

Heat Exchanger Specification Sheet

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6	Size 431.8 / 3000mm Type BEM Hor Connected in 1 parallel 1 series
7	Surf/unit(eff.) 42.5 m2 Shells/unit 1 Surf/shell (eff.) 42.5 m2
8	PERFORMANCE OF ONE UNIT
9	Fluid allocation Shell Side Tube Side
10	Fluid name
11	Fluid quantity, Total kg/h 1072 2098
12	Vapor (In/Out) kg/h 1072 0 0 2098
13	Liquid kg/h 0 1072 2098 0
14	Noncondensable kg/h 0 0
15	
16	Temperature (In/Out) C 100 62.67 20 65.86
17	Dew / Bubble point C 99.63 99.63 64.2 64.2
18	Density (Vap / Liq) kg/m3 .58 / / 981.78 / 794.38 1.08 /
19	Viscosity cp .0126 / / .4548 / .5755 .0111 /
20	Molecular wt, Vap 18.02 32.04
21	Molecular wt, NC
22	Specific heat kcal/(kg*C) .4544 / / .9981 / .6542 .3529 /
23	Thermal conductivity kcal/(h*m*C) .021 / / .56 / .173 .017 /
24	Latent heat kcal/kg 541.57 542.03 262.33 263.14
25	Pressure (abs) kgf/cm2 1.02 .993 1.02 .96

26	Velocity	m/s	16.51				26.37					
27	Pressure drop, allow./calc.	kgf/cm2	.204		.026		.204		.06			
28	Fouling resistance (min)	m2*h*C/kcal	0				0	0	Ao based			
29	Heat exchanged	620348	kcal/h	MTD corrected				31.48	C			
30	Transfer rate, Service	463.4	Dirty	464.9	Clean	464.9	kcal/(h*m2*C)					
31	CONSTRUCTION OF ONE SHELL						Sketch					
32		Shell Side			Tube Side							
33	Design/vac/test pressure:g	kgf/cm2	3.515	/	/	3.515	/				/	
34	Design temperature	C	137.78			104.44						
35	Number passes per shell		1			2						
36	Corrosion allowance	mm	3.18			3.18						
37	Connections	In	mm	1	101.6	/	-	1	25.4	/	-	
38	Size/rating	Out		1	19.05	/	-	1	101.6	/	-	
39	Nominal	Intermediate			/	-			/	-		
40	Tube No.	243	OD	19.05	Tks- Avg	2.11	mm	Length	3000	mm	Pitch23.81	mm
41	Tube type	Plain	Material				Carbon Steel		Tube pattern	30		
42	Shell	Carbon Steel	ID	438.15	OD	457.2	mm	Shell cover	-			
43	Channel or bonnet	Carbon Steel						Channel cover	-			
44	Tubesheet-stationary	Carbon Steel						Tubesheet-floating	-			
45	Floating head cover	-						Impingement protection	None			
46	Baffle-cross	Carbon Steel	Type	Single segmental		Cut(%d)	41.31	H	Spacing: c/c	596.9	mm	
47	Baffle-long	-			Seal type				Inlet	566.55	mm	
48	Supports-tube	U-bend				Type						
49	Bypass seal	Tube-tubesheet joint				Exp. 2 grv						
50	Expansion joint	-			Type							
51	RhoV2-Inlet nozzle	2248	Bundle entrance			62	Bundle exit		0	kg/(m*s2)		
52	Gaskets - Shell side	-			Tube Side		Flat Metal Jacket Fibe					

53	Floating head	-						
54	Code requirements	ASME Code Sec VIII Div 1		TEMA class	R - refinery service			
55	Weight/Shell	1272	Filled with water	1705.4	Bundle	755.7		kg
56	Remarks							
57								
58								

Overall Performance

Design (Sizing)		Shell Side			Tube Side				
Total mass flow rate	kg/h	1072			2098				
Vapor mass flow rate (In/Out)	kg/h	1072		0	0	2098			
Liquid mass flow rate	kg/h	0		1072	2098	0			
Vapor mass quality		1		0	0	1			
Temperatures	C	100		62.67	20	65.86			
Dew point / Bubble point	C	99.63			64.2	64.2			
Operating Pressures	kgf/cm2	1.02		.993	1.02	.96			
Film coefficient	kcal/(h*m2*C)	6402.7			515.1				
Fouling resistance	m2*h*C/kcal	0			0				
Velocity (highest)	m/s	16.51			26.37				
Pressure drop (allow./calc.)	kgf/cm2	.204	/	.026	.204	/	.06		
Total heat exchanged	kcal/h	620348			Unit	BEM	2 pass	1 ser	1 par
Overall clean coeff. (plain/finned)	kcal/(h*m2*C)	464.9	/		Shell size	431.8	-	3000	mm Hor
Overall dirty coeff. (plain/finned)	kcal/(h*m2*C)	464.9	/		Tubes	Plain			
Effective area (plain/finned)	m2	42.5	/		No.	243	OD	19.05 Tks	2.11 mm
Effective MTD	C	31.48			Pattern	30	Pitch	23.81	mm
Actual/Required area ratio (dirty/clean)		1	/	1	Baffles	Single segmental		Cut(%d)	41.31
Vibration problem (Tasc/TEMA)		Possible	/	No					
RhoV2 problem		Yes			Total cost	21520	Dollar(US)		

Resistance Distribution

Overall Coefficient / Resistance Summary		Clean	Dirty	Max Dirty
Area required	m2	42.4	42.4	42.5
Area ratio: actual/required		1	1	1

Overall coefficient	kcal/(h*m2*C)	464.9	464.9	463.4
Overall resistance	m2*h*C/kcal	.00215	.00215	.00216
Shell side fouling	m2*h*C/kcal	0.0	0	0
Tube side fouling		0.0	0	0
Resistance Distribution	kcal/(h*m2*C)	m2*h*C/kcal	%	%
Shell side film	18632	.00016	7.26	7.24
Shell side fouling		0	0	.15
Tube wall	18632	.00005	2.49	2.49
Tube side fouling *		0	0	.15
Tube side film *	515.1	.00194	90.24	89.97

* Based on outside surface - Area ratio: Ao/Ai = 1.28

Heat Transfer Coefficients

Film coefficients		kcal/(h*m2*C)		Shell Side		Tube Side	
				Bare area (OD)	Finned area	Bare area (OD)	ID area
Overall film coefficients				6402.7	/	515.1	661.5
Vapor sensible				4288.2	/	77.9	100.1
Two phase				9311.5	/	505.6	649.3
Liquid sensible				1326.4	/	974.8	1251.9
Heat Transfer Parameters				In	Out	In	Out
Prandtl numbers	Vapor			.98			.85
	Liquid				2.92	7.83	
Reynolds numbers	Vapor Nominal			8501.25			36193.75
	Liquid Nominal				235.04	695.4	

MTD and Flux

Temperature Difference	C	Heat Flux (based on tube O.D)	kcal/(h*m2)
Overall effective MTD	31.48	Overall actual flux	16771

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