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| **طرح نگهداشت و افزایش تولید 27 مخزن** | | | | | | |
| **HAZOP REPORT FOR PIPELINE**  **نگهداشت و افزایش تولید میدان نفتی بینک** | | | | | | |
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| D00 | JUL. 2022 | 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-708520** | | | | |
| **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, New Gas/Condensate Pipelines (from Binak New GCS to Siahmakan GIS/Binak PU) shall be constructed.

## GENERAL DEFINITION

The following terms shall be used in this document.

|  |  |
| --- | --- |
| CLIENT: | National Iranian South Oilfields Company (NISOC) |
| PROJECT: | Binak Oilfield Development – Surface Facilities; Gas & Gas-Condensate Pipelines |
| 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 Gas & Gas-Condensate Pipelines. 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 – Surface Facilities; Gas & Gas-Condensate Pipelines**.

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 |

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

# 7.0 HAZOP OUTCOMES

In order to facilitate the study, the process was broken down into 2 nodes. The node list is presented in appendix C. A total of 14 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. 14 closed recommendation were obtained in the meetings. Open recommendations are those that need more information from vendor for the final decision. Zero open recommendations were 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 |

|  |  |  |  |
| --- | --- | --- | --- |
| **First Name** | **Last Name** | **Company** | **Expertise** |
| Pouya | Maleki | PEDCO | Process Engineer |
| 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-PPL-PEDCO-320-PR-PI-0001\_D03 | Gas Pipeline (to Siahmakan G.I. Station) (3 sheets) | Nodes: 1 |
| BK-PPL-PEDCO-320-PR-PI-0002\_D03 | Condensate Pipeline (to Binak PU) | Nodes: 2 |

## 8.1 APPENDIX C – NODES LIST

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Nodes** | | **Color** | **Type** | **Drawings** | **Equipment ID** | **Date** | |
| 1. | Gas Pipeline (to Siahmakan  G.I. Station) | L Blue | Line | BK-PPL-PEDCO-320-PR-PI- 0001\_D03 | PL-3201 | 1. | 06/25/2022 |
|  | Pig Receiver | PR-3201 |  |  |
|  |  | Pig Launcher |  |  |
| 2. | Condensate Pipeline (to Binak PU) | Violet | Line | BK-PPL-PEDCO-320-PR-PI- 0002\_D03 | - | 1. | 06/25/2022 |

## 8.1 APPENDIX D – RECOMMENDATIONS LIST

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Recommendations** | | **Place(s) Used** | **Responsibility** | **Status** |
| 1. | Proxy limit switch signal of ESDV-3201 should be routed directly to DCS. | Consequences: 1.1.2.2 | Contractor | Closed |
| 2. | Define high alarm on PIC-2152. | Consequences: 1.1.3.1 | Contractor | Closed |
| 3. | Consider startup/backup instrument gas for LBV-3201 and LBV-3202. | Consequences: 1.1.4.1 | Contractor | Closed |
| 4. | Pig signaler ZS-3201 should be changed to local indicator (flag type). | Consequences: 1.7.1.1 | Contractor | Closed |
| 5. | Pig receiver barrel should be shown concentric on P&ID. | Consequences: 1.7.1.1 | Contractor | Closed |
| 6. | Remove pig launcher/receiver and PL-3201, PR-3201 door position indicator. | Consequences: 1.7.1.1 | Contractor | Closed |
| 7. | Remove spectacle blind of ESDV-3202. | Consequences: 1.7.1.1 | Contractor | Closed |
| 8. | Note on PID that pig launcher and receiver doors are equipped with mechanical interlock to prevent opening before depressurizing. | Consequences: 1.7.1.1 | Contractor | Closed |
| 9. | Relocate balance line of PL-3201 to launcher side of kicker line block valve. | Consequences: 1.7.1.1 | Contractor | Closed |
| 10. | Relocate balance line of PR-3201 to receiver side of kicker line block valve. | Consequences: 1.7.1.1 | Contractor | Closed |
| 11. | Remove corrosion inhibitor injection, CC and CP from pig launcher P&ID. | Consequences: 1.7.1.1 | Contractor | Closed |
| 12. | Remove insulation joint of 4" condensate pipeline. | Consequences: 2.1.1.1 | Contractor | Closed |
| 13. | Check requirement for installation of check valve at tie-in point (TP05) of 4" condensate pipeline. | Consequences: 2.1.1.1 | Contractor | Closed |
| 14. | Show on PID of 4" condensate pipeline drain and vent connections and spectacle blind. | Consequences: 2.1.1.1 | Contractor | Closed |

## 8.1 APPENDIX E – HAZOP WORKSHEETS

Node: 1. Gas Pipeline (to Siahmakan G.I. Station) Deviation: 1. No/Less Flow

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | | **Safeguards** | | **Recommendations** | |
| 1. | Decreased flow of dehydrated gas from upstream | 1. | No hazardous consequence |  | |  | |
| 2. | ESDV-3201 closed by failure or error | 1. | Loss of gas to downstream |  | |  | |
|  | 2. | Increased pressure upstream of valve with possibility of damage | 1. | High pressure protection at compressor discharge | 1. | Proxy limit switch signal of ESDV-3201 should be routed directly to DCS. |
|  |  |  | 2. | Limit switch on valve |  |
| 3. | Blockage of pipeline during pig | 1. | Increased pressure upstream of blocked point with possibility of damage | 1. | High pressure protection at compressor discharge | 2. | Define high alarm on PIC- 2152. |
| 4. | LBV-3201 or LBV-3202  closed by failure | 1. | Increased pressure upstream of valve with possibility of damage | 1. | High pressure protection at compressor discharge | 3. | Consider startup/backup instrument gas for LBV- 3201 and LBV-3202. |
|  |  | 2. | Decreased pressure downstream of valve with no hazardous consequence |  | |  | |
| 5. | ESDV-3202 closed by failure or error | 1. | Increased pressure upstream of valve with possibility of damage | 1. | High pressure protection at compressor discharge |  | |
|  |  |  | 2. | Limit switch on valve |
| 6. | Rupture in pipeline due to corrosion, TPD, landslide, etc | 1. | Severe environmental impact | 1. | LBV-3201 |  | |
|  |  |  | 2. | LBV-3202 |
|  |  |  |  | 3. | PALL-3201 that will activate ESD-1 and close ESDV- 3201 |

Node: 1. Gas Pipeline (to Siahmakan G.I. Station) Deviation: 2. More Flow

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

Node: 1. Gas Pipeline (to Siahmakan G.I. Station) Deviation: 3. Reverse/Misdirected Flow

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | **Safeguards** | **Recommendations** |
| 1. | Check valves are considered where required |  |  |  |

Node: 1. Gas Pipeline (to Siahmakan G.I. Station) Deviation: 4. Low Temperature

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | | **Safeguards** | | **Recommendations** |
| 1. | Depressurizing for maintenance | 1. | Possibility of hydrate formation and freezing | 1. | Operating procedure to depressurize at defined time length |  |

Node: 1. Gas Pipeline (to Siahmakan G.I. Station) Deviation: 5. High Pressure

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | | **Safeguards** | | **Recommendations** |
| 1. | External fire case for pig launcher | 1. | Damage to equipment | 1. | PSV-3201 |  |
| 2. | External fire case for pig receiver | 1. | Damage to equipment | 1. | PSV-3202 |  |

Node: 1. Gas Pipeline (to Siahmakan G.I. Station) Deviation: 6. Low Pressure

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

Node: 1. Gas Pipeline (to Siahmakan G.I. Station) Deviation: 7. Miscellaneous

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | **Safeguards** | **Recommendations** | |
| 1. | See Recommendation |  |  | 4. | Pig signaler ZS-3201 should be changed to local indicator (flag type). |
|  |  | 5. | Pig receiver barrel should be shown concentric on P&ID. |
|  |  | 6. | Remove pig launcher/receiver and PL- 3201, PR-3201 door  position indicator. |
|  |  | 7. | Remove spectacle blind of ESDV-3202. |
|  |  | 8. | Note on PID that pig launcher and receiver doors are equipped with mechanical interlock to prevent opening before depressurizing. |

Node: 1. Gas Pipeline (to Siahmakan G.I. Station) Deviation: 7. Miscellaneous

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Causes** | **Consequences** | **Safeguards** | **Recommendations** | |
|  |  |  | 9. | Relocate balance line of  PL-3201 to launcher side of kicker line block valve. |
| 10. | Relocate balance line of PR-3201 to receiver side of kicker line block valve. |
| 11. | Remove corrosion inhibitor injection, CC and CP from pig launcher P&ID. |

Node: 2. Condensate Pipeline (to Binak PU) Deviation: 1. Miscellaneous

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Causes** | | **Consequences** | **Safeguards** | **Recommendations** | |
| 1. | See Recommendation |  |  | 12. | Remove insulation joint of 4" condensate pipeline. |
|  |  | 13. | Check requirement for installation of check valve at tie-in point (TP05) of 4" condensate pipeline. |
|  |  | 14. | Show on PID of 4" condensate pipeline drain and vent connections and spectacle blind. |

## 8.1 APPENDIX F – MARKED-UP P&IDS