



نگهداشت و افزایش تولید میدان نفتی بینک  
سطح الارض

احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک



شماره پیمان:

053 - 073 - 9184

FLARE NETWORK STUDY REPORT

نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادرکننده	بسته کاری	پروژه
D04	0001	RT	PR	120	PEDCO	GCS	BK

شماره صفحه: 1 از 12

## طرح نگهداشت و افزایش تولید 27 مخزن

## FLARE NETWORK STUDY REPORT

نگهداشت و افزایش تولید میدان نفتی بینک

D04	Apr. 2023	IFA	M.Aryafar	M.Fakharian	M.Mehrshad	
D03	Dec. 2022	IFA	M.Aryafar	M.Fakharian	M.Mehrshad	
D02	Oct. 2022	IFA	M.Aryafar	M.Fakharian	M.Mehrshad	
D01	Jun. 2022	IFA	M.Aryafar	M.Fakharian	M.Mehrshad	
D00	Jan. 2022	IFC	M.Aryafar	M.Fakharian	M.Mehrshad	
Rev.	Date	Purpose of Issue/Status	Prepared by:	Checked by:	Approved by:	CLIENT Approval

Class:2

CLIENT Doc. Number: F0Z-708815

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



نگهداشت و افزایش تولید میدان نفتی بینک  
سطح الارض

احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک



شماره پیمان:

053 - 073 - 9184

FLARE NETWORK STUDY REPORT



نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادرکننده	بسته کاری	پروژه
D04	0001	RT	PR	120	PEDCO	GCS	BK

شماره صفحه: 2 از 12

REVISION RECORD SHEET



PAGE	D00	D01	D02	D03	D04
1	X	X	X	X	X
2	X	X	X	X	X
3	X				
4	X				
5	X				
6	X				
7	X		X		
8	X	X	X	X	
9	X	X	X	X	X
10	X	X	X	X	X
11	X		X	X	
12		X	X		
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					
51					
52					
53					
54					
55					
56					
57					
58					
59					
60					
61					
62					
63					
64					
65					

PAGE	D00	D01	D02	D03	D04
66					
67					
68					
69					
70					
71					
72					
73					
74					
75					
76					
77					
78					
79					
80					
81					
82					
83					
84					
85					
86					
87					
88					
89					
90					
91					
92					
93					
94					
95					
96					
97					
98					
99					
100					
101					
102					
103					
104					
105					
106					
107					
108					
109					
110					
111					
112					
113					
114					
115					
116					
117					
118					
119					
120					
121					
122					
123					
124					
125					
126					
127					
128					
129					
130					

 <p>NISOC</p>	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>																	
<p>شماره پیمان: 053 - 073 - 9184</p>	<p>FLARE NETWORK STUDY REPORT</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>پروژه</th> <th>بسته کاری</th> <th>صادرکننده</th> <th>تسهیلات</th> <th>رشته</th> <th>نوع مدرک</th> <th>سریال</th> <th>نسخه</th> </tr> </thead> <tbody> <tr> <td>BK</td> <td>GCS</td> <td>PEDCO</td> <td>120</td> <td>PR</td> <td>RT</td> <td>0001</td> <td>D04</td> </tr> </tbody> </table>	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	PR	RT	0001	D04	<p>شماره صفحه : 3 از 12</p>
پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه											
BK	GCS	PEDCO	120	PR	RT	0001	D04											

## CONTENTS

<b>1.0</b>	<b>INTRODUCTION .....</b>	<b>4</b>
<b>2.0</b>	<b>SCOPE .....</b>	<b>5</b>
<b>3.0</b>	<b>NORMATIVE REFERENCES.....</b>	<b>5</b>
3.1	LOCAL CODES AND STANDARDS.....	5
3.2	INTERNATIONAL CODES AND STANDARDS .....	5
3.3	THE PROJECT DOCUMENTS.....	5
3.4	ENVIRONMENTAL DATA .....	5
3.5	ORDER OF PRECEDENCE.....	6
3.6	ABBREVIATION .....	6
<b>4.0</b>	<b>GENERAL DESCRIPTION.....</b>	<b>7</b>
4.1	RELIEF LOAD SUMMARY .....	7
4.2	FLARE NETWORK SIZING .....	7
<b>5.0</b>	<b>FLARE NETWORK SIMULATION BASIS.....</b>	<b>8</b>
5.1	DIFFERENT SCENARIOS .....	8
<b>6.0</b>	<b>RESULTS .....</b>	<b>9</b>
<b>7.0</b>	<b>SIMULATION REPORT AND SCHEMATIC OF FLARE DISTRIBUTION NETWORK .....</b>	<b>12</b>

	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>																	
شماره پیمان: 053 - 073 - 9184	<b>FLARE NETWORK STUDY REPORT</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">پروژه</td> <td style="width: 10%;">بسته کاری</td> <td style="width: 10%;">صادرکننده</td> <td style="width: 10%;">تسهیلات</td> <td style="width: 10%;">رشته</td> <td style="width: 10%;">نوع مدرک</td> <td style="width: 10%;">سریال</td> <td style="width: 10%;">نسخه</td> </tr> <tr> <td>BK</td> <td>GCS</td> <td>PEDCO</td> <td>120</td> <td>PR</td> <td>RT</td> <td>0001</td> <td>D04</td> </tr> </table>	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	PR	RT	0001	D04	شماره صفحه: 4 از 12
پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه											
BK	GCS	PEDCO	120	PR	RT	0001	D04											

## 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.

### GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – Surface Facilities; 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.

	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>																	
شماره پیمان: 053 - 073 - 9184	<b>FLARE NETWORK STUDY REPORT</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">پروژه</td> <td style="width: 10%;">بسته کاری</td> <td style="width: 10%;">صادرکننده</td> <td style="width: 10%;">تسهیلات</td> <td style="width: 10%;">رشته</td> <td style="width: 10%;">نوع مدرک</td> <td style="width: 10%;">سریال</td> <td style="width: 10%;">نسخه</td> </tr> <tr> <td>BK</td> <td>GCS</td> <td>PEDCO</td> <td>120</td> <td>PR</td> <td>RT</td> <td>0001</td> <td>D04</td> </tr> </table>	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	PR	RT	0001	D04	شماره صفحه: 5 از 12
پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه											
BK	GCS	PEDCO	120	PR	RT	0001	D04											

## 2.0 SCOPE

The scope of this document is to establish the basic engineering data requirements needed for detail design of Binak Gas Compressor Station.

This document is intended to summarize the sizing calculations of flare network for the "Binak Gas Compressor Station" project. The current report has been performed based on Plot Plan, Flare Load Summary and Process Design Criteria.

## 3.0 NORMATIVE REFERENCES

This report should be read in conjunction with the following general standards and guidelines:

### 3.1 LOCAL CODES AND STANDARDS

- IPS-E-PR-450 Process Design of Pressure Relieving Systems Inclusive Safety Relief Valves
- IPS-E-PR-460 Process Design of Flare & Blowdown Systems

### 3.2 INTERNATIONAL CODES AND STANDARDS

- API-RP-521 "Guide for Pressure-Relieving and Depressurizing Systems" Fifth Edition, 2007.
- API-RP-520 "Sizing, Selection and Installation of Pressure-Relieving Devices in Refineries"
- ISO 15156 Petroleum and Natural Gas Industries. Materials for use in H<sub>2</sub>S Containing Environments in Oil and Gas Production



### 3.3 THE PROJECT DOCUMENTS

- Piping & Instrumentation Diagram BK-GCS-PEDCO-120-PR-PI-0002~0025
- ESD Philosophy BK-GCS-PEDCO-120-PR-PH-0005
- Process Design Criteria BK-GNRAL-PEDCO-000-PR-DC-0001
- Calculation Note For PSV Sizing BK-GCS-PEDCO-120-PR-CN-0004
- Calculation Note For Depressurizing (Min. Design Temperature ) BK-GCS-PEDCO-120-PR-CN-0007

### 3.4 ENVIRONMENTAL DATA

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



	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>																	
<p>شماره پیمان: 053 - 073 - 9184</p>	<p>FLARE NETWORK STUDY REPORT</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>پروژه</th> <th>بسته کاری</th> <th>صادرکننده</th> <th>تسهیلات</th> <th>رشته</th> <th>نوع مدرک</th> <th>سریال</th> <th>نسخه</th> </tr> </thead> <tbody> <tr> <td>BK</td> <td>GCS</td> <td>PEDCO</td> <td>120</td> <td>PR</td> <td>RT</td> <td>0001</td> <td>D04</td> </tr> </tbody> </table>	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	PR	RT	0001	D04	<p>شماره صفحه: 7 از 12</p>
پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه											
BK	GCS	PEDCO	120	PR	RT	0001	D04											

#### 4.0 GENERAL DESCRIPTION

The flare must cater to the possibility of depressurization of equipment during emergencies, for this purpose, based on high flow rate & resulted MDMT of depressuring calculation.

Flare systems of Binak Gas Compressor Station are considered for discharge gas during depressurizing and pressure safety valve relief from compressor area (included compressors, scrubbers & air coolers), gas K.O drums and headers.

Flare system consists of following items:

- Flare Header
- Flare K.O. Drum
- Flare Drum Pumps
- Flare Stack
- Flare Ignition Package

Fluid from flare header flows to the flare K.O. drum V-2201 designed to prevent from the possibility that liquids will be entrained with the vent gases. Vent gas flow through one header to the flare stack FST-2201. The liquids (hydrocarbons, water) recovered within the flare K.O. drum are normally sent to the closed drain vessel V-2202 by flare drum pumps (P-2202-A/B).

#### 4.1 RELIEF LOAD SUMMARY



For detail of the flare loads, relevant temperature and pressure refer to the document number BK-GCS-PEDCO-120-PR-LI-0008 entitled "Relief Load Summary". Released gas characteristics (flow rate, temperature and pressure) included in this document which refer to the safety device upstream conditions (process side).

#### 4.2 FLARE NETWORK SIZING

Flare lines including tail pipes, sub headers and main headers shall be determined in accordance with the clause 5 of the document number BK-00-HD-000-PR-DC-0001 entitled "Process Design Criteria". The major criteria governing the sizing of the flare headers are the back pressure and fluid velocity. Based on API 521 recommendation, the rated flow of PSVs will be used in the calculations for the tailpipes. Peak flow of each BDV (fire case, first time step) is used for flare network sizing.

All the possible fire scenarios shall be considered. A fire scenario consists of a potential fire area of typically 300 m<sup>2</sup> where a pool fire due to hydrocarbon accumulation is likely to occur. A circle of about 10 m radius centered on the equipment protected by the relevant PSV should be considered.

Based on flare network calculation flare header with size 10" is directed to V-2201 and from there

 <b>NISOC</b>	<b>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</b>  <b>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</b>																	
شماره پیمان: <b>053 - 073 - 9184</b>	<b>FLARE NETWORK STUDY REPORT</b>	شماره صفحه: <b>8</b> از <b>12</b>																
	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>پروژه</th> <th>بسته کاری</th> <th>صادرکننده</th> <th>تسهیلات</th> <th>رشته</th> <th>نوع مدرک</th> <th>سریال</th> <th>نسخه</th> </tr> </thead> <tbody> <tr> <td>BK</td> <td>GCS</td> <td>PEDCO</td> <td>120</td> <td>PR</td> <td>RT</td> <td>0001</td> <td>D04</td> </tr> </tbody> </table>	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	PR	RT	0001	D04	
پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه											
BK	GCS	PEDCO	120	PR	RT	0001	D04											

it routed to stack with line 12”.

## 5.0 FLARE NETWORK SIMULATION BASIS

Aspen Flare System Analyzer Ver. 11 has been used for flare header, sub-header and tail pipe sizing with the following basis:



- Piping roughness for carbon steel: 0.04572 mm
- Flare tip pressure drop: 0.1 barg
- VLE and enthalpy: Peng-Robinson equation of state
- Friction factor: Chen correlation
- Pressure drop: Beggs and Brill correlations
- Back pressure: Back pressure to be compatible with relief valve type and BDV's restriction orifice follows:
  - 10 % of PSV set pressure for the Conventional valve type
  - 50 % of PSV set pressure for the balanced valve type
  - 50 % of pressure upstream orifice for the BDV's to ensure critical flow in the orifice

### 5.1 DIFFERENT SCENARIOS

Following scenarios have been considered within the current study:

- Case 1: BDV-Fire
- Case 2: Cold Shutdown Blow Down
- Case 3: Spurious Blow Down
- Case 4: Fire Case area 1(PSV-2111/2112, PSV-2113/2114,PSV-2131A ,PSV-2121A,PSV-2271 are in fire)
- Case 5: Fire Case area 2 (PSV2131A ,PSV2121A,PSV2131B ,PSV2121B are in fire)
- Case 6: Fire Case area 3 (PSV2131B,PSV2121B,PSV2131C,PSV2121C,PSV2141 are in fire)
- Case 7: Block Outlet PSV-2122/2123
- Case 8: Block Outlet PSV-2132/2133
- Case 9: PCV-2152(Relief total flow rate of compressor station)
- Case 10: PCV-2135 A/B
- Case 11: Block Outlet PSV-2113/2114
- Case 12: Block Outlet PSV-2111/2112
- Case 13: Block Outlet PSV-2141/2142



 <p>NISOC</p>	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>																	
<p>شماره پیمان: 053 - 073 - 9184</p>	<p>FLARE NETWORK STUDY REPORT</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>پروژه</th> <th>بسته کاری</th> <th>صادرکننده</th> <th>تسهیلات</th> <th>رشته</th> <th>نوع مدرک</th> <th>سریال</th> <th>نسخه</th> </tr> </thead> <tbody> <tr> <td>BK</td> <td>GCS</td> <td>PEDCO</td> <td>120</td> <td>PR</td> <td>RT</td> <td>0001</td> <td>D04</td> </tr> </tbody> </table>	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	PR	RT	0001	D04	<p>شماره صفحه: 9 از 12</p>
پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه											
BK	GCS	PEDCO	120	PR	RT	0001	D04											

## 6.0 RESULTS



Case 4 with 39824 kg/hr gas flow rate (Relief total flow rate of compressor station) is governing scenario for flare header sizing.

Flare network simulation results for the designed arrangement in main scenario have been summarized in below table.

Based on results obtained, the MDMT for flare network system is about -28°C in spurious blow down case, so the material of piping for this System is selected Carbon Steel.

Flare stack's diameter is 12 inch. Obviously calculated size of piping & flare stack shall be finalized by flare package vendor at detail design phase, due to finalization of plot plan, piping plan.

The calculated size of relieving devices downstream Lines is reported in below table and for calculated header size refer to attachment 1.

Schematic of the flare distribution networks and simulation report are presented in attachment 1.

NOTE 1: According to Fire Case area 1, design pressure for LP Flare K.O drum (V-2201) should be consider to 7.5 bar g.





 <p>NISOC</p>	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>																	
<p>شماره پیمان: 053 - 073 - 9184</p>	<p>FLARE NETWORK STUDY REPORT</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>پروژه</th> <th>بسته کاری</th> <th>صادرکننده</th> <th>تسهیلات</th> <th>رشته</th> <th>نوع مدرک</th> <th>سریال</th> <th>نسخه</th> </tr> </thead> <tbody> <tr> <td>BK</td> <td>GCS</td> <td>PEDCO</td> <td>120</td> <td>PR</td> <td>RT</td> <td>0001</td> <td>D04</td> </tr> </tbody> </table>	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	PR	RT	0001	D04	<p>شماره صفحه : 10 از 12</p>
پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه											
BK	GCS	PEDCO	120	PR	RT	0001	D04											



Table 1 - Flare network simulation results



 <p>NISOC</p>	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>																	
<p>شماره پیمان: 053 - 073 - 9184</p>	<p>FLARE NETWORK STUDY REPORT</p> <table border="1"> <thead> <tr> <th>پروژه</th> <th>بسته کاری</th> <th>صادرکننده</th> <th>تسهیلات</th> <th>رشته</th> <th>نوع مدرک</th> <th>سریال</th> <th>نسخه</th> </tr> </thead> <tbody> <tr> <td>BK</td> <td>GCS</td> <td>PEDCO</td> <td>120</td> <td>PR</td> <td>RT</td> <td>0001</td> <td>D04</td> </tr> </tbody> </table>	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	PR	RT	0001	D04	<p>شماره صفحه : 12 از 12</p>
پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه											
BK	GCS	PEDCO	120	PR	RT	0001	D04											

## 7.0 SIMULATION REPORT AND SCHEMATIC OF FLARE DISTRIBUTION NETWORK

Please find attachment-01

### ATTACHMENT-01

