

108982

# Plate Heat Exchanger



## Technical Specification

Customer : E. I. DuPont  
 Model : TS6-MFG  
 Project: : Danisco PF HX Package 9-17-09  
 Item : E900 ET TW HX-TS6MFG

Date: 11/14/2009

		Hot Side	Cold side
Fluid		Steam	Water
Density	lb/ft <sup>3</sup>	0.1298	62.45
Specific heat capacity	Btu/lb, °F	0.55	1.00
Thermal conductivity	Btu/ft, h, °F	0.0163	0.338
Viscosity inlet	cP	0.0139	1.52
Viscosity outlet	cP	0.0139	1.27
Batch mass	lb	6618	
Start temperature	°F	41.0	
End temperature	°F	104.0	
Batch time	min	60.00	
Volume flow rate	GPM	505.8	
Inlet temperature	°F	290.7	41.0
Outlet temperature	°F	290.7	52.0
Pressure drop	psi	0.0564	7.62
Heat Exchanged	kBtu/h	482.8	
L.M.T.D.	°F	244.1	
O.H.T.C service	Btu/ft <sup>2</sup> , h, °F	268.1	
Heat transfer area	ft <sup>2</sup>	7.4	
Relative directions of fluids		Countercurrent	
Number of plates		10	
Effective Plates		8	
Number of passes		1	1
Extension capacity		3	
Plate material		ALLOY 316	
Sealing material		EPDMP CLIP-ON	EPDMP CLIP-
ON			
Connection material		Stainless steel	Stainless steel
Connection diameter	in	3	3
Nozzle orientation		S4 -> S3	S1 <- S2
Pressure vessel code		ASME	
Flange rating		ASME 150	
Design pressure	psi	150.0	150.0
Test pressure	psi	195.0	195.0
Design temperature	°F	347.0	347.0
Overall length x width x height	in	21 x 16 x 28	
Liquid volume	ft <sup>3</sup>	0.1	0.1
Net weight, empty / operating	lb	275 / 280	

Performance is conditioned on the accuracy of customers data and customers ability to supply equipment

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Date/ Author/ Revision                      September 3, 2009                      DCF/ALS                      Rev. 0

Equipment Identification			
Equipment Type:	Plate & Frame Heat Exchanger		
Equipment Name:	ET Tempered Water Heat Exchanger		
Tag:	E900		
PID:	P200		
Service Description:	System Heat-up Duty: Raise the temperature of cooling tower water make-up and the system metal mass from ambient to the tempered water circulation temperature required for process heating. Process Heating Duty: Maintain the operating temperature of the tempered water circulated through the process tank jacket as required for process heating.		
Application Type:	Batch Heating		
Use, hr/day / days/week	8 / 5		
Manufacturer, Model:	By Supplier		
Attachments			
The following files are part of this Equipment Data Sheet and are to be included as attachments: E900 ET Tempered Water Heat Exchanger VD DCF R0.pdf			
Duty			
Water Flow Rate, kg/hr (Cold Side)	19,870		
Operating Pressure, barg	Cold Side In 2.0	Cold Side Out 1.3	Hot Side 3.0
System Heat-up			
Initial System Metal Temp., C	15		
Initial System Water Temp., C	28		
Final System Temperature, deg C	80		
TW System Liquid Inventory, kg	628		
TW Specific Heat, kcal/kg K	1.00		
TW Liquid Sensible Duty, kcal	32,700		
System Metal Mass, kg	2,425		
Metal Specific Heat, kcal/kg K	0.12		
Metal Sensible Duty, kcal	18,900		
Total Heat-up Heat Load, kcal	51,600		
Heat-up Time, min	30		
Average Duty, kcal/hr	103,200		Average duty overall system heat-up step.
Average Steam Rate, kg/hr	200		
Maximum (Design) Duty, kcal/hr	127,400		This maximum duty case accounts for higher heat transfer rate required at start of the system heat-up step.
Maximum Steam Rate, kg/hr	250		
Minimum Duty, kcal/hr	71,300		This minimum duty case represents maximum turndown requirement which will occur at the end of the system heat-up step.
Minimum Steam Rate, kg/hr	140		
Process Heating			
Process Heating Time, min	60		
Initial Process Temperature, C	5		
Final Process Temperature, C	40		
Process Liquid Mass, kg	2,995		
Total Heat-up Heat Load, kcal	105,100		
Average Duty, kcal/hr	105,100		Average duty overall process heating step duration.
Average Steam Rate, kg/hr	210		
Cold Side Water Temp. @Avg. C	Inlet 75	Outlet 80	
Maximum (Design) Duty, kcal/hr	147,700		Maximum duty is the higher heat transfer rate required at start of the process heating step.
Maximum Steam Rate, kg/hr	290		
Cold Side Water Temp. @Max. C	Inlet 73	Outlet 80	
Minimum Duty, kcal/hr	81,500		Minimum duty is the lower heat transfer rate required at end of the process heating step.
Minimum Steam Rate, kg/hr	160		
Cold Side Water Temp. @Min. C	Inlet 76	Outlet 80	

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Fluid Properties	Cold Side			Hot Side	
Fluid	Tempered Water			Steam	
Temperature, deg C	28.0	80.0	143.7	@Sat 3.0 bar g	
Density, g/ml	0.996	0.972	0.00214		
Specific Heat, kcal/kg K	0.993	1.002	0.456		
Viscosity, cp	0.833	0.354	0.0135		
Thermal Conductivity, W/m K	0.580	0.600	0.0292		
Latent Heat, kcal/kg	--	--	509		
Molecular Weight	18.015	18.015	18.015		
Design Data	Cold Side			Hot Side	
Max Allowable Pressure Drop, bar	0.70			0.70	
Fouling Factor, W/m <sup>2</sup> C	By Supplier			By Supplier	
Design Pressure, barg	10			10	
Test Pressure, barg	14.9			14.9	
Design Temperature, deg C	175			175	
Heat Transfer Area, m <sup>2</sup>				By Supplier	
Overall Heat Transfer Coefficient				By Supplier	
Number of Plates				By Supplier	
Overdesign Factor, %				10% Minimum	
Weight - Empty, kg				By Supplier	
Additional Plate Capability, %				15% Minimum	
Materials of Construction					
Plates	AISI 304 or 304L Stainless Steel				
Frame	Carbon Steel - Note 1				
Guide Bars	Stainless Steel				
Carrying Bars	Stainless Steel				
End Plates	Carbon Steel - Note 1				
Connections	AISI 304 or 304L Stainless Steel - Note 2				
Shroud	AISI 304 or 304L Stainless Steel				
Plate Gaskets	EPDM - Note 3				
Nuts/Bolts	304SS				
Notes					
1. Carbon steel components shall be painted with Supplier's Standard coating system.					
2. Connections shall be 150# Flanged or 150# Stud.					
3. Vendor shall confirm that EPDM is suitable at exchanger design temperature.					
Exchanger Weight	kg		lb		
Empty Weight		Supplier to Complete		Supplier to Complete	
Weight Full of Water					
Maximum Operational Weight					
Insulation					
Function	Energy Conservation and Personnel Protection				
Insulation Material with Cover	Mineral Wool with Aluminum Covering & Bands		Furnished & Installed by Others		
Insulation Supports & Tabs	Approved Vendor Standard		Supplier to Submit for Approval		
Insulation Thickness	mm		inch		
Allowance for Insulation (Use for calculating nozzle projection in addition to the required bolting)	50.8		2.0		
Other Requirements					
1. Heat exchanger shall be designed and fabricated according to ASME code and shall be National Board stamped.					
2. The Supplier shall propose an optional splash resistant insulation cover for the heat exchanger.					

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**SYSTEM SKETCH**

