

 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: ۰۵۳ - ۰۷۳ - ۹۱۸۴	<table><tr><th colspan="8">Thermal/Mechanical Calculation Books</th></tr><tr><th>پروژه</th><th>بسته کاری</th><th>صادر کننده</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>AA</td><td>120</td><td>PR</td><td>CN</td><td>0001</td><td>V01</td></tr></table>							Thermal/Mechanical Calculation Books								پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	AA	120	PR	CN	0001	V01	شماره صفحه : 1 از 8
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پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه																									
BK	GCS	AA	120	PR	CN	0001	V01																									

طرح نگهداشت و افزایش تولید ۲۷ مخزن

Thermal/Mechanical Calculation Books

نگهداشت و افزایش تولید میدان نفتی بینک

V01	Mar. 2024	IFA	AAC	M.FAKHARIAN	S.FRAMARZPOR	
V00	Nov. 2023	IFA	AAC	M.FAKHARIAN	S.FRAMARZPOR	
Rev.	Date	Purpose of Issue/Status	Prepared by:	Checked by:	Approved by:	CLIENT Approval

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: ۰۵۳ - ۰۷۳ - ۹۱۸۴	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	V01	

REVISION RECORD SHEET

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	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: ۰۵۳ - ۰۷۳ - ۹۱۸۴	Thermal/Mechanical Calculation Books								شماره صفحه : 3 از 8	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه		
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	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
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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.

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.

 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)								
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	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	AA	120	PR	CN	0001	V01	

2.0 THERMAL/MECHANICAL CALCULATION BOOKS

Rev.			API 661 Air-Cooled Heat Exchanger - Specification Sheet				Rev.
			Job No. _____		Item No. 2101 (summer)		
			Page Page 1		By _____		
			Date 3/4/2024		Revision 1		
			Proposal No. _____		Contract No. _____		
			Inquiry No. _____		Order No. _____		
	Manufacturer _____		Heat exchanged (kW)		391.34		1
	Model no. _____		Surface/Item-Finned tube (m2)		847.16		1
	Customer (PEDCO) / (NISOC)		Bare tube (m2)		40.217		1
	Plant location Binak oilfield		MTD, Eff. (Deg. C)		29.7		1
	Service _____		Transfer rate-Finned (W/m2-K)		15.758		1
	Type draft INDUCED		Bare tube, service (W/m2-K)		331.93		1
1	Bay size (WxL) (m) 3.500 x 5.250		Bare tube, clean (W/m2-K)		362.18		1
1	No. of bays/items 1						
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		/ 9530.4		
	Dew/bubble point (Deg. C) /		Water/Steam (kg/hr) /		/		
	Latent heat (kJ/kg) _____		Noncondensables (kg/hr) _____		/		
	Inlet pressure (barG) 18		Molecular Wt. (Vap/Non-cond) _____		/		
1	Pressure drop (All/Calc) (bar) 0.700 / 0.086		Density (Liq/Vap) (kg/m3) / 14.571		/ 18.177		
1	Velocity (Allow/Calc) (m/s) / 8.89		Specific heat (Liq/Vap) (kJ/kg-C) / 2.2316		/ 2.06		
	Inside fouling resistance (m2-K/W) 0.000200		Thermal cond. (Liq/Vap) (W/m-C) / 0.0422		/ 0.0331		
	Temperature (Deg. C) In 129 Out 60.00		Viscosity (Liq/Vap) (mN-s/m2) / 0.0149		/ 0.0126		
Performance Data - Air Side							
1	Air inlet temperature (Deg. C) 50.26		Face velocity (m/s)		3.45		1
1	Air flow rate/item (m3/s) 30.68		Minimum design ambient temp. (Deg. C)		5		
	Mass velocity (kg/s-m2) _____		Altitude (m)		12.5		
1	Air outlet temperature (Deg. C) 60.8		Static pressure (Pa)		146.16		1
1	Air flow rate/fan (m3/s) 34.591						
Design, Material, and Construction							
1	Design pressure (barG) 24.5		Heating Coil				
	Test pressure (barG) _____		No. of tubes _____				
	Design temperature (Deg. C) 155.00		Tube outside diameter (mm) _____				
	Min. design metal temp. (Deg. C) _____		Tube material _____				
	Tube bundle		Fin material and type _____				
1	Size (WxL) (m) 1.694 X 5.250		Fin thickness (mm) _____				
	No./Bay 1		ASME Code, Sec. VIII, Div. 1 _____				
	Number of tube rows 4		Heating fluid _____				
1	Bundles in parallel 1		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 2				

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شماره پیمان:	Thermal/Mechanical Calculation Books							شماره صفحه : 6 از 8	
۰۵۳ - ۰۷۳ - ۹۱۸۴	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	AA	120	PR	CN	0001		V01

Rev.			API 661 Air-Cooled Heat Exchanger - Specification Sheet				Rev.
			Job No.	Item No.	2101 (summer)		
			Page	Page 2	By		
			Date	3/4/2024	Revision	1	
			Proposal No.		Contract No.		
			Inquiry No.		Order No.		
Design, Material, and Construction (continued)							
	Header (continued)			No./Bundle			96
	Slope			1% on Last pass			
	Plug material			SA 182 F316L			Length (m) 5.25
	Gasket material			spiral wound + S.S 316 inner lin			Pitch (mm) 63.5
	Nozzle			Layout			Triangular
		No.	Size, (in)	Rating/Facing	Fin		
1	Inlet	2	6	300RF	Type		
					Extruded		
1	Outlet	2	6	300RF	Material		
					Aluminum Alloy 1060 - O		
	Vent	1	2	300RF	Thickness (mm)		
					0.480		
	Drain	1	2	300RF	Selection temp. (C)		
	Chemical Cleaning				Outside diameter (mm)		
					57.150		
	Min. Wall Thk.				Fin density (fin/inch)		
					10.0		
	Tube				ASME Code, Sec. VIII, Div. 1		
	Material		SA-213 TP316L Tube (S) S31603		Customer Specifications		
	Tube outside diameter (mm)		25.400				
	Average wall thickness (mm)		1.651				
Mechanical Equipment							
	Fan			RPM			1500
	Manufacturer			Service factor			
	No./Bay			Enclosure			EExd, IIB T3 (IP 55)
1	RPM	(Revs/min.)	447.5	Voltage			400
1	Diameter	(ft)	7	Phase			3
	No. of blades			Cycle			50
	Angle	(degrees)		Fan noise level			(dB) <85
	Pitch adjustment			Speed Reducer			
	Blade material			Type			V-Belt
	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		2				
1	Driver	(kW)	15				
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							
1	Plot area (WxL)	(m)	3.500 x 5.250	Total	(kg)	15691	1
1	Bundle weight	(kg)	1605.5	Shipping	(kg)		
	Bay	(kg)					
Note:							
	1- 10% over design on duty and flow has been considered.						
	2- Maximum allowable nozzle load = 3 x API.						
1	3- This Item, AE-2101 is share a common bay with item AE-2102.						

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	BK	GCS	AA	120	PR	CN	0001	V01	

Rev.	API 661 Air-Cooled Heat Exchanger - Specification Sheet										Rev.
			Job No. _____		Item No. 2102 (Summer)						
			Page Page 1		By _____						
			Date 3/4/2024		Revision 1						
			Proposal No. _____		Contract No. _____						
			Inquiry No. _____		Order No. _____						
	Manufacturer _____		Heat exchanged (kW) 575								
	Model no. _____		Surface/Item-Finned tube (m2) 809.33								1
	Customer (PEDCO) / (NISOC)		Bare tube (m2) 38.542								1
	Plant location Binak oilfield		MTD, Eff. (Deg. C) 31.6								1
	Service _____		Transfer rate-Finned (W/m2-K) 22.816								1
	Type draft INDUCED		Bare tube, service (W/m2-K) 479.1								1
1	Bay size (WxL) (m) 3.500 x 5.250		Bare tube, clean (W/m2-K) 545								1
1	No. of bays/items 1										
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 41.336 / 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) / 42.182 981.96 / 60.091								
1	Pressure drop (All/Calc) (bar) 0.700 / 0.258		Specific heat (Liq/Vap) (kJ/kg-C) / 2.4238 4.3096 / 2.4064								
1	Velocity (Allow/Calc) (m/s) / 6.04		Thermal cond. (Liq/Vap) (W/m-C) / 0.0473 0.6515 / 0.0371								
	Inside fouling resistance (m2-K/W) 0.000200		Viscosity (Liq/Vap) (mN-s/m2) / 0.0164 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) 3.45								
1	Air flow rate/item (m3/s) 29.53		Minimum design ambient temp. (Deg. C) 5.00								
	Mass velocity (kg/s-m2) /		Altitude (m) 12.500								
1	Air outlet temperature (Deg. C) 66.35		Static pressure (Pa) 149.9								
1	Air flow rate/fan (m3/s) 34.591										
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								
1	Size (WxL) (m) 1.630 X 5.250		Fin thickness (mm) /								
	No./Bay 1		ASME Code, Sec. VIII, Div. 1								
	Number of tube rows 4		Heating fluid								
1	Bundles in parallel 1		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								

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	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	AA	120	PR	CN	0001	V01	

Rev.	 API 661 Air-Cooled Heat Exchanger - Specification Sheet										Rev.
	Job No.				Item No.		2102 (Summer)				
	Page		Page 2		By						
	Date		3/4/2024		Revision		1				
	Proposal No.				Contract No.						
	Inquiry No.				Order No.						
Design, Material, and Construction (continued)											
	Header (continued)					No./Bundle					
	Slope 1% on last pass					Length (m) 5.25					1
	Plug material SA 182 F316L					Pitch (mm) 63.500					
	Gasket material spiral wound + S.S 316 inner ring					Layout Triangular					
	Nozzle	No.	Size, (in)	Rating/Facing	Fin						
1	Inlet	2	4	600RF	Type Extruded						
1	Outlet	2	4	600RF	Material Aluminum Alloy 1060 - O						
1	Vent	1	2	600RF	Thickness (mm) 0.480						
1	Drain	1	2	600RF	Selection temp. (C)						
	Chemical Cleaning				Outside diameter (mm) 57.150						
	Min. Wall Thk.				Fin density (fin/inch) 10.0						
	Tube					ASME Code, Sec. VIII, Div. 1					
	Material	SA-213 TP316L Tube (S) S31603				Customer Specifications					
	Tube outside diameter (mm)	25.400									
	Average wall thickness (mm)	1.651									
Mechanical Equipment											
	Fan					RPM					
	Manufacturer					1500					
	No./Bay					Service factor					
1	RPM (Revs/min.)	2				Enclosure EExd, IIB T3 (IP 55)					
1	Diameter (ft)	447.5				Voltage 400					
	No. of blades	7				Phase 3					
	Angle (degrees)					Cycle 50					
	Pitch adjustment					Fan noise level (dB) <85					
	Blade material					Speed Reducer					
	Hub material					Type V- Belt					
	@design temp					Manufacturer					
	@min. ambient temp					No./Bay					
	Tip speed					Service factor					
	Driver					Speed ratio					
	Type					Support					
	Manufacturer					Vib. switch					
1	No./Bay	2				Enclosure					
1	Driver (kW)	15									
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											
1	Plot area (WxL)	(m)	3.500 x 5.250			Total (kg)	9853.9				1
1	Bundle weight (kg)	2626.3			Shipping (kg)						
	Bay (kg)										
	Note: 1- 10% over design on duty and flow has been considered. 2- Maximum allowable nozzle load = 3 x API. 3- This Item, AE-2101 is share a common bay with Item AE-2102.										