

To open again the valve, it’s necessary to decrease the glycol level and reset the system.

The very low level interlock is performed by:

LIT/LALL-2109 device (set at + 220 mm from the vessel bottom).

Activating the interlock chain, I-8 having the following effects:

* Closure of the valve ESDV-2103 on the rich glycol outlet from flash drum

To open again the valve, it’s necessary to increase the glycol level and reset the system.

The condensate level in the flash drum bucket is controlled by the:

LIT-2107 & LIC/LCV-2103 control loop

monitored by:

LIT-2107 high level alarm (set at + 400 mm from the bucket bottom)

LIT-2107 low level alarm (set at + 200 mm from the bucket bottom).

The controller acts in an on/off operation mode.

The flash drum operating pressure is controlled by the loop:

* PIT/PIC-2101 & PCV-2101A/B

The controller operates in split range mode on the valves PCV-2101 A and PCV-2101 B. In particular, if the pressure is higher than 4.5 bar g, the controller opens the PCV-2101 A keeping under control the pressure by conveying the flashed gas to the LP flare. In case the flow rate of flash gas is low (for example at start-up) and the pressure is below 4.0 bar g, the controller opens the PCV-2101 B and the pressure is increased by the fuel gas entering the vessel.

The flash drum temperature is indicated by:

TIT-2105 (normal value about 74 °C)

and monitored by:

TAH-2105 (set at 85 °C)

TAL-2105 (set at 60 °C)

* 1. **FILTERS**

Filters are monitored by local instrumentation only, as follows:

* Cartridges mechanical filters F-100A (F-100B) pressure drop is indicated by the PDG-2101(PDG-2102). When the pressure drop across the filter reaches 0.5 bar, cartridges must the replaced with clean ones. In the meantime, the rich glycol flow is switched to the filter in stand-by.
* Carbon filter F-200A(F-200B) pressure drop is indicated by PDG-2103 (PDG-2104). Normal value is about 0.1 bar. The condition of dirty or exhaust carbon filter is not necessarily detected by a significant increase of the pressure drop. More often, it’s recommended to replace the carbon element when a dark colour is detected in glycol samples (normal glycol colour must be in the range yellow-light brown).

As known, to keep the glycol circuit clean, it’s sufficient to filter about 25% of total rich glycol flow through the carbon filter. The actual flow rate to the filter can be adjusted by the 1” globe valve on the filter bypass line, based on reading of FI-2101.

* 1. **STILL COLUMN**

Temperature at the still column top is indicated by:

TIT-2107 (normal value in the range 88-90 °C).

and monitored by:

TAH-2107 (set at 100 °C)

TAL-2107 (set at 80 °C).

To be noted that the temperature at the still column top depends on:

* Column operating pressure
* Water partial pressure in the overhead vapours.

In particular, the temperature will increase at higher pressure and at higher water higher partial pressure.

Because the water partial pressure will depend on the stripping gas rate, a too low temperature means an excessive stripping gas flow. In this case, it’s recommended to check the lean glycol purity to verify the possibility of decreasing the stripping gas thus optimizing operating costs.

On the other side, a high temperature might be caused by:

* A low stripping gas rate, leading to a low lean glycol purity.
* A low reflux rate, leading to glycol vaporization losses in the overhead stream.

The pressure drop across the random packing of the still column is indicated by:

PDIT-2103.

The normal value is quite low (about 10 mbar).

This value can increase in case of fouling of random packing fouling, and may indicate the necessity of maintenance for cleaning.

* 1. **REBOILER**

For temperature control, see previous paragraph 6.6.

In case of very high temperature, the BMS activates the interlock chain I-1 “Reboiler Shut Down”, as described in the document “ESD/BMS Philosophy”, doc n. BK-GCS-MF-120-PR-PH-0002.

Flue gas temperature at the stack is indicated by TIT-2108 (normal value in 450-550 °C range).

The very high flue gas temperature TAHH-2108 (set at 600 °C), activates the interlock chain I-1 “Reboiler Shut Down”, as described in the document “ESD/BMS Philosophy”, doc n. BK-GCS-MF-120-PR-PH-0002.

The rich glycol level in the reboiler (Upstream the weir) is controlled by the:

LIT-2111 (normal level set at + 945 mm from the vessel bottom

and monitored by:

LAH-2111 high level alarm (set at + 960 mm from the vessel bottom)

LAL-2111 low level alarm (set at + 900 mm from the vessel bottom).

The very low level LIT/LALL-2112 activates on BMS the interlock chain I-1 (reboiler shutdown) as described in the document “ESD/BMS Philosophy”, doc n. BK-GCS-MF-120-PR-PH-0002.

The reboiler pressure, normally ranging between 0.2 and 0.5 bar g, is indicated by:

PIT-2102.

In case of very high pressure (set at 1.4 bar g), the PAHH-2102 activates the interlock chain I-1, as described in the document “ESD/BMS”, doc n. BK-GCS-MF-120-PR-PH-0002.

maintenance for cleaning.

* 1. **SURGE DRUM**

The liquid level control is described at paragraph 6.8.

In case of very high level (by LAHH-2115), the BMS activates the interlock chain I-1 “Reboiler Shut Down”, as described in the document “Burner Management System Philosophy”, doc n. BK-GCS-MF-120-PR-PH-0002. In addition, the very high level LAHH-2115 activates the interlock chain I-5, closing the valve ESDV-001 at the rich glycol outlet line from contactor.

To restart the reboiler and open again the valve it’s necessary to lower the glycol level and reset the system.

To enhance the glycol purity, stripping gas is injected into the surge drum through a dedicated sparger. As discussed at paragraph 6.7, the stripping gas flow rate is controlled by Manual valve through FIT-2103

The normal flow rate (at design condition) is 60 kg/h. However, this value can be changed depending on the reboiler / still column actual operating pressure as well as the wet gas and lean glycol flow rate.

FAH-2103, high flow rate alarm (set at 80 kg/h).

FAL-2103, low flow rate alarm (set 20 kg/h).

1. **PUMPS CONTROL LOGIC**
   1. **GLYCOL CIRCULATION PUMPS**

For the Glycol Circulation Pumps P-100A/B, the following applies.

LOCAL COMMANDS.

On the pumps local push button station, the following commands are provided:

* P-100 A Pump start command YSH-2101A
* P-100 A Pump stop command YSL-2101A
* P-100 B Pump start command YSH-2101B
* P-100 A Pump stop command YSL-2101B
* P-100 A Pump Local/ Remote Selector YXS-2101A
* P-100 B Pump Local/ Remote Selector YXS-2101B

REMOTE COMMANDS.

On the UCP, the following commands are provided:

* P-100 A Pump start command HST-2101A
* P-100 A Pump stop command HSP-2102A
* P-100 B Pump start command HST-2101B
* P-100 A Pump stop command HSP-2102B

In addition, on the UCP, the following signals are available:

* P-100A Pump Status YL-2101A(Running: signal on in green colour / Stop: Signal in red colour)
* P-100A Pump fault YA-2101A (signal on in red colour when the pump has fault)
* P-100A Pump operation mode YXL-2101A (Local/Remote: red colour “Local” / Green colour “Remote”)
* P-100A Pump available YLP-2101A (permitted to start: green)

* P-100B Pump Status YL-2101B(Running: signal on in green colour / Stop: Signal in red colour)
* P-100B Pump fault YA-2101B (signal on in red colour when the pump has fault)
* P-100B Pump operation mode YXL-2101B (Local/Remote: red colour “Local” / Green colour “Remote”)
* P-100B Pump available YLP-2101B (permitted to start: green)

Note: Pumps P-100A/B are in shut down in case of:

1) low low level in Surge Drum (Interlock chain I-4)

2) high high level in the contactor (interlock chain I-3)

The following applies:

* When one of the pump fault, UCP switch to other via I-9 (auto start)
* When the selector YXS-2101A is on “Local”, the pump P-100A can be started only by the command YSH-2101A on local push button station. The remote start command HS-2101A is inhibited.The signal YSH-2101 A is red on PLC panel.
* When the selector YXS-2101B is on “Local”, the pump P-100B can be started only by the command YSH-2101 B on local push button station. The remote start command HS-2101B is inhibited. The signal YSH-2101B is red on PLC panel.
* When the selector YXS-2101A is on “Remote”, the pump P-100A can be started only by the remote command HS-2101A on PLC Panel. The signal YSH-2101A is green on PLC panel.
* When the selector YXS-2101B is on “Remote”, the pump P-100B can be started only by the remote command HS-2101B on PLC Panel. The signal YSH-2101B is green on PLC panel.
* The stop commands, local and remote, are always active whichever is the selection “Local/Remote”.
* When the pump is started (both by remote or by local command), the signal YL-2101A (or YL-2101 B) is in green colour on PLC panel.
* Obviously, if the pumps are in shut down (I-3 and/or I-4 activated), all starts commands are inhibited. To restart the pump, the problem must be solved, and the system must be reset.
* YLP-2101A (YLP-2101 B) depends on MCC and interlock I-3 and/or I-4, whenever has not fault signals and I-3 and I-4 deactivated too, pump is granted to start.

* 1. **ANTIFOAM INJECTION PUMP / pH CONTROLLER INJECTION PUMP**

These pumps have only local operation mode.

Pump can be started / stopped by the relevant commands on the local push button station.

A local selector switch in order to choose one of the pumps located in LCS.

Shut down of chemical injection pumps is activated in case of Glycol Circulation Pumps shut down. Therefore, the chemical pumps shut down is activated by low low liquid level in the surge drum (interlock chain I-3) and high high level in the contactor (interlock chain I-4).

On the UCP panel, a signal is provided to advice operators of the running status of the chemical pumps.