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| **طرح نگهداشت و افزایش تولید 27 مخزن** | | | | | | | |
| **CALCULATION BOOK FOR (CV,PSV,PUMP&LINE SIZING)-EXTENSIION OF BINAK B/C MANIFOLD**  **نگهداشت و افزایش تولید میدان نفتی بینک** | | | | | | | |
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| D01 | AUG.2022 | IFA | M.Aryafar | M.Fakharian | M.Mehrshad |  |
| D00 | FEB. 2022 | IFC | M.Aryafar | M.Fakharian | M.Mehrshad |  |
| **Rev.** | **Date** | **Purpose of Issue/Status** | **Prepared by:** | **Checked by:** | **Approved by:** | **CLIENT Approval** |
| **Class: 2** | | **CLIENT Doc. Number: F0Z-707918** | | | | |
| **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**

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| **PAGE** | **D00** | **D01** | **D02** | **D03** | **D04** |  | **PAGE** | **D00** | **D01** | **D02** | **D03** | **D04** |
| **1** | X |  |  |  |  | **66** |  |  |  |  |  |
| **2** | X |  |  |  |  | **67** |  |  |  |  |  |
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| **19** | X | X | X |  |  | **84** |  |  |  |  |  |
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| **21** | X | X | X |  |  | **86** |  |  |  |  |  |
| **22** | X | X | X |  |  | **87** |  |  |  |  |  |
| **23** | X | X | X |  |  | **88** |  |  |  |  |  |
| **24** | X | X | X |  |  | **89** |  |  |  |  |  |
| **25** | X | X | X |  |  | **90** |  |  |  |  |  |
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| **36** |  |  |  |  |  | **101** |  |  |  |  |  |
| **37** |  |  |  |  |  | **102** |  |  |  |  |  |
| **38** |  |  |  |  |  | **103** |  |  |  |  |  |
| **39** |  |  |  |  |  | **104** |  |  |  |  |  |
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| **42** |  |  |  |  |  | **107** |  |  |  |  |  |
| **43** |  |  |  |  |  | **108** |  |  |  |  |  |
| **44** |  |  |  |  |  | **109** |  |  |  |  |  |
| **45** |  |  |  |  |  | **110** |  |  |  |  |  |
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| **54** |  |  |  |  |  | **119** |  |  |  |  |  |
| **55** |  |  |  |  |  | **120** |  |  |  |  |  |
| **56** |  |  |  |  |  | **121** |  |  |  |  |  |
| **57** |  |  |  |  |  | **122** |  |  |  |  |  |
| **58** |  |  |  |  |  | **123** |  |  |  |  |  |
| **59** |  |  |  |  |  | **124** |  |  |  |  |  |
| **60** |  |  |  |  |  | **125** |  |  |  |  |  |
| **61** |  |  |  |  |  | **126** |  |  |  |  |  |
| **62** |  |  |  |  |  | **127** |  |  |  |  |  |
| **63** |  |  |  |  |  | **128** |  |  |  |  |  |
| **64** |  |  |  |  |  | **129** |  |  |  |  |  |
| **65** |  |  |  |  |  | **130** |  |  |  |  |  |

**CONTENTS**

[1.0 INTRODUCTION 4](#_Toc92726567)

[2.0 Scope 5](#_Toc92726568)

[3.0 NORMATIVE REFERENCES 5](#_Toc92726569)

[3.1 Local Codes and Standards 5](#_Toc92726570)

[3.2 International Codes and Standards 5](#_Toc92726571)

[3.3 The Project Documents 5](#_Toc92726572)

[3.4 ENVIRONMENTAL DATA 5](#_Toc92726573)

[3.5 Order of Precedence 5](#_Toc92726574)

[4.0 CONTROL VALVE SIZING 6](#_Toc92726575)

[4.1 Software 6](#_Toc92726576)

[4.2 Case Study 6](#_Toc92726577)

[4.3 SIZING 6](#_Toc92726578)

[4.4 DETAILS OF CALCULATION RESULT 6](#_Toc92726580)

[ATTACHMENT 1 6](#_Toc92726581)

[5.0 PSV SIZING CALCULATION REPORT 7](#_Toc92726582)

[5.1 software 7](#_Toc92726583)

[ATTACHMENT 2 9](#_Toc92726584)

[6.0 PUMP CALCULATION REPORT 10](#_Toc92726585)

[ATTACHMENT 3 10](#_Toc92726586)

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, construction of well location, access road, wellhead facilities (with electric power supply) for W007S shall be done. In addition, construction of new flowline from aforementioned well location to Binak B/C unit (with extension of relevant manifold) are in the Project scope of work.

**GENERAL DEFINITION**

The following terms shall be used in this document.

|  |  |
| --- | --- |
| CLIENT: | National Iranian South Oilfields Company (NISOC) |
| PROJECT: | Binak Oilfield Development – Construction of Well Location, Wellhead Facilities, Electrification Facilities, Flowlines for W007S and Extension of Binak B/C Manifold |
| 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 covers calculation report such as Pump Calculation,PSV Sizing and Control Valve Calculation for Extension Of Binak Manifold.

1. **NORMATIVE REFERENCES**

## Local Codes and Standards

* IPS-E-IN-160 Engineering Standard for Control Valves
* IPS-M-IN-160 Material Standard for Control Valves
* IPS-E-PR-830 Process design of valves and control valves
* IPS-E-PR-450 Process Design Of Pressure Relieving systems inclusive safety relief valves
* IPS-E-PR-460 Process Design Of Flare And Blowdown Systems

## International Codes and Standards

* API RP 553 Refinery Valves and Accessories for Control and Safety Instrumented Systems
* API-STD-520 Sizing, Selection and Installation of Pressure Relieving Devices in Refineries, Part 1-Sizing and Selection
* API-STD-521 Pressure Relieving and Depressuring Systems
* API-STD-526 Flanged Steel Pressure Relief Valves

## The Project Documents

* 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. BK-GNRAL-PEDCO-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. **CONTROL VALVE SIZING**

## Software

* The software using for sizing Control Valves is Nelprof 5.

## Case Study

Three cases have been considered for control valve sizing:

* Case 1: Maximum operating flow is equal to 110% of normal operating flow.
* Case 2: Normal operating flow.
* Case 3: Minimum operating flow is equal to min operating flow

Note: It should be noted that the special conditions, related to each control valve is taken into account.

## SIZING

D01

* The below table contains the details sizing for the control vales that installed in Manifold.



## DETAILS OF CALCULATION RESULT

**ATTACHMENT 1**

**(SOFTWARE RESULT)**

1. **PSV SIZING CALCULATION REPORT**

## software

The software using for sizing Pressure safety valve is valve star. Pressure safety valve sizing report have been reported as following attachment.

D01

|  |  |  |
| --- | --- | --- |
| PSV No. | PRV-1701A,C | PRV-1701B |
| Service | CRUDE OIL | CRUDE OIL |
| Fire | YES | YES |
| Other | - | - |
| Fluid & State | GAS & OIL / 2 PHASE | GAS & OIL / 2 PHASE |
| Operating Pressure (Barg) | 12.78 | 12.78 |
| Normal Temperature (°C) | 46.19 | 31.60 |
| P set, Barg | 93 | 93 |
| Required massflow (kg/hr) | 11347.034 | 17421.909 |
| Specific Heat Ratio (Cp/Cv) | 1.005 | 1.007 |
| Molecular Weight (kg/Kmol) | 77.41 | 39.09 |
| Compressibility Factor | - | - |
| Total Back Pressure ( Bar ) | 1.5 | 1.5 |
| Allowable Over Pressure (%) | 21 | 21 |
| Discharge area, cm2 | 1.539 | 2.54 |
| Orifice Designation | E | F |
| Body size | 1” × 2” | 1 1/2" × 2” |
| P&ID Number | BK-W007S-PEDCO-110-PR-PI-0001 (3/6,4/6) | BK-W007S-PEDCO-110-PR-PI-0001 (4/6) |

D01

|  |  |  |
| --- | --- | --- |
| PSV No. | PRV-1701D,E | PRV-1701F |
| Service | CRUDE OIL | CRUDE OIL |
| Fire | YES | YES |
| Other | - | - |
| Fluid & State | GAS & OIL / 2 PHASE | GAS & OIL / 2 PHASE |
| Operating Pressure (Barg) | 12.78 | 12.78 |
| Normal Temperature (°C) | 44.41 | 41.77 |
| P set, Barg | 93 | 93 |
| Required massflow (kg/hr) | 29036.515 | 11614.606 |
| Specific Heat Ratio (Cp/Cv) | 1.007 | 1.007 |
| Molecular Weight (kg/Kmol) | 39.09 | 39.09 |
| Compressibility Factor | - | - |
| Total Back Pressure ( Bar ) | 1.5 | 1.5 |
| Allowable Over Pressure (%) | 21 | 21 |
| Discharge area, cm2 | 3.97 | 1.539 |
| Orifice Designation | G | E |
| Body size | 1 1/2” × 3” | 1" × 2” |
| P&ID Number | BK-W007S-PEDCO-110-PR-PI-0001 (4/6,5/6) | BK-W007S-PEDCO-110-PR-PI-0001 (5/6) |

|  |  |  |
| --- | --- | --- |
| PSV No.  D01 | PRV-1701A,C | PRV-1701B |
| Service | CRUDE OIL | CRUDE OIL |
| Block outlet | YES | YES |
| Other | - | - |
| Fluid & State | GAS & OIL / 2 PHASE | GAS & OIL / 2 PHASE |
| Operating Pressure (Barg) | 12.78 | 12.78 |
| Normal Temperature (°C) | 46.19 | 31.60 |
| P set, Barg | 93 | 93 |
| Required massflow (kg/hr) | 11347.034 | 17421.909 |
| Specific Heat Ratio (Cp/Cv) | 1.005 | 1.007 |
| Molecular Weight (kg/Kmol) | 77.41 | 39.09 |
| Compressibility Factor | - | - |
| Total Back Pressure ( Bar ) | 1.5 | 1.5 |
| Allowable Over Pressure (%) | 10 | 10 |
| Discharge area, cm2 | 1.539 | 2.54 |
| Orifice Designation | E | F |
| Body size | 1” × 2” | 1 1/2" × 2” |
| P&ID Number | BK-W007S-PEDCO-110-PR-PI-0001 (3/6,4/6) | BK-W007S-PEDCO-110-PR-PI-0001 (4/6) |

|  |  |  |
| --- | --- | --- |
| PSV No.  D01 | PRV-1701D,E | PRV-1701F |
| Service | CRUDE OIL | CRUDE OIL |
| Block outlet | YES | YES |
| Other | - | - |
| Fluid & State | GAS & OIL / 2 PHASE | GAS & OIL / 2 PHASE |
| Operating Pressure (Barg) | 12.78 | 12.78 |
| Normal Temperature (°C) | 44.41 | 41.77 |
| P set, Barg | 93 | 93 |
| Required massflow (kg/hr) | 29036.515 | 11614.606 |
| Specific Heat Ratio (Cp/Cv) | 1.007 | 1.007 |
| Molecular Weight (kg/Kmol) | 39.09 | 39.09 |
| Compressibility Factor | - | - |
| Total Back Pressure ( Bar ) | 1.5 | 1.5 |
| Allowable Over Pressure (%) | 10 | 10 |
| Discharge area, cm2 | 3.97 | 1.539 |
| Orifice Designation | G | E |
| Body size | 1 1/2” × 3” | 1" × 2” |
| P&ID Number | BK-W007S-PEDCO-110-PR-PI-0001 (4/6,5/6) | BK-W007S-PEDCO-110-PR-PI-0001 (5/6) |

**ATTACHMENT 2**

**(SOFTWARE RESULT)**

1. **PUMP** **CALCULATION REPORT**

Detail of pump calculation are given in the attached file:

**ATTACHMENT 3**

**(SOFTWARE RESULT)**

1. **LINE SIZING**

Detail of line sizing are given in the attached file:

**ATTACHMENT 4**

**(SOFTWARE RESULT)**