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| **طرح نگهداشت و افزایش تولید 27 مخزن** | | | | | | |
| **HAZOP REPORT FOR BINAK B/C MANIFOLD EXTENSION**  **نگهداشت و افزایش تولید میدان نفتی بینک** | | | | | | |
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| D00 | JUL. 2021 | IFI | A.Baghaei | M.Fakharian | M.Mehrshad |  |
| **Rev.** | **Date** | **Purpose of Issue/Status** | **Prepared by:** | **Checked by:** | **Approved by:** | **CLIENT Approval** |
| **Class: 3** | | **CLIENT Doc. Number: F0Z-707340** | | | | |
| **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** |
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# 1.0 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. |

# 2.0 SCOPE

The scope of HAZOP study covers all P&IDs for Extension of Binak B/C Manifold. The list of

P&IDs is presented in appendix B.

# NORMATIVE REFERENCES

## INTERNATIONAL CODES AND STANDARDS

* + - IEC 61882:2016 Hazard and Operability studies (HAZOP Studies) – Application guide

## THE PROJECT DOCUMENTS

* + - BK-GNRAL-HD-000-PR-DB-0001-D05 Process Basis of Design

# PURPOSE

The purpose of this document is to provide the results of “HAZOP Study” for **Binak Oilfield Development – Extension of Binak B/C Manifold**.

The objective of HAZOP study is to perform and achieve the following tasks and goals as far as practicable given the latest piping and instrumentation diagrams (P&ID’s) to identify any potential hazards associated with the system and its utility systems:

* + - To identify any potential operating difficulties,
    - Examine the effectiveness of those measures already incorporated in the design to mitigate the frequency and/or consequences of such hazards;
    - To raise action items for addressing those hazards that the present design does not satisfactorily address.

# 5.0 HAZOP STUDY OVERVIEW

Meeting was conducted in one session at June 25, 2022 held in Neyshekar Hotel main meeting hall, Ahvaz.

A team comprising of experts from different disciplines of National Iranian South Oilfields Company (NISOC), Petro Iran Development Company (PEDCO) and Hirgan Energy Company conducted the study with a third-party HAZOP Chairman and Scribe. The list of team members is presented in appendix A.

# 6.0 PROCEDURE

The review methodology will be the "Guide Word" HAZOP technique and will be performed in accordance with the guidelines published by the Center for Chemical Process Safety (CCPS) of the American Institute of Chemical Engineers (AIChE) and also noted in IEC 61882.

The purpose of the review should not be only to resolve the action items but also to identify credible deviations from the design intent. The method identifies hazards and postulates possible accident sequences resulting from such hazards; Innovative thinking then identifies the consequences of these scenarios. The process demonstrates to the Owner/Management that prudent steps which have been taken to provide a safe installation and operation.

The scope of the HAZOP shall be therefore, on identifying potential process hazards or operability concerns, not on finding solutions to reduce or eliminate these concerns. Attempting to solve problems by the HAZOP team can result in a long and inefficient study process. At the same time, the HAZOP study cannot be intended as a review of Project Design Basis and Operating Philosophies, since these must be considered as resolved when the HAZOP study will be carried out.

Each system or equipment should be divided into subsystems by consensus of the review team. The selected system shall be identified by a study node numbers and for easy reference a color code can also be inserted on the related P&ID prior to the review and worksheet during the review.

**List of possible parameters and guidewords**

|  |  |  |
| --- | --- | --- |
| **Deviations** | **Guide Word** | **Parameter** |
| No/Less Flow | No/Less | Flow |
| More Flow | More | Flow |
| Reverse/Misdirected Flow | Reverse/Misdirected | Flow |
| High Temperature | High | Temperature |
| Low Temperature | Low | Temperature |
| High Pressure | High | Pressure |
| Low Pressure | Low | Pressure |
| High Level | High | Level |
| Low Level | Low | Level |
| Maintenance Hazards | Other than | Maintenance |
| Leakage | As well as | Flow |
| Corrosion | As well as | Operation |
| Composition | As well as | Composition |
| Start-up/Shutdown Hazards | Other than | Start-up/Shutdown |
| Loss of Utilities | Other than | Operation |

|  |  |  |
| --- | --- | --- |
| **Deviations** | **Guide Word** | **Parameter** |
| Miscellaneous | As well as | Operation |

# 7.0 HAZOP OUTCOMES

Only one node is considered for the study which is presented in appendix C. A total of 13 recommendations were obtained which are shown in appendix D. The recommendations are categorized in two groups, namely OPEN and CLOSED.

Closed recommendations are those that the team have arrived at a consensus that it is required to be done. A total of 12 closed recommendation were obtained in the meetings. Open recommendations are those that need more information from vendor for the final decision. One open recommendation was proposed during the meetings.

Appendix E consists of detailed HAZOP Worksheets of the study.

# ATTACHMENTS

## APPENDIX A –TEAM MEMBERS

|  |  |  |  |
| --- | --- | --- | --- |
| **First Name** | **Last Name** | **Company** | **Expertise** |
| S.Mehdi | Ashrafian | NISOC | Project Manager |
| Shamsolah | Bahadori | NISOC | Construction Manager |
| Fatemeh | Ghodsi | NISOC | Head of I&C |
| Mohammad | Torfi | NISOC | Process |
| Sahar | Saba | NISOC | Process |
| Niloofar | Rezaei Baba ahmadi | NISOC | Process |
| Mohammad Reza | Cheraghchi | NISOC | Process |
| Fazel | Moafi | NISOC | Instrument |
| Behzad | Zandian | NISOC | Instrument |
| Peyman | Sarvarian | NISOC | Mechanic |
| Hojjat | Jafarpour | NISOC | Mechanical |
| Faride | Parvin | NISOC | Mechanical |
| Mohammad | Khamisi | NISOC | HSE |
| Mohammad | Shirali | NISOC | Commissioning |
| Ali | Hamidan | NISOC | Commissioning |
| Naji | Hamid | NISOC | Commissioning |
| Khodadad | Kavosi | NISOC | Commissioning |
| Reza | Gholgheysari | NISOC | Process Engineer |
| Mobin | Saeedi | NISOC | Instrument |
| Mohammad | Bakhshi Mohammadi | Gachsaran NISOC | Production Engineer |
| Shahram | Valizadeh | Gachsaran NISOC | Production Engineer |
| Vahid | Mussavi | Gachsaran NISOC | Production Engineer |
| Mohammad | Fakoor | PEDCO | Process Engineer |
| Farshid | Amiri | PEDCO | Piping Lead Engineer |
| Hadi | Mozaffari | PEDCO | Electrical Engineer |
| Mahdi | Karimi | PEDCO | Head of Electrical Department |
| Pouria | Bavarsad | PEDCO | Piping Engineering |
| Sadegh | Gharacheh | PEDCO | Process |
| Morteza | Taherkhani | PEDCO | Head of I&C |
| Sepideh | Akbari | PEDCO | I&C Engineer |
| Sasan | Faramarzpour | PEDCO | Head of Process and Safety Department |
| Pouya | Maleki | PEDCO | Process Engineer |

|  |  |  |  |
| --- | --- | --- | --- |
| **First Name** | **Last Name** | **Company** | **Expertise** |
| Mehdi | Sadeghian | PEDCO | Surface Manager |
| Vahid | Abdeshadi | PEDCO | Project Engineer Manager |
| Masoud | Asgharnejad | Hirgan Energy | Engineering Manager |
| Mohsen | Aryafar | Hirgan Energy | Process |
| Saeed | Ghanbari | Hirgan Energy | Process |
| Parisa | Hajisadeghi | Hirgan Energy | Head of I&C |
| Mohammad | Fakharian | Hirgan Energy | Project Manager |
| Ali | Baghaei | HAZOP Consultant | Process Safety |
| Firoozeh | Khosravi | HAZOP Consultant | Process Safety |

## 8.1 APPENDIX B – DRAWINGS LIST

|  |  |  |
| --- | --- | --- |
| Drawing No. | Drawing Title | Place(s) Used |
| BK-W007S-PEDCO-110-PR-PI- 0001\_D01 | Extension of Binak B/C Manifold (6 sheets) | Nodes: 1 |

## 8.1 APPENDIX C – NODES LIST

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Nodes** | | **Color** | **Type** | **Drawings** | **Equipment ID** | **Date** | |
| 1. | Extension of Binak B/C Manifold | Yellow | Line | BK-W007S-PEDCO-110-PR- PI-0001\_D01 | - | 1. | 06/25/2022 |

## 8.1 APPENDIX D – RECOMMENDATIONS LIST

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Recommendations** | | **Place(s) Used** | **Responsibility** | **Status** |
| 6. | Recheck size of FCV-1701A~F. | Consequences: 1.1.5.1 | Contractor | Open |
| 1. | Relocate class change from LN12 to FN05 at downstream flange of ESDV-1701A. | Consequences: 1.1.4.2 | Contractor | Closed |
| 2. | Size of ESDV-1701A should be 4". | Consequences: 1.1.4.2 | Contractor | Closed |
| 3. | Remove DCS solenoid valve on ESDV-1701A. | Consequences: 1.1.4.2 | Contractor | Closed |
| 4. | General recommendation: Show on P&ID local HS of all ESDVs. | Consequences: 1.1.4.2 | Contractor | Closed |
| 5. | Remove cascade level control signal on FIC-1701A. | Consequences: 1.1.5.1 | Contractor | Closed |
| 7. | Relocate PRV-1701A to upstream of FCV-1701A with class 600#. Also provide procedure that always one manual valve of flow lines to manifolds A/B shall be open. | SIL determination: 1.1.5.1 | Contractor | Closed |
| 8. | Type of LT-1701 should be changed to float type. | Consequences: 1.6.1.1 | Contractor | Closed |
| 9. | Remove auto start of oil sump pump P-1701. | Consequences: 1.6.1.1 | Contractor | Closed |
| 10. | Consider double block for PG-1701A, PG-1702A and inlet side of TRV-1701A. | Consequences: 1.8.1.1 | Contractor | Closed |
| 11. | Remove connection of oil sump pump to drain header and also duplicated isolation valve and check valve at discharge of this pump. | Consequences: 1.12.1.1 | Contractor | Closed |
| 12. | Piping class downstream of oil sump pump check valve to header A/B should be 300#. | Consequences: 1.12.1.1 | Contractor | Closed |
| 13. | General recommendation: Proxy limit switch signal of ESDVs in BINAK manifold should be routed directly to DCS. | Consequences: 1.12.1.1 | Contractor | Closed |

## 8.1 APPENDIX E – HAZOP WORKSHEETS

Node: 1. Extension of Binak B/C Manifold Deviation: 1. No/Less Flow

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | | **Safeguards** | | **Recommendations** | |
| 1. | Decreased flow from multiple wellheads due to any reason | 1. | No hazardous consequence |  | |  | |
| 2. | Decreased flow from one wellhead due to any reason (The study is performed for flow line from W018S, the results are applicable for other flow lines) | 1. | Slight decreased production with no hazardous consequence for this node | 1. | FAL-1701A |  | |
| 3. | Upstream flow line rupture | 1. | Slight decreased production with no hazardous consequence for this node | 1. | FAL-1701A |  | |
|  |  | 2. | Possibility of reverse flow from manifold and increased waste of product, severe environmental effect and possibility of fire | 1. | PALL-1701A that will activate ESD |  | |
|  |  |  | 2. | Wellhead will be closed on flow line pressure loss |
|  |  |  |  | 3. | Check valve is considered |
|  |  |  |  | 4. | PALL on other flow lines will close regarding ESDV |
| 4. | ESDV-1701A closed by failure or error | 1. | Slight decreased production | 1. | FAL-1701A |  | |
|  |  | 2. | Increased pressure upstream of valve with possibility of damage | 1. | Position switch on valve | 1. | Relocate class change from LN12 to FN05 at downstream flange of ESDV-1701A. |
|  |  |  |  |  |  | 2. | Size of ESDV-1701A should be 4". |
|  |  |  |  |  |  | 3. | Remove DCS solenoid valve on ESDV-1701A. |
|  |  |  |  |  |  | 4. | General recommendation:Show on P&ID local HS of all ESDVs. |
| 5. | FCV-1701A closed more by a failure in any elements of its control loop | 1. | Increased pressure upstream of valve with possibility of damage, fire and personnel injury | 1. | FAL-1701A (dependent) | 5. | Remove cascade level control signal on FIC- 1701A. |
|  |  |  | 2. | PAHH-1701A that will activate ESD | 6. | Recheck size of FCV- 1701A~F. |

Node: 1. Extension of Binak B/C Manifold

Deviation: 2. More Flow

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | | **Safeguards** | | **Recommendations** |
| 1. | Increased flow/pressure from one wellhead due to any reason (The study is performed for flow line from W018S, the results are applicable for other flow lines) | 1. | Increased flow and pressure in flow line with no hazardous consequence for this node | 1. | FAH-1701A |  |
|  | 2. | Possible increased level in separator | 1. | Level controller and protection in separator |  |
| 2. | FCV-1701A open more by a failure in any elements of its control loop | 1. | Possible increased level in separator | 1. | Level controller and protection in separator |  |
|  |  |  | 2. | FAH-1701A (dependent) |

Node: 1. Extension of Binak B/C Manifold Deviation: 3. Reverse/Misdirected Flow

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | | **Safeguards** | | **Recommendations** |
| 1. | Check valves are considered where required |  | |  | |  |
| 2. | Rupture of flow line | 1. | Possibility of reverse flow from manifold to flow line | 1. | Check valve is considered on each flow line |  |
|  |  |  |  | 2. | PAHH-1701A that will activate ESD and closed ESDV-1701A |

Node: 1. Extension of Binak B/C Manifold Deviation: 4. High Pressure

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | | **Safeguards** | | **Recommendations** |
| 1. | Line box-in and thermal expansion for each line | 1. | Damage to line and loss of containment | 1. | TRV-1701A |  |

Node: 1. Extension of Binak B/C Manifold Deviation: 5. Low Pressure

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | **Safeguards** | **Recommendations** |
| 1. | No new issue was identified |  |  |  |

Node: 1. Extension of Binak B/C Manifold Deviation: 6. High Level

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | | **Safeguards** | | **Recommendations** | |
| 1. | High level in existing oil sump due to accumulation of liquids during maintenance, upset, etc. | 1. | Over flow of oil from sump with environmental impact | 1. | LAH-1701 that will start pump | 8. | Type of LT-1701 should be changed to float type. |
|  |  |  | 2. | Sump size is large compare to inlet flow | 9. | Remove auto start of oil sump pump P-1701. |

Node: 1. Extension of Binak B/C Manifold Deviation: 6. High Level

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Causes** | **Consequences** | **Safeguards** | | **Recommendations** |
|  |  | 3. | Intermittent operation |  |

Node: 1. Extension of Binak B/C Manifold Deviation: 7. Low Level

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | | **Safeguards** | | **Recommendations** |
| 1. | Pump of existing oil sump remained in service when not required | 1. | Possibility of damage to pump | 1. | LAL-1701 will stop pump |  |

Node: 1. Extension of Binak B/C Manifold Deviation: 8. Maintenance Hazards

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | | **Safeguards** | **Recommendations** | |
| 1. | Isolation | 1. | Possibility of leakage during maintenance |  | 10. | Consider double block for PG-1701A, PG-  1702A and inlet side of TRV-1701A. |

Node: 1. Extension of Binak B/C Manifold Deviation: 9. Leakage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | | **Safeguards** | **Recommendations** |
| 1. | Flange or fitting leakage in flow lines inside fence | 1. | Due to low H2S, no severe toxic effect |  |  |

Node: 1. Extension of Binak B/C Manifold Deviation: 10. Corrosion

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | | **Safeguards** | | **Recommendations** |
| 1. | Corrosion of flow line and piping due to sulphur | 1. | Damage to equipment and piping with possibility of damage | 1. | Material of construction (NACE) |  |
|  |  | 2. | Corrosion monitoring (CP/CC) |

Node: 1. Extension of Binak B/C Manifold Deviation: 11. Composition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | | **Safeguards** | | **Recommendations** |
| 1. | Change in GOR | 1. | Increased pressure in system | 1. | design pressure is based on change in GOR |  |
| 2. | Increased water cut | 1. | Increased corrosion and change in hydraulic | 1. | Increased water cut is considered in design |  |
| 3. | Sand from upstream | 1. | Increased erosion of flow | 1. | Inspection & maintenance |  |

Node: 1. Extension of Binak B/C Manifold Deviation: 11. Composition

|  |  |  |  |
| --- | --- | --- | --- |
| **Causes** | **Consequences** | **Safeguards** | **Recommendations** |
|  | line and blockage of system | procedures |  |

Node: 1. Extension of Binak B/C Manifold Deviation: 12. Miscellaneous

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | **Safeguards** | **Recommendations** | |
| 1. | See Recommendation |  |  | 11. | Remove connection of oil sump pump to drain header and also duplicated isolation valve and check valve at discharge of this pump. |
|  |  | 12. | Piping class downstream of oil sump pump check valve to header A/B should be 300#. |
|  |  | 13. | General recommendation: Proxy limit switch signal of ESDVs in BINAK  manifold should be routed directly to DCS. |

## 8.1 APPENDIX F – MARKED-UP P&IDS