|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **طرح نگهداشت و افزایش تولید 27 مخزن** | | | | | | | |
| **CALCULATION NOTE FOR DRUM SIZING**  **نگهداشت و افزایش تولید میدان نفتی بینک** | | | | | | | |
| D07 | AUG.2023 | AFD | M.Aryafar | M.Fakharian | A.M.Mohseni |  |
| D06 | FEB.2023 | IFA | M.Aryafar | M.Fakharian | M.Mehrshad |  |
| D05 | OCT.2022 | IFA | M.Aryafar | M.Fakharian | M.Mehrshad |  |
| D04 | JUL.2022 | IFA | M.Aryafar | M.Fakharian | M.Mehrshad |  |
| D03 | MAR.2022 | IFA | M.Aryafar | M.Fakharian | M.Mehrshad |  |
| D02 | DEC.2021 | IFA | M.Aryafar | M.Fakharian | M.Mehrshad |  |
| D01 | NOV.2021 | IFA | M.Aryafar | M.Fakharian | M.Mehrshad |  |
| D00 | SEP. 2021 | IFC | M.Aryafar | M.Fakharian | Sh.Ghalikar |  |
| **Rev.** | **Date** | **Purpose of Issue/Status** | **Prepared by:** | **Checked by:** | **Approved by:** | **CLIENT Approval** |
| **Class:2** | | **CLIENT Doc. Number: F0Z-708740** | | | | |
| **Status:** | **IDC: Inter-Discipline Check**  **IFC: Issued For Comment**  **IFA: Issued For Approval**  **AFD: Approved For Design**  **AFC: Approved For Construction**  **AFP: Approved For Purchase**  **AFQ:** Approved For Quotation  **IFI: Issued For Information**  **AB-R: As-Built for Client Review**  **AB-A: As-Built –Approved** | | | | | |

**REVISION RECORD SHEET**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PAGE** | **D00** | **D01** | **D02** | **D03** | **D04** | **D05** | **D06** | **D07** |  | **PAGE** | **D00** | **D01** | **D02** | **D03** | **D04** | **D05** | **D06** |
| **1** | X | X | X | X | X | X | X | X | **66** | X |  | X |  |  |  |  |
| **2** | X | X | X | X | X | X | X | X | **67** | X |  | X |  |  |  |  |
| **3** | X |  | X |  |  |  |  |  | **68** |  |  |  |  |  |  |  |
| **4** | X |  | X |  |  |  |  |  | **69** |  |  |  |  |  |  |  |
| **5** | X | X | X | X | X | X |  |  | **70** |  |  |  |  |  |  |  |
| **6** | X | X | X | X | X | X | X |  | **71** |  |  |  |  |  |  |  |
| **7** | X |  | X | X | X |  | X |  | **72** |  |  |  |  |  |  |  |
| **8** | X | X | X | X | X |  |  |  | **73** |  |  |  |  |  |  |  |
| **9** | X | X | X | X | X | X |  |  | **74** |  |  |  |  |  |  |  |
| **10** | X | X | X | X | X |  |  |  | **75** |  |  |  |  |  |  |  |
| **11** | X | X | X | X | X |  |  |  | **76** |  |  |  |  |  |  |  |
| **12** | X |  | X | X | X |  |  |  | **77** |  |  |  |  |  |  |  |
| **13** | X |  | X | X | X |  | X |  | **78** |  |  |  |  |  |  |  |
| **14** | X |  | X | X | X |  |  |  | **79** |  |  |  |  |  |  |  |
| **15** | X |  | X | X | X |  |  |  | **80** |  |  |  |  |  |  |  |
| **16** | X |  | X | X | X |  |  |  | **81** |  |  |  |  |  |  |  |
| **17** | X |  | X | X | X |  |  |  | **82** |  |  |  |  |  |  |  |
| **18** | X |  | X | X | X |  |  |  | **83** |  |  |  |  |  |  |  |
| **19** | X |  | X | X | X |  |  |  | **84** |  |  |  |  |  |  |  |
| **20** | X |  | X | X | X |  |  |  | **85** |  |  |  |  |  |  |  |
| **21** | X |  | X |  |  |  |  |  | **86** |  |  |  |  |  |  |  |
| **22** | X |  | X |  |  |  |  |  | **87** |  |  |  |  |  |  |  |
| **23** | X |  | X |  |  |  |  |  | **88** |  |  |  |  |  |  |  |
| **24** | X |  | X |  |  |  |  |  | **89** |  |  |  |  |  |  |  |
| **25** | X |  | X |  |  |  |  |  | **90** |  |  |  |  |  |  |  |
| **26** | X |  | X |  |  |  |  |  | **91** |  |  |  |  |  |  |  |
| **27** | X |  | X |  |  |  |  |  | **92** |  |  |  |  |  |  |  |
| **28** | X |  | X |  |  |  |  |  | **93** |  |  |  |  |  |  |  |
| **29** | X |  | X |  |  |  |  |  | **94** |  |  |  |  |  |  |  |
| **30** | X |  | X |  |  |  |  |  | **95** |  |  |  |  |  |  |  |
| **31** | X |  | X |  |  |  |  |  | **96** |  |  |  |  |  |  |  |
| **32** | X |  | X |  |  |  |  |  | **97** |  |  |  |  |  |  |  |
| **33** | X |  | X |  |  |  |  |  | **98** |  |  |  |  |  |  |  |
| **34** | X |  | X |  |  |  |  |  | **99** |  |  |  |  |  |  |  |
| **35** | X |  | X |  |  |  |  |  | **100** |  |  |  |  |  |  |  |
| **36** | X |  | X |  |  |  |  |  | **101** |  |  |  |  |  |  |  |
| **37** | X |  | X |  |  |  |  |  | **102** |  |  |  |  |  |  |  |
| **38** | X |  | X |  |  |  |  |  | **103** |  |  |  |  |  |  |  |
| **39** | X |  | X |  |  |  |  |  | **104** |  |  |  |  |  |  |  |
| **40** | X |  | X |  |  |  |  |  | **105** |  |  |  |  |  |  |  |
| **41** | X |  | X |  |  |  |  |  | **106** |  |  |  |  |  |  |  |
| **42** | X |  | X |  |  |  |  |  | **107** |  |  |  |  |  |  |  |
| **43** | X |  | X |  |  |  |  |  | **108** |  |  |  |  |  |  |  |
| **44** | X |  | X |  |  |  |  |  | **109** |  |  |  |  |  |  |  |
| **45** | X |  | X |  |  |  |  |  | **110** |  |  |  |  |  |  |  |
| **46** | X |  | X |  |  |  |  |  | **111** |  |  |  |  |  |  |  |
| **47** | X |  | X |  |  |  |  |  | **112** |  |  |  |  |  |  |  |
| **48** | X |  | X |  |  |  |  |  | **113** |  |  |  |  |  |  |  |
| **49** | X |  | X |  |  |  |  |  | **114** |  |  |  |  |  |  |  |
| **50** | X |  | X |  |  |  |  |  | **115** |  |  |  |  |  |  |  |
| **51** | X |  | X |  |  |  |  |  | **116** |  |  |  |  |  |  |  |
| **52** | X |  | X |  |  |  |  |  | **117** |  |  |  |  |  |  |  |
| **53** | X |  | X |  |  |  |  |  | **118** |  |  |  |  |  |  |  |
| **54** | X |  | X |  |  |  |  |  | **119** |  |  |  |  |  |  |  |
| **55** | X |  | X |  |  |  |  |  | **120** |  |  |  |  |  |  |  |
| **56** | X |  | X |  |  |  |  |  | **121** |  |  |  |  |  |  |  |
| **57** | X |  | X |  |  |  |  |  | **122** |  |  |  |  |  |  |  |
| **58** | X |  | X |  |  |  |  |  | **123** |  |  |  |  |  |  |  |
| **59** | X |  | X |  |  |  |  |  | **124** |  |  |  |  |  |  |  |
| **60** | X |  | X |  |  |  |  |  | **125** |  |  |  |  |  |  |  |
| **61** | X |  | X |  |  |  |  |  | **126** |  |  |  |  |  |  |  |
| **62** | X |  | X |  |  |  |  |  | **127** |  |  |  |  |  |  |  |
| **63** | X |  | X |  |  |  |  |  | **128** |  |  |  |  |  |  |  |
| **64** | X |  | X |  |  |  |  |  | **129** |  |  |  |  |  |  |  |
| **65** | X |  | X |  |  |  |  |  | **130** |  |  |  |  |  |  |  |

**CONTENTS**

[1.0 NTRODUCTION 4](#_Toc116387322)

[2.0 Scope 4](#_Toc116387323)

[3.0 NORMATIVE REFERENCES 5](#_Toc116387324)

[3.1 Local Codes and Standard 5](#_Toc116387325)

[3.2 The Project Documents 5](#_Toc116387326)

[3.3 ENVIRONMENTAL DATA 5](#_Toc116387327)

[3.4 ORDER OF PRECEDENCE 5](#_Toc116387328)

[4.0 Abbreviations 5](#_Toc116387329)

[5.0 Calculation Results 6](#_Toc116387330)

[6.0 Close drain drum calculation report 6](#_Toc116387331)

[7.0 Diesel oil storage tank calculation report 7](#_Toc116387332)

[8.0 Air receiver volume calculation report 7](#_Toc116387333)

[9.0 Nitrogen receiver volume calculation report 8](#_Toc116387334)

[10.0 Glycol sump drum calculation 8](#_Toc116387335)

[11.0 POTABLE WATER TANK 8](#_Toc116387336)

[12.0 OILY WATER SUMP 9](#_Toc116387337)

[13.0 GLYCOL STORAG TANK 10](#_Toc116387338)

[14.0 Flare drum calculation 11](#_Toc116387339)

[15.0 Calculation Report 13](#_Toc116387340)

[ATTACHMENT 13](#_Toc116387342)

1. **NTRODUCTION**

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.

**GENERAL DEFINITION**

The following terms shall be used in this document.

|  |  |
| --- | --- |
| CLIENT: | National Iranian South Oilfields Company (NISOC) |
| PROJECT: | Binak Oilfield Development – Surface Fcilities; New Gas Compressor Station |
| EPD/EPC CONTRACTOR (GC): | Petro Iran Development Company (PEDCO) |
| EPC CONTRACTOR: | Joint Venture of : Hirgan Energy – Design & Inspection (D&I) Companies |
| VENDOR: | The firm or person who will fabricate the equipment or material. |
| EXECUTOR: | Executor is the party which carries out all or part of construction and/or commissioning for the project. |
| THIRD PARTY INSPECTOR (TPI): | The firm appointed by EPD/EPC CONTRACTOR (GC) and approved by CLIENT (in writing) for the inspection of goods. |
| SHALL: | Is used where a provision is mandatory. |
| SHOULD: | Is used where a provision is advisory only. |
| WILL: | Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR. |
| MAY: | Is used where a provision is completely discretionary. |

1. **Scope**

This document provides the vessel and drum sizing calculation for BINAK Gas Compressor Station.

1. **NORMATIVE REFERENCES**

## Local Codes and Standard

* IPS-E-PR-360 Engineering Standard For Process Requirement Of Vessels Reactors And Separators
* IPS-E-PR-850 Engineering Standard For Process Design Of Liquid & Gas Transfer And Storage

## The Project Documents

BK-GCS-PEDCO-120-PR-PF-0001 Process Flow Diagram (PFD)

BK-GNRAL-PEDCO-000-PR-DB-0001 Process Basis of Design

BK-GNRAL-PEDCO-000-PR-DC-0001 Process Design Criteria

## ENVIRONMENTAL DATA

Refer to "Process Basis of Design”; Doc. No. Process Basis of Design BK-00-HD-000-PR-DB-0001

## ORDER OF PRECEDENCE

In case of any conflict between the contents of this document or any discrepancy between this document and other project documents or reference standards, this issue must be reported to the CLIENT. The final decision in this situation will be made by CLIENT.

1. **Abbreviations**

NIOC: National Iranian Oil Company

NISOC: National Iranian South Oil Company

PFD: Process Flow Diagram

P&ID: Piping and Instrumentation Diagram

BFPD: Barrel Fluid per Day

1. **Calculation Results**

For sizing of equipment’s all possible cases have been considered and worst case has been chosen. The details of calculations are presented as follow.

List of equipment is summarized in below table:

|  |  |  |  |
| --- | --- | --- | --- |
| ***Tag Number*** | ***Equipment Description*** | ***P&ID. N*** | ***SIZE***  ***(ID\*TL-TL)(m)*** |
| V-2101 | 1ST STAGE GAS COMPRESSION SUCTION DRUM | BK-GCS-PEDCO-120-PR-PI-0006 | 0.9 × 3 |
| V-2102 | 2ND STAGE GAS COMPRESSION SUCTION DRUM | BK-GCS-PEDCO-120-PR-PI-0009 | 0.9 × 3 |
| V-2103 | GAS COMPRESSION DISCHARGE DRUM | BK-GCS-PEDCO-120-PR-PI-0012 | 0.9 × 3 |
| V-2104 | SLUG CATCHER | BK-GCS-PEDCO-120-PR-PI-0004 (1/3) | 4.2 × 12.6 |
| V-2105 | INLET KNOCK OUT DRUM | BK-GCS-PEDCO-120-PR-PI-0005 | 1.5 × 4.5 |
| V-2205 | FUEL GAS K.O. DRUM | BK-GCS-PEDCO-120-PR-PI-0022 | 0.438 × 2.95 |
| V-2106 | DEGASSING VESSEL | Deleted | Deleted |
| V-2202 | CLOSED DRAIN DRUM | BK-GCS-PEDCO-120-PR-PI-0017(2/2) | 2.6 × 7.8 |
| V-2206 | DESEL OIL DRUM | BK-GCS-PEDCO-120-PR-PI-0023 | 2.3 × 6 |
| V-2203 | INSTRUMENT AIR RECEIVER | BK-GCS-PEDCO-120-PR-PI-0015(2/2) | 1.5×5 |
| V-2204 | NITROGEN RECEIVER | BK-GCS-PEDCO-120-PR-PI-0016 | 1 × 3.15 |
| V-2201 | LP FLARE K.O. DRUM | BK-GCS-PEDCO-120-PR-PI-0020(2/3) | 1 × 3 |
| V-2107 | GLYCOL SUMP DRUM | BK-GCS-PEDCO-120-PR-PI-0025 | 1.1 × 3.6 |
| T-2101 | SLUG STORAGE TANK | Deleted | Deleted |
| T-2102 | LEAN GLYCOL STORAGE TANK | BK-GCS-PEDCO-120-PR-PI-0014 | 4 × 5 |
| T-2209 | POTABLE WATER TANK | BK-GCS-PEDCO-120-PR-PI-0024 | 3.5 x 2.6 |
| SU-2202 | OILY WATER SUMP | BK-GCS-PEDCO-120-PR-PI-0021 | 3x 3 x 4 |

1. **Close drain drum calculation report**

For sizing close drain vessel, all continuous and intermittent drain should be investigated and the greatest inventory (V-2104) at a same time should be selected as the basis of drain drum sizing.

|  |  |  |
| --- | --- | --- |
| **Close Drain Drum Calculation** | | |
| Drum Diameter | 2.6 | m |
| Drum Length | 7.8 | m |
| Drum Total Volume | 46 | m3 |
| Maximum Continues Inlet Flow | 3 | m3/hr |
| HLL | 2.15 | m |
| LLL | 0.3 | m |
| Liquid Volume HLL | 40.9 | m3 |
| Liquid Volume LLL | 2.9 | m3 |
| Storage Volume (between HLL & LLL) | 38 | m3 |

1. **Diesel oil storage tank calculation report**

The Diesel Oil Storage Drum shall be capable to supply fuel oil to all the users for a minimum of 4 days of continuous operation.

Fuel oil storage drum volume is based on corrosion study, fire water pump calculation and diesel generator consumption.

|  |  |  |
| --- | --- | --- |
| **Fuel Oil Storage Drum Calculation** | | |
| Drum Diameter | 2300 | m |
| Drum Length | 6000 | m |
| Drum Total Volume | 28.11 | m3 |
| Total Fuel Oil Consumption | 5.1 | m3/day |
| HLL | 2.05 | m |
| LLL | 0.15 | m |
| Vol. from Bottom to HLL | 26.54 | m3 |
| Vol. from Bottom to LLL | 0.73 | m3 |
| Working Capacity | 28.5 | m3 |

1. **Air receiver volume calculation report**

The air receiver is sized to provide a buffer supply for air of 15 minutes from a pressure of 8 barg down to 4.5 barg, based on the air consumption rate of the plant.

|  |  |  |
| --- | --- | --- |
| **Air receiver** | | |
| Barometric Pressure P0 | 1.03 | Bara |
| Initial Air Receiver Pressure P1 | 9.03 | Bara |
| Final Air Receiver Pressure P2 | 5.53 | Bara |
| Air Receiver Retention time | 15 | Min |
| Total Plant Air Consumption | 119.7 | Nm3/hr |
| 126.2 | Sm3/hr |
| Max. Air Receiver Required Volume | 9.3 | m3 |
| Air Receiver Selected Diameter | 1.5 | m |
| Air Receiver Selected Length | 5 | m |
| Air Receiver Calculated Volume | 9.7 | m3  D06 |

1. **Nitrogen receiver volume calculation report**

The nitrogen receiver is sized to provide a buffer supply for 15 minutes from a pressure of 8 barg down to 4 barg, based on the maximum nitrogen consumption rate of the plant.

|  |  |  |
| --- | --- | --- |
| **Nitrogen receiver** | | |
| Barometric Pressure P0 | 1.03 | Bara |
| Initial N2 Receiver Pressure P1 | 9.03 | Bara |
| Final N2Receiver Pressure P2 | 5.03 | Bara |
| N2 Receiver Retention time | 15 | Min |
| Total N2 Consumption | 34 | Nm3/hr |
| 35.9 | Sm3/hr |
| Max. N2 Receiver Required Volume | 2.31 | m3 |
| N2 Receiver Selected Diameter | 1.05 | m |
| N2 Receiver Selected Length | 3.15 | m |
| N2 Receiver Calculated Volume | 3 | m3 |

1. **Glycol sump drum calculation**

|  |  |  |
| --- | --- | --- |
| **Glycol Sump Drum Calculation** | | |
| Drum Diameter | 1.1 | m |
| Drum Length | 3.6 | m |
| Drum Total Volume | 3.77 | m3 |
| HLL | 0.65 | m |
| LLL | 0.3 | m |
| Liquid Volume HLL | 2.33 | m3 |
| Liquid Volume LLL | 0.82 | m3 |
| Storage Volume (between HLL & LLL) | 1.51 | m3 |

1. **POTABLE WATER TANK**

|  |  |  |
| --- | --- | --- |
| **Potable Water Tank Calculation** | | |
| Tank Diameter | 3.5 | m |
| Tank Height | 2.6 | m |
| Tank Nominal Capacity | 25 | m3 |
| HLL | 2.25 | m |
| LLL | 0.15 | m |
| Working Capacity | 20 | m3 |

1. **OILY WATER SUMP**

|  |  |  |
| --- | --- | --- |
| **Oily Water Sump** | | |
| Hold-Up time | 15 | m |
| Length (L) | 3 | m |
| Hight (H) | 3 | m |
| Width (W) | 4 | m |
| HLL | 2.2 | m |
| Full Volume | 30 | m |
| Usable Volume | 26.4 | m |

1. **GLYCOL STORAG TANK**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| TAG NUMBER | | TK-2102 | | DESCRIPTION | |
| Working Capacity (m3) | | 44 | |  | |
| Discharge Flow rate (m3/h) | | 5.5 | |  | |
| Estimated Nominal capacity (m3) | | 62 | | Should be great that working capacity | |
| Tank Height (selected from table) (m) | | 5 | | Refer to TABLE A1 (IPS-E-PR360) | |
| Tank Diameter (selected from table) (m) | | 4 | | Refer to TABLE A1 (IPS-E-PR360) | |
| Outlet Nozzle Diameter (in) | | 2 | | (Set By Pump Calculation) | |
| Minimum Distance From Bottom Of Tank To Center Of Nozzles(mm) | | 175 | | Refer to TABLE 5.6a (API 650) | |
| Selected Distance | | 250 | |  | |
| Center Of Nozzle(mm) | | 30 | |  | |
| Value For low low liquid level from top of nozzle | | 150 | | minimum 150 mm Refer to (IPS-E-PR-360) section 6.3.1.2.1 | |
| calculated low low liquid of tank level (mm) | | 430 | |  | |
| selected low low liquid of tank level (mm) | | 600 | |  | |
| Time between low low liquid level and low liquid level (min) | | 2 | | usually 2-5 min | |
| volume of liquid between low liquid level  and low low liquid level (m3) | | 0.2 | |  | |
| Height of low liquid level and low low liquid level(mm) | | 15 | |  | |
| Selected Height of low liquid level and low low liquid level(mm) | | 200 | |  | |
| Height of high liquid level and low liquid level(mm) | | 3503 | |  | |
| Time between high high liquid level and high liquid level (min) | | 2 | | usually 2-5 min | |
| volume of liquid between high high liquid level  and high liquid level (m3) | | 0.2 | |  | |
| Height of high high liquid level and high liquid level(mm) | | 15 | |  | |
| Selected Height of high high liquid level and high liquid level(mm) | | 200 | |  | |
| Heigh between of roof tank and  high high liquid level (mm) | | 450 | |  | |
| Calculated height of tank (m) | | **5.0** | | **TRUE** | |
| **RESULTS** | |  | |
| **Tank Height (m)** | | **5** | |
| **Tank Diameter (m)** | | **4** | |
| **LLL (mm)** | | **600** | |
| **LL (m)** | | **800** | |
| **HL(m)** | | **4300** | |
| **HHL (m)** | | **4500** | |

1. **Flare drum calculation**

The drum size is based on depressurizing study and result shown as follow:





1. **Calculation Report**

**ATTACHMENT**

**(SOFTWARE RESULT)**