

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک								
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طرح نگهداشت و افزایش تولید 27 مخزن

FLARE NETWORK STUDY REPORT

نگهداشت و افزایش تولید میدان نفتی بینک

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

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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, 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.

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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 H₂S 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".

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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 m² 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.

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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:
 - o 10 % of PSV set pressure for the Conventional valve type
 - o 50 % of PSV set pressure for the balanced valve type
 - o 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 (PSV2111,PSV2113,PSV2251,PSV2131A ,PSV2121A,PSV2271 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-2135A
- Case 11:PCV-2135B
- Case 12: Block Outlet PSV-2113/2114
- Case 13: Block Outlet PSV-2111/2112

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6.0 RESULTS



Case 9 with 18888 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 10 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 PSV 2113-2114's block outlet scenario, design pressure for LP Flare K.O drum (V-2201) should be consider to 7.5 bar g.

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Table 1 - Flare network simulation results





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	سرپال	نوع مدرک	رشته	تسهيلات	صادر کننده	بسته کاری	پروژه
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Flare Load Summary For LP Flare										
Source	Location	Flowrate kg/hr	Relieving Temp(°C)	Set Pressure(barg)	Back Temp (°C)	Back Pressure (barg)	MW	Tail Pipe Rho V2 (kg/m.s ²)	Tail Pipe Size	Remarks
DEPRESSURIZING FIRE CASE										
BDV-2141	V-2103	1722	60.0	62.0	42.1	0.87	21.6	35610	2"	
BDV-2132A	AC-2122 A	1333.8	60.0	62.0	42.1	0.82	21.6	20775	2"	
BDV-2132B	AC-2122 B	1333.8	60.0	62.0	42.1	0.82	21.6	20888	2"	
BDV-2134A	V-2102 A	778.4	60.0	22.0	53.3	0.97	21.6	7300	2"	
BDV-2134B	V-2102 B	778.4	60.0	22.0	53.3	0.97	21.6	7325	2"	
BDV-2151	PK-2101	3236	60.0	62.0	42.1	0.76	21.6	26239	3"	
XV-2110	V-2105	250.7	36.9	9.0	33.5	0.73	21.6	710	2"	
Flare Load		5168								
COLD SHUTDOWN										
BDV-2141	V-2103	1825	21.0	60.0	-4.0	0.84	21.6	34614	2"	
BDV-2134A	V-2102 A	796	21.0	22.0	12.1	0.92	21.6	6787	2"	
BDV-2134B	V-2102 B	796.4	21.0	22.0	12.0	0.92	21.6	6809	2"	
BDV-2132A	AC-2122 A	1414.0	21.0	62.0	-4.2	0.79	21.6	20243	2"	
BDV-2132B	AC-2122 B	1414.0	21.0	62.0	-4.2	0.78	21.6	20346	2"	
BDV-2151	PK-2101	3430.0	21.0	62.0	-4.2	0.73	21.6	25510	3"	
XV-2110	V-2105	205.5	19.0	9.0	15.1	0.69	21.6	456	2"	
Flare Load		9881								
SPURIOUS BLOWDOWN CASE										
BDV-2141	V-2103	1548	60.0	62.0	42.1	0.75	21.6	30517	2"	
BDV-2132A	AC-2122 A	1199.0	60.0	62.0	42.3	0.71	21.6	17865	2"	
BDV-2132B	AC-2122 B	1199.0	60.0	62.0	42.1	0.70	21.6	17937	2"	
BDV-2134A	V-2102 A	725.6	21.0	22.0	12.1	0.84	21.6	5893	2"	
BDV-2134B	V-2102 B	725.6	21.0	22.0	12.1	0.82	21.6	5897	2"	
XV-2110	V-2105	205.5	19.0	9.0	15.1	0.62	21.6	477	2"	
BDV-2151	PK-2101	2913.0	60.0	62.0	42.1	0.65	21.6	22518	3"	
Flare Load		8516								
FIRE AREA 1										
PSV-2111	V-2104	5086	301.9	9.00	300.6	1.01	24.52	5053	6"	
PSV-2113	V-2105	736.0	280.0	22.00	275.4	1.04	24.52	3243	6"	
PSV-2121A	V-2101A	221	350.7	9.00	349.7	1.28	24.52	9497	2"	
PSV-2271	V-2205	506	216.0	9.00	214.0	1.36	24.52	9517	2"	
PSV-2131A	V-2102A	809	208.3	22.00	191.1	1.48	24.52	16293	2"	
Flare Load		7358								
FIRE AREA 2										
PSV-2121A	V-2101A	221	234.5	9.00	232.0	0.73	33.74	16015	2"	
PSV-2131A	V-2102A	809	123.9	22.00	107.3	1.03	33.74	29034	2"	
PSV-2121B	V-2101B	221	234.5	9.00	232.0	0.33	33.74	5052	2"	
PSV-2131B	V-2102B	809	123.9	22.00	107.3	0.28	33.74	5994	3"	
Flare Load		2060								
FIRE AREA 3										
PSV-2121B	V-2101B	221	234.5	9.00	232.7	0.40	24.52	4798	2"	
PSV-2131B	V-2102B	809	123.9	22.00	112.6	0.35	24.52	5522	3"	
PSV-2121C	V-2101C	221	234.5	9.00	232.7	0.24	24.52	991	3"	
PSV-2131C	V-2102C	809	123.9	22.00	112.6	0.34	24.52	5535	3"	
PSV-2141	V-2103	1505	121.0	62.00	88.2	0.68	24.52	48079	8"	
Flare Load		3565								
Blocked Outlet PSV-2122/2123										
PSV-2122	C-2101A	8664	132.0	62.00	89.6	2.08	32.72	22337	6"	
Flare Load		8664								
Blocked Outlet PSV-2132/2133										
PSV-2132	C-2102A	8664	132.0	62.00	87.8	1.14	33.72	38307	6"	
Flare Load		8664								
PV-2152										
PV-2152	STATION OUTLET	18888	60.0	53.90	44.8	2.000	24.52	33533	6"	
Flare Load		18888								
PCV-2135A										
PCV-2135A	AC-2102A	9531	60.0	53.10	40.5	1.140	24.52	57099	4"	
Flare Load		9531								
PCV-2135B										
PCV-2135B	AC-2102B	9531	60.0	53.10	40.5	1.060	24.52	60095	4"	
Flare Load		9531								
PSV-2111/2112 Blockoutlet										
PSV-2111/2112	V-2104	11269	254.0	9.00	252.7	1.900	24.52	18909	6"	
Flare Load		11269								
PSV-2113/2114 Blockoutlet										
PSV-2113/2114	V-2105	17833	280.0	9.00	278.8	4.330	24.52	13160	8"	
Flare Load		17833								

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7.0 SIMULATION REPORT AND SCHEMATIC OF FLARE DISTRIBUTION NETWORK

Please find attachment-01

ATTACHMENT-01

Aspen Flare System Analyzer

Version 37.0.0.395



User Name : Undefined
Job Code :
Project : BINAK
Description :
Scenario : Cold shutdown case
Label : Pressure /(bar)



PFD

