



**NOTES:**

- (\*) Seller to specify or confirm.
- 1) Seller shall verify and guarantee thermal rating of the unit.
- 2) Fouling factors used for thermal rating are zero for both sides. Approximately 15% surface area is included in the design.
- 3) Shellside shall include NPS 2 (300# RFLWN) vent. Vent shall be located at the centre full diameter baffle support plate.  
Trim top of central baffle support plate to allow non condensables from both sides to escape from the vent. Vent shall come complete with blind flange, gasket, bolts & nuts.
- 4) Each process nozzle shall be provided with 1 - 1" RFLWN (complete with blind flange, gasket, bolts & nuts).
- 5) Full support at the U-bend tangent line shall be trimmed beyond the top and the bottom tube rows as much as possible.
- 6) Exchanger is to be designed for future field hydrotest in the fully corroded condition.
- 7) Exchanger to be designed for liquid full condition with SG=1.
- 8) 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 a non-hazardous area.
- 9) Seller is to supply and install 64 mm thick mineral fiber insulation.
- 10) Seller to design tubesheet and girth flanges for gasket with an outer diameter of 1340 mm and inner diameter of 1305 mm.
- 11) EHT design shall use voltage of 277 VAC.
- 12) This document is designated for the Standard Package Catalogue per MEG Standard DMG-BAS-ST-0012.

**BFW Analysis**

Water Analysis (mg/l as ion unless noted)			
	Normal	Max.	
Ca <sup>++</sup>	0.10		
Mg <sup>++</sup>	0.10		
Na <sup>+</sup>	626		
K <sup>+</sup>	1.00		
Fe <sup>++</sup>	0.80		
Cu <sup>++</sup>	0.00		
Mn <sup>++</sup>	0.00		
Ba <sup>++</sup>	0.10		
Sr <sup>++</sup>	0.20		
HCO <sub>3</sub> <sup>-</sup>	0.00		
CO <sub>3</sub> <sup>-</sup>	107.7		
OH <sup>-</sup>	2.70		
SO <sub>4</sub> <sup>-</sup>	3.20		
Cl <sup>-</sup>	833	< 4190	
Silica ppm as SiO <sub>2</sub>	36.20	< 50	
Sulphides ppm as S <sup>-</sup>	0.00		
TOC ppm as TOC	0.10	< 350	
TDS ppm as ion	1611	< 8,000	
TSS ppm TSS	0.0		
Oil & Grease ppm oil in water	0.0		
Total Hardness ppm as CaCO <sub>3</sub>	0.3988	< 0.50	
P-Alk (ppm as CaCO <sub>3</sub> )	98.0		
M-Alk (ppm as CaCO <sub>3</sub> )	188.0		
Total Alkalinity (ppm as CaCO <sub>3</sub> )		< 600	
CO <sub>2</sub>	---		
Dissolved O <sub>2</sub>	---		
Estimated pH	10.79		

**REVISIONS**

REV NO.	DATE	BY	CHK	APP	DESCRIPTION
C	7-Dec-12	SS	CS	CS	Issued for Squad Check
D	28-Jan-13	SS	CS	CS	Issued for Quote
0	9-May-13	SS	SY / AH	CS	Issued for Purchase
0A1	11-Feb-14	SS	SY	CS	Re-issued for Purchase

<b>MEG Energy Corp.</b>		<b>SNC-LAVALIN</b>	
PROJECT	CLRPHASE 3A CENTRAL PLANT FACILITY: EPC		
JOB NO.	511036	TAG NO.	3A-E-302
		PAGE	2 of 3

SHELL AND TUBE HEAT EXCHANGER						Data Sheet No.:		DS-CL03A-E-300-E302		REV					
Service <b>BFW / MP Steam Condenser</b>						Item No.		<b>3A-E-302</b>		0A1					
Size <b>1225 x 4572</b>		Type <b>AJ21U</b>		(vert/horiz) <b>Horizontal</b>		Connected In <b>1</b>		Parallel <b>1</b>		Series <b>1</b>					
Mfr <b>SEWON Cellontech</b>		Surf/Unit/ (Eff.) <b>304.7</b>		m <sup>2</sup> ; Shells/Unit <b>1</b>		Surf/Shell (Eff.) <b>304.7</b>		m <sup>2</sup>		0A1					
<b>PERFORMANCE OF ONE UNIT (Min Duty Case)</b>															
Fluid Allocation		IN Shell Side			OUT			IN Tube Side		OUT					
Fluid Name		MP Steam						BFW							
Fluid Quantity, Total		kg/hr <b>36,112</b>			kg/hr <b>36,112</b>			kg/hr <b>1,081,404</b>		kg/hr <b>1,081,404</b>					
Vapor (In / Out)		kg/hr <b>36,112</b>			kg/hr <b>7,222</b>			kg/hr <b>0</b>		kg/hr <b>0</b>					
Liquid		kg/hr <b>0</b>			kg/hr <b>28,889</b>			kg/hr <b>1,081,404</b>		kg/hr <b>1,081,404</b>					
Steam		kg/hr			kg/hr			kg/hr		kg/hr					
Water		kg/hr			kg/hr			kg/hr		kg/hr					
Non-Condensables		kg/hr			kg/hr			kg/hr		kg/hr					
Fluid Vaporized / Condensed		kg/hr			kg/hr			kg/hr		kg/hr					
Temperature		°C <b>198.3</b>			°C <b>197.3</b>			°C <b>156.8</b>		°C <b>168.9</b>					
Density (Liq./Vap.)		kg/m <sup>3</sup> <b>- / 7.508</b>			kg/m <sup>3</sup> <b>867.5 / 7.446</b>			kg/m <sup>3</sup> <b>911.1 / -</b>		kg/m <sup>3</sup> <b>899.2 / -</b>					
Viscosity (Liq./Vap.)		cP <b>- / 0.0156</b>			cP <b>0.136 / 0.0156</b>			cP <b>0.173 / -</b>		cP <b>0.160 / -</b>					
Molecular Weight (Vapor)		<b>18.02</b>			<b>18.02</b>										
Molecular Weight (Non-Condensable)															
Specific Heat (Liq./Vap.)		kJ/(kg·°C) <b>- / 2.808</b>			kJ/(kg·°C) <b>4.485 / 2.808</b>			kJ/(kg·°C) <b>4.324 / -</b>		kJ/(kg·°C) <b>4.362 / -</b>					
Thermal Conductivity (Liq./Vap.)		W/(m·°C) <b>- / 0.0371</b>			W/(m·°C) <b>0.6664 / 0.0329</b>			W/(m·°C) <b>0.6852 / -</b>		W/(m·°C) <b>0.6815 / -</b>					
Latent Heat		kJ/kg			kJ/kg			kJ/kg		kJ/kg					
Saturation temperature / dew point		°C			°C			°C		°C					
Operating Pressure		kPaa <b>1485</b>			kPaa <b>1485</b>			kPaa <b>2309</b>		kPaa <b>2309</b>					
Velocity		m/s <b>1.82</b>			m/s <b>1.82</b>			m/s <b>2.14</b>		m/s <b>2.14</b>					
Pressure Drop - Allowed / Calculated		kPa <b>15</b>			kPa <b>1.1</b>			kPa <b>70</b>		kPa <b>32.5</b>					
Minimum Ambient Temperature		°C <b>-39</b>			°C <b>-39</b>			°C <b>-39</b>		°C <b>-39</b>					
Fouling Resistance (Min.)		m <sup>2</sup> ·°C/kW <b>(Note 2)</b>			m <sup>2</sup> ·°C/kW <b>(Note 2)</b>			m <sup>2</sup> ·°C/kW <b>(Note 2)</b>		m <sup>2</sup> ·°C/kW <b>(Note 2)</b>					
Heat Exchanged		kW <b>15,661</b>			kW <b>15,661</b>			kW: MTD Corrected <b>34.6</b>		°C					
Transfer Rate, Service		<b>1481</b>			Clean <b>5100.6</b>			Actual <b>5100.6</b>		W/(m <sup>2</sup> ·°C)					
<b>Refer to Page 1 for Details</b>						<b>Sketch (Bundle / Nozzle Orientation)</b>									
						Design / Test Pressure		kPag			kPag			kPag	
						Design Temperature (MDMT/Max.)		°C			°C			°C	
						No. Passes per Shell									
						Corrosion Allowance		mm			mm			mm	
						Connections		In			In			In	
						Size (NPS) & Rating/ Facing		Out			Out			Out	
								Intermediate			Intermediate			Intermediate	
						Tubes No.		OD			mm, Thk (Min/Avg.)			mm; Length	
														mm, Pitch	
						Tube Type								Material	
						Shell		ID			OD			(Integ.)	
						Channel or Bonnet								(Remov.)	
						Tubesheet - Stationary									
						Floating Head Cover									
No. of Cross Baffles		Type			Type			Spacing: Center							
Baffles - Long								mm Inlet							
Tube Supports		U-Bend Support			U-Bend Support			Type							
Pairs of Seal Strips		Pass Lane Seal Rod No.			Pass Lane Seal Rod No.			Tube-to-Tubesheet Joint							
Expansion Joint		Type			Type			Type							
ρ v <sup>2</sup> - Inlet Nozzle		Bundle Entrance			Bundle Entrance			Bundle Exit							
Gaskets - Shell Side								kg/m-s2							
Gaskets - Tube Side															
Floating Head								Channel Cover Davit							
Code Requirements								TEMA Class							
Weight / Shell		Filled with Water			Filled with Water			Bundle							
Weight / Bundle								kg							
Radiographic Inspection:															
<b>Notes:</b>															
<b>REVISIONS</b>						 <b>MEG Energy Corp.</b>									
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