طرح نگهداشت و افزایش تولید 27 مخزن

CALCULATION NOTE FOR UPS SYSTEM

نگهداشت و افزایش تولید میدان نفتی بینک

Rev.	Date	Purpose of Issue/Status	Prepared by:	Checked by:	Approved by:	Client Approval
D06	Sep.2024	AFD	H.Shakiba	M.Fakharian	M.Sadeghian	
D05	Jan. 2024	AFD	H.Shakiba	M.Fakharian	S.Faramazpour	
D04	May. 2023	AFD	H.Shakiba	M.Fakharian	A.M.Mohseni	
D03	Jul. 2022	IFA	H.Shakiba	M.Fakharian	M.Mehrshad	
D02	Apr. 2022	IFA	H.Shakiba	M.Fakharian	M.Mehrshad	
D01	Dec. 2021	IFA	H.Shakiba	M.Fakharian	M.Mehrshad	
D00	Nov. 2021	IFC	H.Shakiba	M.Fakharian	M.Mehrshad	

Class:2 **Client Doc. Number: F0Z-709010**

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
1	X	X	X	X	X
2	X	X	X	X	X
3	X	X			
4	X	X			
5	X	X			
6	X	X	X	X	
7	X	X	X		X
8	X	X	X	X	X
9				X	X
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					

PAGE	D05	D06	D07	D08	D09
1	X	X			
2	X	X			
3					
4					
5		X			
6	X	X			
7	X	X			
8	X	X			
9	X	X			
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					

CONTENTS

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, 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.

2.0 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. (Vendor Shall Be From AVL)
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.

3.0 SCOPE

D06

This specification describes the practices that shall be employed and the Standards that will be required to be met for the UPS sizing of the required AC power for Instrument and paging system related to new loads in control room of compressor station.

4.0 NORMATIVE REFERENCES

4.1 Codes & Standards

- IPS-M-EL-176(2) Material & Equipment Standard for Uninterruptible Power Supply System (UPS)
- IPS-E-EL-100 Engineering Standard for Electrical System Design (Industrial And Non-Industrial)

4.2 The Project Reference Documents

- IEC 62040-3 Uninterruptible power systems-methods of specifying the performance and test requirements
- IEC 60146 Semiconductor Converters
- IEC 60529 Classification of degrees of protection provided by enclosures
- IEEE 1115 Recommended practice for sizing Nickel-Cadmium batteries for stationary applications

4.3 The Project Documents

- BK-GNRAL-PEDCO-000-PR-DB-0001 Process Basis of Design
- BK-GNRAL-PEDCO-000-EL-DC-0001 Electrical System Design Criteria
- BK-GNRAL-PEDCO-000-EL-SP-0003 Specification for UPS System
- BK-GCS-PEDCO-120-IN-LI-0007 I&C Power Consumption

4.4 Environmental Data

Refer to " Process Basis of Design; Doc. No. BK-GNRAL-PEDCO-000-PR-DB-0001".

4.5 Language & System of Units

All documentation, drawings, data, etc. furnished by the manufacturer shall be in English. SI metric system of measurement shall be used except for pipe and pipe fitting sizes, flange ratings and

nozzle dimensions in which inch will be used.

5.0 Design Basis

Assumptions for Battery Sizing for AC UPS

Input AC Voltage	400VAC (3Ph)
Input AC Voltage frequency	50Hz ± 5%
AC System Nominal Voltage	110 VAC ± 1%
AC System Voltage Limits	104.50 VAC ~ 133.10 VAC
Overall Aging Factor	1.1
Design Margin Factor	1.1
Battery Backup Time	2 hours
Battery Configuration	2 x 100%
Battery Rate	M rate
Max. Temperature	52 °C
Min. Temperature	5 °C
Design Temperature	+ 20 °C
Power Factor	0.85
Efficiency	0.9
DC Link Voltage (*)	By Vendor
Min. System Voltage (%)	5 %
Max. System Voltage (%)	21 %
Charger Configuration	2 x 100%
Battery Type	Ni-Cd (SBM)
Nominal Cell Voltage	1.2 V/Cell
Battery Float Voltage	1.4 V/Cell
Battery Boost Voltage	1.44 V/Cell
Battery End Voltage	1.136 V/Cell
Battery Equalize Voltage	1.45 ~ 1.55 V Cell
Battery Initial Voltage	1.65~1.75 V Cell
Battery Cell Number	92 Cells Each Bank

D06

(*) Shall be finalized by vendor.

6.0 UPS SIZING

The total required AC power for control and paging system which shall be supplied by UPS system in Binak oilfield in Bushehr province is calculated according to the following data. The output rating of UPS should be 110 VAC.

6.1 AC LOAD PROFILE

According to I&C Power Consumption Summary Doc No" BK-GCS-PEDCO-120-IN-LI-0007-", total required AC power for control system has been shown in table (1):

D06

Table (1): AC Load Consumption of instrument & control systems

DESCRIPTION	TOTAL POWER (KW)
Total Power Consumption	19.8

By considering power factor 0.85, output apparent power will be:

$S = \frac{19.8}{0.85} = 23.3 \text{ KVA}$

This consumption is provided by the normal AC supply source through rectifier. Battery does not interfere in normal operating condition. When normal AC supply source fails, then the UPS makes use of its battery to provide the power to loads.

Figure (1) shows the AC load profile for UPS system.

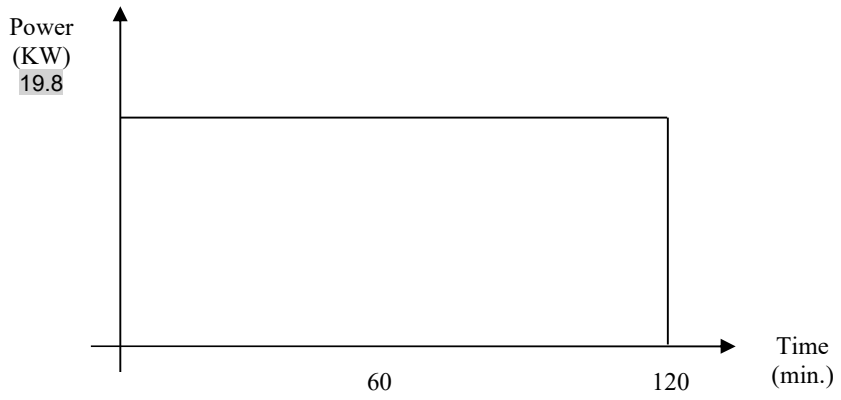

Figure (1): AC Load Profile

6.2 Battery Sizing Calculation

Regarding to the specification for UPS System, the size of battery has been calculated at 100%

capacity for each battery bank. Based on IEEE 1115 battery sizing are as follows:

Selected Batteries Acc to Attachment-1: SAFT Software Calculation report is 92-Cell SBM723

6.3 UPS BATTERY CHARGER CALCULATION

Based on IPS-M-EL-174(2) standard, the station battery charger should be sized in accordance with the following formulas;

$$N = \frac{V_{DC\ nominal}}{V_{Cell\ nominal}} \qquad \text{Formula (1)}$$

$$N = \frac{110\ V}{1.2\ V/Cell} \cong 92\ Cells$$

$$I_{DC\ Inverter} = \frac{S_{out} \times P_f}{V_{DC\ min} \times \eta} \qquad \text{Formula (2)}$$

$\eta = Efficiency\ of\ Inverter$

$$I_{DC\ Inverter} = \frac{23300 \times 0.85}{92 \times 1.136 \times 0.9} = 210.6\ A$$

$$I_{Charger} = I_{DC\ Inverter} + 0.2 \times C_s \qquad \text{Formula (3)}$$

D06

$I_{Ch} = Charger\ Required\ Current$

$N = Number\ of\ Cells\ (Each\ battery\ Bank)$

$C_s = Battery\ \ Capacity\ (Ah)$

$$I_{Charger} = 210.6 + 0.2 \times 723 = 355.2\ A$$

$$P_{Charger} = 355.2 \times 110 / 0.9 \approx 43.41\ Kw$$

7.0 CONCLUSION

The final result of battery / charger systems is calculated as follows:

Number of battery cells : 2 × 92

Cell Battery Ah : 2 × 92 × 723 Ah

Charger rated current : 2 × 355.2 A

Note: The final sizes of UPS, battery Ah and quantity of cells shall be recalculated by vendor according to the final data. In addition, vendor shall consider the minimum voltage 93V for UPS system.

8.0 ATTACHMENTS

ATTACHMENT A- Native file of 110 VAC Calculation

ATTACHMENT B- I&C Power Consumption Summary-D05

D06

ATTACHMENT 1- Catalogue

ATTACHMENT 2- Battery & Stand Sizing Report for 110 VAC (1x92xSBM723)

ATTACHMENT 3- Battery Stand proposal for 110 VAC (92xSBM723+EQ-2US-ST__2)

ATTACHMENT 4- Battery Data Sheet (SBM723_CellDataSheet)