
	<p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>فعالیت های روزمینی در بسته های کاری تحت الارض</p> <p>عمومی و مشترک</p>																	
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## طرح نگهداشت و افزایش تولید ۲۷ مخزن

### CALCULATION NOTE FOR DC CHARGER OF WELL PADS

#### نگهداشت و افزایش تولید میدان نفتی بینک



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#### 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  
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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 roads, wellhead facilities for 6 new wells (with electric power supply for 2 of them) and required modifications on 4 workover wells (with electric power supply) shall be done. In addition, construction of 6 new flowlines from new wells 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 New Well Locations, Modifications on Workover Wells, Wellhead Facilities, Electrification Facilities, Flowlines 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

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CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.

MAY:

Is used where a provision is completely discretionary.

## 2.0 SCOPE

This document describes the calculation sizing of DC Battery & Battery Charger for each well of BK-12, BK-15, BK-05, Well 007, Well 046 & BK-14.

## 3.0 NORMATIVE REFERENCES

- IEC 60478 Stabilized Power Supplies, DC Output
- IEC 60623 Secondary Cells and Batteries Containing Alkaline or Other non-acid electrolytes Vented Nickel-Cadmium Prismatic Rechargeable Single Cells
- IEC 60947 LV Switchgear & Control Gear
- IEEE 1115 IEEE Recommended Practice for Sizing Nickel-Cadmium Batteries for Stationary Applications
- IPS-E-EL-100 Engineering Standard for Electrical System Design
- IPS-M-EL-174 Material and Equipment Standard for Battery & Battery Charger

## 4.0 ENVIRONMENTAL DATA



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

## 5.0 DC SIZING ASSUMPTIONS

**Table 1: DC UPS Characteristics for Compressor Station**

Item	110 VDC
Input AC Voltage	440/400/380 V±10%
Input AC Voltage frequency	50Hz±5%
DC system Nominal Voltage	110 VDC
DC system Voltage Limits	104.89 VDC~151.8 VDC
Overall Aging Factor	1.1
Design Margin Factor	1.1
Battery Backup Time	8 hours
Battery Configuration	2 x 50%
Charger Configuration	2 x 100%



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**Table 1: DC UPS Characteristics for Compressor Station**

Item	110 VDC
Battery Type	Ni-Cd (SBLE)
Nominal Cell Voltage	1.2 V/Cell
Float Charge Voltage	1.42 V/Cell
Fast Charge Voltage	1.65 V/Cell
End Cell Voltage	1.14 V/Cell

## 6.0 DC LOAD CONSUMPTION

DC load consists of the power absorbed by control and protection devices in switchgear cabinets. These devices include CB spring charging motors, CB closing coils, CB opening coils, contactors coils, auxiliary relays, protective relays, signal lamps, annunciators and transducers.

Depending on the type of a feeder, different equipment in the relevant cubicle shall be used. The DC power consumed in each cubicle equals to sum of the consumptions.



Where more than one equipment of the same type is used, a utilization factor is applied to consider the non-simultaneous operation. In, DC load of each substation is calculated in normal status and during plant shutdown. For each switchgear, there is a separate table comprising of all available types of feeders. Here also, a utilization factor is used for non-simultaneous operation of the similar feeders.

Total DC consumption of the switchgear is calculated at the bottom of the table.

**Table 3: Total DC Consumption**

DC System Tag	Consumption in Normal Condition		Consumption in Worst Case Condition	
	Power (W)	Current (A)	Power (W)	Current (A)
DC-UPS-01 (110 VDC)	171	1.4	875	7.95

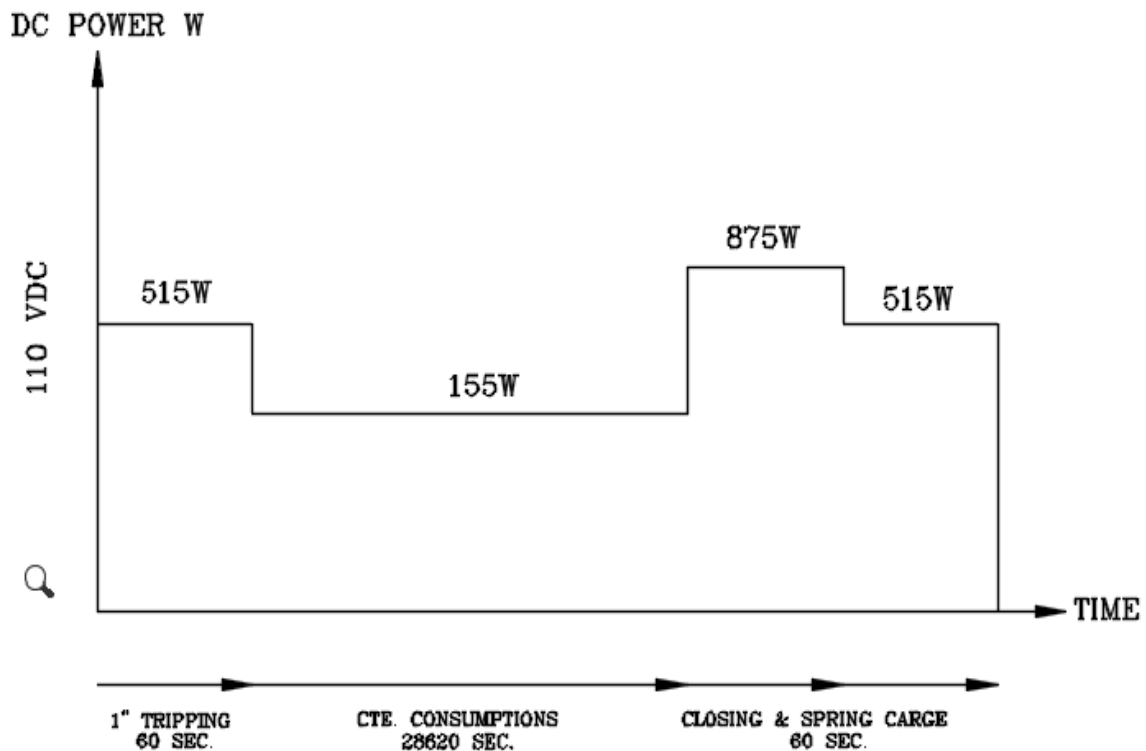
Note: According to Item 5.3 of IPS-M-EI-174(2), the DC power supply shall consist of two similar thyristor type chargers each rated for 100 percent of rated load, two battery banks each rated for 50 percent of the rated load and one DC distribution panel. Therefore to calculate the capacity of battery bank half of demand load shall be considered.

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## 7.0 DC DUTY CYCLE

Duty cycle diagram shows the total load at any time during the cycle is an aid in the analysis of the duty cycle. This profile obtained based on two consecutives tripping of the switchgears. The details of the consumptions have been listed in separate Tables of Attachment #1 for 110 VDC.

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## 8.0 NUMBER OF CELL CALCULATION

### 8.1 110 VDC Cell

With considering nominal DC link voltage equal to 110VDC, the No. of cells is obtaining as below:



$$\text{No. of cells} = \text{Nominal DC Link Voltage} /$$

$$= 110 / 1.2 \sim 92 \text{ cells Final discharge cell voltage}$$

Note: The exact number depends on the type of battery and will be determined by the vendor.

### 8.2 Battery Selection

Overall rating of batteries shall be so chosen to provide the load current for 8 hours for 50% load, according to project specification.

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To calculate battery capacity, the following equation can be used.

$$C = \frac{1}{L} \sum_{i=1}^n I_i T_i \quad (1)$$

Where:

C: Rated Capacity (Ah)

L: Maintenance Factor (1) (Design Margin 1.1 & Aging Factor 1.1)

n: Number of Loads

I: Load Current

T: Battery Discharge Time

In equation (1), T is the same 8 hours for 50% loads in the substations. Therefore,

$$C = \frac{1}{L} (T) \sum_{i=1}^n I_i \quad (2)$$

where, "1" is the total current consumption. Using the values of the battery duty cycle diagram presented in clause 7 which obtained from attachment #1, battery capacity can be calculated.

The battery calculation is performed by using SAFT BaSics Software. According to the results presented in Attachment #2 & #4, the selected battery set for 110 VDC system is 2 sets of (1×92×SBLE 40 AH).

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The stand proposal proposed in Attachment #3, also. It should be noted that this is only typical and the battery layout can be configured according to the space which is available using the adopted stand structure.

## 9.0 BATTERY CHARGER RATING

In the worst condition when batteries are completely discharged, the charger should provide power for DC loads and charge the batteries at the same time. The total size of battery chargers shall meet the following equation:

Battery charger current (A) = IC=LLc+2\*(0.2\*C5)

Where:



C5: Battery Capacity (ampere-hours)

LLc: Continuous Dc Load (in amperes)

Battery Charger Rating for 110 VDC is as follow:

According to table 3, LLc is 2×1. 4=2.8



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$$IC = LLc + 2 * (0.2 * C5)$$

$$IC = 2.8 + 2 * (0.2 * 40) = 18.8$$

$$PC = 18.8 * 92 * 1.65 / 0.9 \sim 3.17 \text{ KW}$$

Note 1: Since in basic document battery charger is 3KW, therefore the basic power request will be followed.

## 10.0 CONCLUSION

Item	Charger		Battery		Inverter	
	Configuration	Size	Config	Cell No.x Cap.	Config	Size
DC-UPS-01(110VDC)	2x100% (Redundant)	18.8 A	2x50%	2 x (92 x SBLE 40)	-	-

Final calculations shall be provided and/or verified by selected vendor as per type and characteristics of equipment.

## 11.0 REFERENCE DOCUMENTS

Document No.	Title
BK-GNRAL-PEDCO-000-EL-SP-0005	Specification for DC Charger
BK-SSGRL-PEDCO-110-EL-SL-0001	Overall Single Line Diagram of Well Pads
BK-SSGRL-PEDCO-110-EL-SL-0002	Single Line Diagram For LV Switchgear of Well Pads

## 12.0 ATTACHMENTS

ATTACHMENT A- Native File of 110 VDC Calculation

ATTACHMENT 1- 110 VDC Load Consumption List for Substation

ATTACHMENT 2- Battery & Stand Sizing Report for 110 VDC

ATTACHMENT 3- Battery Stand proposal for 110 VDC

ATTACHMENT 4- Battery Datasheet