

 SEWON CELLONTECH				TUBULAR HEAT EXCHANGER			
				SHEET 2 OF 47			
CUSTOMER	MEG Energy Corp.			REV	MADE BY	CHECKED BY	APPROVED BY
LOCATION	CANADA			0	-	-	DATE
JOB NO.	511036			1	-	-	07-01-2013
SERVICE	Sales Oil / Glycol Exchanger						08-14-2013
ITEM NO.	3A-E-111 A to H (Max UA Case)						
Total	8	Shells, Connected in	2 Parallel 4 Series Shells	Install	<input checked="" type="checkbox"/> Hor. <input type="checkbox"/> Vert.	Size	1,143.0 ID - 8,534.0 L
Code	ASME Sec.VIII Div.1 (STAMP), TEMA, API680 TEMA Type BEU			TEMA Class	R	Effective Area	556.41 m ² /Shell
PERFORMANCE OF ONE BATTERY							
		SHELL SIDE		TUBE SIDE			
		INLET		OUTLET		INLET	
						OUTLET	
Fluid Circulated		BP Frac Dilbit		TEG/Water (60%/40% wt)			
Total Fluid kg/hr		444696		527298			
Vapor kg/hr							
Liquid kg/hr		444696		444696		527298	
Steam kg/hr						527298	
Water kg/hr							
Noncondensable kg/hr							
Operating Temperature °C		117.90		49.70		40.00	
Operating Pressure kPa		984.014				994.015	
Density kg/m ³		875		921		1078.00	
Viscosity cP		13.580		195.68		4.6600	
Thermal Conductivity W/m·°C		0.1031		0.1167		0.3281	
Specific Heat kJ/kg·°C		2.1040		1.8400		3.2231	
Latent Heat kJ/kg						3.3481	
Bubble / Dew Point °C							
Critical Press. / Temp. kPa / °C							
Velocity m/sec		0.31				0.98	
Pressure Drop kPa		Allow. 250.000		Calc. 217.538		Allow. 200.000	
Fouling Resistance m ² ·°C/kW		0.616				0.18	
Film Coefficient W/m ² ·K		318.71				1,446.38	
Overall Coefficient W/m ² ·K		Clean 249.85		Calc. 206.70		Design 175.27	
Heat Duty KW		12,630.00		LMTD °C		MTD 21.6 °C	
CONSTRUCTION							
Design Pressure	Design Temperature	1450.0 / FV	kPa.G	-29 / 178 °C	1500.0 / FV	kPa.G	-29 / 178 °C
No. of Passes		1			4		
Tubes No.	396U / Shell, Size	25.40 mm	Thickness	2.11 (Min.) mm (BWG: 14)	Length	8,534.0 mm	
Shell	1143 mm ID	Tube Pitch	31.75 mm		Layout angle	45 °	
Baffles	Cross Baffle 16 ea / Shell, Type Single Seg. (Hori.)	Cut	24.5 % Dia.		Spacing c/c	486.0 mm	
Impingement plate	Circular plate	End					
Material	Tube SA 179 Seamless	Shell & Cover	SA 516 GR. 70N		Channel & Cover	SA 516 GR. 70N	
Tube Sheet	SA 266 GR.2	Baffle	Carbon Steel		Expansion Joint	N/A	
Estimated Weight	Empty Weight	kg	Bundle Weight	kg	Full Water Weight	kg	
Corrosion Allowance	Shell side 3.2 mm	Tube side 3.2 mm	Tube Joints: Rolled (two grooves) and Expanded				
Insulation	Shell side 64 mm	Tube side 64 mm					
MEAN METAL TEMPERATURE	Temperature, °C	Pressure, kPa.G		5) Each process nozzle shall be provided with one 1" 300# RFLWN (complete with blind flange, gasket, bolts & nuts).			
Normal Operating	Shell Tube	Shell Tube		6) Exchanger is to be designed for future field hydrotest in the fully corroded condition.			
Startup	-	-		7) Seller is to design and install electrical heat tracing for hold temperature of 10 °C.			
				CSA approval is required for electric components and installation. The heat exchanger is located in hazardous area class 1, Zone 2.			
NOZZLE	SHELL SIDE		TUBE SIDE		8) Seller is to supply and install 64mm thick mineral fiber insulation.		
Inlet	Tag S1	No 1	NPS 10	Remarks	Tag T1	No 1	NPS 8
Outlet	Tag S2	No 1	NPS 10		Tag T2	No 1	NPS 8
Vent				(Note 5)			(Note 5)
Drain				(Note 5)			(Note 5)
Thermowell							
Util. Con.							
RATING	RFWN 300#		RFWN 300#		9) Exchangers that are to be stacked shall be hydrotested stacked.		
Remarks	10) Concentration of CO2 and H2S in the liquid phase is 73 ppmw and 8 ppmw respectively.						
11) delete							
12) All category D welds shall be spot ultrasonic examined.							
13) Baffle to shell clearance shall be 4.8mm or less.							
14) EHT design shall use voltage of 277 VAC.							
1) Seller shall verify and guarantee thermal rating of the unit.							
2) Mass flow and duty will be split into two parallel trains.							
3) Exchangers shall be stacked two high.							
4) Minimum 20 pass lane seal rods.							



SHEET 3 OF 47

CUSTOMER	MEG Energy Corp.					REV	MADE BY	CHECKED BY	APPROVED BY	DATE
LOCATION	CANADA					0	-	-	-	07-01-2013
JOB NO.	511036					1	-	-	-	08-14-2013
SERVICE	Sales Oil / Glycol Exchanger									
ITEM NO.	3A-E-111 A to H (Max Duty Case)									
Total	8	Shells, Connected in	2	Parallel	4	Series Shells	Install	<input checked="" type="checkbox"/> Hor. <input type="checkbox"/> Vert.	Size	1,143.0 ID - 8,534.0 L
Code	ASME Sec.VIII Div.1 (STAMP), TEMA, API680 TEMA Type					BEU	TEMA Class	R	Effective Area	556.41 m² /Shell
PERFORMANCE OF ONE BATTERY										
			SHELL SIDE				TUBE SIDE			
			INLET		OUTLET		INLET		OUTLET	
Fluid Circulated			BP Frac Dilbit				TEG/Water (60%/40% wt)			
Total Fluid kg/hr			457483				589132			
Vapor kg/hr MW										
Liquid kg/hr MW			457483		457483		589132		589132	
Steam kg/hr										
Water kg/hr										
Noncondensable kg/hr MW										
Operating Temperature °C			126.00		52.70		40.00		75.00	
Operating Pressure kPaa			984.014				994.015			
Density kg/m3 L / V			870.0		920		1078.00		1052.00	
Viscosity cP L / V			9.4400		127.91		4.6600		2.0900	
Thermal Conductivity W/m·°C L / V			0.1058		0.1193		0.3281		0.3371	
Specific Heat kJ/kg·°C L / V			2.1330		1.8500		3.2231		3.3481	
Latent Heat kJ/kg										
Bubble / Dew Point °C			/		/		/		/	
Critical Press. / Temp. kPaa / °C			/		/		/		/	
Velocity m/sec			0.33				1.10			
Pressure Drop kPa			Allow. 250.000		Calc. 175.705		Allow. 225.000		Calc. 212.167	
Fouling Resistance m2·°C/kW			0.616				0.18			
Film Coefficient W/m2·K			339.86				1,678.93			
Overall Coefficient W/m2·K			Clean 270.88		Calc. 220.83		Design 155.44			
Heat Duty KW			14,112.00				LMTD °C		MTD 27.2 °C	
CONSTRUCTION										
Design Pressure		Design Temperature		kPa.G		°C		kPa.G		°C
No. of Passes										
Tubes No.		/ Shell, Size mm		Thickness (Min.) mm		(BWG :)		Length mm		
Shell		mm ID		Tube Pitch mm		Layout angle °		Effective		- mm
Baffles		Cross Baffle ea / Shell, Type		Cut % Dia.		Spacing c/c mm		End		- mm
pv²		Inlet Nozzle 2,162.01		Entrance 2,670.48		Outlet Nozzle 2,044.30		kg/m-sec2		Impingement plate
Material		Tube		Shell & Cover		Channel & Cover				
		Tube Sheet		Baffle		Expansion Joint				
Estimated Weight		Empty Weight kg		Bundle Weight		- kg		Full Water Weight		kg
Corrosion Allowance		Shell side mm		Tube side mm		Tube Joints :				
Insulation		Shell side mm		Tube side mm						
MEAN METAL		Temperature, °C		Pressure, kPa.G						
TEMPERATURE		Shell Tube		Shell Tube						
Normal Operating		-		-						
Startup		-		-						
NOZZLE		SHELL SIDE				TUBE SIDE				
		Tag	No	NPS	Remarks	Tag	No	NPS	Remarks	
Inlet										
Outlet										
Vent										
Drain										
Thermowell										
Util. Con.										
RATING										
Remarks										

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SERVICE	Sales Oil / Glycol Exchanger					
ITEM NO.	3A-E-111 A to H					

