

		<b>Output Summary</b>		Page 1
Released to the following HTRI Member Company:		YPFB REFINACION S.A. YPFB REFINACION S.A.		
Xhpe Ver. 6.00 24/09/2009 08:04 SN: 1500214177				<b>US Units</b>
TUBOS ASTM B111-443 KOCH HEAT TRANSFER : Summary Unit Rating - Horizontal Hairpin				
<b>No Data Check Messages.</b> <b>No Runtime Messages.</b>				
<b>Process Conditions</b>		<b>Hot Shellside</b>		<b>Cold Tubeside</b>
Fluid name				
Flow rate	(1000-lb/hr)		18.2580	34.8400
Inlet/Outlet Y	(Wt. frac vap.)	0.000	0.000	0.000
Inlet/Outlet T	(Deg F)	100.40	76.90	71.60
Inlet P/Avg	(psia)	439.696		54.696
dP/Allow.	(psi)	2.086	10.000	5.589
Fouling	(ft2-hr-F/Btu)		0.00100	0.00000
<b>Exchanger Performance</b>				
Shell h	(Btu/ft2-hr-F)	196.57	Actual U	(Btu/ft2-hr-F) 48.71
Tube h	(Btu/ft2-hr-F)	1021.55	Required U	(Btu/ft2-hr-F) 43.78
Hot regime	(--)	Sens. Liquid	Duty	(MM Btu/hr) 0.2587
Cold regime	(--)	Sens. Liquid	Area	(ft2) 504.587
EMTD	(Deg F)	11.7	Overdesign	(%) 11.28
<b>Shell Geometry</b>		<b>Baffle Geometry</b>		
Type	(--)	Hairpin	Baffle type	(--)
Shell ID	(inch)	3.0680	Baffle cut	(Pct Dia.)
Series	(--)	2	Baffle orientation	(--)
Parallel	(--)	2	Central spacing	(inch) 478.421
Orientation	(deg)	0.00	Crosspasses	(--)
<b>Tube Geometry</b>		<b>Nozzles</b>		
Tube type	(--)	Longitudinal Fin	Shell inlet	(inch) 2.0670
Tube OD	(inch)	1.9000	Shell outlet	(inch) 2.0670
Nominal length	(ft)	19.750	Inlet height	(inch) 0.5840
Pitch ratio	(--)		Outlet height	(inch) 0.5840
Layout	(deg)	30	Tube inlet	(inch) 1.0490
Tubecount	(--)	1	Tube outlet	(inch) 1.0490
<b>Thermal Resistance, %</b>		<b>Velocities, ft/sec</b>		<b>Flow Fractions</b>
Shell	24.78	Shellside	2.53	A
Tube	35.80	Tubeside	5.44	B
Fouling	4.87	Crossflow		C
Metal	34.55	Window	2.53	E
				F



## Series Summary

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Released to the following HTRI Member Company:

YPFB REFINACION S.A.

YPFB REFINACION S.A.

Xhpe Ver. 6.00 24/09/2009 08:04 SN: 1500214177

US Units

TUBOS ASTM B111-443

KOCH HEAT TRANSFER : Summary Unit

Rating - Horizontal Countercurrent Flow Hairpin

Unit #	1	2
<b>Performance</b>		
Overdesign (%)	11.29	11.28
Overall U (Btu/ft2-hr-F)	49.03	48.40
Required U (Btu/ft2-hr-F)	44.06	43.49
Duty (MM Btu/hr)	0.1737	0.0849
Shellside h (Btu/ft2-hr-F)	197.95	195.19
Tubeside h (Btu/ft2-hr-F)	1033.61	1009.61
Shellside delta P (psi)	1.044	1.042
Tubeside delta P (psi)	2.788	2.801
EMTD (F)	15.6	7.7
<b>Process Conditions</b>		
Inlet T, Shell (F)	100.40	84.74
Outlet T, Shell (F)	84.74	76.90
Inlet T, Tube (F)	73.97	71.60
Outlet T, Tube (F)	78.80	73.97
Inlet Y, Shell (Wt. fraction)	0.0000	0.0000
Outlet Y, Shell (Wt. fraction)	0.0000	0.0000
Inlet Y, Tube (Wt. fraction)	0.0000	0.0000
Outlet Y, Tube (Wt. fraction)	0.0000	0.0000
<b>Geometry</b>		
Shell type (--)	E	E
Parallel (--)	2	2
Effective area (ft2)	252.294	252.294
Shell orientation (--)	Horizontal	Horizontal
Shell ID (inch)	3.0680	3.0680
Shellside fluid (--)	Hot	Hot
Baffle type (--)	None	None
Baffle cut (Pct Dia.)		
Baffle orientation (--)		
Central spacing (inch)	478.421	478.421
Crosspasses (--)	1	1
Tube type (--)	Longitudinal Fin	Longitudinal Fin
Tube Pass (--)	1	1
Tubecount (--)	1	1
Tube length (ft)	40.185	40.185
Tube OD (inch)	1.9000	1.9000
Tube layout angle (--)	30	30
Pitch ratio (--)		

HTRI		HEAT EXCHANGER RATING DATA SHEET				Page 3 US Units			
Service of Unit		Item No.							
Type	Hairpin	Orientation		Horizontal	Connected In		2 Parallel 2 Series		
Surf/Unit (Gross/Eff)		505.22 / 504.59 ft2		Shell/Unit	4		Surf/Shell (Gross/Eff) 126.30 / 126.15 ft2		
PERFORMANCE OF ONE UNIT									
Fluid Allocation		Shell Side			Tube Side				
Fluid Name									
Fluid Quantity, Total		1000-lb/hr			18.2580				
Vapor (In/Out)		wt%			0.0				
Liquid		wt%			100.0				
Temperature (In/Out)		F			100.40				
Density		lb/ft3			33.339				
Viscosity		cP			0.1258				
Specific Heat		Btu/lb-F			0.6173				
Thermal Conductivity		Btu/hr-ft-F			0.0491				
Critical Pressure		psia							
Inlet Pressure		psia			439.696				
Velocity		ft/sec			2.53				
Pressure Drop, Allow/Calc		psi			10.000				
Average Film Coefficient		Btu/ft2-hr-F			196.57				
Fouling Resistance (min)		ft2-hr-F/Btu			0.00100				
Heat Exchanged		0.2587 MM Btu/hr			MTD (Corrected)		11.7 F		
Transfer Rate, Service		43.78 Btu/ft2-hr-F			Calculated		48.71 Btu/ft2-hr-F		
					Clean		51.21 Btu/ft2-hr-F		
CONSTRUCTION OF ONE SHELL				Sketch (Bundle/Nozzle Orientation)					
		Shell Side		Tube Side					
Design Pressure		psig		424.478				150.000	
Design Temperature		F		92.57				92.57	
No Passes per Shell				1				1	
Flow Direction				Downward					
Connections		In inch		1 @ 2.0670		1 @ 1.0490			
Size & Rating		Out inch		1 @ 2.0670		1 @ 1.0490			
		Liq. Out inch		@		@			
Tube No.		1 OD 1.9000 inch		Thk(Avg) 0.1450 inch		Length 40.185 ft			
Tube Type		Longitudinal Fin		Material NOT IN DATA BANK		Pitch inch			
Shell ID		3.0680 inch		Kettle ID		inch			
Cross Baffle Type		%Cut (Diam)		Impingement Plate		None			
Spacing(c/c)		478.421 inch		Inlet		inch			
Rho-V2-Inlet Nozzle		lb/ft-sec2		Shell Entrance		Shell Exit			
				Bundle Entrance		Bundle Exit			
Weight/Shell		Filled with Water		Bundle					
Notes:		Thermal Resistance, %		Velocities, ft/sec		Flow Fractions			
		Shell 24.78		Shellside 2.53		A			
		Tube 35.80		Tubeside 5.44		B 1.000			
		Fouling 4.87		Crossflow		C 0.000			
		Metal 34.55		Window 2.53		E			
						F			

