

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک							
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	BK	GCS	PEDCO	120	PR	CN	0002	D04

طرح نگهداشت و افزایش تولید 27 مخزن

CALCULATION NOTE FOR DRUM SIZING

نگهداشت و افزایش تولید میدان نفتی بینک

D04	JUL.2022	IFA	M.Aryafar	M.Fakharian	M.Mehrshad	
D03	MAR.2022	IFA	M.Aryafar	M.Fakharian	M.Mehrshad	
D02	DEC.2021	IFA	M.Aryafar	M.Fakharian	M.Mehrshad	
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Class:2

CLIENT Doc. Number: F0Z-708740

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

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

2.0 SCOPE

This document provides the vessel and drum sizing calculation for BINAK Gas Compressor Station.

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک							
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3.0 NORMATIVE REFERENCES

3.1 Local Codes and Standard

- IPS-E-PR-360 Engineering Standard For Process Requirement Of Vessels Reactors And Separators
- IPS-E-PR-850 Engineering Standard For Process Design Of Liquid & Gas Transfer And Storage

3.2 The Project Documents

BK-GCS-PEDCO-120-PR-PF-0001	Process Flow Diagram (PFD)
BK-GNRAL-PEDCO-000-PR-DB-0001	Process Basis of Design
BK-GNRAL-PEDCO-000-PR-DC-0001	Process Design Criteria

3.3 ENVIRONMENTAL DATA

Refer to "Process Basis of Design"; Doc. No. Process Basis of Design BK-00-HD-000-PR-DB-0001

3.4 ORDER OF PRECEDENCE

In case of any conflict between the contents of this document or any discrepancy between this document and other project documents or reference standards, this issue must be reported to the CLIENT. The final decision in this situation will be made by CLIENT.

4.0 ABBREVIATIONS

NIOC:	National Iranian Oil Company
NISOC:	National Iranian South Oil Company
PFD:	Process Flow Diagram
P&ID:	Piping and Instrumentation Diagram
BFPD:	Barrel Fluid per Day

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک																									
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5.0 CALCULATION RESULTS

For sizing of equipment's all possible cases have been considered and worst case has been chosen. The details of calculations are presented as follow.

List of equipment is summarized in below table:



Tag Number	Equipment Description	P&ID. N	SIZE (ID*TL-TL)(m)
V-2101	1ST STAGE GAS COMPRESSION SUCTION DRUM	BK-GCS-PEDCO-120-PR-PI-0006	0.9 × 3
V-2102	2ND STAGE GAS COMPRESSION SUCTION DRUM	BK-GCS-PEDCO-120-PR-PI-0009	0.9 × 3
V-2103	GAS COMPRESSION DISCHARGE DRUM	BK-GCS-PEDCO-120-PR-PI-0012	0.9 × 2.84
V-2104	SLUG CATCHER	BK-GCS-PEDCO-120-PR-PI-0004 (1/3)	4.2 × 12.6
V-2105	INLET KNOCK OUT DRUM	BK-GCS-PEDCO-120-PR-PI-0005	1.5 × 4.5
V-2205	FUEL GAS K.O. DRUM	BK-GCS-PEDCO-120-PR-PI-0022	0.438 × 2.95
V-2106	DEGASSING VESSEL	Deleted	Deleted
V-2202	CLOSED DRAIN DRUM	BK-GCS-PEDCO-120-PR-PI-0017(2/2)	2.6 × 7.8
V-2206	DESEL OIL DRUM	BK-GCS-PEDCO-120-PR-PI-0023	2.3 × 6
V-2203	INSTRUMENT AIR RECEIVER	BK-GCS-PEDCO-120-PR-PI-0015(2/2)	1.5×5
V-2204	NITROGEN RECEIVER	BK-GCS-PEDCO-120-PR-PI-0016	1 × 3.15
V-2201	LP FLARE K.O. DRUM	BK-GCS-PEDCO-120-PR-PI-0020(2/3)	1 × 3
V-2107	GLYCOL SUMP DRUM	BK-GCS-PEDCO-120-PR-PI-0025	1.1 × 3.6
T-2101	SLUG STORAGE TANK	Deleted	Deleted
T-2102	LEAN GLYCOL STORAGE TANK	BK-GCS-PEDCO-120-PR-PI-0014	4 × 5
T-2209	POTABLE WATER TANK	BK-GCS-PEDCO-120-PR-PI-0024	3.5 × 2.6
SU-2202	OILY WATER SUMP	BK-GCS-PEDCO-120-PR-PI-0021	2.5 × 3 × 4

6.0 Close drain drum calculation report

For sizing close drain vessel, all continuous and intermittent drain should be investigated and the greatest inventory (V-2104) at a same time should be selected as the basis of drain drum sizing.

Close Drain Drum Calculation		
Drum Diameter	2.6	m
Drum Length	7.8	m
Drum Total Volume	46	m ³
Maximum Continues Inlet Flow	3	m ³ /hr
HLL	2.15	m
LLL	0.3	m
Liquid Volume HLL	40.9	m ³
Liquid Volume LLL	2.9	m ³
Storage Volume (between HLL & LLL)	38	m ³

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7.0 Diesel oil storage tank calculation report



The Diesel Oil Storage Drum shall be capable to supply fuel oil to all the users for a minimum of 5 days of continuous operation.

Fuel oil storage drum volume is based on corrosion study, fire water pump calculation and diesel generator consumption.

Fuel Oil Storage Drum Calculation(Diesel generator)		
Drum Diameter	1.5	m
Drum Length	3.0	m
Drum Total Volume	6.0	m3
Maximum Fuel Oil Consumption	5.0	m3/hr
HLL	1.3	m
LLL	0.2	m
Liquid Volume HLL	5.3	m3
Liquid Volume LLL	0.3	m3
Storage Volume (between HLL & LLL)	5.0	m3

Fuel Oil Storage Drum Calculation(fire Diesel pump)		
Drum Diameter	1.2	m
Drum Length	3.0	m
Drum Total Volume	3.7	m3
Maximum Fuel Oil Consumption	2.7	m3/hr
HLL	1.0	m
LLL	0.2	m
Liquid Volume HLL	3.1	m3
Liquid Volume LLL	0.3	m3
Storage Volume (between HLL & LLL)	2.9	m3

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک								
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8.0 Air receiver volume calculation report

The air receiver is sized to provide a buffer supply for air of 15 minutes from a pressure of 8 barg down to 4.5 barg, based on the air consumption rate of the plant.

Air receiver		
Barometric Pressure P0	1.03	Bara
Initial Air Receiver Pressure P1	8	Barg
Final Air Receiver Pressure P2	4.5	Barg
Air Receiver Retention time	15	Min
Total Plant Air Consumption	119.34	Nm ³ /hr
	125.9	Sm ³ /hr
Max. Air Receiver Required Volume	9.3	m ³
Air Receiver Selected Diameter	1.5	m
Air Receiver Selected Length	5	m
Air Receiver Calculated Volume	9.7	m ³

9.0 Nitrogen receiver volume calculation report

The nitrogen receiver is sized to provide a buffer supply for 15 minutes from a pressure of 8 barg down to 4 barg, based on the maximum nitrogen consumption rate of the plant.

Nitrogen receiver		
Barometric Pressure P0	1.03	Bara
Initial N2 Receiver Pressure P1	8	Barg
Final N2Receiver Pressure P2	4	Barg
N2 Receiver Retention time	15	Min
Total N2 Consumption	43	Nm ³ /hr
	45.8	Sm ³ /hr
Max. N2 Receiver Required Volume	2.95	m ³
N2 Receiver Selected Diameter	1	m
N2 Receiver Selected Length	3.15	m
N2 Receiver Calculated Volume	3	m ³

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک																									
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10.0 Glycol sump drum calculation

Glycol Sump Drum Calculation		
Drum Diameter	1.1	m
Drum Length	3.6	m
Drum Total Volume	3.77	m ³
HLL	0.65	m
LLL	0.3	m
Liquid Volume HLL	2.33	m ³
Liquid Volume LLL	0.82	m ³
Storage Volume (between HLL & LLL)	1.51	m ³

11.0 POTABLE WATER TANK

Potable Water Tank Calculation		
Tank Diameter	3.5	m
Tank Height	2.6	m
Tank Nominal Capacity	25	m ³
HLL	2.25	m
LLL	0.15	m
Working Capacity	20	m ³

12.0 OILY WATER SUMP



Oily Water Sump		
Hold-Up time	15	m
Length (L)	3	m
Hight (H)	3	m
Width (W)	4	m
HLL	2.2	m
Full Volume	30	m
Usable Volume	26.4	m

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13.0 GLYCOL STORAG TANK

TAG NUMBER	TK-2102	DESCRIPTION
Working Capacity (m3)	44	
Discharge Flow rate (m3/h)	5.5	
Estimated Nominal capacity (m3)	62	Should be great that working capacity
Tank Height (selected from table) (m)	5	Refer to TABLE A1 (IPS-E-PR360)
Tank Diameter (selected from table) (m)	4	Refer to TABLE A1 (IPS-E-PR360)
Outlet Nozzle Diameter (in)	2	(Set By Pump Calculation)
Minimum Distance From Bottom Of Tank To Center Of Nozzles(mm)	175	Refer to TABLE 5.6a (API 650)
Selected Distance	250	
Center Of Nozzle(mm)	30	
Value For low low liquid level from top of nozzle	150	minimum 150 mm Refer to (IPS-E-PR-360) section 6.3.1.2.1
calculated low low liquid of tank level (mm)	430	
selected low low liquid of tank level (mm)	600	
Time between low low liquid level and low liquid level (min)	2	usually 2-5 min
volume of liquid between low liquid level and low low liquid level (m3)	0.2	
Height of low liquid level and low low liquid level(mm)	15	
Selected Height of low liquid level and low low liquid level(mm)	200	
Height of high liquid level and low liquid level(mm)	3503	
Time between high high liquid level and high liquid level (min)	2	usually 2-5 min
volume of liquid between high high liquid level and high liquid level (m3)	0.2	
Height of high high liquid level and high liquid level(mm)	15	
Selected Height of high high liquid level and high liquid level(mm)	200	
Heigh between of roof tank and high high liquid level (mm)	450	
Calculated height of tank (m)	5.0	TRUE
RESULTS		
Tank Height (m)	5	
Tank Diameter (m)	4	
LLL (mm)	600	
LL (m)	800	
HL(m)	4300	
HHL (m)	4500	

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14.0 Flare drum calculation



The drum size is based on depressurizing study and result shown as follow:

Project Name : BINAK Gas Compressor Station			
Item Name : Flare Drum			
FLARE DRUM CALCULATION =====			

OPERATING DATA			

Gas mass flow rate,(Kg/s)	5.25		
Gas density T,P (Kg/m3)	2.86		
Qg actual volume flow,(m3/s)	1.83		
Gas viscosity,(cp)	0.01		
Liquid flow rate,(Kg/s)	0.264		
Liquid density T,P (Kg/m3)	848.2		
Ql actual volume flow,(m3/s)	0.000		
Particle size,(microns)	600.0		
Number of vapor pass	1		
Over design factor,(%)	10		

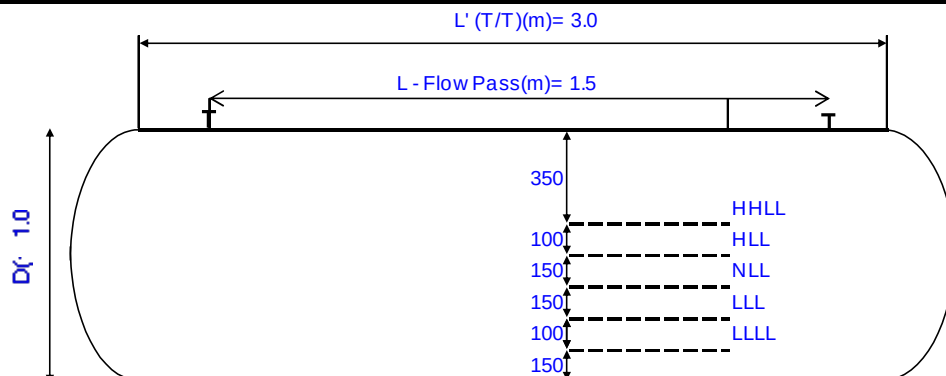
CALCULATION RESULTS			

Ud, Dropout Velocity(m/s)	1.9830		
C(Re) ²	86870.9		
C, Drag coefficient	0.58		
$CR_g^2 = 0.13 \times 10^8 \times D^3 \times (\rho_l - \rho_v) / \mu^2$			
From API-521 Fig.9			

DRUM SIZING CRITERIA			
		R.min	mm
	hv	-	
HHLL	h1	2	100
HLL	h2	30	300
LLL	h3	2	100
LLLL	h4	-	150
BL	-	-	0

	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک								
شماره پیمان:	CALCULATION NOTE FOR DRUM SIZING							شماره صفحه : 12 از 67	
053 - 073 - 9184	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	PR	CN	0002	D04	

CALCULATION RESULTS		Trial.1	Trial.2	Trial.3	Trial.4
Assumed diameter (m)		6	1	1.1	1.2
Assumed Length (m)		2.5	2.4	2.5	2.2
Added Length		0.6	0.6	0.6	0.6
At, Total area(m2)		28.27	0.79	0.95	1.13
Av, Vapor area(m2)		26.62	0.24	0.37	0.51
Ah1, Liquid area(m2)		0.36	0.10	0.11	0.12
Ah2, Liquid area(m2)		0.89	0.29	0.31	0.33
Ah3, Liquid area(m2)		0.21	0.08	0.08	0.09
Ah4, Liquid area(m2)		0.19	0.07	0.08	0.08
ht (Cm)		600	100	110	120
hv(ht-H1) (Cm)		535	35	45	55
hL1(HH)(Cm)		65	65	65	65
hL2(H)(Cm)		55	55	55	55
hL3(L)(Cm)		25	25	25	25
h4(LL)(Cm)		15	15	15	15
Liquid drop out time.(sec)		2.70	0.18	0.23	0.28
Vapor velocity (m/s)		0.08	8.24	5.52	3.99
L, Flowpath length(m)		0.2	1.5	1.3	1.1
3<L/D<4		0.5	3.0	2.8	2.4
Stimated Weight (kg)		1568	249	283	279
% Total area (vapor)		94	31	38	45
Selected Length (m)		3.1	3.0	3.1	2.8
		Trial. 1	Trial.2	Trial.3	Trial.4
Top. (mm)	hv	5350	350	450	550
HHLL (mm)	h1	100	100	100	100
HLL (mm)	h2	300	300	300	300
LLL (mm)	h3	100	100	100	100
LLLL (mm)	h4	150	150	150	150
Bt.	-				



 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک																									
شماره پیمان: 053 - 073 – 9184	<table><tr><th colspan="8">CALCULATION NOTE FOR DRUM SIZING</th></tr><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><tr><td>BK</td><td>GCS</td><td>PEDCO</td><td>120</td><td>PR</td><td>CN</td><td>0002</td><td>D04</td></tr></table>	CALCULATION NOTE FOR DRUM SIZING								پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	PR	CN	0002	D04	شماره صفحه : 13 از 67
CALCULATION NOTE FOR DRUM SIZING																										
پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه																			
BK	GCS	PEDCO	120	PR	CN	0002	D04																			

15.0 Calculation Report



ATTACHMENT

(SOFTWARE RESULT)