

Xist Ver. 6.00 SP3 07/02/2014 14:56 SN: 1500215039

**CE Units**

Rating - Horizontal Multipass Flow TEMA BFU Shell With Single-Segmental Baffles

Process Data		Hot Shellside		Cold Tubeside		Shellside Performance					
2	Fluid name	H2SO4 85%		HNO3 68%		Nom vel, X-flow/window 0,27 / 0,68					
3	Fluid condition	Sens. Liquid		Sens. Liquid		Flow fractions for heat transfer 0,848					
4	Total flow rate	(kg/hr)	30000,0		21000,0	A=2,362e-4 B=0,8377 C=0,1041 E=0,0580 F=0,0000					
5	Weight fraction vapor, In/Out	(--)	0,000	0,000	0,000						
6	Temperature, In/Out	(Deg C)	153,60	106,95	68,30						
7	Temperature, Average/Skin	(Deg C)	130,27	115,41	94,15						
8	Wall temperature, Min/Max	(Deg C)	84,76	138,37	84,50						
9	Pressure, In/Average	(bar-G)	8,000	7,855	7,500						
10	Pressure drop, Total/Allowed	(kgf/cm2)	0,296	0,340	0,157						
11	Velocity, Mid/Max allow	(m/s)	0,27		0,80						
12	Mole fraction inert	(--)									
13	Average film coef.	(kcal/m2-hr-C)		2448,20		2729,08					
14	Heat transfer safety factor	(--)		1,000		1,000					
15	Fouling resistance	(m2-hr-C/kcal)		0,000100		0,000100					
16	<b>Overall Performance Data</b>										
17	Overall coef., Reqd/Clean/Actual	(kcal/m2-hr-C)	961,25 /	1242,69 /	989,72						
18	Heat duty, Calculated/Specified	(kW)	765, /								
19	Effective overall temperature difference	(Deg C)	31,9								
20	EMTD = (MTD) * (DELTA) * (F/G/H)	(Deg C)	33,24 *	0,9966 *	0,9634						
21											
23	See Runtime Messages Report for warnings.										
24											
25											
26	<b>Exchanger Fluid Volumes</b>										
27	Approximate shellside (L)		269,3								
28	Approximate tubeside (L)		168,9								
29	<b>Shell Construction Information</b>										
30	TEMA shell type	BFU	Shell ID	(mm)	346,000						
31	Shells Series	1 Parallel	1	Total area	(m2)	21,652					
32	Passes Shell	2 Tube	4	Eff. area	(m2/shell)	21,451					
33	Shell orientation angle (deg)		0,00								
34	Impingement present		No								
35	Pairs seal strips		0	Passlane seal rods (mm)	0,000	No. 0					
36	Shell expansion joint		No	Full support at U-Bend		No					
37	Weight estimation Wet/Dry/Bundle		1346,31 /	908,41 /	282,50 (kg/shell)						
38											
39	<b>Baffle Information</b>										
40	Type	Parallel	Single-Seg.	Baffle cut (% dia)	25,00						
41	Crosspasses/shellpass		16	No. (Pct Area)	(mm) to C.L						
42	Central spacing	(mm)	250,000	1	20,34	86,500					
43	Inlet/Outlet Spacing	(mm)	461,885	2	0,00	0,000					
44	Turn Spacing	(mm)	212,708								
45	Baffle thickness	(mm)	3,175	Long. baffle length	(mm)	3962,					
46	Insulated long baffle		No								
47											
48	<b>Tube Information</b>										
49	Tube type		Plain	Tubecount per shell	88						
50	Length to tangent	(mm)	4000,	Pct tubes removed (both)	5,68						
51	Effective length	(mm)	4073,	Outside diameter	(mm)	19,050					
52	Total tubesheet	(mm)	38,075	Wall thickness	(mm)	0,500					
53	Area ratio	(out/in)	1,0554	Pitch (mm)	27,0000	Ratio	1,4173				
54	Tube metal	Tantalum		Tube pattern (deg)	45						
						<b>Shellside Heat Transfer Corrections</b>					
						Total	Beta	Gamma	End	Fin	
						0,984	0,919	1,071	0,965	1,000	
						<b>Pressure Drops (Percent of Total)</b>					
						Cross	Window	Ends	Nozzle	Shell	Tube
						24,80	56,81	10,02	Inlet	4,18	4,02
						MOMENTUM		0,00	Outlet	4,20	2,69
						<b>Two-Phase Parameters</b>					
						Method	Inlet	Center	Outlet	Mix F	
						<b>H. T. Parameters</b>					
						Overall wall correction		Shell	1,988	Tube	1,014
						Midpoint	Prandtl no.		14,16		5,65
						Midpoint	Reynolds no.		4649		19823
						Bundle inlet	Reynolds no.		1387		12810
						Bundle outlet	Reynolds no.		2950		31294
						Fouling layer	(mm)				
						<b>Thermal Resistance</b>					
						Shell	Tube	Fouling	Metal	Over Des	
						40,43	38,27	20,36	0,94	2,96	
						Total fouling resistance					2,055e-4
						Differential resistance					2,992e-5
						<b>Shell Nozzles</b>					
						Inlet at channel end-Yes		Inlet	Outlet	Liquid	Outlet
						Number at each position		1	1		0
						Diameter	(mm)	77,927	77,927		
						Velocity	(m/s)	1,01	1,00		
						Pressure drop	(kgf/cm2)	0,012	0,012		
						Height under nozzle	(mm)	26,899	26,899		
						Nozzle R-V-SQ	(kg/m-s2)	1764,00	1745,69		
						Shell ent.	(kg/m-s2)	623,18	616,71		
						<b>Tube Nozzle</b>					
								Inlet	Outlet	Liquid	Outlet
						Diameter	(mm)	77,927	77,927		
						Velocity	(m/s)	0,92	0,96		
						Pressure drop	(kgf/cm2)	6,300e-3	4,209e-3		
						Nozzle R-V-SQ	(kg/m-s2)	1123,18	1179,04		
						<b>Annular Distributor</b>					
						Length	(mm)		Inlet	Outlet	
						Height	(mm)				
						Slot area	(mm2)				
						<b>Diametral Clearances (mm)</b>					
						Baffle-to-shell	Bundle-to-shell		Tube-to-baffle		
						2,0000	11,0913		0,1000		