

EQUIPMENT DATASHEET - SHELL AND TUBE EXCHANGERS

Page 1 of 4

1	CUSTOMER	ChevronTexaco LAPC		PROJECT	Ethanol Drying Unit		PID Number	50-PID-003		
2	LOCATION	Refineria Panama		PROJ NO.	613144		Date	4/5/2004		
3	SERVICE	Regeneration Cooler		ITEM NO.	50-X-103					
4	CASE	Design		REVISION	1		FOR PURCHASE	Engineer	gpm/mod	
5	Each Unit:	Type -	AHS	Horizontal/Vertical	HORIZONTAL		Connected in -	<input type="checkbox"/> Series	<input checked="" type="checkbox"/> Parallel	
6	Surf/Unit (Effective) -	ft ²		Shells/Unit	1		Surf/Shell (Effective) -	ft ²		
PERFORMANCE OF ONE UNIT										
8			Shellside IN		Shellside OUT		Tubeside IN		Tubeside OUT	
9	Fluid Name			Ethanol				Cooling Water		
10	Fluid Quantity, Total	lb/hr	9585 * 1.1				645790 * 1.1			
11	Vapor	lb/hr	10491		0		0		0	
12	Liquid	lb/hr	0		10491		0		0	
13	Steam	lb/hr	0		0		0		0	
14	Sea Water	lb/hr	0		0		710369		710369	
15	Noncondensable	lb/hr	53		53		0		0	
16	Temperature	°F	270		95		85		95	
17	Density, Liq/Vapor	lb/ft ³	NA / 0.0087		55.126 / NA		62.681 / NA		62.416 / NA	
18	Viscosity, Liq/Vapor	cP	NA / 0.0097		0.86 / NA		0.81 / NA		0.72 / NA	
19	Molecular Weight, Vapor	MW	30.318		NA		NA		NA	
20	Molecular Weight, Noncondensable	MW	29		29		NA		NA	
21	Specific Heat, Liq/Vapor	Btu/lb°F	NA / 0.4345		0.8685 / NA		1.009 / NA		1.0096 / NA	
22	Thermal Conductivity, Liq/Vapor	Btu/hr ft°F	NA / 0.01384		0.2112 / NA		0.3568 / NA		0.3612 / NA	
23	Bubble Pt./Dew Pt.	deg F	102		111.6					
24	Latent Heat	Btu/lb	612.51 @ 95 F				NA		NA	
25	Inlet Pressure	psig	-12.45				NA		NA	
26	Velocity	ft/s					NA		30.0	
27	Pressure Drop, Allow/Calc	psi	0.25	/			10			
28	Fouling Resistance, Min.	hr ft ² °F/Btu	0.002				0.003			
29	Heat Exchanged -					MTD, (Corrected)(Weighted)				
30	Transfer Rate, Service -	5344000*1.1	Btu/hr ft ² °F				Clean -			
31	CONSTRUCTION OF ONE SHELL									
32			Shellside		Tubeside		See attached sketch for flow orientation			
33	Design/Minimum Test Press	psig	150 & FV	/ code	150 & FV	/ code				
34	Design Temp. (Max/Min)	°F	500	/ -20	500	/ -20				
35	No. Passes per Shell									
36	Corrosion Allowance	in	.125"		0.125					
37	Connections	In								
38	Size &	Out								
39	Rating	Misc Connections	1" flg'd vents/drains		1" flg'd vents/drains					
40	Tube No. -	OD -	3/4	Thk(Min)	Length	Note 5	in	Pitch -	square or rotated sc	in. Pattern -
41	Tube Type -	plain								
42	Impingement Protection Required -	<input checked="" type="checkbox"/>	Attachment of Impingement Plate							
43		<input type="checkbox"/>								
44		<input type="checkbox"/>								
45		<input type="checkbox"/>								
46	Baffles-Cross -									
47	Baffles-Long -	Spacing: c/c Inlet in								
48	Supports-Tube -	Transverse baffle	U-Bend -		Seal Type -					
49	Bypass Seals:	Pass Lane - Yes/No	Peripheral - Yes/No		No. Pairs -		Type -			
50	Expansion Joint -	Per fabricator	Type -		Metal Temp: °F		Tube-Tubesheet Joint -			
51	Rho-V-sq: Shell Entrance -	Bundle Entrance -				Shell -		Tube -		
52	Gaskets:	See Page 3								
53	Code Requirements:	ASME Sect. VIII, Div I		Stamp:	<input checked="" type="checkbox"/>	National Board No:	<input checked="" type="checkbox"/>	TEMA Class		R
54	Weights:	See Page 2								
55	Test Ring Req'd:	<input type="checkbox"/>	Spare Gaskets Req	<input checked="" type="checkbox"/>	No. Sets-	1	Design for Bundle Extractors:	<input type="checkbox"/>	Type:	
56	Stacking:	NO	Shell Insulation thk	1.5	in		Tubeside Insulation thk	NR	in	
57	Applicable Specifications:	See Page 2								
58	Vibration Analysis Required: (Yes)(No)	<input checked="" type="checkbox"/>	Note 4	Design for full tubesheet differential? [Y/N]	<input type="checkbox"/>	TEMA REGISTRATION REQUIRED? [Y/N]		<input type="checkbox"/>		
59	NOTES -									
60	1) Vendor to complete and return these datasheets with proposal.									
61	2) Vendor shall notify purchaser of any conflicts between datasheet, standards, and specifications.									
62	3) All exceptions to datasheet, standards or specifications must be stated in writing as part of proposal.									
63	4) Should velocities fall outside ranges given in E-1D2, Section 5; vibration analysis shall be required.									
64	5) Preferred tube length is 20 for straight tubes; vendor to advise if more economical to build in 8,10,12 or 16 ft tube length.									
65	G:\Chev_Tex613144 Ethanol Drying Project\7_Engineering\Mechanical\Equipment\Rev0_SPEC SHEETS\50-X-103SpecSht-Rev1.xls\X-103									

2/14/2006 9:00

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ADDITIONAL DATA HEAT EXCHANGER

PREP. BY	gpm/mcd			Page 2 of 4
CHKD. BY				
APPROVED				
DATE	4/5/2004			
ISSUE	1			

CLIENT: ChevronTexaco LAPC	PROJECT NO.: 613144	ITEM NO. 50-X-103
LOCATION: Refineria Panama		PID NO: 50-PID-003
PLANT:	PROCESS AREA:	
SERVICE: Regeneration Cooler	EQUIPMENT NAME:	

SHELLSIDE	TUBESIDE	WEIGHTS
Operating Static Head, in	Full of Water	Full of Water
Test Static Head, in	Full of Water	Full of Water
Radiography	Spot, minimum	Spot, minimum
Longitudinal Joint Eff.		Operating/Shell
Circumferential Joint Eff.		Full of Water/Shell
Category		Emergency
Post Weld Heat Treatment	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes
Chemical Cleaning	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes
Hazard Considerations		

Surface Treatment	SSPC SP 10	SSPC SP 10	Applicable Specifications
Painting	Inorganic Zinc	Inorganic Zinc/Note 3	Shell & Tube Exchangers:
Insulation	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> Yes	API 660 Latest Edition
Insulation Thickness, inches	1.5	NR	GEMS G-1P0 (Dated Sept.94)
Location	<input type="checkbox"/> Indoors	<input checked="" type="checkbox"/> Outdoors	TEMA "R", Latest Edition
Wind Design Code	Note 5		GEMS E-1M18 (Dated Dec 98)
Wind Velocity / Pressure			GEMS V-1P (Dated Dec 97)
Earthquake Zone			GEMS G-3D12 (Dated Dec 96)
Earthquake Factor			Mechanical Design materials & fabrication:
Other Non-Destructive Testing			ASME Section VIII, Latest Edition
			ASME B 31.3, Latest Edition
			ASME B16.5, Latest Edition
			ASME B16.11, Latest Edition

Reference	Service	Flg Type	Size, in	Rating, psi	Facing
	Shellside Inlet	Dry Ethanol/Water	note 1,2		RF
	Shellside Outlet	Dry Ethanol/Water	note 1,2		RF
	Vent (Flanged w/blind)	Dry Ethanol/Water	note 1,2		RF
	Drain (Flanged w/blind)	Dry Ethanol/Water	note 1,2		RF

Reference	Service	Flg Type	Size, in	Rating, psi	Facing
	Channel Inlet	Cooling Water	note 1,2		RF
	Channel Outlet	Cooling Water	note 1,2		RF
	Vent (Flanged w/blind)	Cooling Water	note 1,2		RF
	Drain (Flanged w/blind)	Cooling Water	note 1,2		RF

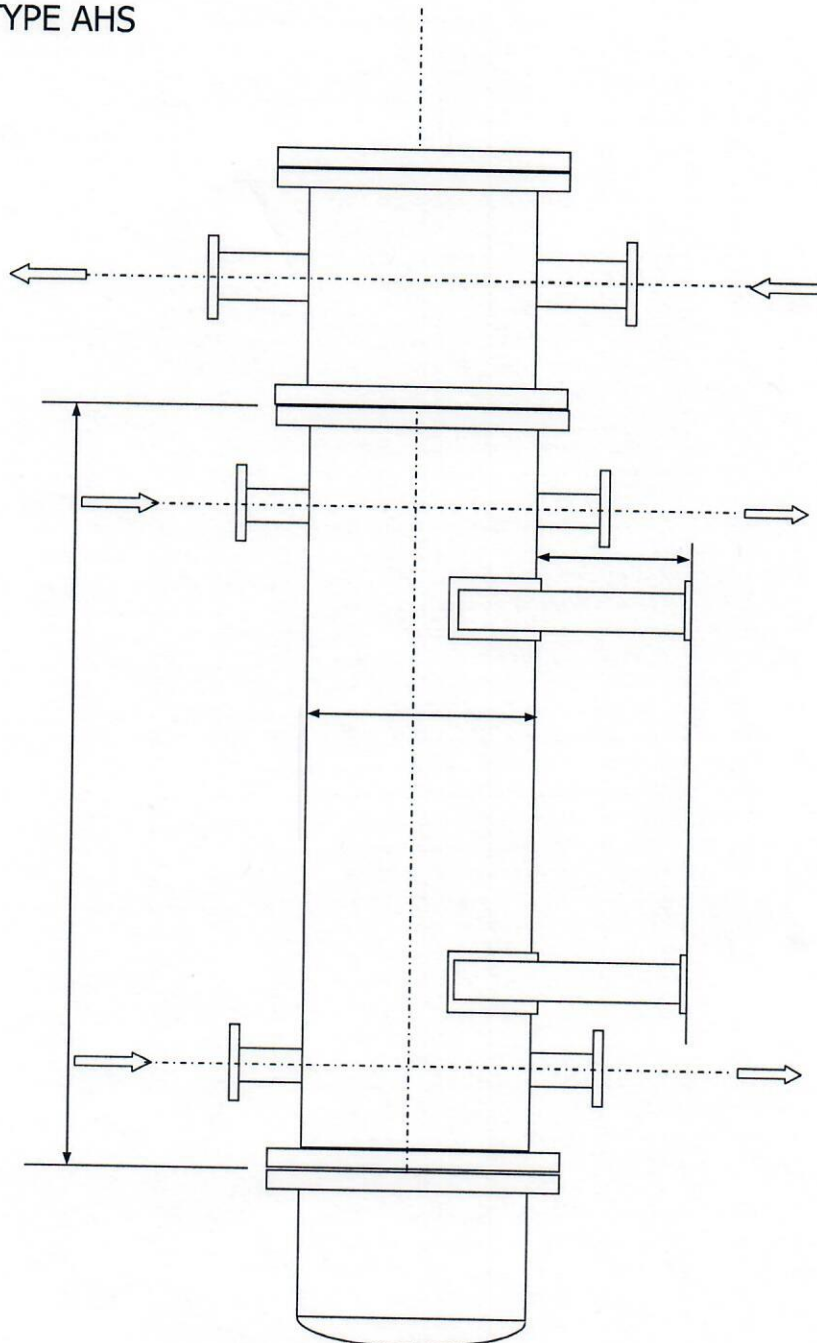
REMARKS
1) Reference GEMS E-1M18 for restrictions on use of slip-on flanges. Screwed flanges shall not be used.
2) Bottom nozzle shall have 90 deg elbow for single exchanger or lowest exchanger in stacked exchangers.
3) Inorganic zinc primer and silicone, acrylic topcoat = 5 dft
4) Stacked units shall be tested as assembled units.
5) Refer to GEMS G-3D12 for climatic data - Location is Refineria Panama.

OUTLINE SKETCH
HEAT EXCHANGER

PREP. BY	gpm/mcd			Page 4 of 4
CHKD. BY				
APPROVED				
DATE	4/5/2004			
ISSUE	1			

CLIENT: ChevronTexaco	PROJECT NO.: 613144	ITEM NO. 50-X-103
LOCATION: Refineria Panama		PID NO: 50-PID-003
PLANT:	PROCESS AREA:	
SERVICE: Regeneration Cooler	EQUIPMENT NAME:	

TYPE AHS



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FORM U-1 MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

HEAT EXCHANGER

1. Manufactured and certified by OHMSTEDE LTD. BEAUMONT PLANT, 895 NORTH MAIN STREET BEAUMONT, TEXAS 77701
(Name and address of Manufacturer)
2. Manufactured for Matrix Engineering Ltd. 1725 W. Cardinal Drive Beaumont Texas 77705-6415
(Name and address of Purchaser)
3. Location of installation ChevronTexaco Latin America Products-Colon, Panama
(Name and address)
4. Type: HORIZ. HEAT EXCHANGER 478288 - 478288 2707 2004
(Horiz., vert., or sphere) (Tank, separator, jkt. vessel, heat exch., etc.) (Mfg's serial No.) (CRN) (Drawing No.) (Nat'l. Bd. No.) (Year built)
5. ASME Code, Section VIII, Div. 1 2001, 2003 2429 -
Edition and Addenda (date) Code Case No. Special Service per UG-120(d)

Items 6 - 11 incl. to be completed for single wall vessels, jackets of jacketed vessels, shell of heat exchangers, or chamber of multi-chamber vessels.

6. Shell (a) No. of course(s): 2 (b) Overall length (ft & in.): 18'-6 13/16"

Course(s)			Material	Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B & C)			Heat Treatment					
No.	Diameter, in.	Length (ft & in.)	Spec./Grade or Type	Nom.	Corr.	Type	Full	Spot	None	Eff.	Type	Full	Spot	None	Eff.	Temp.	Time
1	42" I.D.	9'-11"	SA-516-70	.500	.125	1	SPOT	.85			1	SPOT	.85			-	-
2	42" I.D.	8'-7 13/16"	SA-516-70	.500	.125	1	SPOT	.85			1	SPOT	.85			-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

7. Heads: (a) _____ (b) _____

(Mat'l Spec. No., Grade or Type) H.T. - Time & Temp (Mat'l Spec. No., Grade or Type) H.T. - Time & Temp

	Location (Top, Bottom, Ends)	Thickness		Radius		Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure		Category A		
		Min.	Corr.	Crown	Knuckle					Convex	Concave	Type	Full	Spot
(a)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(b)	-	-	-	-	-	-	-	-	-	-	-	-	-	-

If removable, bolts used (describe other fastening) -
(Mat'l Spec. No., Grade, size, No.)

8. Type of jacket - Jacket closure -
(Describe as ogee & weld, bar, etc.)

If bar, give dimensions - If bolted, describe or sketch.

9. MAWP 151 FV psi at max. temp. 500 - °F Min. design metal temp. -20 °F at 151/FV psi.
(internal) (external) (internal) (external)

10. Impact test UCS 66 (a) (d) at test temperature of - °F
(Indicate yes or no and the component(s) impact tested)

11. Hydro., ~~proof~~, ~~stress~~ test press. 226 Proof test -

Items 12 and 13 to be completed for tube sections.

12. Tubesheet: sa-516-70n/sb-171C71500 41 7/8" 2 3/8" .250 BOLTED
Stationary (Mat'l Spec. No.) Dia., in. (subject to press.) Nom. thk., in. Corr. Allow., in. Attachment (welded or bolted)

sa-516-70n/sb171c71500 41 5/8" 2 3/8" .250 BOLTED
Floating (Mat'l Spec. No.) Dia., in. Nom. thk., in. Corr. Allow., in. Attachment

13. Tubes: SB-395C71500 3/4" 0.0650" MW 1156 STRAIGHT
Mat'l Spec. No., Grade or Type O.D., in. Nom. thk., in. or gauge Number Type (Straight or U)

Items 14 - 18 incl. to be completed for inner chambers of jacketed vessels or channels of heat exchangers.

14. Shell															(a) No. of course(s):		(a) 1 (b)1			(b) Overall length (ft & in.):					(a) 1'11" (b) 0'-8"			
Course(s)			Material		Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B & C)			Heat Treatment															
No.	Diameter, in.	Length (ft & in.)	Spec./Grade or Type		Nom.	Corr.	Type	Full	Spot	None	Eff.	Type	Full	Spot	None	Eff.	Temp.	Time										
a	42" I.D.	1'-11"	SA-516-70		.500	.125	1	SPOT			.85	1	SPOT			.85	-	-										
b	45" I.D.	0'-8"	SA-516-70		.500	.125	1	SPOT			.85	1	SPOT			.85	-	-										
-	-	-	-		-	-	-	-			-	-	-			-	-	-										

15. Heads: (a)		SA-516-70N NO HEAT TREAT						(b)		SA-516-70 1150 DEG. FOR 1 HOUR					
		(Mat'l Spec. No., Grade or Type) H.T. - Time & Temp								(Mat'l Spec. No., Grade or Type) H.T. - Time & Temp					
	Location (Top, Bottom, Ends)	Thickness		Radius		Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure		Category A			
		Min.	Corr.	Crown	Knuckle					Convex	Concave	Type	Full	Spot	None
(a)	END	7/16"	.125	-	-	2:1	-	-	-	-	YES	-	SEAMLESS	.85	
(b)	END	3/4"	.125	33"	-	-	-	-	-	-	YES	-	SEAMLESS	.85	

If removable, bolts used (describe other fastening) 52-3/4" studs 7 3/4" Lg. & 52-3/4" studs 9 3/4" Lg. SA-193B7 / 208-Heavy Hex Nuts SA-194-2H
(Mat'l Spec. No., Grade, Size, No.)

16. ~~1~~AWP 151 FV psi at max. temp. 500 - °F Min. design metal temp. -20 °F at 151/FV psi.
(internal) (external) (internal) (external)

17. Impact test NO PER UCS 66 (a) (d) at test temperature of - °F
(Indicate yes or no and the component(s) impact tested)

18. Hydro. ~~226~~ test press. 226 Proof test -

3. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diameter or Size	Flange Type	Material		Nozzle Thickness		Reinforcement Material	How Attached		Location (Insp. Open)
				Nozzle	Flange	Nom.	Corr.		Nozzle	Flange	
Shell inlet	2	10"150#	RFWN	SA-106-B	SA-105	.500	.125	INTREGAL	WELDED	WELDED	-
Shell outlet	2	4"150#	RFWN	SA-106-B	SA-105	.3370	.125	INTREGAL	WELDED	WELDED	-
Tube In/Outlet	1Ea	10"150#	RFWN	SA-106-B	SA-105	.500	.125	INTREGAL	WELDED	WELDED	-
Tube Vent	1	1"150#	RFLWN	SA-105	-	0.50	.125	INTREGAL	WELDED	-	-
Shell CVR Vent	1	1"150#	RFLWN	SA-105	-	0.50	.125	INTREGAL	WELDED	-	-
Shell CVR Drain	1	1"150#	RFLWN	SA-105	-	0.50	.125	INTREGAL	WELDED	-	-
Tube Drain	1	1"150#	RFLWN	SA-105	-	0.50	.125	INTREGAL	WELDED	-	-

20. Supports: Skirt NO Lugs NONE Legs NONE Others 2-SADDLES Attached TO SHELL / WELDED
(Yes or No) (No.) (No.) (Describe) (Where and How)

21. Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report:
(List the name of part, item number, mfg's. name and identifying number)

22. Remarks: OUR JOB NO:478288 YOUR P.O. NO: 13351 ITEM NO: 50-X-103

2-Chan. Flg. 47 1/4"o.d. X 42"i.d. X 4 3/16"THK. SA-266-4N and 1-Chan. Cover 47 1/4" Flat Diam. X 3 1/8"THK. SA-516-70N C.A. .125"

2-Shell Flg's. SA-266-4N / 1-Shell cover Flg. SA-266-4N 50 1/4"o.d. x 45" i.d. x 3" Thk.

48-3/4" Studs 9" Lg. & 40-3/4" Studs 8" Lg. SA-193-B7 170-Heavy Hex Nuts SA-194-2H

CERTIFICATE OF SHOP COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1,

U Certificate of Authorization No. 14,155 Expires 09/04/2004

Date 08/24/2004 Name OHMSTEDE LTD. BEAUMONT PLANT Signed *Michael A. [Signature]*
(Manufacturer) (Representative)

CERTIFICATE OF SHOP INSPECTION

I, the undersigned, holding a valid commission issued by The National Board of Boiler and Pressure Vessel Inspectors and the State or Province of TEXAS and employed by HSB CT of HARTFORD, CT have inspected the pressure vessel described in this Manufacturer's Data Report on 08/24/2004, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 08/24/2004 Signed *[Signature]* Commissions AB 8604 AB, TX 925
(Authorized Inspector) (Nat'l Board incl. endorsement, State, Province and No.)

CERTIFICATE OF FIELD ASSEMBLY COMPLIANCE

We certify that the statements on this report are correct and that the field assembly construction of all parts of this vessel conforms with the requirements of ASME Code, Section VIII, Division 1,

U Certificate of Authorization No. Expires

Date Name Signed
(Assembler) (Representative)

CERTIFICATE OF FIELD ASSEMBLY INSPECTION

I, the undersigned, holding a valid commission issued by The National Board of Boiler and Pressure Vessel Inspectors and the State or Province of and employed by have compared the statements in this Manufacturer's Data Report with the described pressure vessel and state that parts referred to as data items, not included in the certificate of shop inspection, have been inspected by me and to the best of my knowledge and belief, the Manufacturer has constructed and assembled this pressure vessel in accordance with ASME Code, Section VIII, Division 1. The described vessel was inspected and subjected to a hydrostatic test of psi. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date Signed Commissions
(Authorized Inspector) (Nat'l Board incl. endorsement, State, Province and No.)



50-x-103