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| **طرح نگهداشت و افزایش تولید 27 مخزن** | | | | | | | |
| **ELECTRICAL NETWORK (LOAD FLOW, MOTOR STARTING &**  **SHORT CIRCUIT) STUDY REPORT**  **نگهداشت و افزایش تولید میدان نفتی بینک** | | | | | | | |
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| D02 | Oct. 2023 | IFA | H.Shakiba | M.Fakharian | S.Faramarzpour |  |
| D01 | Jan. 2023 | IFA | H.Shakiba | M.Fakharian | M.Mehrshad |  |
| D00 | Jun. 2022 | IFC | H.Shakiba | M.Fakharian | M.Mehrshad |  |
| **Rev.** | **Date** | **Purpose of Issue/Status** | **Prepared by:** | **Checked by:** | **Approved by:** | **Client Approval** |
| **Class:1** | | **Client Doc. Number: F0Z-709071** | | | | |
| **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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| **3** | X |  |  |  |  | **53** |  |  |  |  |  |
| **4** | X |  |  |  |  | **54** |  |  |  |  |  |
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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.

**GENERAL DEFINITION**

The following terms shall be used in this document.

|  |  |
| --- | --- |
| CLIENT: | National Iranian South Oilfields CLIENT (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 is prepared to report Load Flow, Motor Starting & Short Circuit Study in New Gas Compressor Station of Binak oilfield.

1. **NORMATIVE REFERENCES**

## Local Codes & Standards

* IPS-E-EL-100 (1) Engineering Standard for Electrical System

## International Codes & Standard

This document shall be shall be produced in accordance with the latest editions of the International Electro technical Commission (IEC) and BS standards

## The Project Documents

* BK-GNRAL-PEDCO-000-PR-DB-0001 Process Basis of Design
* BK-GCS-PEDCO-120-EL-LI-0001 Electrical Load List
* BK-GNRAL-PEDCO-000-EL-DC-0001 Electrical System Design Criteria
* BK-GCS-PEDCO-120-EL-SL-0001 Overall single line diagram
* BK-GCS-PEDCO-120-EL-SL-0003 Existent MV Switchgear Expansion Single Line Diagram
* BK-GCS-PEDCO-120-EL-SL-0002 LV Switchgear/MCC Single Line Diagram
* BK-GCS-PEDCO-120-EL-LI-0002 Electrical Power & Control Cable Schedule

1. **plant model**

The model used for the calculations of the distribution network for Binak Oilfield Development gas compressor station units includes:

* The 11KV switchgear expansion fed by two 230/11 kV Transformers and 11KV motors.
* The new 0.4 KV switchgear installation fed by two 11/0.42 kV Transformers.
* Emergency bus bar fed by a 0.4 KV, 500 KVA diesel generators.

1. **STUDIED CONFIGURATION**

## Normal Configuration

In normal configuration bus-tie breaker is normally open, and each section is fed by its own transformer.



## Worst Case Configuration

In the worst case condition, or also for maintenance purposes, one transformer can be out of service and whole load feed from the other transformer by closing the bus-tie breaker.



## Emergency Configuration

In the emergency condition, all transformers are out of service and only emergency loads will be fed from the Diesel generator. The bus-tie breaker “C” is open in this configuration.



1. **LOAD FLOW STUDy**

The load flow study calculates the active and reactive power flow and the bus voltages in different plant configurations. The main goals of the load flow studies are:

* To verify that no cable or transformer is overloaded.

D02

* To check the bus voltages

Result of load flow study is reported in Attachment 1.

| **Load Flow Result (Based on ETAP 12.6)** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Item** | **Tag** | **Normal** | | **Worst Case** | | **Emergency** |
| **Condition** | | **With Cap** | **Without Cap** | **With Cap** | **Without Cap** | **-** |
| 1 | 230 KV Substation | 99.21% | 99.16% | 99.22% | 99.17% | - |
| 2 | SS-11-OSWG-001A | 98.26% | 97.88% | 96.62% | 95.93% | - |
| 3 | SS-11-OSWG-001B | 97.63% | 97.26% | - | - | - |
| 4 | GCS-11-OSWG-001A | 98.24% | 97.86% | 96.57% | 95.88% | - |
| 5 | GCS-11-OSWG-001B | 97.61% | 97.23% | - | - | - |
| 6 | GCS-3.3-SWG-001 | 95.44% | 95.05% | 94.38% | 93.67% | - |
| 7 | GCS-400-NSWG-001A | 102.21% | 101.22% | 97.84% | 96.05% | - |
| 8 | GCS-400-NSWG-001B | 99.81% | 98.86% | 97.84% | 96.05% | - |
| 9 | GCS-400-NSWG-001E | 99.81% | 98.86% | 97.84% | 96.05% | 99.75% |
| 10 | T1-Existing (25 MVA) | 4481 KVA | 4917 KVA | 11466 KVA | 12321 KVA | - |
| 11 | T3-Existing (25 MVA) | 6991 KVA | 7420 KVA | - | - | - |
| 12 | T5-New (1250 KVA) | 344 KVA | 388 KVA | 1021 KVA | 1105 KVA | - |
| 13 | T8-New (1250 KVA) | 725 KVA | 777 KVA | - | - | - |
| 14 | Gen 2-New (500 KVA) | - | - | - | - | 422 KVA |
| Note 1: Items 1~9 are voltage%.  Note 2: “Cap” means Capacitor bank | | | | | | |

1. **SHORT CIRCUIT ANALYSIS**

At this stage, the maximum short circuit values are calculated in worst case operation to verify that the switchgear withstand capacity is higher than the maximum short circuit current. In this configuration the motor contribution for each bus is maximum.

Result of maximum short circuit currents is reported in Attachment 2.

Table below compares the results of the 3ph short circuit studies with the switchgear withstand capacity.

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|  |  |  |  |
| --- | --- | --- | --- |
| **Short Circuit Result (Based on ETAP 12.6)** | | | |
| **Item** | **Tag** | **Maximum (KA)** | **Minimum (KA)** |
| 1 | 230 KV Substation | 2.07 | 1.63 |
| 2 | SS-11-OSWG-001A | 13.31 | 10.53 |
| 3 | SS-11-OSWG-001B | - | 10.79 |
| 4 | GCS-11-OSWG-001A | 13.21 | 10.44 |
| 5 | GCS-11-OSWG-001B | 13.21 | 10.71 |
| 6 | GCS-3.3-SWG-001 | 2.9 | 2.62 |
| 7 | GCS-400-NSWG-001A | 27.66 | 23.6 |
| 8 | GCS-400-NSWG-001B | 27.66 | 23.69 |
| 9 | GCS-400-NSWG-001E | 27.66 | 23.69 |
| Note 1: Maximum short circuit will be occurred in Worst Case Condition.  Note 2: Minimum short circuit will be occurred in Normal Condition. | | | |

All the switchgears are able to withstand the expected fault currents.

1. **Motor starting analysis**

At this stage, the motor starting analysis is considered according to client request in worst case that all of continues loads & 4 continuous motors are in service, then the 5th (Mtr5-New) standby largest motor will be started & one of the largest motor will be shut down.

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Result of motor starting analysis is reported in Attachment 3.