

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض خرید پکیج کولرهای هوایی ایستگاه تقویت فشار گاز بینک (قرارداد BK-HD-GCS-CO-0015_02)								
شماره پیمان: 053 – 073 – 9184	Thermal/Mechanical Calculation Books							شماره صفحه : 1 از 8	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	AA	120	PR	CN	0001	V00	

طرح نگهداشت و افزایش تولید 27 مخزن

Thermal/Mechanical Calculation Books

نگهداشت و افزایش تولید میدان نفتی بینک

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Status:

IFA: Issued For Approval

IFI: Issued For Information

AFC: Approved For Construction

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض خرید پکیج کولرهای هوایی ایستگاه تقویت فشار گاز بینک (قرارداد BK-HD-GCS-CO-0015_02)								
شماره پیمان: 053 – 073 – 9184	Thermal/Mechanical Calculation Books							شماره صفحه : 2 از 8	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	AA	120	PR	CN	0001	V00	

REVISION RECORD SHEET

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 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض خرید پکیج کولرهای هوایی ایستگاه تقویت فشار گاز بینک (قرارداد BK-HD-GCS-CO-0015_02)								
شماره پیمان: 053 – 073 – 9184	Thermal/Mechanical Calculation Books							شماره صفحه : 3 از 8	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	AA	120	PR	CN	0001		V00

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 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض خرید پکیج کولرهای هوایی ایستگاه تقویت فشار گاز بینک (قرارداد BK-HD-GCS-CO-0015_02)								
شماره پیمان: 053 – 073 – 9184	Thermal/Mechanical Calculation Books							شماره صفحه : 4 از 8	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	AA	120	PR	CN	0001	V00	

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.

GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – Manufacturing (w/Engineering & Material Supply) of Air Coolers
EPD/EPC CONTRACTOR (GC):	Petro Iran Development Company (PEDCO)
OWNER:	OWNER is collectively refer to National Iranian South Oil Company (NISOC) and Petro Iran Development Company (PEDCO)
EPC CONTRACTOR:	Joint Venture of : Hirgan Energy – Design & Inspection(D&I) Companies
VENDOR:	Aban Air Cooler (AAC)
EXECUTOR:	Executor is the party which carries out all or part of construction and/or commissioning for the project.
THIRD PARTY INSPECTOR (TPI):	Third Party Inspector
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.

		API 661 Air-Cooled Heat Exchanger - Specification Sheet			
		Job No. _____		Item No. <u>2101 (summer)</u>	
		Page <u>Page 1</u>		By _____	
		Date <u>11/22/2023</u>		Revision <u>0</u>	
		Proposal No. _____		Contract No. _____	
Inquiry No. _____		Order No. _____			
Manufacturer _____		Heat exchanged (kW) _____		391.34	
Model no. _____		Surface/Item-Finned tube (m2) _____		691.54	
Customer <u>(PEDCO) / (NISOC)</u>		Bare tube (m2) _____		33.078	
Plant location <u>Binak oilfield</u>		MTD, Eff. (Deg. C) _____		30.6	
Service _____		Transfer rate-Finned (W/m2-K) _____		18.686	
Type draft <u>INDUCED</u>		Bare tube, service (W/m2-K) _____		390.66	
Bay size (WxL) (m) <u>1.514 x 3.048</u>		Bare tube, clean (W/m2-K) _____		433.60	
No. of bays/Items <u>2</u>					
Basic design data					
Pressure design code _____		Structural code _____			
Tube bundle code stamped _____		Flammable service _____			
Heating coil code stamped _____		Lethal/toxic service _____			
Performance Data - Tube Side					
Fluid name <u>Hydrocarbon</u>				In Out	
Total fluid entering (kg/hr) _____	<u>9530.4</u>	Total flow rate (Liq/Vap) (kg/hr) _____	<u>9530.4</u>		
Dew/bubble point (Deg. C) _____	<u>/</u>	Water/Steam (kg/hr) _____	<u>/</u>		
(Deg. C) _____		Noncondensables (kg/hr) _____			
Latent heat (kJ/kg) _____		Molecular Wt. (Vap/Non-cond) _____	<u>/</u>	<u>/</u>	
Inlet pressure (barG) _____	<u>18</u>	Density (Liq/Vap) (kg/m3) _____	<u>/ 15.306</u>	<u>/ 18.737</u>	
Pressure drop (All/Calc) (bar) _____	<u>0.700 / 0.232</u>	Specific heat (Liq/Vap) (kJ/kg-C) _____	<u>/ 2.2230</u>	<u>/ 2.0641</u>	
Velocity (Allow/Calc) (m/s) _____	<u>/ 12.05</u>	Thermal cond. (Liq/Vap) (W/m-C) _____	<u>/ 0.0416</u>	<u>/ 0.0331</u>	
Inside fouling resistance (m2-K/W) _____	<u>0.000200</u>	Viscosity (Liq/Vap) (mN-s/m2) _____	<u>/ 0.0148</u>	<u>/ 0.0127</u>	
In Out					
Temperature (Deg. C) _____	<u>129 60.00</u>				
Performance Data - Air Side					
Air inlet temperature (Deg. C) _____	<u>50.26</u>	Face velocity (m/s) _____	<u>3.85</u>		
Air flow rate/item (m3/s) _____	<u>34.507</u>	Minimum design ambient temp. (Deg. C) _____	<u>5.00</u>		
Mass velocity (kg/s-m2) _____		Altitude (m) _____	<u>12.500</u>		
Air outlet temperature (Deg. C) _____	<u>59.63</u>	Static pressure (Pa) _____	<u>130.29</u>		
Air flow rate/fan (m3/s) _____	<u>9.798</u>				
Design, Material, and Construction					
Design pressure (barG) _____	<u>22.000</u>	Heating Coil			
Test pressure (barG) _____		No. of tubes _____			
Design temperature (Deg. C) _____	<u>155.00</u>	Tube outside diameter (mm) _____			
Min. design metal temp. (Deg. C) _____		Tube material _____			
Tube bundle		Fin material and type _____			
Size (WxL) (m) _____	<u>1.470 X 3.048</u>	Fin thickness (mm) _____			
No./Bay _____	<u>1</u>	ASME Code, Sec. VIII, Div. 1 _____			
Number of tube rows _____	<u>4</u>	Heating fluid _____			
Bundles in parallel _____	<u>2</u>	Heating fluid flow rate (kg/hr) _____			
Bundles in series _____		Temperature (In/Out) (Deg. C) _____ / _____			
Structure mounting _____		Inlet pressure (barG) _____			
Pipe rack beams _____		Pressure drop (All/Calc) (kPa) _____ / _____			
Ladders, walkways, platforms _____		Design temperature (Deg. C) _____			
Structure surface prep. _____		Design pressure (barG) _____			
Header surface prep. _____		Inlet/Outlet nozzle _____ / _____			
Louver	<u>Required.</u>	Header			
Material _____		Type _____			
Action control _____	<u>Manual</u>	Material _____			
Action type _____		Corrosion Allowance (mm) _____			
		No. of passes _____ <u>4</u>			

		API 661 Air-Cooled Heat Exchanger - Specification Sheet			
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		Page _____		By _____	
		Date <u>11/22/2023</u>		Revision _____	
		Proposal No. _____		Contract No. _____	
Inquiry No. _____		Order No. _____			
Design, Material, and Construction (continued)					
Header (continued)				No./Bundle _____ <u>68</u> Length (m) _____ <u>3.048</u> Pitch (mm) _____ <u>71.000</u> Layout _____ <u>Triangular</u>	
Slope _____ <u>1% on Last pass</u> Plug material _____ <u>SA 182 F316L</u> Gasket material _____ <u>spiral wound + S.S 316 inner</u>					
Nozzle				Fin	
	No.	Size, (in)	Rating/Facing	Type	_____ <u>Extruded</u>
Inlet	<u>1</u>	<u>6</u>	<u>300RF</u>	Material	_____ <u>Aluminum Alloy 1060 - O</u>
Outlet	<u>1</u>	<u>6</u>	<u>300RF</u>	Thickness (mm)	_____ <u>0.480</u>
Vent	<u>1</u>	<u>2</u>	<u>300RF</u>	Selection temp. (C)	_____
Drain	<u>1</u>	<u>2</u>	<u>300RF</u>	Outside diameter (mm)	_____ <u>57.150</u>
Chemical Cleaning	_____	_____	_____	Fin density (fin/inch)	_____ <u>10.0</u>
Min. Wall Thk.	_____	_____	_____	ASME Code, Sec. VIII, Div. 1	_____
Tube				Customer Specifications _____	
Material	_____ <u>SA-213 TP316L Tube (S) S31603</u>			_____	
Tube outside diameter (mm)	_____ <u>25.400</u>			_____	
Average wall thickness (mm)	_____ <u>1.651</u>			_____	
Mechanical Equipment					
Fan				RPM _____ <u>1500</u>	
Manufacturer	_____			Service factor	_____
No./Bay	_____ <u>2</u>			Enclosure	_____ <u>EExd, IIB T3 (IP 55)</u>
RPM (Revs/min.)	_____ <u>783.4</u>			Voltage	_____ <u>400</u>
Diameter (ft)	_____ <u>3.6</u>			Phase	_____ <u>3</u>
No. of blades	_____			Cycle	_____ <u>50</u>
Angle (degrees)	_____			Fan noise level (dB)	_____ <u><85</u>
Pitch adjustment	_____			Speed Reducer	
Blade material	_____			Type	_____ <u>V-Belt</u>
Hub material	_____			Manufacturer	_____
@design temp	_____			No./Bay	_____
@min. ambient temp	_____			Service factor	_____
Tip speed	_____			Speed ratio	_____
Driver				Support	_____
Type	_____			Vib. switch	_____
Manufacturer	_____			Enclosure	_____
No./Bay	_____ <u>2</u>				
Driver (kW)	_____ <u>5.5</u>				
Controls - Air Side					
Air recirculation _____				Louvers _____	
Degree control of outlet process temp. _____				Positioner _____	
(Max. Cooling), +/- _____ / _____				Signal air pressure (barG)	
Action on control signal failure _____				From _____ To _____	
Fan pitch _____				From _____ To _____	
Louvers _____				Supply air pressure (barG)	
Actuator air supply _____				From _____ To _____	
Fan _____				From _____ To _____	
Shipping					
Plot area (WxL) (m)		_____ <u>1.514 x 3.048</u>		Total (kg)	_____ <u>15691</u>
Bundle weight (kg)		_____ <u>1605.5</u>		Shipping (kg)	_____
Bay (kg)		_____			
Note: 1- 10% over design on duty and flow has been considered. 2- Maximum allowable nozzle load = 3 x API.					

		API 661 Air-Cooled Heat Exchanger - Specification Sheet	
		Job No.	Item No. 2102 (Summer)
		Page Page 1	By
		Date 11/22/2023	Revision 0
		Proposal No.	Contract No.
		Inquiry No.	Order No.
Manufacturer _____ Model no. _____ Customer (PEDCO) / (NISOC) Plant location Binak oilfield Service _____ Type draft INDUCED Bay size (WxL) (m) 1.759 x 3.300 No. of bays/items 2		Heat exchanged (kW) 575.4 Surface/Item-Finned tube (m2) 988.27 Bare tube (m2) 47.399 MTD, Eff. (Deg. C) 32.7 Transfer rate-Finned (W/m2-K) 17.963 Bare tube, service (W/m2-K) 374.52 Bare tube, clean (W/m2-K) 413.92	
Basic design data			
Pressure design code _____		Structural code _____	
Tube bundle code stamped _____		Flammable service _____	
Heating coil code stamped _____		Lethal/toxic service _____	
Performance Data - Tube Side			
Fluid name Hydrocarbon		In Out	
Total fluid entering (kg/hr)	9530.4	Total flow rate (Liq/Vap) (kg/hr)	/ 9530.4 41.362 / 9489.1
Dew/bubble point (Deg. C)	/	Water/Steam (kg/hr)	/
(Deg. C)		Noncondensables (kg/hr)	
Latent heat (kJ/kg)		Molecular Wt. (Vap/Non-cond)	/
Inlet pressure (barG)	54.9	Density (Liq/Vap) (kg/m3)	/ 42.838 981.96 / 60.168
Pressure drop (All/Calc) (bar)	0.700 / 0.051	Specific heat (Liq/Vap) (kJ/kg-C)	/ 2.4158 4.3096 / 2.4071
Velocity (Allow/Calc) (m/s)	/ 3.05	Thermal cond. (Liq/Vap) (W/m-C)	/ 0.0467 0.6515 / 0.0371
Inside fouling resistance (m2-K/W)	0.000200	Viscosity (Liq/Vap) (mN-s/m2)	/ 0.0163 0.4943 / 0.0142
In Out			
Temperature (Deg. C)	147 60.00		
Performance Data - Air Side			
Air inlet temperature (Deg. C)	50.26	Face velocity (m/s)	3.51
Air flow rate/item (m3/s)	39.350	Minimum design ambient temp. (Deg. C)	5.00
Mass velocity (kg/s-m2)		Altitude (m)	12.500
Air outlet temperature (Deg. C)	62.34	Static pressure (Pa)	146.74
Air flow rate/fan (m3/s)	11.266		
Design, Material, and Construction			
Design pressure (barG) 62.000		Heating Coil	
Test pressure (barG) _____		No. of tubes _____	
Design temperature (Deg. C) 175.00		Tube outside diameter (mm) _____	
Min. design metal temp. (Deg. C) _____		Tube material _____	
Tube bundle		Fin material and type _____	
Size (WxL) (m) 1.699 X 3.300		Fin thickness (mm) _____	
No./Bay 1		ASME Code, Sec. VIII, Div. 1 _____	
Number of tube rows 4		Heating fluid _____	
Bundles in parallel 2		Heating fluid flow rate (kg/hr) _____	
Bundles in series _____		Temperature (In/Out) (Deg. C) _____ / _____	
Structure mounting _____		Inlet pressure (barG) _____	
Pipe rack beams _____		Pressure drop (All/Calc) (kPa) _____ / _____	
Ladders, walkways, platforms _____		Design temperature (Deg. C) _____	
Structure surface prep. _____		Design pressure (barG) _____	
Header surface prep. _____		Inlet/Outlet nozzle _____ / _____	
Louver	Required.	Header	
Material _____		Type _____	
Action control _____	Manual	Material _____	
Action type _____		Corrosion Allowance (mm) _____	
		No. of passes _____ 4	

**API 661 Air-Cooled Heat Exchanger - Specification Sheet**

Job No.		Item No.	2102 (Summer)
Page	Page 2	By	
Date	11/22/2023	Revision	0
Proposal No.		Contract No.	
Inquiry No.		Order No.	

Design, Material, and Construction (continued)**Header (continued)**

Slope	1% on last pass
Plug material	SA 182 F316L
Gasket material	spiral wound + S.S 316 inner ring

Nozzle

	No.	Size, (in)	Rating/Facing
Inlet	1	6	300RF
Outlet	1	6	300RF
Vent	1	2	300RF
Drain	1	2	300RF
Chemical Cleaning			
Min. Wall Thk.			

Tube

Material	SA-213 TP316L Tube (S) S31603
Tube outside diameter	(mm) 25.400
Average wall thickness	(mm) 1.651

No./Bundle	90
Length	(m) 3.300
Pitch	(mm) 63.500
Layout	Triangular

Fin

Type	Extruded
Material	Aluminum Alloy 1060 - O
Thickness	(mm) 0.480
Selection temp.	(C)
Outside diameter	(mm) 57.150
Fin density	(fin/inch) 10.0
ASME Code, Sec. VIII, Div. 1	
Customer Specifications	

Mechanical Equipment**Fan**

Manufacturer	
No./Bay	2
RPM	(Revs/min.)
Diameter	(ft) 4
No. of blades	
Angle	(degrees)
Pitch adjustment	
Blade material	
Hub material	
@design temp	
@min. ambient temp	
Tip speed	
Driver	
Type	
Manufacturer	
No./Bay	2
Driver	(kW) 5.5

RPM	1500
Service factor	
Enclosure	EExd, IIB T3 (IP 55)
Voltage	400
Phase	3
Cycle	50
Fan noise level	(dB) <85

Speed Reducer

Type	V- Belt
Manufacturer	
No./Bay	
Service factor	
Speed ratio	
Support	
Vib. switch	
Enclosure	

Controls - Air Side

Air recirculation	
Degree control of outlet process temp.	
(Max. Cooling), +/-	/
Action on control signal failure	
Fan pitch	
Louvers	
Actuator air supply	
Fan	

Louvers	
Positioner	
Signal air pressure (barG)	
From	To
From	To
Supply air pressure (barG)	
From	To
From	To

Shipping

Plot area (WxL)	(m) 1.759 x 3.300
Bundle weight	(kg) 2278.9
Bay	(kg)

Total	(kg) 17475
Shipping	(kg)

Note:

- 1- 10% over design on duty and flow has been considered.
- 2- Maximum allowable nozzle load = 3 x API.