PROJECT : PPPE PILOT PLANT	client:
TITLE : Data Sheet for 1st G.P.R. gas cooler(E- 411)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

Data Sheet for 1st G.P.R. gas cooler(E- 411)

	Document No.: 400-DAS-A4-EQ-0094	**Rev.: 00**
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PROJECT: PPPE PILOT PLANT	Client:
TITLE :Data Sheet for 1st G.P.R. gas cooler(E- 411)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

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0	28/12/2011	H.R	A.A	H.R	AFC

Document revision

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PROJECT: PPPE PILOT PLANT	client:
TITLE :Data Sheet for 1st G.P.R. gas cooler(E- 411)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

Heat Exchanger Specification Sheet

Basell Polyolefins;Project :Hostalen Pilot Plant

Company: NPC-RT;Location:Arak;Country :Iran

Service of Unit: I GPR COOLER

Item No.: E-411 P&ID.No.:

Date:17/8/2010 Rev No.: 00 Quantity: 2

Size	298.5/5200	mm	Type	BEM	ver	Connected in	1 parallel	1 series	
Surf/unit(eff.)	25.1	m2	Shells/Unit	1		Surf/shell (eff.)	25.1	m2	

PERFORMANCE OF ONE UNIT

Fluid allocation		Shell side		Tube Side	
Fluid name		cooling water		process gas	
Fluid quantity, Total	kg/h	30000		14000	
Vapor (In/Out)	kg/h			14000	14000
Liquid	kg/h	30000	30000		
Noncondensable	kg/h				
Temperature (In/Out)	C	59	62.02	80	65.69
Dew / Bubble point	C				
Density	kg/m3	986.1	984.47	27	28.74
Viscosity	cp	0.481	0.461	0.011	0.011
Molecular wt, Vap					
Molecular wt, NC					
Specific heat	kJ/(kg*k)	4.185	4.185	1.909	1.872
Thermal conductivity	W/(m*k)	0.642	0.645	0.027	0.026
Latent heat	kJ/kg	297.3	297.3		
Pressure	bar	3.5		19	
Velocity	m/s	0.45		6.52	
Pressure drop, allow./calc.	bar	0.689	0.14	0.689	0.034
Fouling resist. (min)	m2*K//W	0,0002		0.0005	

Heat exchanged 105187 W MTD corrected 11.42 C

Transfer rate, Service 367.5 Dirty 367.3 Clean 520 W/(m^2*k)

CONSTRUCTION OF ONE SHELL

		Shell Side	Tube Side
Design/Test pressure	bar	29.42 / 44.13	29.42 / 44.13
Design temperature	C	180	180
Number passes per shell		1	1
Corrosion allowance	mm	0	0
Connections	In	101.6 / 300 ANSI	152.4 / 300 ANSI
Size/rating	Out	101.6 / 300 ANSI	152.4 / 300 ANSI
mm/	Intermediate	/ 300 ANSI	/ 300 ANSI

Sketch

Tube No. 61 OD 25.4 Tks-avg 2.11 mm Length 5200 mm Pitch 32 mm

Tube type Plain Material SA-312 TP304 Tube pattern 30

Shell	SS 304	Pipe 12" , Sch80S	Shell cover
Channel or bonnet		SS304	Channel cover
Tubesheet-stationary		SS304	Tubesheet-floating
Floating head cover			Impingement protection: Circular Plate on bundel

Baffle-crossing SA240-304L Type single seg Cut(%d) 31 vert Spacing:c/c 200 mm

Baffle-long Seal type Inlet 274.6 mm

Supports-tube U-bend Type

Bypass seal Tube-tubesheet joint exp./seal wld

Expansion joint Type

RhoV2-Inlet nozzle 1072 Bundle entrance 335 Bundle exit 335 kg/(m*s2)

Gaskets - Shell side Comp. fiber Tube side Comp. fiber (m=2.75 y=3700 psi)

Floating head

Code requirements ASME Code Sec VIII Div 1 TEMA class R

Fabricated Weight [kg]:1183.3 Empty weight [kg]: 1183.3 Shop test weight [kg]: 1581 Bundle weight [kg]: 434.26

LOADS AT BASE (*) : [[WIND: Load[kgf]: 45 , Moment[kg.m]: 25 , SEISMIC: Load[kgf]: 45 , Moment[kg.m]: 25]]

Remarks (*) : These item should be verified by vendor.

Simulation with velocity in bed reactor: 0.5 m/s

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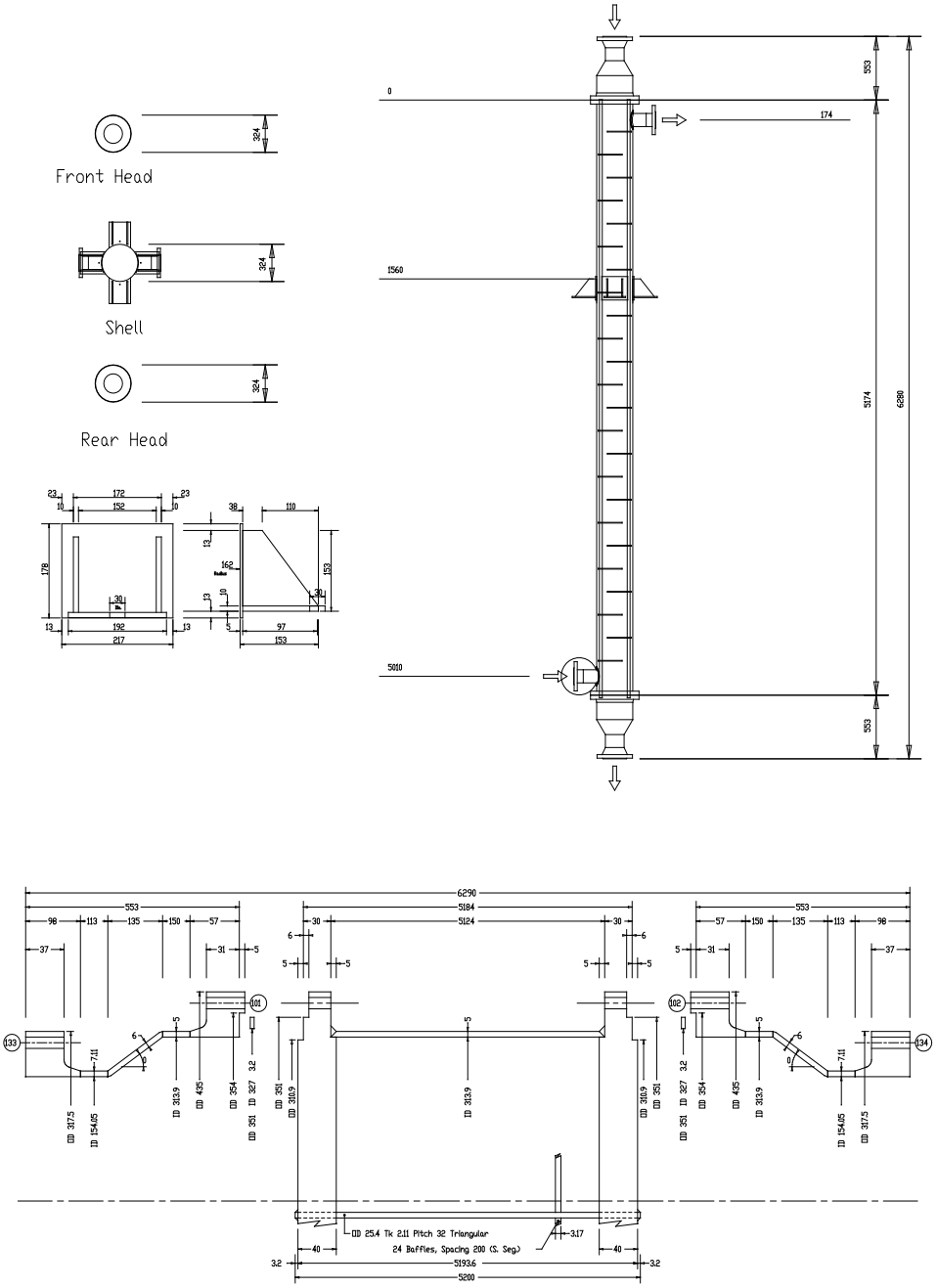
PROJECT: PPPE PILOT PLANT	client:
TITLE : Data Sheet for 1st G.P.R. gas cooler(E- 411)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی



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Row	Holes
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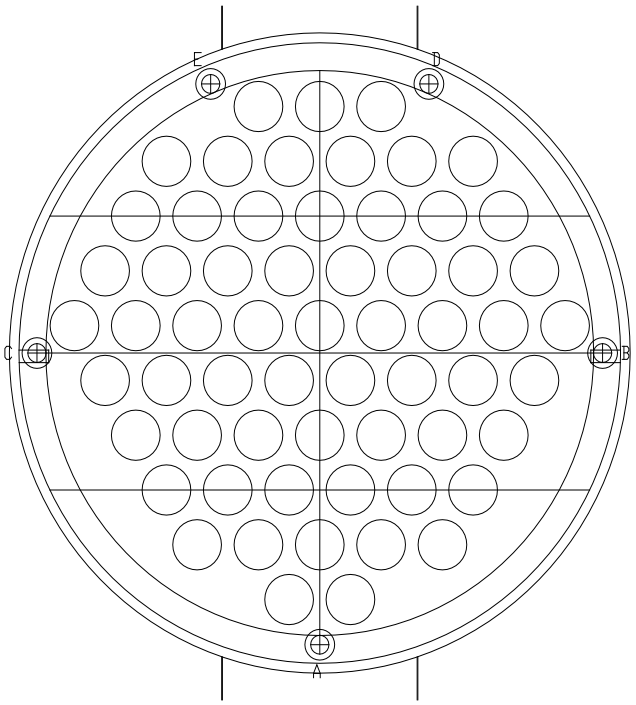
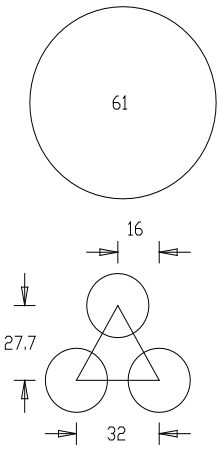


Shell ID	313.9 mm
O.T.L.	285.8 mm
Baffle cut to C/L	69.3 mm



PROJECT: PPPE PILOT PLANT	client: شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی
TITLE : Data Sheet for 1st G.P.R. gas cooler(E- 411)	

1- UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN MM.

2- UNLESS OTHERWISE NOTED , OUTSIDE PROJECTION OF NOZZLES ARE MEASURED FROM C.L./T.L. OF EXCHANGER TO THE EXTREME FACE OR BUTT WELDED EDGE OF NOZZLE.

3-THE MECHANICAL DATA SPECIFIED ON DRAWINGS ARE MINUMUM PURCHASER'S REQUIREMENTS ADQEUACY AND COMPLIANCE OF DESIGN WITH APPLICABLE CODE AND PROJECT SPECIFICATIONS IS MANUFACTURER'S RESPONSIBILITY.

4- LIFTING LUGS SHALL BE DESIGNED AND EXACT LOCATION DETERMINED BY THE MANUFACTURER.

5- THE INDICATED WEIGHTS TO BE CONFIRMED /CHECKED BY MANUFACTURER.

6- ALL FLANGE BOLT HOLES TO STRADDLE CENTER LINES EXCEPT AS SHOOWN OTHERWISE.

7- OUTSIDE EDGE OF ALL FLANGES / FORGINGS TO BE BEVELLED WITH 45 DEGREE ANGLE IN 5 MM DISTANCE.

8- NOZZLE /GIRTH FLANGE FACE FINISHING SHALL BE SMOOTH WITH 125 -250 MICROINCH AVERAGE ROUGHNESS.

9- DRILING AND TOLERANCES OF TUBESHEET SHALL BE PER TEMA STANDARD FIT.

10 - BOTH ENDS OF TIE RODS SHALL BE UNC THREADED ON 50 MM.

11- THREADED HOLES IN TUBESHEET MUST NOT BE COMPLETELY DRILLED.

13- DIAMETER OF HOLES FOR TIE RODS IN BAFFLE = TIE ROD DIA. + 0.5 MM.

14- ALL TAILED DIMENSIONS ARE MEASURED FROM BASE LINE.

15- EDGE OF HOLES IN BAFFLES SHALL BE ROUNDED (R=2MM)OR BEVELED.

16- HANDLING LUGS FOR EXCHANGER COMPONENTS SHALL BE DESIGNED AND EXACT LOCATED BY MANUFACTURER.

17- DIMENSIONS REFER TO BAFFLES OR TUBE SUPPORTS ARE MEASURED FROM CENTER OF EACH ONE.

18- MANUFACURER SHALL PERFORM THE REQUIRED CHECKING /DESIGN OF SHELL EXPANSION JOINT.

WHERE EXPANSION JOINT IS REQUIRED , BLINDED LWN FLANGES FOR VENT AND DRAIN ON EXPANSION JOINT SHALL BE CONSIDERER.

19 - IMPACT TEST REQUIREMENTS FOR ALL PARTS MATERIAL SHALL BE CHECKED BY MANUFATURER RESULTS SHALL BE CONCLUDED IN CALCULATIONS AND THEN REFLECTED IN FABRICATION DRAWINGS.

20-ALL NOZZLES SHALL BE RADIUSED WITH THE CONTOUR OF THE SHELL , CHANNEL AND HEADS INNER WALLS AS FOLLOWS:ITEM R = 6 MM , ALL THE OTHER ONES R=2MM . INTERNAL

21-ALL SHELL INTERNAL WELDS SHALL BE SMOOTH GRINDED.

22-SHELL / NOZZLE THICKNESS AT CONNECTION/ ATTACHMENT AREA SHALL BE VERIFIED BY LOCAL STRESS CALCULATION.

23-BASE LINE (B.L.)INDICATES THE GASKET FACE OF TUBESHEET .

PROJECT : PPPE PILOT PLANT	client:
TITLE : Data Sheet for 2nd G.P.R. gas cooler(E -421)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

Data Sheet for 2nd G.P.R. gas cooler(E -421)

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PROJECT: PPPE PILOT PLANT	Client:
TITLE :Data Sheet for 2nd G.P.R. gas cooler(E -421)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

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0	16/12/2011	H.R	A.A	H.R	AFC

Document revision

	Document No.: 400-DAS-A4-EQ-0096	Rev.: 00
	Owner Job No.:	Type: DAS
		Page B

PROJECT: PPPE PILOT PLANT	client:
TITLE :Data Sheet for 2nd G.P.R. gas cooler(E- 421)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

Heat Exchanger Specification Sheet

Basell Polyolefins;Project :Hostalen Pilot Plant

Company: NPC-RT;Location:Arak;Country :Iran

Service of Unit: II GPR COOLER

Item No.: E-421 P&ID.No.:

Date:23/8/2010 Rev No.: 00

Size	400-4800	mm	Type	BEM	ver	Connected in	1 parallel	1 series	
Surf/unit(eff.)	45.8	m2	Shells/Unit	1		Surf/shell (eff.)	45.8	m2	

PERFORMANCE OF ONE UNIT

Fluid allocation		Shell side		Tube Side	
Fluid name		Cooling water		Process gas	
Fluid quantity, Total	kg/h	50000		30000	
Vapor (In/Out)	kg/h			30000	30000
Liquid	kg/h	50000	50000		
Noncondensable	kg/h				
Temperature (In/Out)	C	62.5	65.15	75	66.82
Dew / Bubble point	C				
Density	kg/m3	984.2	982.7	26.57	27.43
Viscosity	cp	0.457	0.44	0.011	0.01
Molecular wt, Vap					
Molecular wt, NC					
Specific heat	kJ/(kg*k)	4.185	4.185	2.279	2.256
Thermal conductivity	W/(m*k)	0.646	0.649	0.052	0.051
Latent heat	kJ/kg				
Pressure	bar	3.5		25	
Velocity	m/s	0.49		7.25	
Pressure drop, allow./calc.	bar	0.689	0.14	0.689	0.041
Fouling resist. (min)	m2*K//W	0,0002		0.0005	

Heat exchanged 154346 W MTD corrected 6.71 C

Transfer rate, Service 431.9 Dirty 431.8 Clean 721.4 W/(m^2*k)

CONSTRUCTION OF ONE SHELL

		Shell Side	Tube Side
Design/Test pressure	bar	30/ /45	30/ /45
Design temperature	C	180	180
Number passes per shell		1	1
Corrosion allowance	mm	0	0
Connections	In	152.4 / 300 ANSI	203.2 / 300 ANSI
Size/rating	Out	152.4 / 300 ANSI	203.2 / 300 ANSI
mm/	Intermediate	/ 300 ANSI	/ 300 ANSI

Sketch

Tube No. 121 OD 25.4 Tks-avg 2.11 mm Length 4800 mm Pitch 32 mm

Tube type Plain Material SS304 Tube pattern 30

Shell	SS304	Pipe 18" , Sch80S	Shell cover
Channel or bonnet		SS304	Channel cover
Tubesheet-stationary		SS304	Tubesheet-floating
Floating head cover			Impingement protection: Circular Plate on bundel

Baffle-crossing SS304 Type single seg Cut(%d) 29 vert Spacing:c/c 230 mm

Baffle-long Seal type Inlet 416.43 mm

Supports-tube U-bend Type

Bypass seal Tube-tubesheet joint exp./seal wld

Expansion joint Type

RhoV2-Inlet nozzle 590 Bundle entrance 330 Bundle exit 330 kg/(m*s2)

Gaskets - Shell side Comp. fiber Tube side Comp. fiber (m=2.75 y=3700 psi)

Floating head

Code requirements ASME Code Sec VIII Div 1 TEMA class R

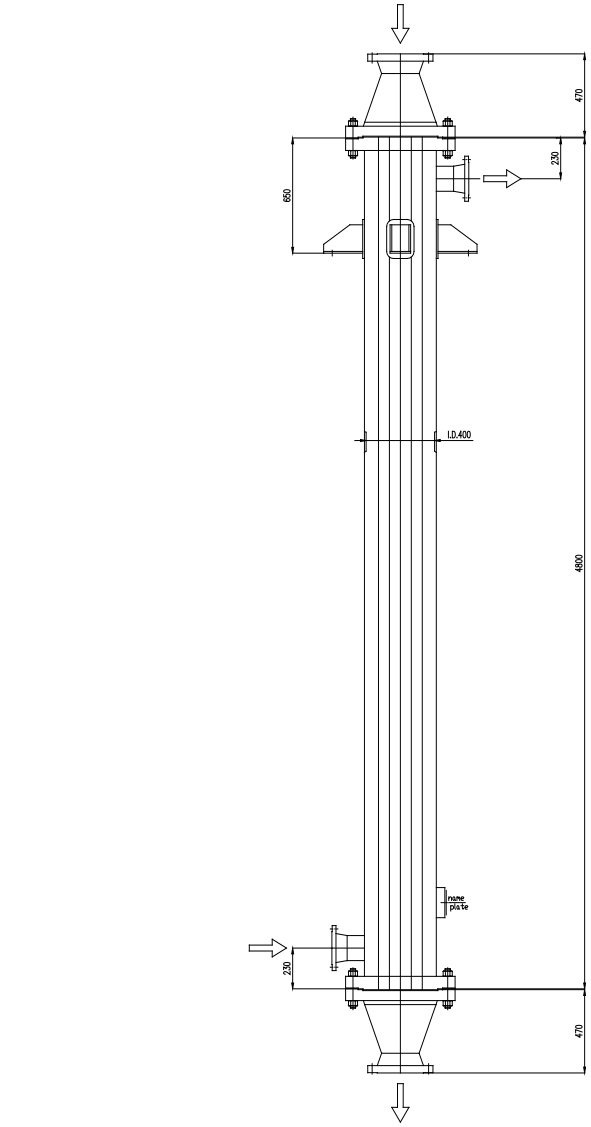
Fabricated Weight [kg]:2105 Empty weight [kg]: 2105 Shop test weight [kg]: 2929 Bundle weight [kg]: 896

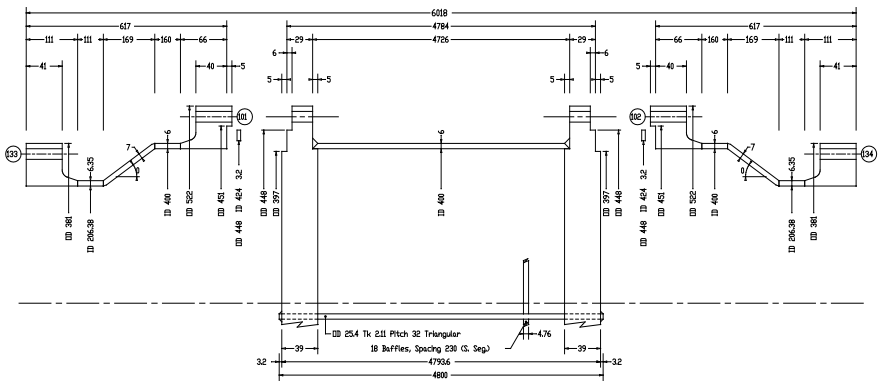
LOADS AT BASE (*) : [[WIND: Load[kgf]: 45 , Moment[kg.m]: 25 , SEISMIC: Load[kgf]: 45 , Moment[kg.m]: 25]]

Remarks (*) : These item should be verified by vendor.

Simulation with velocity in bed reactor: 0.5 m/s

PROJECT: PPPE PILOT PLANT	client:
TITLE : Data Sheet for 2nd G.P.R. gas cooler(E -421)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی





side view

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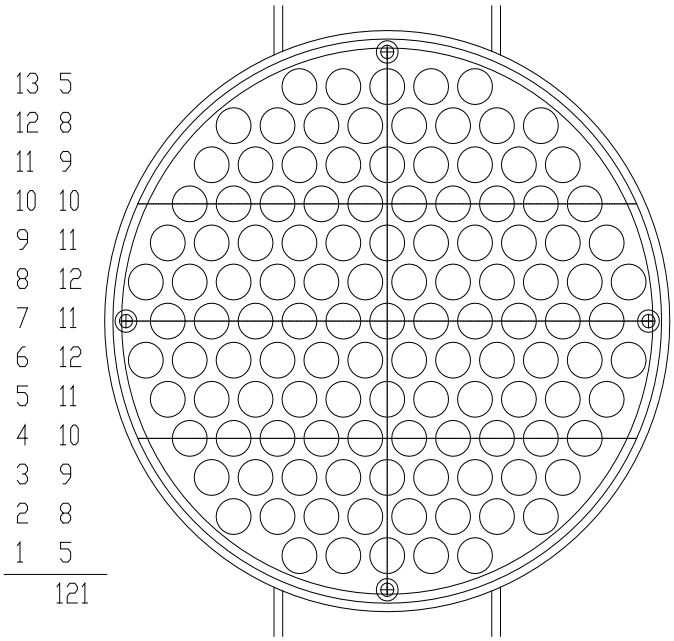

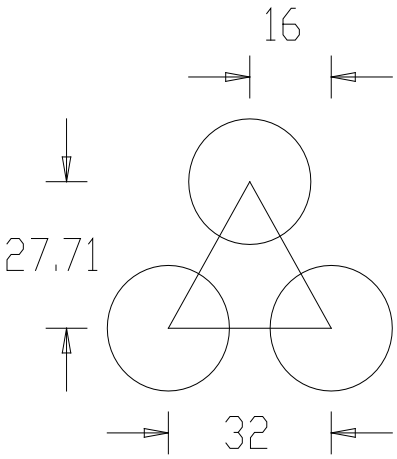

Shell ID	400 mm
O.T.L.	387.3 mm
Baffle cut to C/L	83.1 mm

PROJECT: PPPE PILOT PLANT	client: شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی
TITLE : Data Sheet for 2nd G.P.R. gas cooler(E -421)	

GENERAL NOTES

1- UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN MM.

2- UNLESS OTHERWISE NOTED , OUTSIDE PROJECTION OF NOZZLES ARE MEASURED FROM C.L./T.L. OF EXCHANGER TO THE EXTREME FACE OR BUTT WELDED EDGE OF NOZZLE.

3-THE MECHANICAL DATA SPECIFIED ON DRAWINGS ARE MINUMUM PURCHASER'S REQUIREMENTS ADQEUACY AND COMPLIANCE OF DESIGN WITH APPLICABLE CODE AND PROJECT SPECIFICATIONS IS MANUFACTURER'S RESPONSIBILITY.

4- LIFTING LUGS SHALL BE DESIGNED AND EXACT LOCATION DETERMINED BY THE MANUFACTURER.

5- THE INDICATED WEIGHTS TO BE CONFIRMED /CHECKED BY MANUFACTURER.

6- ALL FLANGE BOLT HOLES TO STRADDLE CENTER LINES EXCEPT AS SHOOWN OTHERWISE.

7- OUTSIDE EDGE OF ALL FLANGES / FORGINGS TO BE BEVELLED WITH 45 DEGREE ANGLE IN 5 MM DISTANCE.

8- NOZZLE /GIRTH FLANGE FACE FINISHING SHALL BE SMOOTH WITH 125 -250 MICROINCH AVERAGE ROUGHNESS.

9- DRILING AND TOLERANCES OF TUBESHEET SHALL BE PER TEMA STANDARD FIT.

10 - BOTH ENDS OF TIE RODS SHALL BE UNC THREADED ON 50 MM.

11- THREADED HOLES IN TUBESHEET MUST NOT BE COMPLETELY DRILLED.

13- DIAMETER OF HOLES FOR TIE RODS IN BAFFLE = TIE ROD DIA. + 0.5 MM.

14- ALL TAILED DIMENSIONS ARE MEASURED FROM BASE LINE.

15- EDGE OF HOLES IN BAFFLES SHALL BE ROUNDED (R=2MM)OR BEVELED.

16- HANDLING LUGS FOR EXCHANGER COMPONENTS SHALL BE DESIGNED AND EXACT LOCATED BY MANUFACTURER.

17- DIMENSIONS REFER TO BAFFLES OR TUBE SUPPORTS ARE MEASURED FROM CENTER OF EACH ONE.

18- MANUFACURER SHALL PERFORM THE REQUIRED CHECKING /DESIGN OF SHELL EXPANSION JOINT.
WHERE EXPANSION JOINT IS REQUIRED , BLINDED LWN FLANGES FOR VENT AND DRAIN ON EXPANSION JOINT SHALL BE CONSIDERER.

19 - IMPACT TEST REQUIREMENTS FOR ALL PARTS MATERIAL SHALL BE CHECKED BY MANUFATURER RESULTS SHALL BE CONCLUDED IN CALCULATIONS AND THEN REFLECTED IN FABRICATION DRAWINGS.

20-ALL NOZZLES SHALL BE RADIUSED WITH THE CONTOUR OF THE SHELL , CHANNEL AND HEADS INNER WALLS AS FOLLOWS:ITEM R = 6 MM , ALL THE OTHER ONES R=2MM . INTERNAL

21-ALL SHELL INTERNAL WELDS SHALL BE SMOOTH GRINDED.

22-SHELL / NOZZLE THICKNESS AT CONNECTION/ ATTACHMENT AREA SHALL BE VERIFIED BY LOCAL STRESS CALCULATION.

23-BASE LINE (B.L.)INDICATES THE GASKET FACE OF TUBESHEET .

PROJECT : PP-PE PILOT PLANT	client:
TITLE : Data Sheet for Propane recovery condenser (E-351)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

Data Sheet for Propane recovery condenser (E -351)

licensor:	**Document No.: 300-DAS-A4-EQ-0172**	**Rev.: 01**
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PROJECT: PP-PE PILOT PLANT	Client:
TITLE : Data Sheet for Propane recovery condenser (E-351)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

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PROJECT: PP-PE PILOT PLANT

client:

شرکت ملی صنایع پتروشیمی
شرکت پژوهش و فناوری پتروشیمی

TITLE : Data Sheet for Propane recovery condenser (E-351)

Heat Exchanger Specification Sheet

PP-PE Pilot Plant

Company: NPC-RT, Location:Arak; Country: Iran

Service of Unit: Propane tower condenser

Item No.: E-351 P&ID.No.:JS-300-PID-A1-FS-0404

Date: Rev No.: 01

Size	307/1850	mm	Type	BEM	Hor	Connected in	1 parallel	1 series	
Surf/unit(eff.)	11.8	m2	Shells/Unit	1		Surf/shell (eff.)	11.8	m2	

PERFORMANCE OF ONE UNIT

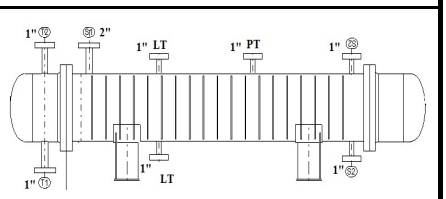
Fluid allocation		Shell side		Tube Side	
Fluid name		Hydrocarbons Vapor (E & P)		Cooling Water	
Fluid quantity, Total	kg/h	700		4200	
Vapor (In/Out)	kg/h	700	100		
Liquid	kg/h		526	4200	4200
Noncondensable	kg/h	75			
Temperature (In/Out)	C	53	40	27	37
Dew / Bubble point	C	52	28		
Density	kg/m3	42	457	1000	1000
Viscosity	cp	0.01	0.09	0.9	0.7
Molecular wt, Vap					
Molecular wt, NC					
Specific heat	kcal/(kg*C)	0.5	0.8	1	1
Thermal conductivity	kcal/(h m C)	0.02	0.08	0.5	0.5
Latent heat	kJ/kg	285	304		
Pressure	bar	20.5	20.4	4	3.8
Velocity	m/s	20		3	
Pressure drop, allow./calc.	bar	0.1	0.1	0.2	0.2
Fouling resist. (min)	m2*K//W				

Heat exchanged	49	kW		MTD corrected	14.2	C
Transfer rate, Service	292	Dirty	304	Clean	304	W/(m2*k)

CONSTRUCTION OF ONE SHELL

		Shell Side	Tube Side
Design/Test pressure	bar	31 / Code	31 / Code
Design temperature	C	-60~230	-60~230
Number passes per shell		1	2
Corrosion allowance	mm	0	0
Connections	In in	2" / 300#	1" / 300#
Size/rating	Out	1" / 300#	1" / 300#
	Intermediate	1" / 300#	/ 300#

Sketch



Tube No.	111	OD	19.05	Tks-avg	2.1	mm	Length	1850 mm	Pitch	23.81	mm
Tube type	Plain	Material	S.S304L						Tube pattern	30	
Shell & Channel	S.S304L	Tks	10 mm				Shell cover				
Channel or bonnet		SA-312 TP304					Channel cover				
Tubesheet-stationary		SA-312 TP304					Tubesheet-floating				
Floating head cover							Impingement protection		Circular Plate on bundel		
Baffle-crossing	SA240-304L	Type	single seg	Cut(%d)	23	vert			Spacing:c/c	85	mm
Baffle-long		Seal type							Inlet	121	mm
Supports-tube		U-bend					Type				
Bypass seal				Tube-tubesheet joint		exp./seal wld					
Expansion joint				Type							
RhoV2-Inlet nozzle		Bundle entrance					Bundle exit				kg/(m*s2)
Gaskets - Shell side		Tube side									
Floating head											
Code requirements		ASME Code Sec VIII Div 1					TEMA class	B			

Fabricated Weight [kg]: 515 Empty weight [kg]: Shop test weight [kg]: Bundle weight [kg]:

LOADS AT BASE (*) : [[WIND: 120 km/hr Load[kgf]: , Moment[kg.m]: , SEISMIC: Load[kgf]: , Moment[kg.m]:]]

Remarks (*) : These item should be verified by vendor.

LICENSOR:

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Owner Job No.:	**Type: DAS**
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PROJECT: PP-PE PILOT PLANT	client:
TITLE : Data Sheet for Propane recovery condenser (E-351)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

GENERAL NOTES

1- UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN MM.

2- UNLESS OTHERWISE NOTED , OUTSIDE PROJECTION OF NOZZLES ARE MEASURED FROM C.L./T.L. OF EXCHANGER TO THE EXTREME FACE OR BUTT WELDED EDGE OF NOZZLE.

3-THE MECHANICAL DATA SPECIFIED ON DRAWINGS ARE MINUMUM PURCHASER'S REQUIREMENTS ADQEUACY AND COMPLIANCE OF DESIGN WITH APPLICABLE CODE AND PROJECT SPECIFICATIONS IS MANUFACTURER'S RESPONSIBILITY.

4- LIFTING LUGS SHALL BE DESIGNED AND EXACT LOCATION DETERMINED BY THE MANUFACTURER.

5- THE INDICATED WEIGHTS TO BE CONFIRMED /CHECKED BY MANUFACTURER.

6- ALL FLANGE BOLT HOLES TO STRADDLE CENTER LINES EXCEPT AS SHOOWN OTHERWISE.

7- NOZZLE /GIRTH FLANGE FACE FINISHING SHALL BE SMOOTH WITH 125 -250 MICROINCH AVERAGE ROUGHNESS.

8- DRILING AND TOLERANCES OF TUBESHEET SHALL BE PER TEMA STANDARD FIT.

9- THREADED HOLES IN TUBESHEET MUST NOT BE COMPLETELY DRILLED.

10- ALL TAILED DIMENSIONS ARE MEASURED FROM BASE LINE.

11- HANDLING LUGS FOR EXCHANGER COMPONENTS SHALL BE DESIGNED AND EXACT LOCATED BY MANUFACTURER.

12- DIMENSIONS REFER TO BAFFLES OR TUBE SUPPORTS ARE MEASURED FROM CENTER OF EACH ONE.

13- MANUFACURER SHALL PERFORM THE REQUIRED CHECKING /DESIGN OF SHELL EXPANSION JOINT.

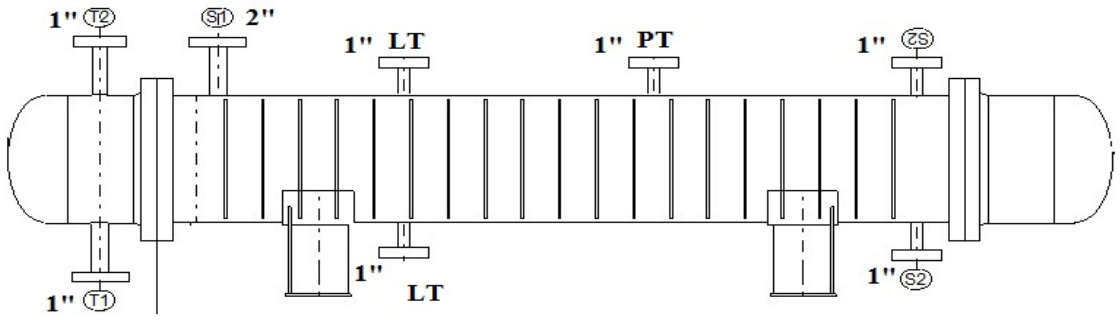
WHERE EXPANSION JOINT IS REQUIRED , BLINDED LWN FLANGES FOR VENT AND DRAIN ON EXPANSION JOINT SHALL BE CONSIDERER.

14 - IMPACT TEST REQUIREMENTS FOR ALL PARTS MATERIAL SHALL BE CHECKED BY MANUFATURER RESULTS SHALL BE CONCLUDED IN CALCULATIONS AND THEN REFLECTED IN FABRICATION DRAWINGS.

15-ALL SHELL INTERNAL WELDS SHALL BE SMOOTH GRINDED.

16-SHELL / NOZZLE THICKNESS AT CONNECTION/ ATTACHMENT AREA SHALL BE VERIFIED BY LOCAL STRESS CALCULATION.

17-BASE LINE (B.L.)INDICATES THE GASKET FACE OF TUBESHEET .



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PROJECT : PP-PE PILOT PLANT	client: شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی
TITLE : Data Sheet for Reboiler Tower 351 (E-352)	

Data Sheet for Reboiler Tower 351 (E-352)

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PROJECT: PP-PE PILOT PLANT	Client: شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی
TITLE : Data Sheet for Reboiler Tower 351 (E-352)	

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PROJECT: PP-PE PILOT PLANT

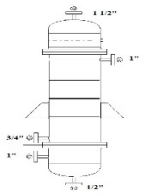
client:

شرکت ملی صنایع پتروشیمی
شرکت پژوهش و فناوری پتروشیمی

TITLE : Data Sheet for Reboiler Tower 351 (E-352)

Size	330 / 1000 mm		Type	BEM	Ver		Connected in	1	parallel	1	series			
Surf/unit(eff.)	9.1	m2	Shells/unit	1			Surf/shell (eff.)		9.1		m2			
PERFORMANCE OF ONE UNIT														
Fluid allocation				**Shell Side**				**Tube Side**						
Fluid name				LPS				Propane/1-Butene						
Fluid quantity, Total		kg/h		39				500						
Vapor (In/Out)		kg/h		39		0		0		500				
Liquid		kg/h		0		39		500		0				
Noncondensable		kg/h		0				0						
Temperature (In/Out)		C		120		120		100		110				
Dew / Bubble point		C		120		120		103		97				
Density (Vap / Liq)		kg/m3		1.1 /		/ 959		50 / 456		50 /				
Viscosity		cp		0.013 /		/ 0.284		0.011 / 0.091		0.011 /				
Molecular wt, Vap				18.02				53.21		53.21				
Molecular wt, NC														
Specific heat		kcal/(kg*C)		0.4826 /		/ 1.002		0.5081 / 0.5892		0.5081 /				
Thermal conductivity		kcal/(h*m*C)		0.023 /		/ 0.583		0.023 / 0.1		0.023 /				
Latent heat		kcal/kg		538.1		538.1		59.76		58.77				
Pressure		bar		2		1.99		20.9		20.8				
Velocity		m/s		15				3						
Pressure drop, allow./calc.		kgf/cm2		0.264		0.006		0.51		0.011				
Fouling resist. (min)		m2*h*C/kcal		0.0001				0.0002	0.00024	Ao based				
Heat exchanged	36	kW					MTD corrected		18	C				
Transfer rate, Service	130		Dirty	133			Clean	133		kcal/(h*m2*C)				
CONSTRUCTION OF ONE SHELL														
			Shell Side				**Tube Side**							
Design/Vac/Test pressure		bar	31 / /				31 / /							
Design temperature		C	-60~230				-60~230							
Number passes per shell			1				1							
Corrosion allowance		mm	0				0							
Connections	In	in	1	/	300#		1	/	300#					
Size/rating	Out		3/4	/	300#		1 1/2	/	300#					
Nominal	Intermediate			/	-			/	-					
Tube No.	161	OD	19.05	Tks- Avg	2.1	mm	Length	1000	mm	Pitch	23.81	mm		
Tube type	Plain		Material		S.S304L		Tube pattern	30						
Shell&Channel	S.S304L	ID	330	Tks	10	mm	Shell cover	-						
Channel or bonnet		SA-312 TP304					Channel cover	-						
Tubesheet-stationary		SA-312 TP304					Tubesheet-floating	-						
Floating head cover		-					Impingement protection		None					
Baffle-crossing	S.S304L	Type	Single segmer		Cut(%d)	33 V	Spacing: c/c		15	cm				
Baffle-long	-		Seal type				Inlet		15	cm				
Supports-tube			U-bend				Type							
Bypass seal			Tube-tubesheet joint				Exp.							
Expansion joint	-		Type											
RhoV2-Inlet nozzle			Bundle entrance		0		Bundle exit		0	kg/(m*s2)				
Gaskets - Shell side			Tube Side											
Floating head	-													
Code requirements	ASME Code Sec VIII Div 1						TEMA class		B - chemical service					
Weight/Shell	350		Filled with water		450		Bundle	170	kg					
Remarks	Wind velocity: 120 km/hr													

Sketch



نازل خروجی مسیر تیوب (یک و نیم اینچ) در قسمت بالایی کپ بالا نصب و برای کپ پایین یک نازل نیم اینچ جهت تخلیه سیال تعبیه گردد.
برای مسیر شل؛ نازل یک اینچ در قسمت بالای شل نصب گردد.

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PROJECT:PP-PE PILOT PLANT	client:
TITLE : Data Sheet for Reboiler Tower 351 (E-352)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

GENERAL NOTES

1- UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN MM.

2- UNLESS OTHERWISE NOTED , OUTSIDE PROJECTION OF NOZZLES ARE MEASURED FROM C.L./T.L. OF EXCHANGER TO THE EXTREME FACE OR BUTT WELDED EDGE OF NOZZLE.

3-THE MECHANICAL DATA SPECIFIED ON DRAWINGS ARE MINUMUM PURCHASER'S REQUIREMENTS ADQEUACY AND COMPLIANCE OF DESIGN WITH APPLICABLE CODE AND PROJECT SPECIFICATIONS IS MANUFACTURER'S RESPONSIBILITY.

4- LIFTING LUGS SHALL BE DESIGNED AND EXACT LOCATION DETERMINED BY THE MANUFACTURER.

5- THE INDICATED WEIGHTS TO BE CONFIRMED /CHECKED BY MANUFACTURER.

6- ALL FLANGE BOLT HOLES TO STRADDLE CENTER LINES EXCEPT AS SHOOWN OTHERWISE.

7- OUTSIDE EDGE OF ALL FLANGES / FORGINGS TO BE BEVELLED WITH 45 DEGREE ANGLE IN 5 MM DISTANCE.

8- NOZZLE /GIRTH FLANGE FACE FINISHING SHALL BE SMOOTH WITH 125 -250 MICROINCH AVERAGE ROUGHNESS.

9- DRILING AND TOLERANCES OF TUBESHEET SHALL BE PER TEMA STANDARD FIT.

10 - BOTH ENDS OF TIE RODS SHALL BE UNC THREADED ON 50 MM.

11- THREADED HOLES IN TUBESHEET MUST NOT BE COMPLETELY DRILLED.

13- DIAMETER OF HOLES FOR TIE RODS IN BAFFLE = TIE ROD DIA. + 0.5 MM.

14- ALL TAILED DIMENSIONS ARE MEASURED FROM BASE LINE.

15- EDGE OF HOLES IN BAFFLES SHALL BE ROUNDED (R=2MM)OR BEVELED.

16- HANDLING LUGS FOR EXCHANGER COMPONENTS SHALL BE DESIGNED AND EXACT LOCATED BY MANUFACTURER.

17- DIMENSIONS REFER TO BAFFLES OR TUBE SUPPORTS ARE MEASURED FROM CENTER OF EACH ONE.

18- MANUFACURER SHALL PERFORM THE REQUIRED CHECKING /DESIGN OF SHELL EXPANSION JOINT.

WHERE EXPANSION JOINT IS REQUIRED , BLINDED LWN FLANGES FOR VENT AND DRAIN ON EXPANSION JOINT SHALL BE CONSIDERER.

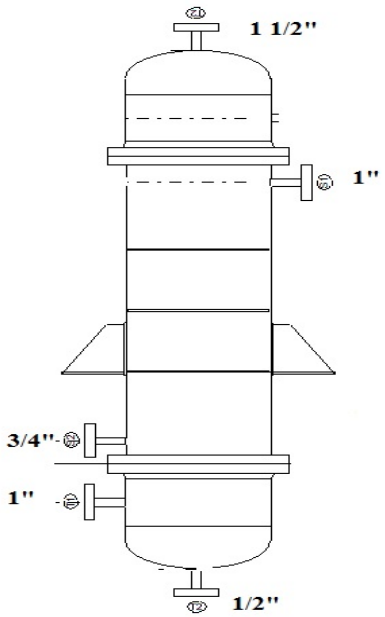
19 - IMPACT TEST REQUIREMENTS FOR ALL PARTS MATERIAL SHALL BE CHECKED BY MANUFATURER RESULTS SHALL BE CONCLUDED IN CALCULATIONS AND THEN REFLECTED IN FABRICATION DRAWINGS.

20-ALL NOZZLES SHALL BE RADIUSED WITH THE CONTOUR OF THE SHELL , CHANNEL AND HEADS INNER WALLS AS FOLLOWS:ITEM R = 6 MM , ALL THE OTHER ONES R=2MM . INTERNAL

21-ALL SHELL INTERNAL WELDS SHALL BE SMOOTH GRINDED.

22-SHELL / NOZZLE THICKNESS AT CONNECTION/ ATTACHMENT AREA SHALL BE VERIFIED BY LOCAL STRESS CALCULATION.

23-BASE LINE (B.L.)INDICATES THE GASKET FACE OF TUBESHEET .



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PROJECT : PP PILOT PLANT	client:
TITLE : Data Sheet for Propane recovery condenser (E -361)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

Data Sheet for Propane recovery condenser (E -361)

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PROJECT: PP PILOT PLANT	Client:
TITLE : Data Sheet for Propane recovery condenser (E -361)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

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Revision	Date	Prepared By	Checked By	Approved By	Status

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PROJECT: PP PILOT PLANT

client:

شرکت ملی صنایع پتروشیمی
شرکت پژوهش و فناوری پتروشیمی

TITLE : Data Sheet for Propane recovery condenser (E -361)

Heat Exchanger Specification Sheet

NPC-RT;Project :PP-PE Pilot Plant

Company: NPC-RT;Location:Arak;Country :Iran

Service of Unit: Propane tower condenser

Item No.: E-361 P&ID.No.:

Date:27/11/2021 Rev No.: 1

Size	386/2600	mm	Type	BEM	hor	Connected in	1 parallel	1 series	
Surf/unit(eff.)	23.6	m2	Shells/Unit	1		Surf/shell (eff.)	23.6	m2	

PERFORMANCE OF ONE UNIT

Fluid allocation		Shell side		Tube Side	
Fluid name		Hydrocarbons Vapor		Cooling Tower Water	
Fluid quantity, Total	kg/h	1500		23000	
Vapor (In/Out)	kg/h	1500			
Liquid	kg/h		1500	23000	23000
Noncondensable	kg/h				
Temperature (In/Out)	C	48	40	30	34.97
Dew / Bubble point	C	47	46.23		
Density	kg/m3	29.93	484.69	997.25	996
Viscosity	cp	0.01	0.09	0.8	0.72
Molecular wt, Vap					
Molecular wt, NC					
Specific heat	kJ/(kg*k)	1.813	3.077	4,191	4,188
Thermal conductivity	W/(m*k)	0.024	0.094	0.608	0.613
Latent heat	kJ/kg	297.3	297.3		
Pressure	bar	19		4.5	
Velocity	m/s	1.71		1.42	
Pressure drop, allow./calc.	bar	0.138	0.019	0,68948	0.089
Fouling resist. (min)	m2*K//W	0,0002		0.0003	

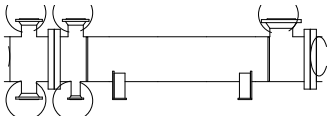
Heat exchanged 114451 W MTD corrected 13.12 C

Transfer rate, Service 368.8 Dirty 526.6 Clean 812.9 W/(m2*k)

CONSTRUCTION OF ONE SHELL

		Shell Side	Tube Side
Design/Test pressure	bar	30 / Code	30 / Code
Design temperature	C	-45~180	-45~180
Number passes per shell		1	4
Corrosion allowance	mm	0	0
Connections	In	2" / 300 ANSI	3" / 300 ANSI
Size/rating	Out	2" / 300 ANSI	3" / 300 ANSI
mm/	Intermediate	/ 300 ANSI	/ 300 ANSI

Sketch



Tube No. 148 OD 20 Tks-avg 2 mm Length 2600 mm Pitch 26 mm

Tube type Plain Material SA-213 TP304L Tube pattern 30

Shell SA312-TP304L ID:Pipe 16" , Sch40S Shell cover

Channel or bonnet SA312-TP304L Channel cover

Tubesheet-stationary SA182-F304L Tubesheet-floating

Floating head cover Impingement protection Circular Plate on bundel

Baffle-crossing SA240-304L Type single seg Cut(%d) 34 vert Spacing:c/c mm

Baffle-long Seal type Inlet 208.9 mm

Supports-tube U-bend Type

Bypass seal Tube-tubesheet joint exp./seal wld

Expansion joint Type

RhoV2-Inlet nozzle 1413 Bundle entrance 12 Bundle exit 1 kg/(m*s2)

Gaskets - Shell side Comp. fiber Tube side Comp. fiber (m=2.75 y=3700 psi)

Floating head

Code requirements ASME Code Sec VIII Div 1 TEMA class R

Fabricated Weight [kg]: 812 Empty weight [kg]: Shop test weight [kg]: Bundle weight [kg]:

LOADS AT BASE (*) : [[WIND: Load[kgf]: , Moment[kg.m]: , SEISMIC: Load[kgf]: , Moment[kg.m]:]]

Remarks (*) : These item should be verified by vendor.

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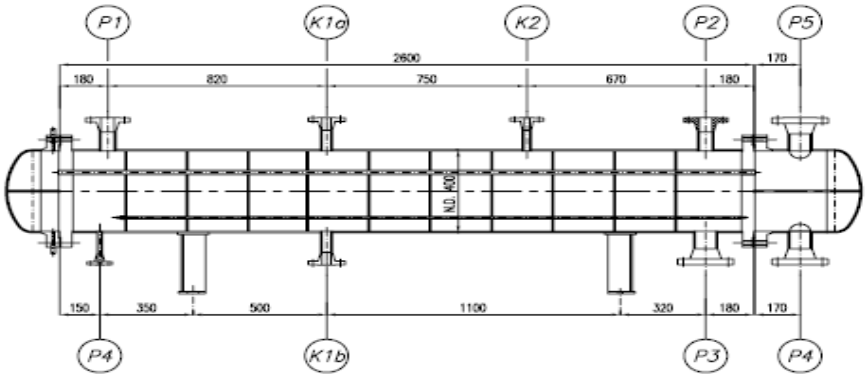
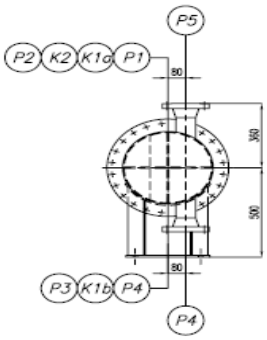
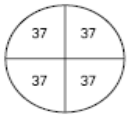
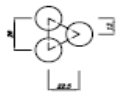


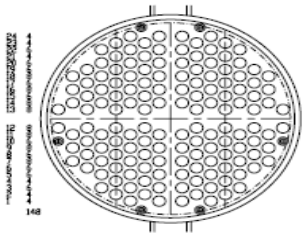




Shell ND 400 mm
D.T.L. 374.6 mm
Baffle cut to C/L 85.5 mm



Shell ND 400 mm
D.T.L. 374.6 mm
Baffle cut to C/L 85.5 mm



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PROJECT: PP PILOT PLANT	client:
TITLE : Data Sheet for Propane recovery condenser (E -361)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

GENERAL NOTES

1- UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN MM.

2- UNLESS OTHERWISE NOTED , OUTSIDE PROJECTION OF NOZZLES ARE MEASURED FROM C.L./T.L. OF EXCHANGER TO THE EXTREME FACE OR BUTT WELDED EDGE OF NOZZLE.

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6- ALL FLANGE BOLT HOLES TO STRADDLE CENTER LINES EXCEPT AS SHOOWN OTHERWISE.

7- NOZZLE /GIRTH FLANGE FACE FINISHING SHALL BE SMOOTH WITH 125 -250 MICROINCH AVERAGE ROUGHNESS.

8- DRILING AND TOLERANCES OF TUBESHEET SHALL BE PER TEMA STANDARD FIT.

9- THREADED HOLES IN TUBESHEET MUST NOT BE COMPLETELY DRILLED.

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WHERE EXPANSION JOINT IS REQUIRED , BLINDED LWN FLANGES FOR VENT AND DRAIN ON EXPANSION JOINT SHALL BE CONSIDERER.

14 - IMPACT TEST REQUIREMENTS FOR ALL PARTS MATERIAL SHALL BE CHECKED BY MANUFATURER RESULTS SHALL BE CONCLUDED IN CALCULATIONS AND THEN REFLECTED IN FABRICATION DRAWINGS.

15-ALL SHELL INTERNAL WELDS SHALL BE SMOOTH GRINDED.

16-SHELL / NOZZLE THICKNESS AT CONNECTION/ ATTACHMENT AREA SHALL BE VERIFIED BY LOCAL STRESS CALCULATION.

17-BASE LINE (B.L.)INDICATES THE GASKET FACE OF TUBESHEET .

PROJECT : PP PILOT PLANT	client:
TITLE : Data Sheet for Reboiler tower 361(E -362)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

Data Sheet for Reboiler tower 361(E -362)

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PROJECT: PP PILOT PLANT	Client:
TITLE : Data Sheet for Reboiler tower 361(E -362)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

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PROJECT: PP PILOT PLANT

client:

شرکت ملی صنایع پتروشیمی
شرکت پژوهش و فناوری پتروشیمی

TITLE : Data Sheet for Reboiler tower 361(E -362)

Size	1000	mm	Type	BEM	Hor	Connected in	1	parallel	1	series		
Surf/unit(eff.)	4	m2	Shells/unit	1		Surf/shell (eff.)	4			m2		
PERFORMANCE OF ONE UNIT												
Fluid allocation			**Shell Side**				**Tube Side**					
Fluid name												
Fluid quantity, Total		kg/h	7				300					
Vapor (In/Out)		kg/h	7		0		0		42			
Liquid		kg/h	0		7		300		258			
Noncondensable		kg/h	0				0					
Temperature (In/Out)		C	151.18		150.02		45.55		45.55			
Dew / Bubble point		C	151.13		151.13							
Density (Vap / Liq)		kg/m3	2.5	/ 861.91	/ ##		29.65	/ 469	29.63	/ 469.02		
Viscosity		cp	0.0145	/ 0.178	/ 0		0.0092	/ 0.1	0.0092	/ 0.0628		
Molecular wt, Vap			18.02				42.16		42.16			
Molecular wt, NC												
Specific heat		kcal/(kg*C)	0.457	/ 1.2245	/ 1		0.3878	/ 1	0.3878	/ 0.991		
Thermal conductivity		kcal/(h*m*C)	0.025	/ 0.59	/ 1		0.017	/ 0.1	0.017	/ 0.078		
Latent heat		kcal/kg	505.58				69.88		69.89			
Pressure		kgf/cm2	5		4.994		19		18.989			
Velocity		m/s	0.13				0.05					
Pressure drop, allow./calc.		kgf/cm2	0.264		0.006		0.51		0.011			
Fouling resist. (min)		m2*h*C/kcal	0.0001				0.0002	0002 Ao based				
Heat exchanged	2953	kcal/h					MTD corrected	100.65	C			
Transfer rate, Service	6.4		Dirty	313.6			Cle	313.(	kcal/(h*m2*C)			

CONSTRUCTION OF ONE SHELL			**Sketch**
	Shell Side	**Tube Side**	
Design/Vac/Test pres kgf/cm2	31 / /	31 / /	
Design temperature C	-60~240	-60~240	
Number passes per shell	1	1	
Corrosion allowance nm	1.59	1.59	
Connections In mm	/ -	/ -	
Size/rating Out	/ -	/ -	
Nominal Intermedia	/ -	/ -	

Tube Nc 60	OD 25.4	Tks- Avg 2.11	mm	Length 100(mm		Pitch 33.75	mm					
Tube type	Plain	Material	S.S304L	Tube p	30							
Shell S.S304L	ID	OD 400	mm	Shell cover	-							
Channel or bonnet	S.S304L			Channel cover	-							
Tubesheet-stationary	S.S304L			Tubesheet-floating	-							
Floating head cover	-			Impingement protection	None							
Baffle-crossing	S.S304L	Type	Single segmenta	Cut(%d)	27.98	V Spacing: c/c	mm					
Baffle-long	-	Seal t		Inlet	mm							
Supports-tube		U-bend	Type									
Bypass seal		Tube-tubesheet joint	Exp.									
Expansion joint	-	Type										
RhoV2-Inlet nozzle		Bundle entrance	0	Bundle exit	0	kg/(m*s2)						
Gaskets - Shell side	Flat Metal Jacket Fibe	Tube Side	Flat Metal Jacket Fibe									
Floating head	-											
Code requirements	ASME Code Sec VIII Div 1		TEMA class	R - refinery service								
Weight/Shell	423	Filled with water	523.4	Bunc 177	kg							
Remarks												

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PROJECT:PP PILOT PLANT	client: شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی
TITLE : Data Sheet for Reboiler tower 361(E -362)	

GENERAL NOTES

1- UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN MM.
2- UNLESS OTHERWISE NOTED , OUTSIDE PROJECTION OF NOZZLES ARE MEASURED FROM C.L./T.L. OF EXCHANGER TO THE EXTREME FACE OR BUTT WELDED EDGE OF NOZZLE.

3-THE MECHANICAL DATA SPECIFIED ON DRAWINGS ARE MINUMUM PURCHASER'S REQUIREMENTS ADQEUACY AND COMPLIANCE OF DESIGN WITH APPLICABLE CODE AND PROJECT SPECIFICATIONS IS MANUFACTURER'S RESPONSIBILITY.

4- LIFTING LUGS SHALL BE DESIGNED AND EXACT LOCATION DETERMINED BY THE MANUFACTURER.

5- THE INDICATED WEIGHTS TO BE CONFIRMED /CHECKED BY MANUFACTURER.

6- ALL FLANGE BOLT HOLES TO STRADDLE CENTER LINES EXCEPT AS SHOOWN OTHERWISE.

7- OUTSIDE EDGE OF ALL FLANGES / FORGINGS TO BE BEVELLED WITH 45 DEGREE ANGLE IN 5 MM DISTANCE.

8- NOZZLE /GIRTH FLANGE FACE FINISHING SHALL BE SMOOTH WITH 125 -250 MICROINCH AVERAGE ROUGHNESS.

9- DRILING AND TOLERANCES OF TUBESHEET SHALL BE PER TEMA STANDARD FIT.

10 - BOTH ENDS OF TIE RODS SHALL BE UNC THREADED ON 50 MM.

11- THREADED HOLES IN TUBESHEET MUST NOT BE COMPLETELY DRILLED.

13- DIAMETER OF HOLES FOR TIE RODS IN BAFFLE = TIE ROD DIA. + 0.5 MM.

14- ALL TAILED DIMENSIONS ARE MEASURED FROM BASE LINE.

15- EDGE OF HOLES IN BAFFLES SHALL BE ROUNDED (R=2MM)OR BEVELED.

16- HANDLING LUGS FOR EXCHANGER COMPONENTS SHALL BE DESIGNED AND EXACT LOCATED BY MANUFACTURER.

17- DIMENSIONS REFER TO BAFFLES OR TUBE SUPPORTS ARE MEASURED FROM CENTER OF EACH ONE.

18- MANUFACURER SHALL PERFORM THE REQUIRED CHECKING /DESIGN OF SHELL EXPANSION JOINT.

WHERE EXPANSION JOINT IS REQUIRED , BLINDED LWN FLANGES FOR VENT AND DRAIN ON EXPANSION JOINT SHALL BE CONSIDERER.

19 - IMPACT TEST REQUIREMENTS FOR ALL PARTS MATERIAL SHALL BE CHECKED BY MANUFATURER RESULTS SHALL BE CONCLUDED IN CALCULATIONS AND THEN REFLECTED IN FABRICATION DRAWINGS.

20-ALL NOZZLES SHALL BE RADIUSED WITH THE CONTOUR OF THE SHELL , CHANNEL AND HEADS INNER WALLS AS FOLLOWS:ITEM R = 6 MM , ALL THE OTHER ONES R=2MM . INTERNAL

21-ALL SHELL INTERNAL WELDS SHALL BE SMOOTH GRINDED.

22-SHELL / NOZZLE THICKNESS AT CONNECTION/ ATTACHMENT AREA SHALL BE VERIFIED BY LOCAL STRESS CALCULATION.

23-BASE LINE (B.L.)INDICATES THE GASKET FACE OF TUBESHEET .

PROJECT : PP PILOT PLANT	client:
TITLE : Data Sheet for T-361 CONDENSER (E -363)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

Data Sheet for T-361 CONDENSER (E -363)

licensor:basell	**Document No.:**	**Rev.: 01**
	Owner Job No.:	**Type: DAS**
		Page A

PROJECT: PP PILOT PLANT	Client:
TITLE : Data Sheet for T-361 CONDENSER (E -363)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

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4					
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1	2021-11-27	K.A	M.N	AA.SH	AFC
Revision	Date	Prepared By	Checked By	Approved By	Status

Document revision

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شرکت ملی صنایع پتروشیمی
شرکت پژوهش و فناوری پتروشیمی

HEAT EXCHANGER SPECIFICATION SHEET

SI Units

			Job No.		
Customer	NPC-RT		Reference No.		
Address			Proposal No.		
Plant Location	ARAK		Date	2021-12-01	Rev 01
Service of Unit			Item No.	E-363	
Size	168.000 x 999.988 mm	Type BEM Vert.	Connected In	1 Parallel	1 Series
Surf/Unit (Gross/Eff)	0.72 / 0.69 m2	Shell/Unit 1	Surf/Shell (Gross/Eff)	0.72 / 0.69 m2	

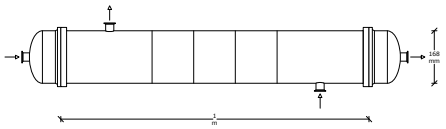
PERFORMANCE OF ONE UNIT

Fluid Allocation		Shell Side		Tube Side	
Fluid Name		RWS		Propane	
Fluid Quantity, Total	kg/hr	300.001		15.0001	
Vapor (In/Out)				3.0000	
Liquid		300.001	300.001	12.0001	15.0001
Steam					
Water					
Noncondensables					
Temperature (In/Out)	C	5.00	10.00	46.00	41.00
Specific Gravity		1.0225	1.0225	0.4802	0.4802
Viscosity	mN-s/m2	1.5010	1.5010	0.0137 V/L 0.0552	0.0552
Molecular Weight, Vapor					
Molecular Weight, Noncondensables					
Specific Heat	kJ/kg-C	4.3211	4.3211	1.8540 V/L 1.837	1.8370
Thermal Conductivity	W/m-C	0.5781	0.5781	0.0219 V/L 0.100	0.0998
Latent Heat	kJ/kg	232.590	232.590	293.767	293.767
Inlet Pressure	kPa	401.336		2001.36	
Velocity	m/s	1.527e-2		8.314e-3	
Pressure Drop, Allow/Calc	kPa	20.000	9.677	20.000	3.559e-4
Fouling Resistance (min)	m2-K/W				

Heat Exchanged W	983.949	MTD (Corrected)	37.4 C	
Transfer Rate, Service	38.11 W/m2-K	Clean	476.21 W/m2-K	Actual 476.21 W/m2-K

CONSTRUCTION OF ONE SHELL

Sketch (Bundle/Nozzle Orientation)



			Shell Side	Tube Side
Design/Test Pressure		kPaG	700.010 /	2600.04 /
Design Temperature		C	160.00	130.00
No Passes per Shell			1	1
Corrosion Allowance		mm		
Connections Size & Rating	In	mm	1 @ 26.645	1 @ 26.645
	Out	mm	1 @ 26.645	1 @ 26.645
	Intermediate		@	@

Tube No.	12	OD 19.050 mm	Thk(Avg) 2.413 mm	Length 1.000 m	Pitch 24.000 mm Layout 30
Tube Type	Plain			Material	304 STAINLESS STEEL (18 CR, 8 NI)
Shell	ID 168.000 mm	OD mm		Shell Cover	
Channel or Bonnet				Channel Cover	
Tubesheet-Stationary				Tubesheet-Floating	
Floating Head Cover				Impingement Plate	None

Baffles-Cross	Type SINGLE-SEG.	%Cut (Diam) 28.71	Spacing(c/c) 135.000	Inlet 278.445 mm
Baffles-Long		Seal Type		
Supports-Tube		U-Bend	Type	
Bypass Seal Arrangement		Tube-Tubesheet Joint		
Expansion Joint		Type		
Rho-V2-Inlet Nozzle	21.86 kg/m-s2	Bundle Entrance 0.16	Bundle Exit	6.459e-2 kg/m-s2
Gaskets-Shell Side		Tube Side		
-Floating Head				
Code Requirements			TEMA Class	
Weight/Shell 145.19		Filled with Water 177.31	Bundle 20.01	kg

Remarks:

PROJECT: PP PILOT PLANT	client:
TITLE : Data Sheet for T-361 CONDENSER (E -363)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

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PROJECT:PP-PE PILOT PLANT	**Client:**
TITLE:Data Sheet for HEXANE vapor cooler E-343	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

Data Sheet for HEXANE vapor cooler

E-343

	Document No.:	**Rev. : 00**
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PROJECT:PP-PE PILOT PLANT	**Client:**
TITLE:Data Sheet for HEXANE vapor cooler E-343	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

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0	2021-11-27	K.A	M.N	AA.SH	AFC

	Document No.:	**Rev. : 00**
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Data Sheet

Heat Exchanger

Technical Abbreviation: **E**

Project: **PP-PE PILOT PLANT** Country: **IRAN**

Company: **NPC-RT**

Location: **ARAK**

Document n°	Page
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Type: Double pipe Manufacturer: Belongs to: TK 343

Item No.: **E 363** No. Required: 1 P&ID-No.:

Name/description: **Hexane Vapour Cooler** Area: 300

Service/mode of operation: ☑ continuous ☐ discontinuous

5	Quantity (operation/stand by)		1		25	Calculated Surface	m²	0.25
6	Orientation **(1)**		☑ horizontal	☐ vertical	26	Selected Surface	m²	0.5
7	Type		☑ tube	☐ plate	27	Over design	%	50
8	Arranged	☐ parallel	☑ serial	☐ stand by	28	Number of tubes		7
9			**Tube side**	**Shell side**	29	Tube length	mm	1400
10	**Process fluid:**		cold hexane	nitrogen and hexane	30	Tube outer diameter	mm	50
11					31	Tube inlet diameter	mm	19
12					32			
13	pH-Value				33	number of fins		12
14	Solid content	%			34			
15	Particle size	µm			35	fins	☑ horizontal	☐ vertical
16	Design temperature	°C	-30/+180	-30/+180	36	height of fin	mm	12.7
17	Design pressure	barg	10/-1	6/-1	37	Baffles spacing	mm	
18	Log. temperature difference	K			38	Number of passes		
19	**Material:**		low temp carbon steel		39			
20	Surface treatment				40	Medium process side		
21	-coating				41	☐ toxic	☐ explodable	☑ combustible
22	Corrosion allo., process req.	mm			42	Medium service side		
23	Insulation				43	☐ toxic	☐ explodable	☑ combustible
24	Gaskets				44			

			Tube side		Shell side	
45	**Operation conditions per unit**					
46			inlet	outlet	inlet	outlet
47	Total flow	kg/h	960	960	22	
48	Vapour / Gas	kg/h			14	1.1
49	Steam	kg/h				
50	Inerts	kg/h			8	8
51	Liquid	kg/h	960	960		12.9
52	Water	kg/h				
53	Operating temperature	°C	-15	-12	40	-10
54	Operating pressure	barg			0.10	0.08
55						
56	**Liquid / Vapour**					
57	Density (vap./liq.)	kg/m³	680	680	2.3	2.15
58	Molar mass	kg/kmol	86.2	86.2		
59	Specific heat (vap./liq.)	kJ/kgK	2.18	2.18	1.46	1,1/2,17
60	Thermal conductivity (vap./liq.)	W/mK	0.135	0.135	0.022	0,022/0,135
61	Dynamic viscosity (vap./liq.)	cP	0.5	0.5	0.007	0,017/0,5
62						
63						
64						
65						
66						
67	Velocity (mean)	m/s	1.4	1.4	1.8	1
68	Press. drop, max. admissible / calcul.	bar	0.5		0.05	
69	Heat transfer coefficient	W/m²K				
70	Fouling factor	m²K/W				
71	Corrected mean temp. difference	°C	20			
72	(Overall) Heat transfer rate	W/m²K	340			
73	Heat duty	kW	1.7			
74						

75 **(1)** sloped for draining the condensate

76

77

Data Sheet

Heat Exchanger

Technical Abbreviation: **E**

Project: **PP-PE PILOT PLANT** Country: **IRAN**

Company **NPC-RT**

Location: **ARAK**

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Type: Double pipe Manufacturer: Belongs to: TK 343

Item No.: **E 343** No. Required: 1 P&ID-No.:

Name/description: **Hexane Vapour Cooler** Area: 300

Service/mode of operation: ☑ continuous ☐ discontinuous

Nozzle Details

	Designation	DN	PN	Facing	Flange	Length of nozzle	Comments
P1	vapour outlet	1 1/2"	300#	RF	WN		
P2	cold hexane inlet	3/4"	300#	RF	WN		
P3	cold hexane outlet	3/4"	300#	RF	WN		
P4	vapour/liquid inlet	1 1/2"	300#	RF	WN		

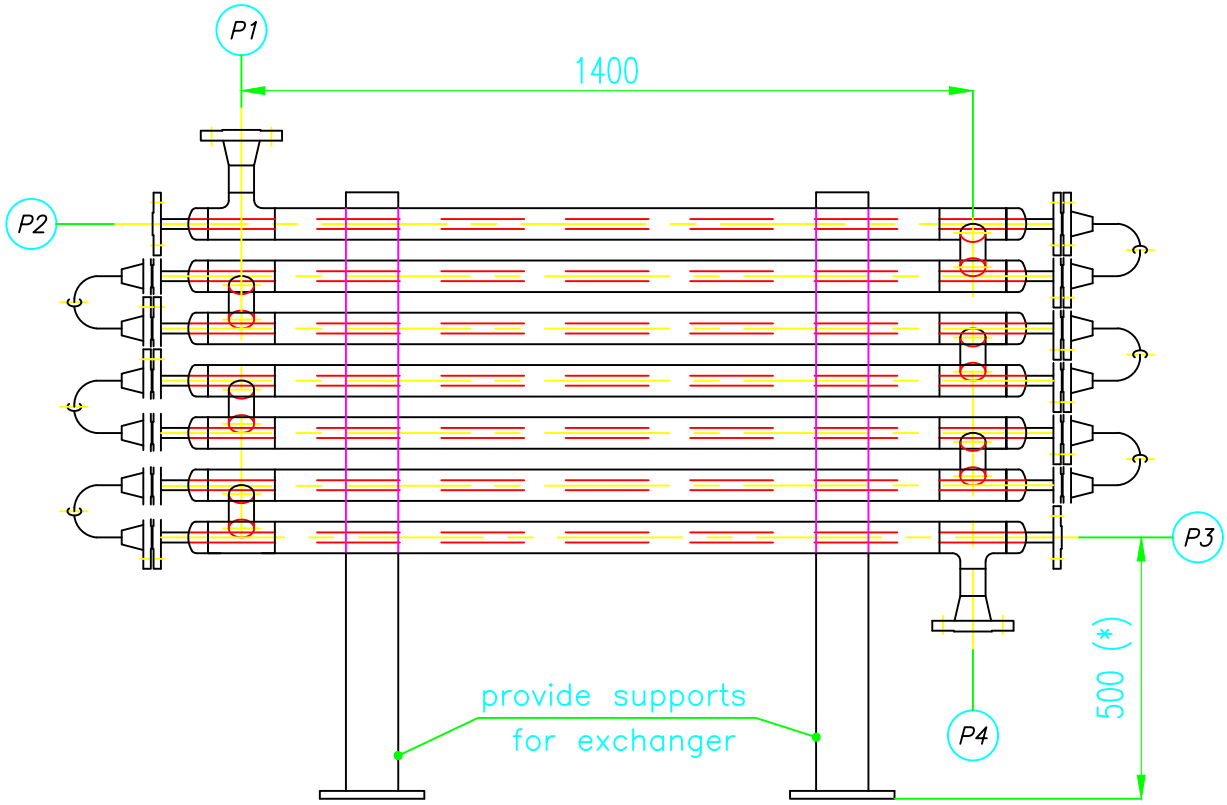
- All nozzle details will be determined during detail engineering

Comments

- All data have to be checked during detail engineering

Sketch

Sketch available: ■yes; see attachment



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*) - To be define

B					U.E.	DRAWING N.		SH N.
					FE			3
					U.D.	PLANT		CT
	0	FIRST ISSUE		2021-11-27	IR	PP-PE		
						CREATION DATE		SCL
This drawing contains CONFIDENTIAL and PROPRIETARY information by BASELL Polyolefins. This information has not to be used, or disclosed to anyone outside of BASELL Polyolefins and its subsidiaries, except pursuant to a written agreement with BASELL Polyolefins.	Project: PP-PE PILOT PLANT					2021-11-27		
	Title HEXANE VAPOUR COOLER				DWG Issued by: BASELL Polyolefins Italia S.p.A. - Reserch Centre "Giulio Natta"- P.le Donegani, 12 - 44100 Ferrara (Italy)			Scale 1:15
File name	ITEM	Company	Location	Country	Drawn	Checked		Approved
.DWG	E-343	NPC-RT	ARAK	IRAN	K.A	M.N		AA.SH

PROJECT : PP PILOT PLANT	client:
TITLE : Data Sheet for Heat excenger N2 to Dryer (E-621)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

Data Sheet for Heat excenger N2 to Dryer (E -621)

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PROJECT: PP PILOT PLANT	Client:
TITLE : Data Sheet for Heat excenger N2 to Dryer (E-621)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

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PROJECT: PP PILOT PLANT

client:

شرکت ملی صنایع پتروشیمی
شرکت پژوهش و فناوری

TITLE : Data Sheet for Refrigeration Unit Exchanger (E -041)

Heat Exchanger Specification Sheet

Company: NPC R&T

Location: NPC R&T - ARAK - IRAN

Service of Unit: Heat excenger N2 to Dryer

Item No.: E-621 Your Reference: PP-PE PILOT PLANT

Date: 2021/11/28 Rev No.: 00

Size			214/ 2500	mm	Type	BEM	vert	Connected in	1 parallel		1 series		
Surf/unit(eff.)	5,7	m2	Shells/unit	1	Surf/shell (eff.)	5,7	m2						

PERFORMANCE OF ONE UNIT

Fluid allocation		Shell Side		TubeSide	
Fluid name		Steam		Nitrogen	
Fluid quantity, Total	kg/h	25		700	
Vapor (In/Out)	kg/h	25		700	700
Liquid	kg/h		25		
Noncondensable	kg/s				
Temperature (In/Out)	C	162,17	114,54	35	112,81
Dew / Bubble point	C	162,17	162,17		
Density	kg/m3	3,34	939,33	1,42	1,13
Viscosity	cp	0,015	0,273	0,018	0,022
Molecular wt, Vap					
Molecular wt, NC					
Specific heat	kcal/(kg*C)	0,5897	1,0119	0,2483	0,2497
Thermal conductivity	kcal/(h*m*C)	0,027	0,567	0,022	0,026
Latent heat	kcal/kg	494,13	525,79		
Pressure	bar	6,5		1,3	
Velocity	m/s	0,17		13,59	
Pressure drop, allow./calc.	kgf/cm2	0,141	0	0,53	0,005
Fouling resist. (min)	m2*h*C/kcal	0,0003		0,0003	

Heat exchanged	13555	kcal/h		MTD corrected	70,01	C
Transfer rate, Service	34,2		Dirty 44,8	Clean	46,1	kcal/(h*m2*C)

CONSTRUCTION OF ONE SHELL

Sketch

		Shell Side	Tube Side
Design/Test pressure	bar	6 / code	6 / code
Design temperature	C	180	180
Number passes per shell		1	1
Corrosion allowance	mm		
Connections	In	25,4 / 300 ANSI	152,4 / 150 ANSI
Size/rating	Fuori	25,4 / 300 ANSI	152,4 / 150 ANSI
mm	Intermediate	/ 300 ANSI	/ 150 ANSI

Tube No.	29	OD	25,4	1,6	mm	Length	2500	mm	Pitch	32	mm
Tube type				Material		SS304			Tube pattern	30	
Shell	SS304		ID	OD	220 mm	Shell cover					
Channel or bonnet			SS304			Channel cover					
Tubesheet-stationary			SS304			Tubesheet-floating					
Floating head cover						Impingement protection					piastra d'urto sul fascio
Baffle-crossing	SS304		Type	single seg	Cut(%d)	37	vert				mm
Baffle-long				Seal type					Inlet	279.4	mm
Supports-tube				U-bend			Type				
Bypass seal				Tube-tubesheet joint			exp./seal wld				
Expansion joint				Tipo							
RhoV2-Inlet nozzle	56		Bundle entrance		0		Bundle exit	0			kg/(m*s2)
Gaskets - Shell side				Tube Side							
Floating head											
Code requirements		ASME Sez VIII Div 1				TEMA class	R				
Weight/Shell	257,4		Filled with water		363,3				Bundle	99,5	kg
Remarks		Over design area ~50%									

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PROJECT: PP PILOT PLANT	client:
TITLE : Data Sheet for Heat excenger N2 to Dryer (E-621)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

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12- DIMENSIONS REFER TO BAFFLES OR TUBE SUPPORTS ARE MEASURED FROM CENTER OF EACH ONE.

13- MANUFACURER SHALL PERFORM THE REQUIRED CHECKING /DESIGN OF SHELL EXPANSION JOINT.

WHERE EXPANSION JOINT IS REQUIRED , BLINDED LWN FLANGES FOR VENT AND DRAIN ON EXPANSION JOINT SHALL BE CONSIDERER.

14 - IMPACT TEST REQUIREMENTS FOR ALL PARTS MATERIAL SHALL BE CHECKED BY MANUFATURER RESULTS SHALL BE CONCLUDED IN CALCULATIONS AND THEN REFLECTED IN FABRICATION DRAWINGS.

15-ALL SHELL INTERNAL WELDS SHALL BE SMOOTH GRINDED.

16-SHELL / NOZZLE THICKNESS AT CONNECTION/ ATTACHMENT AREA SHALL BE VERIFIED BY LOCAL STRESS CALCULATION.

17-BASE LINE (B.L.)INDICATES THE GASKET FACE OF TUBESHEET .

PROJECT : PP PILOT PLANT	client:
TITLE : Data Sheet for Refrigeration Unit Exchanger (E-041)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

Data Sheet for Propane recovery condenser (E -041)

licensor:basell	Document No.:	Rev.: 01
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PROJECT: PP PILOT PLANT	Client:
TITLE : Data Sheet for Refrigeration Unit Exchanger (E-041)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

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1	2021-11-27	K.A	M.N	AA.SH	AFC
Revision	Date	Prepared By	Checked By	Approved By	Status

Document revision

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PROJECT: PP PILOT PLANT

client:

شرکت ملی صنایع پتروشیمی
شرکت پژوهش و فناوری پتروشیمی

TITLE : Data Sheet for Refrigeration Unit Exchanger (E -041)

Heat Exchanger Specification Sheet

NPC-RT;Project :PP-PE Pilot Plant

Company: NPC-RT;Location:Arak;Country :Iran

Service of Unit: Refrigeration Unit Exchanger | Location: Indoors | TEMA type:AEL

Item No.: E-041 | P&ID.No.:00

Date:27/11/2021 | Rev No.: 1

Size	254/1000	mm	Type	Vertical	Connected in	1 parallel	1 series	
Surf/unit(eff.)	3.3/3.1	m2	Shells/Unit	1	Surf/shell (eff.)	3.3/3.1	m2	

PERFORMANCE OF ONE UNIT

Fluid allocation		Shell side		Tube Side	
		In	Out	In	Out
Fluid name		Water+Glycol		Hexane Chilled	
Fluid quantity, Total	kg/h	300		26.93	
Vapor Quantity	kg/h			26.93	
Liquid Quantity	kg/h	300	300		26.93
Noncondensable	kg/h				
Specific Gravity(Water=1,Air=1.@T=25 C,P=1bar)		0.9983	0.9983	0.0056	0.606
Operating Temperature	C	15	23	50	30
Dew / Bubble point	C				
Density	kg/m3			680	
Viscosity	cp	1.102	1.102	0.4846	0.4846
Molecular wt, Vapor	Kg/Kmole	18	18	86	86
Molecular wt, Liguid	Kg/Kmole				72
Specific heat	Kj/(kg*C)	4.318	4.318	1.932	1.932
Thermal conductivity	W/(m*k)	0.586	0.586	0.1264	0.1264
Latent heat	kJ/kg				
Operating Pressure	bar	3	3	2	2
Velocity	m/s	0.11		0.072	
Pressure drop, allow./calc.	bar	0.2/0.15		0.05/0.009	
Fouling Factor	m2*K//W	0.00035			

Heat exchanged 2449.7 W | LMTD 28.63

Overall heat Transfer Coef. | Service 67.9 | Clean 69.6 W/(m2*C)

ON OF ONE SHELL | **Sketch**

		Shell Side	Tube Side
Design/Test pressure	bar	4.5 / 6.75	3 / 4.5
Design temperature	C	100	100
Number passes per shell			1
Corrosion allowance	mm	1	1
		Size/Rating/Facting	Size/Rating/Facting
Connections	In	1 1/2"/150/R.F	2 1/2"/150/R.F
Size/rating	Out	1 1/2"/150/R.F	2 1/2"/150/R.F
mm/	Intermediate		

Pitch 32 mm

Tube No. 42 | OD 25mm | Tks-avg 2 mm | Length 1000 mm | Tube pattern 60

Tube type Seamless | Material SS304 | BWG 15

Shell SS304 | ID: 254mm | Shell cover

Bonnet | Channel cover

stationary | Tubesheet-floating

Impingement protection | Spacing:c/c 91 mm

Baffle-crossing | Type SSEG | single seg | Cut(%d) 32 | vert | Inlet 136 mm

Baffle-long | Seal type | No. of Baffles 9

Supports-tube | U-bend | Type exp./seal wld

Bypass seal | Tube-tubesheet joint Expanded

Expansion joint | Type | Bundle exit | kg/(m*s2)

V-Inlet nozzle 4.4 | Bundle entrance

Gaskets - Shell side P.T.F.E | Tube side

Floating head

Code requirements ASME Code Sec VIII Div 1 | TEMA class R | Bundle weight [kg]:

Fabricated Weight [kg]: | Empty weight [kg]: 155 | Shop test weight [kg]:

LOADS AT BASE (*) : [[WIND: Load[kgf]: , Moment[kg.m]: , SEISMIC: Load[kgf]: , Moment[kg.m]:]]

Remarks (*) : These item should be verified by vendor.

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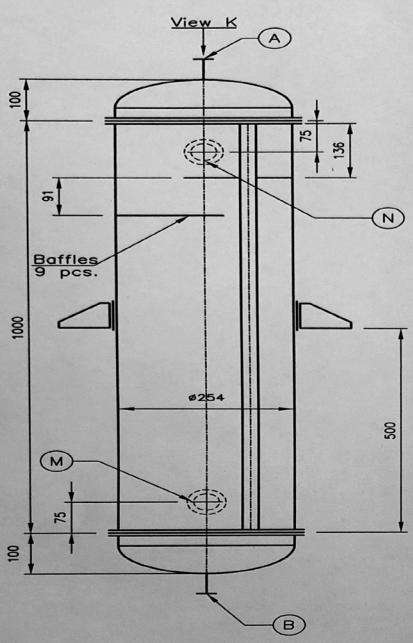
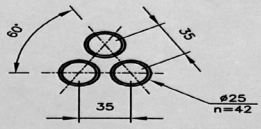
Apparatus sketch



Tubes spacing scheme
sc. 1:2



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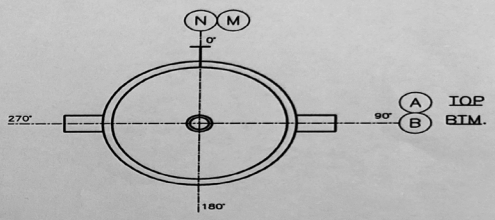

Baffles % cut—32
Baffle inlet 136

Note 1: Domed heeds are ellipsoidal 2:1
Note 2: Nozzles Projection in all sides are 150 mm

Sleeves table

Symbol	Purpose	Dconv. mm	Number	Remarks
A	Product inlet	90	1	
B	Product outlet	40	1	
M	Cold water inlet	40	1	
N	Cold water outlet	40	1	

PROJECT: PP PILOT PLANT	client:
TITLE : Data Sheet for Refrigeration Unit Exchanger (E-041)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

GENERAL NOTES

1- UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN MM.

2- UNLESS OTHERWISE NOTED , OUTSIDE PROJECTION OF NOZZLES ARE MEASURED FROM C.L./T.L. OF EXCHANGER TO THE EXTREME FACE OR BUTT WELDED EDGE OF NOZZLE.

3-THE MECHANICAL DATA SPECIFIED ON DRAWINGS ARE MINUMUM PURCHASER'S REQUIREMENTS ADQEUACY AND COMPLIANCE OF DESIGN WITH APPLICABLE CODE AND PROJECT SPECIFICATIONS IS MANUFACTURER'S RESPONSIBILITY.

4- LIFTING LUGS SHALL BE DESIGNED AND EXACT LOCATION DETERMINED BY THE MANUFACTURER.

5- THE INDICATED WEIGHTS TO BE CONFIRMED /CHECKED BY MANUFACTURER.

6- ALL FLANGE BOLT HOLES TO STRADDLE CENTER LINES EXCEPT AS SHOOWN OTHERWISE.

7- NOZZLE /GIRTH FLANGE FACE FINISHING SHALL BE SMOOTH WITH 125 -250 MICROINCH AVERAGE ROUGHNESS.

8- DRILING AND TOLERANCES OF TUBESHEET SHALL BE PER TEMA STANDARD FIT.

9- THREADED HOLES IN TUBESHEET MUST NOT BE COMPLETELY DRILLED.

10- ALL TAILED DIMENSIONS ARE MEASURED FROM BASE LINE.

11- HANDLING LUGS FOR EXCHANGER COMPONENTS SHALL BE DESIGNED AND EXACT LOCATED BY MANUFACTURER.

12- DIMENSIONS REFER TO BAFFLES OR TUBE SUPPORTS ARE MEASURED FROM CENTER OF EACH ONE.

13- MANUFACURER SHALL PERFORM THE REQUIRED CHECKING /DESIGN OF SHELL EXPANSION JOINT.

WHERE EXPANSION JOINT IS REQUIRED , BLINDED LWN FLANGES FOR VENT AND DRAIN ON EXPANSION JOINT SHALL BE CONSIDERER.

14 - IMPACT TEST REQUIREMENTS FOR ALL PARTS MATERIAL SHALL BE CHECKED BY MANUFATURER RESULTS SHALL BE CONCLUDED IN CALCULATIONS AND THEN REFLECTED IN FABRICATION DRAWINGS.

15-ALL SHELL INTERNAL WELDS SHALL BE SMOOTH GRINDED.

16-SHELL / NOZZLE THICKNESS AT CONNECTION/ ATTACHMENT AREA SHALL BE VERIFIED BY LOCAL STRESS CALCULATION.

17-BASE LINE (B.L.)INDICATES THE GASKET FACE OF TUBESHEET .

PROJECT:PP-PE PILOT PLANT	**Client:**
TITLE:Data Sheet for CONVEYING GAS COOLER (E-531,E-532)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

Data Sheet for
CONVEYING GAS COOLER

(E-531,E-532)

	Document No.:	**Rev. : 01**
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PROJECT:PP-PE PILOT PLANT	**Client:**
TITLE:Data Sheet for CONVEYING GAS COOLER (E-531,E-532)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

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شرکت ملی صنایع پتروشیمی
شرکت پژوهش و فناوری پتروشیمی

Data sheet
E-531,E-532

Plant Label
PP-PE PILOT PLANT

Customer`s Jobname	Customer`s Jobnumber	Customer`s Documentnumber

Description	**Conveying Gas Cooler**		**Quantity**	2
Manufacturer			Type designation	BEM (C200-302-6-1pass)

Installation data/ Ambient conditions

Installation		**Environmental conditions**	Min.	Max.
Country	Iran	Ambient temperature	-28	44 ℃
Installation location	Outdoor, without roof	Relative humidity	46 % - 86 %	
Climatic condition	domestic	Altitude over a normal zero		1889 m
Ambient condition	corrosive atmosphere	**Hazardous area classification**		
		Zone Gas	zone 2	
		Dust	none	

Comments Heat Exchanger will be exposed to sunlight ==> max. surface temperature = 83 ℃

Process data

Exchanger chamber	**tube side**	exchanger chamber (utility side)	**shell side**

Data of Medium/ Process

Medium	**Nitrogen (Conveying Gas)**
Medium code letter	NIC
Relative gas humidity	%
Average density	1.251 kg/m³
With condition	0℃ / 1013 mbar (abs)
specific thermal capacity	1.05 kJ/(kg*K)
heat transfer coefficient	149.61 W/(m²*K)

	Min.	Normal	Max.	
Viscosity	20.1		21.9	Pa*s

Comments

Data of Medium/ Utility

Medium	**cooling water**
Medium code letter	CW
Average density	999.800 kg/m³
With condition	0℃ / 1013 mbar (abs)
Specific thermal capacity	4.18 kJ/(kg*K
Heat transfer coefficient	3249.30 W/(m²*K

	Min.	Normal	Max.	
Viscosity	816.7		859.4	Pa*s

Comments

Inlet — Nozzle N1

	Min.	Normal	Max.	
Operating volume flow	191	192.1	209.5	m³/h
Operating mass flow	204	204	225	kg/h
Operating pressure	339	427	460	mbar (g)
operating temperature	90	120	125	℃

Comments

Inlet — Nozzle N3

		Min.	Normal	Max.	
01	*Operating volume flow*	1.06	*1.06*	1.06	m³/h
	Operating mass flow		1051		kg/h
	Operating pressure (in)		5.5	6	bar (g)
	Operating temperature (in)		27		℃

Outlet — Nozzle N2

		Min.	Normal	Max.	
01	*Operating pressure (out)*	*316*	*404*	*437*	mbar (g)
	Operating temperature (out)	80	80	80	℃

Comments :

Allow. temperature difference	℃
Allow. pressure difference (Pressure loss)	40 mbar (g)

Outlet — Nozzle N4

	Min.	Normal	Max.	
Operating pressure (out)		2.5		bar (g)
Operating temperature (out)			37	℃

Allow. temperature difference	10 ℃
Allow. pressure difference (Pressure loss)	bar (g)

Operation Requirements

Exchange surface	0.38 m²	Operation manner 8000 h/year	yes
heat amount	2963 W		
heat transfer coefficient	W/(m*K)		
process side		**coolant (utility)**	
velocity (process side)	36.76 m/s	velocity (utility side)	0.20 m/s
fouling factor (process side)	0.00000 m²℃/W	fouling factor (utility side)	0.00033 m²℃/W
		coolant analysis present	☒

Comments

Technical datas

Design

Type	horizontal
Design type	fixed tube bundle

design guidelines

Design based on	ASME
Production based on	manufacturer

Housing / shell side

01	*Material*	*S.S 304*			Number of routes (shell side)	
01	*Material number*				Sealing material	
	Allowable pressure	min/ max	0.00 /	10.00 bar (g)	Corrosion allowance	0 mm
	Allowable temperature	min/ max	-28 /	120 ℃		

Comments Material resistance to be confirmed by supplier (see also "cooling water analysis")!

Pipe bundle

Material, tube bundle	S.S 304	Number of routes (pipe side)	
Material number, tube bundles		Number of inner pipes	
Allowable pressure, tube bundle	10.00 bar (g)	Pipe diameter	mm
Allowable temperature, tube bundle	120 ℃	Corrosion allowance	0 mm

Comments Material resistance to be confirmed by supplier (see also "cooling water analysis")!

Rev.	Remark	Date	drawn	checked	released
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Jobnumber	Unit-No. / Assembly

Rev. 01 — Sheet 1 of 3

شرکت ملی صنایع پتروشیمی
شرکت پژوهش و فناوری پتروشیمی

Data sheet
E-531,E-532

Plant Label
PP-PE PILOT PLANT

Customer`s Jobname	Customer`s Jobnumber	Customer`s Documentnumber

Paint/surface processing

	Surface preparation inside			Coat	no
	Surface preparation outside			Layer thickness	µm
				Top coat paint acc. to RAL	
	Comments				

Insulation

	Insulation	cold (insulation by customer)		Insulation thickness	70 mm
	Fastening clips for insulation	customer guidelines			
	Comments	insulation clips to be considered			

Main dimensions

	Nominal volume (gross volume)			m³		Length	765 mm
		Min.	Normal	Max.		Width/diameter	89 mm
	Work volume (net volume)			m³	01	*Height (total)*	*390* mm

Weights

		Min.	Normal	Max.	01	*Empty weight*	*33.0* kg
01	*Operating weight*			*40* kg		Maintenance weight	kg

Accessories

anchoring/fastening material to be delivered also

Fastening material	no	Grounding clip	at nozzle and for equipment earthing
Design type	n.a.	Transport eye	no

Accessories in Subvendor's Scope of Supply

Pollutant filter	n.a.	**safety valve (coolant side)**	
Condensate drain	n.a.	safety valve	no
		Manufacturer	
		type	

Comments: HIGHT OF SUPPORTS OF HEAT EXCHANGER TO BE ADAPTED ACC. TO CUSTOMERS REQUIREMENT!!!

Table of Nozzles

Rev.	Item	Description	Diameter	Rating	Connection Type	Flange Standard	Remarks
	N1	Gas Inlet	3"	150 LBS	flanged	DIN/ ISO PN10	Flange to be drilled acc. to ANSI B16.5, 150 lbs.
	N2	Gas Outlet	3"	150 LBS	flanged	DIN/ ISO PN10	Flange to be drilled acc. to ANSI B16.5, 150 lbs.
	N3	Cooling Water Inlet	1 1/2"	150 LBS	flanged	DIN/ ISO PN10	Flange to be drilled acc. to ANSI B16.5, 150 lbs.
	N4	Cooling Water Outlet	1 1/2"	150 LBS	flanged	DIN/ ISO PN10	Flange to be drilled acc. to ANSI B16.5, 150 lbs.

Rev.	Remark	Date	drawn	checked	released
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Jobname		Unit-No. / Assembly

شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی	Data sheet E-531,E-532	PP-PE PILOT PLANT
Customer`s Jobname	Customer`s Jobnumber	Customer`s Documentnumber

Applicable Documents

Documentation request/ -schedule

Inspections/ Test

QC plan at supplier	yes		Tests with customer participation	inform customer + certificate
Test guidelines	manufacturer			
Country specific test regulations				
Certification				
Manufacturing certificates				
Material certificates				
Pressure equipment directive PED				
pressure equipment directive				
PED fluid group				
PED category				
PED module				
Comments				

Remarks

Attach Coperion nameplate	yes		Language for labels/nameplates	english
Attach customer's nameplate	no		Language warning and directive labels	english
Item no. on stainless steel label	yes			
Comments				
Document no. CWA				
Seller to check all data and correct or add applicable.				

Rev.	Remark	Date	drawn	checked	released
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	Jobnumber	Unit-No. / Assembly

PROJECT:PP-PE PILOT PLANT	Client:
TITLE:Data Sheet for RETURN GAS COOLER (E-533)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

Data Sheet for
RETURN GAS COOLER
(E-533)

	Document No.:	Rev. : 01
	Owner Job No.:	Type: DAS
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PROJECT:PP-PE PILOT PLANT	**Client:**
TITLE:Data Sheet for RETURN GAS COOLER (E-533)	شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی

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شرکت ملی صنایع پتروشیمی
شرکت پژوهش و فناوری پتروشیمی

Data sheet

E-533

Plant Label: **PP-PE PILOT PLANT**

Customer`s Jobname | Customer`s Jobnumber | Customer`s Documentnumber

Description	**Return Gas Cooler**	**Quantity**	1
Manufacturer		Type designation	BEM (C200-503-6-1pass)

Installation data/ Ambient conditions

Installation		**Environmental conditions**	Min.	Max.
Country	Iran	Ambient temperature	-28	44 ℃
Installation location	Outdoor, without roof	Relative humidity	46 % - 86 %	
Climatic condition	domestic	Altitude over a normal zero		1889 m
Ambient condition	corrosive atmosphere	**Hazardous area classification**		
		Zone Gas	zone 2	
		Dust	none	

Comments: Heat Exchanger will be exposed to sunlight ==> max. surface temperature = 83 ℃

Process data

Exchanger chamber	**tube side**	exchanger chamber (utility side)	**shell side**

Data of Medium/ Process

Medium	**Nitrogen (Return Gas)**
Medium code letter	NIC
Relative gas humidity	%
Average density	1.251 kg/m³
With condition	0℃ / 1013 mbar (abs)
specific thermal capacity	1.05 kJ/(kg*K)
heat transfer coefficient	141.01 W/(m²*K)

	Min.	Normal	Max.	
Viscosity	18.4		20.7	Pa*s

Comments

Inlet — Nozzle N1

	Min.	Normal	Max.	
Operating volume flow	229	628	664.5	m³/h
Operating mass flow	188	520	542	kg/h
Operating pressure	50	70	80	mbar (g)
operating temperature	80	85	95	℃

Comments

Outlet — Nozzle N2

	Min.	Normal	Max.	
Operating pressure (out)	20	30	40	mbar (g)
Operating temperature (out)	40	40	40	℃

Comments

Allow. temperature difference		℃
Allow. pressure difference (Pressure loss)	40	mbar (a)

Data of Medium/ Utility

Medium	**Cooling Water**
Medium code letter	CW
Average density	999.800 kg/m³
With condition	0℃ / 1013 mbar (abs)
Specific thermal capacity	4.18 kJ/(kg*K)
Heat transfer coefficient	4804.69 W/(m²*K)

	Min.	Normal	Max.	
Viscosity	859.4		807	Pa*s

Comments

Inlet — Nozzle N3

		Min.	Normal	Max.	
01	*Operating volume flow*	2.5	*2.5*	2.51	m³/h
	Operating mass flow		2493		kg/h
	Operating pressure (in)		5.5	6	bar (g)
	Operating temperature (in)		27		℃

Outlet — Nozzle N4

	Min.	Normal	Max.	
Operating pressure (out)		2.5		bar (g)
Operating temperature (out)			37	℃

Allow. temperature difference	10	℃
Allow. pressure difference (Pressure loss)		bar (g)

Operation Requirements

Exchange surface	2.87 m²	Operation manner 8000 h/year	yes
heat amount	8694 W		
heat transfer coefficient	W/(m*K)		
process side		**coolant (utility)**	
velocity (process side)	37.50 m/s	velocity (utility side)	0.28 m/s
fouling factor (process side)	0.00000 m²℃/W	fouling factor (utility side)	0.00033 m²℃/W
		coolant analysis present	☒

Comments

Technical datas

Design

Type	horizontal
Design type	fixed tube bundle

design guidelines

Design based on	ASME
Production based on	manufacturer

Housing / shell side

01	*Material*	*S.S 304*		Number of routes (shell side)	
01	*Material number*			Sealing material	
	Allowable pressure	min/ max	0.00 / 10.00 bar (g)	Corrosion allowance	0 mm
	Allowable temperature	min/ max	-28 / 120 ℃		

Comments: Material resistance to be confirmed by supplier (see cooling water Analysis)

Pipe bundle

Material, tube bundle	S.S 304	Number of routes (pipe side)	
Material number, tube bundles		Number of inner pipes	
Allowable pressure, tube bundle	10.00 bar (g)	Pipe diameter	mm
Allowable temperature, tube bundle	120 ℃	Corrosion allowance	0 mm

Comments: Material resistance to be confirmed by supplier (see cooling water Analysis)

Rev.	Remark	Date	drawn	checked	released
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Jobnumber	Unit-No. / Assembly

For Rev. 01 — Sheet 1 of 3

شرکت ملی صنایع پتروشیمی
شرکت پژوهش و فناوری پتروشیمی

Data sheet
E-533

Plant Label
PP-PE PILOT PLANT

Customer`s Jobname	Customer`s Jobnumber	Customer`s Documentnumber

Paint/surface processing

Surface preparation inside			Coat	no
Surface preparation outside			Layer thickness	µm
			Top coat paint acc. to RAL	n.a.
Comments				

Insulation

Insulation	cold (insulation by customer)	Insulation thickness	70 mm
Fastening clips for insulation	customer guidelines		
Comments	insulation clips to be considered		

Main dimensions

Nominal volume (gross volume)			m³		Length	1070 mm
	Min.	Normal	Max.		Width/diameter	140 mm
Work volume (net volume)			m³	01	*Height (total)*	*450* mm

Weights

		Min.	Normal	Max.	01	*Empty weight* *70.0* kg
01	*Operating weight*			*85* kg		Maintenance weight kg

Accessories

anchoring/fastening material to be delivered also

Fastening material	no	Grounding clip	none
Design type	n.a.	Transport eye	no

Accessories in Subvendor's Scope of Supply

Pollutant filter	n.a.	**safety valve (coolant side)**	
Condensate drain	n.a.	safety valve	no
		Manufacturer	
		type	
Comments	HIGHT OF SUPPORTS OF HEAT EXCHANGER TO BE ADAPTED ACC. TO CUSTOMERS REQUIREMENT!!!		

Table of Nozzles

Rev.	Item	Description	Diameter	Rating	Connection Type	Flange Standard	Remarks
	N1	Gas Inlet	5"	150 lbs	flanged		flange to be drilled acc. to ANSI B16.5, 150 lbs.
	N2	Gas Outlet	5"	150 lbs	flanged		flange to be drilled acc. to ANSI B16.5, 150 lbs.
	N3	Cooling Water Inlet	1 1/2"	150 lbs	flanged		flange to be drilled acc. to ANSI B16.5, 150 lbs.
	N4	Cooling Water Outlet	1 1/2"	150 lbs	flanged		flange to be drilled acc. to ANSI B16.5, 150 lbs.

Rev.	Remark	Date	drawn	checked	released
00					
01					

	Jobnumber	Unit-No. / Assembly

شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی	Data sheet E-533	Plant Label PP-PE PILOT PLANT
Customer`s Jobname	Customer`s Jobnumber	Customer`s Documentnumber

Applicable Documents

Documentation request/ -schedule

Inspections/ Test

QC plan at supplier	yes		Tests with customer participation	inform customer + certificate
Test guidelines	manufacturer			
Country specific test regulations				
Certification				
Manufacturing certificates				
Material certificates				
Pressure equipment directive PED				
pressure equipment directive				
PED fluid group				
PED category				
PED module				
Comments				

Remarks

Attach Coperion nameplate	yes		Language for labels/nameplates	english
Attach customer's nameplate	no		Language warning and directive labels	english
Item no. on stainless steel label	yes			
Comments				
Document no. CWA				
Seller to check all data and correct or add applicable.				

Rev.	Remark	Date	drawn	checked	released
00					
01					

	Jobnumber	Unit-No. / Assembly

EXCHANGER 7011 A

REVISED DATA ROW NUMBER	ISSUE	DESCRIPTION	DRAWN UP	VERIFIE	APROVED	DATE

National Petrochemical Company
Petrochemical Research & Technology Company

SAZ CATALYST PLANT

DOCUMENT NUMBER

PROCESS DATA SHEET

SHEET N. 2 OF 5 ISSUE 0

E-7011 A

1	SERVICE	HEXANE CONDENSOR						QUANTITY	1		
2	INSTALLATION			SERVICE TYPE				PLANT UNIT	700		
3	TYPE	BEM	HORIZONTAL	TEMA CLASS	R - refinery service			INCLUDED IN			
4	N. OF UNITS		SHELL / UNIT	PARALLEL / SERIES	1			SURF. PER SHELL / UNIT	6.3	m^2	
5	DATA OF ONE UNIT										
6				SHELL SIDE				TUBE SIDE			
7	FLUID NAME/		HAZARDOUSNESS	HEXANE				COOLING WATER			
8	TOTAL FLOWRATE		kg/h	1500				13000			
9	LIQUID [Kg/h]		GAS AND VAPOURS	INLET		OUTLET		INLET		OUTLET	
10	VAPOR [Kg/h]			1500							
11											
12	LIQUID [Kg/h]					1500		13000		13000	
13								.			
14											
15				INLET		AVERAGE	OUTLET	INLET		AVERAGE	OUTLET
16	OPERATING TEMPERATURE		°C	68		53.00	38	20		25.5	31
17	OPERATING PRESSURE		bar(g)	0		-0.04	-0.08	5		4.95	4.9
18	LIQUID	DENSITY	kg/m^3				619	998			994
19		VISCOSITY	mPa s				0.3512	0.4881			0.5904
20		SPECIFIC HEAT	kJ/kg K				0.207	1			0.72
21		THERMAL CONDUCTIVITY	W/m K				0.1054	0.6			0.62
22		SURFACE TENSION	mN/M								
23		BOILING POINT	°C								
24	VAPOR	MOLECULAR WEIGHT		3.16							
25		DENSITY	kg/m^3	0.0075							
26		VISCOSITY	mPa s	1.976							
27		SPECIFIC HEAT	kJ/kg K	0.0173							
28		THERMAL CONDUCTIVITY	W/m K								
29		DT / DP	°C/MPa								
30		LATENT HEAT	kJ/kg								
31		DEW POINT	°C	68.44							
32	VELOCITY		m/S	5			14.7	0.8			0.9
33	DP MAX. ALLOWED / ACTUAL		bar	0.1	/		0.07	0.5	/		0.09
34	FOULING FACTOR		°C m^2/w								
35	OVER DES. ON DUTY AND FLOW			%							
36	HEAT EXCHANGED			170 KW	LMTD (CORR.)		37.3	TRANSF. RATE DIRTY	955	$W/(m^2-K)$	
37	CONSTRUCTION OF ONE SHELL										
38	DES. PRESS. 1 / 2 / F.V. REQ.'D		bar(g)	3			YES	4			
39	DES. TEMP. 1 / 2 / F.V. TEMP		°C	105			@	70			@
40	MDMT	@	START-UP TEMP.		@				@		
41	CORROSION ALLOWANCE		mm								
42	NUMBER OF PASSES			1				1			
43	TUBES N.	43	OD / ID / THK	19.05	/	-	/ 1.65	LENGTH	mm	2500	
44	SHELL I.D./OD	213.54	/ 219.08	KETTLE I.D.				LAYOUT / PITCH	30	/	23.81
45	CROSS	TYPE				N.		SEALING STRIP PAIRS			
46	BAFFLES	CUT %	40	SPACING	205			INLET SPACING			
47	LONG. BAFFLE TYPE			INLET DEVICE		TUBE-TUBESH. JOINT					
48	TUBE WALL TMP CLEAN / DIRTY		/	INSULATION SHELL / TUBE				/			
49	MATERIAL	SHELL	SS 304	FRONT END				CHANNEL	SS 304		
50		TUBES	SS 304	REAR END				CH.COVER			
51		FIX. TUBESHEET	SS 304	FLOAT.TUBESHEET				FL.HEAD COV.			
52		CROSS BAFFLES		LONG. BAFFLES							
53	GASKETS	NOZZLES SHELL / TUBE				/		FLOAT. HEAD			
54		MAIN FLANGES SHELLSIDE						MAIN FLANGES TUBESIDE			

REVISED DATA ROW NUMBER	ISSUE	DESCRIPTION	DRAWNUP	VERIFIE	APROVED	DATE

National Petrochemical Company
Petrochemical Research & Technology Company

SAZ CATALYST PLANT

DOCUMENT NUMBER

PROCESS DATA SHEET
E-7011 A

SHEET N. 3 OF 5 | ISSUE 2

SERVICE HEXANE CONDENSOR | QUANTITY 1

PLANT UNIT 700

NOZZLE

POS.	N.	SERVICE	DN	RATING	FLANGE	FINISHING	NOTE
N1		SHELL IN	4"	**150#**	**SORF**		
N2		SHELL OUT	1"	**150#**	**SORF**		
N3		SHELL OUT	1"	**150#**	**SORF**		
N4		TUBE IN	1½"	**150#**	**SORF**		
N5		TUBE OUT	2"	**150#**	**SORF**		

REVISED DATA ROW NUMBER

National Petrochemical Company
Petrochemical Research & Technology Company

SAZ CATALYST PLANT

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PROCESS DATA SHEET
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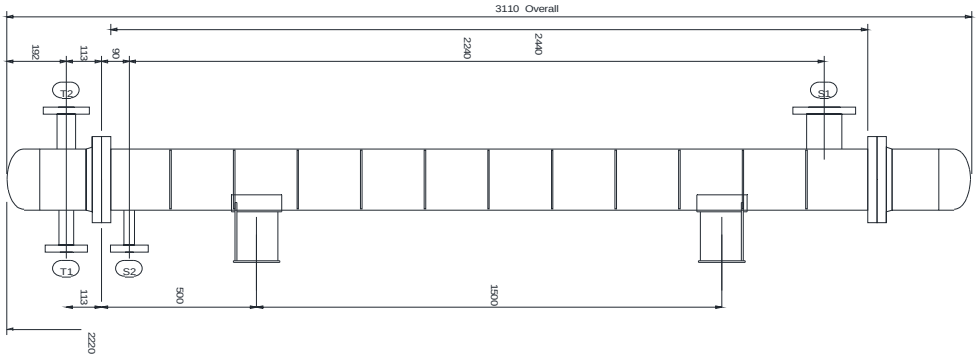
SHEET N. 4 OF 5 ISSUE 0

SERVICE	HEXANE CONDENSOR
QUANTITY	1
PLANT UNIT	700

SKETCH



REVISED DATA
ROW NUMBER

National Petrochemical Company Petrochemical Research & Technology Company	SAZ CATALYST PLANT	DOCUMENT NUMBER
	PROCESS DATA SHEET E-7011 A	SHEET N. 5 OF 5 ISSUE 0

1	SERVICE	HEXANE CONDENSOR	QUANTITY	1
2			PLANT UNIT	700
3				

NOTE

NOZZLE DATA SHEET NOTES

REVISED DATA ROW NUMBER

National Petrochemical Company Petrochemical Research & Technology Company	SAZ CATALYST PLANT	DOCUMENT NUMBER
	PROCESS DATA SHEET E-7021 A	SHEET N. 1 OF 5 ISSUE 0

EXCHANGER 7021 A

REVISED DATA ROW NUMBER	ISSUE	DESCRIPTION	DRAWN UP	VERIFIE	APROVED	DATE

National Petrochemical Company
Petrochemical Research & Technology Company

SAZ CATALYST PLANT

DOCUMENT NUMBER

PROCESS DATA SHEET

SHEET N. 2 OF 5 ISSUE 0

E-7021 A

1	SERVICE	HEXANE CONDENSOR						QUANTITY	1		
2	INSTALLATION			SERVICE TYPE				PLANT UNIT	700		
3	TYPE	BEM	HORIZONTAL	TEMA CLASS	R - refinery service			INCLUDED IN			
4	N. OF UNITS		SHELL / UNIT	PARALLEL / SERIES	1			SURF. PER SHELL / UNIT	6.3	m^2	
5	DATA OF ONE UNIT										
6				SHELL SIDE				TUBE SIDE			
7	FLUID NAME/		HAZARDOUSNESS	HEXANE				COOLING WATER			
8	TOTAL FLOWRATE		kg/h	1500				13000			
9	LIQUID [Kg/h]		GAS AND VAPOURS	INLET		OUTLET		INLET		OUTLET	
10	VAPOR [Kg/h]			1500							
11											
12	LIQUID [Kg/h]					1500		13000		13000	
13								.			
14											
15				INLET		AVERAGE	OUTLET	INLET		AVERAGE	OUTLET
16	OPERATING TEMPERATURE		°C	68		53.00	38	20		25.5	31
17	OPERATING PRESSURE		bar(g)	0		-0.04	-0.08	5		4.95	4.9
18	LIQUID	DENSITY	kg/m³				619	998			994
19		VISCOSITY	mPa s				0.3512	0.4881			0.5904
20		SPECIFIC HEAT	kJ/kg K				0.207	1			0.72
21		THERMAL CONDUCTIVITY	W/m K				0.1054	0.6			0.62
22		SURFACE TENSION	mN/M								
23		BOILING POINT	°C								
24	VAPOR	MOLECULAR WEIGHT		3.16							
25		DENSITY	kg/m³	0.0075							
26		VISCOSITY	mPa s	1.976							
27		SPECIFIC HEAT	kJ/kg K	0.0173							
28		THERMAL CONDUCTIVITY	W/m K								
29		DT / DP	°C/MPa								
30		LATENT HEAT	kJ/kg								
31		DEW POINT	°C	68.44							
32	VELOCITY		m/S	5.7			18.1	4			4
33	DP MAX. ALLOWED / ACTUAL		bar	0.1	/		0.07	0.5	/		0.09
34	FOULING FACTOR		°C m²/w								
35	OVER DES. ON DUTY AND FLOW			%							
36	HEAT EXCHANGED			170 KW	LMTD (CORR.)		37	TRANSF. RATE DIRTY	726	W/(m^2-K)	
37	CONSTRUCTION OF ONE SHELL										
38	DES. PRESS. 1 / 2 / F.V. REQ.'D		bar(g)	3			YES	4			
39	DES. TEMP. 1 / 2 / F.V. TEMP		°C	105			@	70			@
40	MDMT	@	START-UP TEMP.		@				@		
41	CORROSION ALLOWANCE		mm								
42	NUMBER OF PASSES			1				1			
43	TUBES N.	43	OD / ID / THK	19.05	/	-	/ 1.65	LENGTH	mm	2500	
44	SHELL I.D./OD	213.54	/ 219.08	KETTLE I.D.				LAYOUT / PITCH	30	/	23.81
45	CROSS	TYPE				N.		SEALING STRIP PAIRS			
46	BAFFLES	CUT %	40	SPACING	205			INLET SPACING			
47	LONG. BAFFLE TYPE			INLET DEVICE		TUBE-TUBESH. JOINT					
48	TUBE WALL TMP CLEAN / DIRTY		/	INSULATION SHELL / TUBE				/			
49	MATERIAL	SHELL	SS 304	FRONT END				CHANNEL	SS 304		
50		TUBES	SS 304	REAR END				CH.COVER			
51		FIX. TUBESHEET	SS 304	FLOAT.TUBESHEET				FL.HEAD COV.			
52		CROSS BAFFLES		LONG. BAFFLES							
53	GASKETS	NOZZLES SHELL / TUBE				/		FLOAT. HEAD			
54		MAIN FLANGES SHELLSIDE						MAIN FLANGES TUBESIDE			

REVISED DATA

ROW NUMBER	ISSUE	DESCRIPTION	DRAWNUP	VERIFIE	APROVED	DATE

National Petrochemical Company
Petrochemical Research & Technology Company

SAZ CATALYST PLANT

DOCUMENT NUMBER

PROCESS DATA SHEET
E-7021 A

SHEET N. 3 OF 5 | ISSUE 2

SERVICE HEXANE CONDENSOR | QUANTITY 1

PLANT UNIT 700

NOZZLE

POS.	N.	SERVICE	DN	RATING	FLANGE	FINISHING	NOTE
N1		SHELL IN	4"	**150#**	**SORF**		
N2		SHELL OUT	1"	**150#**	**SORF**		
N3		SHELL OUT	1"	**150#**	**SORF**		
N4		TUBE IN	1½"	**150#**	**SORF**		
N5		TUBE OUT	2"	**150#**	**SORF**		

REVISED DATA | ROW NUMBER

National Petrochemical Company
Petrochemical Research & Technology Company

SAZ CATALYST PLANT

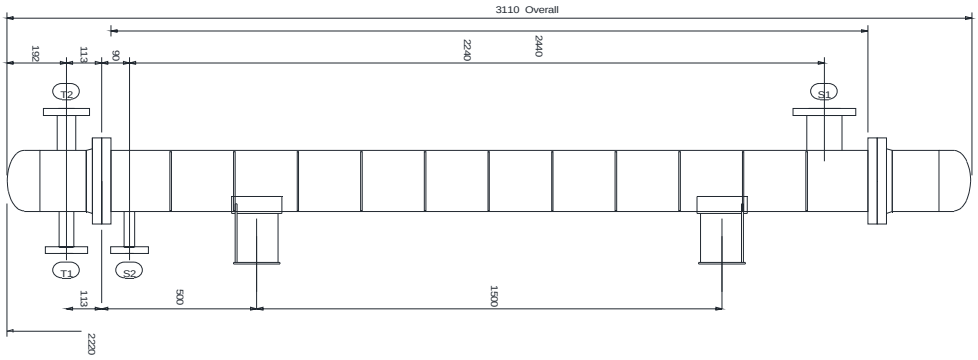
DOCUMENT NUMBER

PROCESS DATA SHEET
E-7021 A

SHEET N. 4 OF 5 ISSUE 0

SERVICE	HEXANE CONDENSOR	QUANTITY	1
		PLANT UNIT	700

SKETCH



REVISED DATA
ROW NUMBER

National Petrochemical Company Petrochemical Research & Technology Company	SAZ CATALYST PLANT	DOCUMENT NUMBER	
	PROCESS DATA SHEET E-7021 A	SHEET N. 5 OF 5	ISSUE 0

SERVICE	HEXANE CONDENSOR	QUANTITY	1
		PLANT UNIT	700

NOTE

NOZZLE DATA SHEET NOTES

REVISED DATA ROW NUMBER

National Petrochemical Company Petrochemical Research & Technology Company	SAZ CATALYST PLANT	DOCUMENT NUMBER
	PROCESS DATA SHEET E-8023	SHEET N. 1 OF 5 ISSUE 0

EXCHANGER 8023

REVISED DATA ROW NUMBER	ISSUE	DESCRIPTION	DRAWN UP	VERIFIE	APROVED	DATE

National Petrochemical Company
Petrochemical Research & Technology Company

SAZ CATALYST PLANT

DOCUMENT NUMBER

PROCESS DATA SHEET
E-8023

SHEET N. 2 OF 5 ISSUE 0

1	SERVICE	HEXANE REBOILER							QUANTITY	1			
2	INSTALLATION			SERVICE TYPE					PLANT UNIT	700			
3	TYPE	BEM	VERTICAL	TEMA CLASS	R - refinery service				INCLUDED IN				
4	N. OF UNITS		SHELL / UNIT	PARALLEL / SERIES	1				SURF. PER SHELL / UNIT	7	m^2		
5	DATA OF ONE UNIT												
6				SHELL SIDE					TUBE SIDE				
7	FLUID NAME/		HAZARDOUSNESS	STEAM					HEXANE				
8	TOTAL FLOWRATE		kg/h	112					700				
9	LIQUID [Kg/h]		GAS AND VAPOURS	INLET		OUTLET			INLET		OUTLET		
10	VAPOR [Kg/h]			112							700		
11													
12	LIQUID [Kg/h]					112			700				
13									.				
14													
15				INLET		AVERAGE		OUTLET	INLET		AVERAGE		OUTLET
16	OPERATING TEMPERATURE		°C	170		169.75		169.5	81.97		82		82.03
17	OPERATING PRESSURE		bar(g)	7.8		7.8		7.8	1.523		1.51		1.5
18	LIQUID	DENSITY	kg/m³					898	601.31				
19		VISCOSITY	mPa s					0.16	0.18				
20		SPECIFIC HEAT	kJ/kg K					4.4	2.5				
21		THERMAL CONDUCTIVITY	W/m K					0.67	0.099				
22		SURFACE TENSION	mN/M										
23		BOILING POINT	°C										
24	VAPOR	MOLECULAR WEIGHT		18.02									86.18
25		DENSITY	kg/m³	4.07									4.6
26		VISCOSITY	mPa s	0.0147									0.0078
27		SPECIFIC HEAT	kJ/kg K	2.46									1.9
28		THERMAL CONDUCTIVITY	W/m K	0.0347									0.0185
29		DT / DP	°C/MPa										
30		LATENT HEAT	kJ/kg										
31		DEW POINT	°C										
32	VELOCITY		m/S										
33	DP MAX. ALLOWED / ACTUAL		bar	0.26	/			1.84	1.34	/			2.65
34	FOULING FACTOR		°C m²/w										
35	OVER DES. ON DUTY AND FLOW			%									
36	HEAT EXCHANGED			63.6 KW	LMTD (CORR.)	87.3	TRANSF. RATE DIRTY	104.4 W/(m²-K)					
37	CONSTRUCTION OF ONE SHELL												
38	DES. PRESS. 1 / 2 / F.V. REQ.'D		bar(g)	9				YES	3				
39	DES. TEMP. 1 / 2 / F.V. TEMP		°C					@					@
40	MDMT @		START-UP TEMP.		@					@			
41	CORROSION ALLOWANCE		mm										
42	NUMBER OF PASSES			1					1				
43	TUBES N.	81	OD / ID / THK	19.05	/	-	/	1.65	LENGTH	mm	1500		
44	SHELL I.D./OD	257.45 / 273.05	KETTLE I.D.						LAYOUT / PITCH	30	/	23.81	
45	CROSS	TYPE					N.		SEALING STRIP PAIRS				
46	BAFFLES	CUT %	18	SPACING	150				INLET SPACING				
47	LONG. BAFFLE TYPE			INLET DEVICE		TUBE-TUBESH. JOINT							
48	TUBE WALL TMP CLEAN / DIRTY		/	INSULATION SHELL / TUBE					/				
49	MATERIAL	SHELL	CS	FRONT END					CHANNEL	SS 304			
50		TUBES	SS 304	REAR END					CH.COVER				
51		FIX. TUBESHEET	SS 304	FLOAT.TUBESHEET					FL.HEAD COV.				
52		CROSS BAFFLES	CS	LONG. BAFFLES									
53	GASKETS	NOZZLES SHELL / TUBE				/			FLOAT. HEAD				
54		MAIN FLANGES SHELLSIDE					MAIN FLANGES TUBESIDE						

REVISED DATA ROW NUMBER	ISSUE	DESCRIPTION	DRAWNUP	VERIFIE	APROVED	DATE

National Petrochemical Company
Petrochemical Research & Technology Company

SAZ CATALYST PLANT

DOCUMENT NUMBER

PROCESS DATA SHEET
E-8023

SHEET N. 3 OF 5 | ISSUE 2

SERVICE HEXANE CONDENSOR | QUANTITY 1

PLANT UNIT 700

NOZZLE

POS.	N.	SERVICE	DN	RATING	FLANGE	FINISHING	NOTE
N1		SHELL IN	1	**150#**	**SORF**		
N2		SHELL OUT	½	**150#**	**SORF**		
N3		TUBE IN	1	**150#**	**SORF**		
N4		TUBE OUT	3	**150#**	**SORF**		

REVISED DATA | ROW NUMBER

National Petrochemical Company
Petrochemical Research & Technology Company

SAZ CATALYST PLANT

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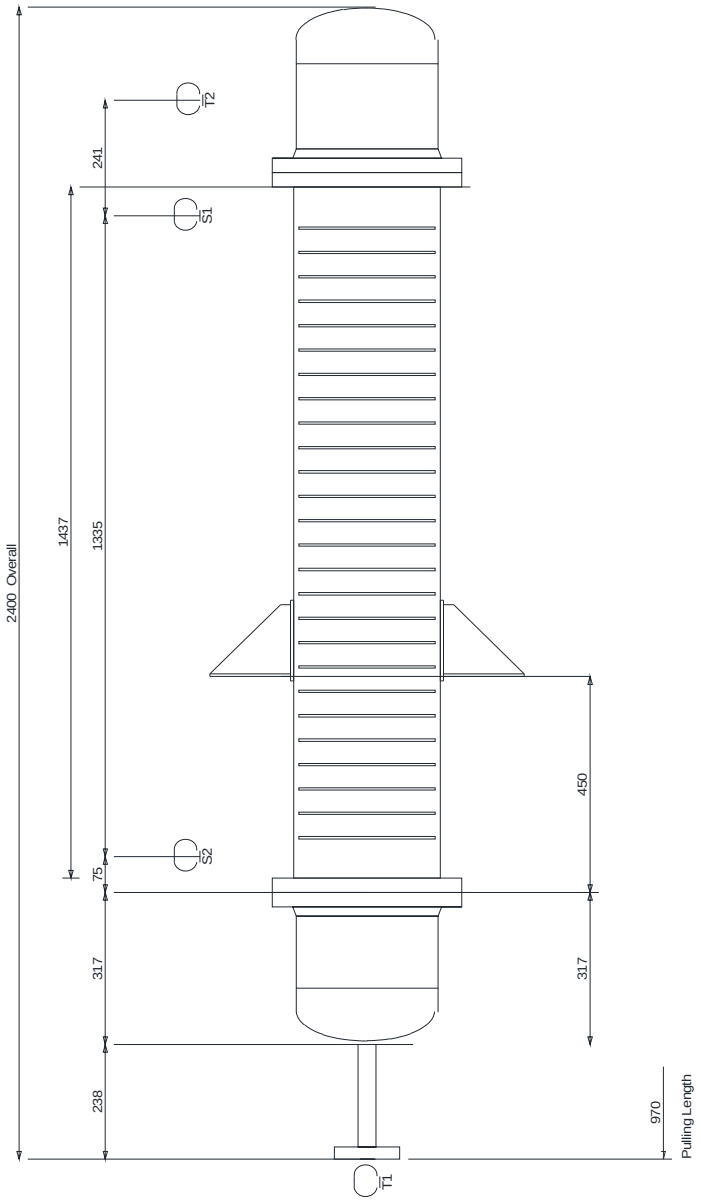
PROCESS DATA SHEET
E-8023

SHEET N. 4 OF 5 ISSUE 0

SERVICE	HEXANE CONDENSOR	QUANTITY	1
		PLANT UNIT	700

SKETCH



REVISED DATA
ROW NUMBER

National Petrochemical Company
Petrochemical Research & Technology Company

SAZ CATALYST PLANT

DOCUMENT NUMBER

PROCESS DATA SHEET
E-8023

SHEET N. 5 OF 5 ISSUE 0

SERVICE	HEXANE CONDENSOR	QUANTITY	1
		PLANT UNIT	700

NOTE

NOZZLE DATA SHEET NOTES

REVISED DATA
ROW NUMBER