OPERATING MANUAL

c/o TUNDRA ENGINEERING LTD.

CONDENSATE STABILIZER PACKAGE

PROJECT REFERENCES
ALCO Shop Order Number 2007

Commissioned in May 2007

1.0 PROCESS DESCRIPTION AND DESIGN

1.1 Refer to the Process Flow Diagram, attached.

1.2 Refer to the HYSYS" process computer simulation stream summary for the plant inlet conditions, attached.

1.3 Refer to the Mechanical Flow Sheets, ALCO drawings D-2006- D-2006- and D-2006 and attached.

2.0 PROCESS DESCRIPTION

Condensate, water and sweet gas enter the unit stabilizer package from skid edge. The flow rates are 500-2000 bbl/day for the condensate, 10 MMscf/day for the gas and 10 bbl/day for the water. The flow passes through an inlet pressure control valve (PV-6010), which reduces the pressure from field pressure to 350 Psig. It is a fail-closed valve to stop flow in the case of a high level situation in the feed separator. The flow enters the Stabilizer Feed Separator /Slug Catcher Vessel (V-600). The Back Pressure Valve and Pressure Controller (PCV-6011 and PC-6011) located on the gas out piping maintains the pressure of the Stabilizer Feed Separator /Slug Catcher Vessel at Approx. 350 psig.

Gas evolved from the Stabilizer Feed Separator /Slug Catcher Vessel (V-600) passes through a removable Mist Extractor and is routed to skid edge. The water, which has settled to the bottom of the vessel and into the 12 ¾" O.D. boot, will exit under level control (LC/LCV-6003) when the level of water (Water/Condensate Interface) reaches approx 0'-2" High on the main body of the vessel.
The unstable condensate which settled by gravity on top of the accumulated water in the bottom of the Stabilizer Feed Separator /Slug Catcher Vessel (V-600) will exit the Vessel under level control when the level of condensate reaches approx 1'-4" high. Level Controller LC-6004 will open Level Control Valve LCV-6004 and this will start the flow of condensate through the tubeside of the Feed/Bottoms Exchanger (E-605) where it is heated by exchanging heat with the hot stabilized condensate from the bottom of the stabilizer tower (T-610). After passing through the Feed/Bottom Exchanger the raw condensate enters the top of the Stabilizer Tower at the top of its packed section. Condensate (2 Phase Flow) enters the top of the Stabilizer Tower at approx. 100 psig and 94 Deg F via an inlet distribution nozzle. The raw condensate flows downward through a packed bed of #1.5 Nutter rings. As the raw condensate cascades down through the random packing it is put into intimate contact with the rising hot vapors flowing countercurrent upward. The hot hydrocarbon vapors rising through the Stabilizer Tower are generated by heating the stabilized condensate, which has accumulated on the chimney tray of the stabilizer tower. The liquid is heated in the reboiler and partially vaporized. The two phase flow then passes to the accumulator section at the bottom of the stabilizer tower. Here the liquid is separated out and passed on under level control to the shell side of the Feed/Bottoms exchanger to be cooled by the raw condensate. The vapors in the accumulator section of the stabilizer pass upward through a chimney and continue up through the packed bed.

The vapors exit the top of stabilizer and are run to skid edge to be passed along to the recycle compressor package. The operating pressure in the stabilizer is maintained by a backpressure control station on this overheads gas line (PC/PCV-6104), which maintains a pressure of approx. 80 Psig in the stabilizer tower.

The stabilized condensate exiting from the bottom of the stabilizer accumulator will enter the Feeds/Bottom Exchanger where it is cooled from approximately 289 Deg F to 265 Deg F. while raising the raw condensate from approx. 74 Deg F to 100 Deg F. The Flow of this stabilized condensate is controlled by a Level Control Valve on the Stabilizer (LC-6103) acting on Level Control Valve (LCV-6103), which is located on ALCO's package but downstream of the off-skid aerial cooler. The cooler Stabilized condensate from the shell side of the feed bottom exchanger (E-605) is now piped to skid edge where it will be directed to the off-skid aerial cooler (AC-620) where it is reduced in temperature from 265 Deg F to Approx. 120 Deg F. The stabilized condensate is then routed back to the stabilizer package to be metered (FQT-6200) and passed back to skid edge to tie-in to storage.

The Stabilizer Reboiler (E-615) maintains the stabilized condensate at a temperature of approx. 289 Deg F. The temperature in the Reboiler is controlled by opening and closing a Temperature Control Valve (TCV-6150) on demand from the Temperature Controller (TIC-6150). The Heat Medium is Hot Oil (SUN 21) at 350 Deg F and circulates through the tubeside of the reboiler.

3.0 START-UP

Have safety equipment and personnel in position for start-up. A start-up "boss" should be nominated to whom all start-up personnel report. The start-up "boss" must be totally familiar with the start-up procedure and the equipment. NOTE: Valves should not be opened nor any piece of equipment started without direction from the start-up "boss". Ensure that all manual valves are closed.

Pre-Commissioning

Prior to start-up operating and start-up, personnel should become familiar with the Mechanical Flow Sheet, this Operating Manual, safety procedures and equipment. Tracing all lines with the flowsheet will aid operators with this initial familiarization. At this time check all equipment to ensure that everything is installed and installed correctly. Control valves should be stroked. Controllers should be checked for operation and set points where possible. PI's & TI's are to be installed. The control room should "Bump" the electric motors on the Ruffneck Heaters and the aerial cooler to ensure proper rotation. All flanges and unions shall be checked for tightness. Tag all items, which need further checking or adjustments later in the start-up to ensure attention. All lines should be cleaned of dirt, welding slag and other contaminants. Fill all pumps to recommended levels with an approved lubricant. Check all electrical controls and shutdowns.

Purging

Before any start-up, the plants must be purged with an inert gas to displace all oxygen from the system. The use of a systematic purging procedure will ensure complete plant and to start purging from the inlet, doing sections at a time. Use the mechanical flowsheet as a map for purging. Oxygen content should be less than 6% after purging.

Pressuring

Prior to pressuring the plant with gas, close all valves in the gas system. Have safety equipment and personnel in position for start-up. Ensure that all personnel are aware of each stage of pressuring. Pressuring may involve multiple pressuring and depressuring to fix problem leaks. Admit gas slowly and pressure up one section at a time. Start with 25 PSIG. Use flowsheet to map the pressuring sequence and rectify all leaks detected. Leave all valving in their operating position except for plant, inlet and outlet. Increase pressure to final operating pressure. Set all pressure controls. Check all shutdowns and flare system for correct operation.

The design basis for Condensate Stabilizer Reboiler was to use Hot Oil (SUNOIL 21) as the Heat Medium at 350 F inlet temperature.

Electrical

Check operation of all electrical controls, shutdowns and instruments.

Instrument Air

Pressurize system and check all controls and shutdowns.
The hot oil heater (H-300) must be filled to the 'Cold Fill Line'. Do not over fill as expansion will result in spillage. The burner must now be lit and the oil allowed to heat up. See the details on starting the heater at the end of this section.

After all checks have been made the aerial cooler can be started (AC-620). Before the introduction of feed to the facility hot oil flow should be introduced to the Stabilizer Reboiler (E-615) The control of the hot oil flow to the Reboiler is by a Temperature Controller (TIC-6150) opening and closing a temperature control valve (TCV-6150).

Mixed condensate/water/gas can now be introduced into the facility at a reduced flow rate.

With feed flowing to the Stabilizer Feed Separator/Slug Catcher Vessel the level transmitter (LC –6004) should be set to dump condensate by opening LCV-6004 when the level in the Stabilizer Feed Separator/Slug Catcher Vessel reaches 1'-4" high. This will allow the raw condensate to pass through the Feed/Bottoms Exchanger and enter the Condensate Stabilizer Tower. This also applies to the water controller and valve LC/LCV-6003 which will allow the dumping of water to skid edge.

With Condensate flowing to the Stabilizer Tower (T-610) the bottoms level controller (LC-6103) can now be set and the Stabilizer Reboiler (E-615) can now be stabilized. A preliminary setting can be done on the temperature controller (TI-6150).

Note: If liquids are being produced too rapidly, reduce the inlet flow rate.

Once all levels and pressure set points are stabilized, increase the condensate flow-rate in increments. Check and adjust all instruments after each increase. Note: Always allow time for

the plant to stabilize after any change in conditions. Any changes to the controls or instrument settings should be done gradually. During the initial running of the equipment, the strainer on the condensate line should be checked if applicable
After the stable operation is established, progress through the plant starting at the inlet and fine-tune all controls.

A list of initial set points for all controls follows. Check all instruments against this list and record any discrepancies.

With the plant on stream, if conditions warrant, additional adjustments can be made. After adjusting any set point each phase of operation should be rechecked thoroughly and closely monitored for 24 hours before leaving the plant unsupervised.

4.0 MAINTENANCE

To minimize the operating costs, a preventive maintenance schedule should be established for this plant. This should include:

a) Daily Checks:
- Process temperature, pressures and flowrates.
- Liquid levels in vessels and reboiler.
- Differential pressures.
- Reboiler temperature.

. b) Monthly Checks:
- Strainer baskets.
- Lubricating oils.
- Safety devices.
- Meters.

c) Annual Checks:
- Pumps.
- Vessel internals.
- Tower packings.
- Exchangers.
- Aerial coolers.

INSTRUCTIONS FOR FIRING GAS BURNERS

A. INSTALLATION

1. Consult the packing list and the assembly drawing. Locate and install the components which have been stripped loose in packing boxes. Use Teflon tape on threaded connections.
2. Check all piping and instrumentation lines for shipping damages. Verify that they are tight, leak-proof and free from dirt or other obstructions.

B. START-UP

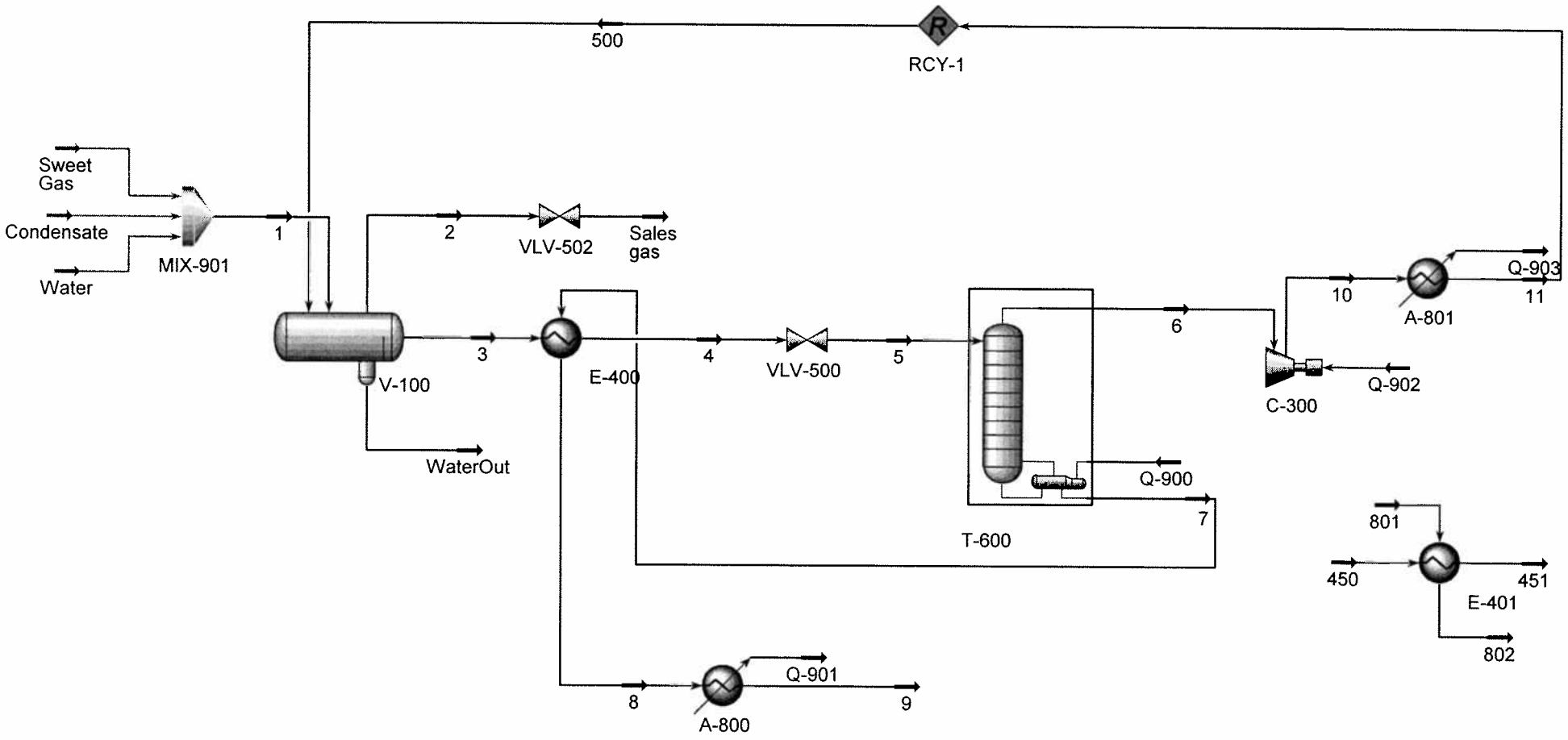
1. Read carefully operating instructions for various components.
2. Close main fuel and pilot block valves.
3. Connect fuel supply to unit. Generally burner gas pressure required is 20 psig. Do not exceed 125 Psig at fuel inlet to package.

C. OPERATION

1. Flame sensor/Ignitor assembly are installed in the flame arrested burner at the factor. Open pilot block valve and light the pilot utilizing the Profire 1100 burner management system. (Pilot mixer is set at factory and should not require adjustment).
2. Open the flame arrested burner assembly and open the primary air adjustment on the main burner as far as possible.
3. Slowly open main fuel block valve to light burner.
4. Slowly close primary air adjustment until the flame shows tinges of red or yellow on the periphery. Local conditions occasionally require secondary air adjustment to accomplish proper burner adjustment.
5. Close and latch flame arrested burner housing

D. SHUT-DOWN

1. Close main fuel supply valve allowing all gas in the manifold to be released and burned at the burner and pilot.


500
RCY-1
Sweet Gas
Condensate
Water
MIX-901
1
2
VLV-502
Sales gas
V-100
WaterOut
3
E-400
4
VLV-500
5
6
T-600
Q-900
7
10
A-801
Q-903
11
C-300
Q-902
801
450
451
E-401
802
8
A-800
Q-901
9

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Case Name:	H:\QUOTES\Q2006-
Unit Set:	NewUser2
Date/Time:	Wed Sep 06 15:10:06 2006

Workbook: Case (Main)

Streams

Fluid Pkg: All

Name		Sweet Gas	Condensate	Water	1	2
Vapour Fraction		---	---	---	0.858834	1.000000
Temperature	(F)	---	---	---	71.60 *	74.03
Pressure	(psia)	363.5	363.5	363.5	363.5 *	363.5
Molar Flow	(lbmole/hr)	1098 *	175.1	8.090	1281	1142
Mass Flow	(lb/hr)	2.166e+004	2.060e+004	145.7	4.241e+004	2.289e+004
Std Ideal Liq Vol Flow	(barrel/day)	4428	2000 *	10.00 *	6438	4637
Heat Flow	(Btu/hr)	---	---	---	-5.761e+007	-3.985e+007
Molar Enthalpy	(Btu/lbmole)	---	---	---	-4.496e+004	-3.490e+004
Power	(hp)	---	---	---	-2.264e+004	-1.566e+004
Std Gas Flow	(MMSCFD)	10.00	1.595	7.368e-002	11.67	10.40
Specific Gravity		---	---	---	---	---
Specific Gravity rel Air	(rel_to_air)	---	---	---	---	0.6921
Comp Mole Frac (Helium)		0.000300 *	0.000000 *	0.000000 *	0.000257	0.000289
Comp Mole Frac (Nitrogen)		0.004100 *	0.000000 *	0.000000 *	0.003514	0.003943
Comp Mole Frac (CO2)		0.006300 *	0.001500 *	0.000000 *	0.005604	0.006288
Comp Mole Frac (Methane)		0.833000 *	0.103300 *	0.000000 *	0.727998	0.816939
Comp Mole Frac (Ethane)		0.094700 *	0.064100 *	0.000000 *	0.089919	0.100893
Comp Mole Frac (Propane)		0.042400 *	0.093200 *	0.000000 *	0.049076	0.050732
Comp Mole Frac (i-Butane)		0.004800 *	0.020200 *	0.000000 *	0.006875	0.005018
Comp Mole Frac (n-Butane)		0.008300 *	0.054400 *	0.000000 *	0.014549	0.009107
Comp Mole Frac (i-Pentane)		0.001900 *	0.027300 *	0.000000 *	0.005360	0.001925
Comp Mole Frac (n-Pentane)		0.001600 *	0.030800 *	0.000000 *	0.005581	0.001643
Comp Mole Frac (n-Hexane)		0.001000 *	0.040600 *	0.000000 *	0.006407	0.000735
Comp Mole Frac (n-Heptane)		0.000400 *	0.045200 *	0.000000 *	0.006521	0.000273
Comp Mole Frac (n-Octane)		0.000200 *	0.052100 *	0.000000 *	0.007293	0.000108
Comp Mole Frac (n-Nonane)		0.000100 *	0.039600 *	0.000000 *	0.005499	0.000029
Comp Mole Frac (n-Decane)		0.000000 *	0.040500 *	0.000000 *	0.005536	0.000011
Comp Mole Frac (n-C11)		0.000000 *	0.033000 *	0.000000 *	0.004511	0.000003
Comp Mole Frac (n-C12)		0.000000 *	0.027500 *	0.000000 *	0.003759	0.000001
Comp Mole Frac (n-C13)		0.000000 *	0.026400 *	0.000000 *	0.003609	0.000000
Comp Mole Frac (n-C14)		0.000000 *	0.022000 *	0.000000 *	0.003007	0.000000
Comp Mole Frac (n-C15)		0.000000 *	0.021900 *	0.000000 *	0.002993	0.000000
Comp Mole Frac (n-C16)		0.000000 *	0.017800 *	0.000000 *	0.002433	0.000000
Comp Mole Frac (n-C17)		0.000000 *	0.014600 *	0.000000 *	0.001996	0.000000
Comp Mole Frac (n-C18)		0.000000 *	0.015700 *	0.000000 *	0.002146	0.000000
Comp Mole Frac (n-C19)		0.000000 *	0.123700 *	0.000000 *	0.016908	0.000000
Comp Mole Frac (Benzene)		0.000000 *	0.002800 *	0.000000 *	0.000383	0.000046
Comp Mole Frac (Toluene)		0.000100 *	0.009500 *	0.000000 *	0.001384	0.000056
Comp Mole Frac (E-Benzene)		0.000100 *	0.012300 *	0.000000 *	0.001767	0.000026
Comp Mole Frac (o-Xylene)		0.000000 *	0.003800 *	0.000000 *	0.000519	0.000006
Comp Mole Frac (124-MBenzene)		0.000000 *	0.004600 *	0.000000 *	0.000629	0.000002
Comp Mole Frac (Cyclopentane)		0.000100 *	0.002700 *	0.000000 *	0.000455	0.000112
Comp Mole Frac (Mcyclopentan)		0.000200 *	0.010200 *	0.000000 *	0.001566	0.000182
Comp Mole Frac (Cyclohexane)		0.000200 *	0.013800 *	0.000000 *	0.002058	0.000202
Comp Mole Frac (Mcyclohexane)		0.000200 *	0.024900 *	0.000000 *	0.003575	0.000176
Comp Mole Frac (H2O)		0.000000 *	0.000000 *	1.000000 *	0.006314	0.001252
Comp Mole Frac (PathrmHE)		0.000000 *	0.000000 *	0.000000 *	0.000000	0.000000

* Specified by user.

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Production Equipment Ltd.
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(780) 465-9061
pamela.pilipchuk@alcogasoil.com

Case Name:	H:\QUOTES\Q2006-
Unit Set:	NewUser2
Date/Time:	Wed Sep 06 15:10:06 2006

Workbook: Case (Main) (continued)

Streams (continued)

Fluid Pkg: All

Name		3	4	5	6	7
Vapour Fraction		0.000000	0.019954	0.146834	1.000000	0.000000
Temperature	(F)	74.03	100.0 *	94.04	99.45	288.6
Pressure	(psia)	363.5	358.5	113.5 *	92.50	93.50
Molar Flow	(lbmole/hr)	179.1	179.1	179.1	46.31	132.8
Mass Flow	(lb/hr)	2.085e+004	2.085e+004	2.085e+004	1447	1.940e+004
Std Ideal Liq Vol Flow	(barrel/day)	2028	2028	2028	235.4	1792
Heat Flow	(Btu/hr)	-1.880e+007	-1.852e+007	-1.852e+007	-1.844e+006	-1.445e+007
Molar Enthalpy	(Btu/lbmole)	-1.049e+005	-1.034e+005	-1.034e+005	-3.983e+004	-1.088e+005
Power	(hp)	-7387	-7277	-7277	-724.8	-5680
Std Gas Flow	(MMSCFD)	1.632	1.632	1.632	0.4218	1.210
Specific Gravity		0.7166	---	---	---	0.6397
Specific Gravity rel Air	(rel_to_air)	---	---	---	1.079	---
Comp Mole Frac (Helium)		0.000013	0.000013	0.000013	0.000051	0.000000
Comp Mole Frac (Nitrogen)		0.000189	0.000189	0.000189	0.000730	0.000000
Comp Mole Frac (CO2)		0.002124	0.002124	0.002124	0.008214	0.000000
Comp Mole Frac (Methane)		0.104053	0.104053	0.104053	0.402514	0.000000
Comp Mole Frac (Ethane)		0.059956	0.059956	0.059956	0.231453	0.000167
Comp Mole Frac (Propane)		0.096864	0.096864	0.096864	0.267925	0.037227
Comp Mole Frac (i-Butane)		0.022922	0.022922	0.022922	0.022204	0.023172
Comp Mole Frac (n-Butane)		0.056396	0.056396	0.056396	0.040185	0.062048
Comp Mole Frac (i-Pentane)		0.028277	0.028277	0.028277	0.008543	0.035157
Comp Mole Frac (n-Pentane)		0.031364	0.031364	0.031364	0.007414	0.039713
Comp Mole Frac (n-Hexane)		0.042008	0.042008	0.042008	0.003360	0.055481
Comp Mole Frac (n-Heptane)		0.045224	0.045224	0.045224	0.001255	0.060553
Comp Mole Frac (n-Octane)		0.051603	0.051603	0.051603	0.000496	0.069421
Comp Mole Frac (n-Nonane)		0.039175	0.039175	0.039175	0.000135	0.052786
Comp Mole Frac (n-Decane)		0.039538	0.039538	0.039538	0.000050	0.053305
Comp Mole Frac (n-C11)		0.032246	0.032246	0.032246	0.000015	0.043483
Comp Mole Frac (n-C12)		0.026880	0.026880	0.026880	0.000005	0.036249
Comp Mole Frac (n-C13)		0.025808	0.025808	0.025808	0.000002	0.034805
Comp Mole Frac (n-C14)		0.021508	0.021508	0.021508	0.000000	0.029006
Comp Mole Frac (n-C15)		0.021410	0.021410	0.021410	0.000000	0.028875
Comp Mole Frac (n-C16)		0.017402	0.017402	0.017402	0.000000	0.023469
Comp Mole Frac (n-C17)		0.014274	0.014274	0.014274	0.000000	0.019250
Comp Mole Frac (n-C18)		0.015349	0.015349	0.015349	0.000000	0.020700
Comp Mole Frac (n-C19)		0.120936	0.120936	0.120936	0.000000	0.163098
Comp Mole Frac (Benzene)		0.002502	0.002502	0.002502	0.000218	0.003298
Comp Mole Frac (Toluene)		0.009612	0.009612	0.009612	0.000271	0.012869
Comp Mole Frac (E-Benzene)		0.012504	0.012504	0.012504	0.000124	0.016821
Comp Mole Frac (o-Xylene)		0.003683	0.003683	0.003683	0.000030	0.004957
Comp Mole Frac (124-MBenzene)		0.004486	0.004486	0.004486	0.000011	0.006045
Comp Mole Frac (Cyclopentane)		0.002671	0.002671	0.002671	0.000516	0.003422
Comp Mole Frac (Mcyclopentan)		0.010255	0.010255	0.010255	0.000843	0.013537
Comp Mole Frac (Cyclohexane)		0.013674	0.013674	0.013674	0.000942	0.018113
Comp Mole Frac (Mcyclohexane)		0.024655	0.024655	0.024655	0.000804	0.032971
Comp Mole Frac (H2O)		0.000437	0.000437	0.000437	0.001691	0.000000
Comp Mole Frac (PathrmHE)		0.000000	0.000000	0.000000	0.000000	0.000000

* Specified by user.

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Case Name:	H:\QUOTES\Q2006-
Unit Set:	NewUser2
Date/Time:	Wed Sep 06 15:10:06 2006

Workbook: Case (Main) (continued)

Streams (continued)

Fluid Pkg: All

Name	8	9	10	11	Sales gas
Vapour Fraction	0.000000	0.000000	1.000000	0.983506	0.999998
Temperature (F)	264.9	120.0 *	258.3	120.0 *	72.09
Pressure (psia)	90.50	80.50	373.5	363.5 *	338.5
Molar Flow (lbmole/hr)	132.8	132.8	46.31	46.31	1142
Mass Flow (lb/hr)	1.940e+004	1.940e+004	1447	1447	2.289e+004
Std Ideal Liq Vol Flow (barrel/day)	1792	1792	235.4	235.4	4637
Heat Flow (Btu/hr)	-1.473e+007	-1.631e+007	-1.746e+006	-1.858e+006	-3.985e+007
Molar Enthalpy (Btu/lbmole)	-1.109e+005	-1.228e+005	-3.769e+004	-4.012e+004	-3.490e+004
Power (hp)	-5791	-6409	-686.1	-730.2	-1.566e+004
Std Gas Flow (MMSCFD)	1.210	1.210	0.4218	0.4218	10.40
Specific Gravity	0.6518	0.7214	---	---	---
Specific Gravity rel Air (rel_to_air)	---	---	1.079	---	---
Comp Mole Frac (Helium)	0.000000	0.000000	0.000051	0.000051	0.000289
Comp Mole Frac (Nitrogen)	0.000000	0.000000	0.000730	0.000730	0.003943
Comp Mole Frac (CO2)	0.000000	0.000000	0.008214	0.008214	0.006288
Comp Mole Frac (Methane)	0.000000	0.000000	0.402514	0.402514	0.816939
Comp Mole Frac (Ethane)	0.000167	0.000167	0.231453	0.231453	0.100893
Comp Mole Frac (Propane)	0.037227	0.037227	0.267925	0.267925	0.050732
Comp Mole Frac (i-Butane)	0.023172	0.023172	0.022204	0.022204	0.005018
Comp Mole Frac (n-Butane)	0.062048	0.062048	0.040185	0.040185	0.009107
Comp Mole Frac (i-Pentane)	0.035157	0.035157	0.008543	0.008543	0.001925
Comp Mole Frac (n-Pentane)	0.039713	0.039713	0.007414	0.007414	0.001643
Comp Mole Frac (n-Hexane)	0.055481	0.055481	0.003360	0.003360	0.000735
Comp Mole Frac (n-Heptane)	0.060553	0.060553	0.001255	0.001255	0.000273
Comp Mole Frac (n-Octane)	0.069421	0.069421	0.000496	0.000496	0.000108
Comp Mole Frac (n-Nonane)	0.052786	0.052786	0.000135	0.000135	0.000029
Comp Mole Frac (n-Decane)	0.053305	0.053305	0.000050	0.000050	0.000011
Comp Mole Frac (n-C11)	0.043483	0.043483	0.000015	0.000015	0.000003
Comp Mole Frac (n-C12)	0.036249	0.036249	0.000005	0.000005	0.000001
Comp Mole Frac (n-C13)	0.034805	0.034805	0.000002	0.000002	0.000000
Comp Mole Frac (n-C14)	0.029006	0.029006	0.000000	0.000000	0.000000
Comp Mole Frac (n-C15)	0.028875	0.028875	0.000000	0.000000	0.000000
Comp Mole Frac (n-C16)	0.023469	0.023469	0.000000	0.000000	0.000000
Comp Mole Frac (n-C17)	0.019250	0.019250	0.000000	0.000000	0.000000
Comp Mole Frac (n-C18)	0.020700	0.020700	0.000000	0.000000	0.000000
Comp Mole Frac (n-C19)	0.163098	0.163098	0.000000	0.000000	0.000000
Comp Mole Frac (Benzene)	0.003298	0.003298	0.000218	0.000218	0.000046
Comp Mole Frac (Toluene)	0.012869	0.012869	0.000271	0.000271	0.000056
Comp Mole Frac (E-Benzene)	0.016821	0.016821	0.000124	0.000124	0.000026
Comp Mole Frac (o-Xylene)	0.004957	0.004957	0.000030	0.000030	0.000006
Comp Mole Frac (124-MBenzene)	0.006045	0.006045	0.000011	0.000011	0.000002
Comp Mole Frac (Cyclopentane)	0.003422	0.003422	0.000516	0.000516	0.000112
Comp Mole Frac (Mcyclopentan)	0.013537	0.013537	0.000843	0.000843	0.000182
Comp Mole Frac (Cyclohexane)	0.018113	0.018113	0.000942	0.000942	0.000202
Comp Mole Frac (Mcyclohexane)	0.032971	0.032971	0.000804	0.000804	0.000176
Comp Mole Frac (H2O)	0.000000	0.000000	0.001691	0.001691	0.001252
Comp Mole Frac (PathrmHE)	0.000000	0.000000	0.000000	0.000000	0.000000

* Specified by user.

Alco Gas & Oil
Production Equipment Ltd.
Edmonton, Alberta
(780) 465-9061
pamela.pilipchuk@alcogasoil.com

Case Name:	H:\QUOTES\Q2006-
Unit Set:	NewUser2
Date/Time:	Wed Sep 06 15:10:06 2006

Workbook: Case (Main) (continued)

Streams (continued)

Fluid Pkg: All

Name		450	451	500	801	802
Vapour Fraction		0.000000	0.000000	0.983543	0.000000	0.380920
Temperature	(F)	350.0 *	300.0 *	120.0 *	178.6	288.6
Pressure	(psia)	33.50 *	28.50	363.5 *	93.30	93.50
Molar Flow	(lbmole/hr)	163.5	163.5	46.30 *	214.6	214.6
Mass Flow	(lb/hr)	7.241e+004	7.241e+004	1447	2.464e+004	2.464e+004
Std Ideal Liq Vol Flow	(barrel/day)	5731	5731	235.4	2386	2386
Heat Flow	(Btu/hr)	1.015e+007	7.931e+006	-1.858e+006	-2.076e+007	-1.854e+007
Molar Enthalpy	(Btu/lbmole)	6.208e+004	4.852e+004	-4.012e+004	-9.675e+004	-8.642e+004
Power	(hp)	3988	3117	-730.1	-8159	-7287
Std Gas Flow	(MMSCFD)	1.489	1.489	0.4217	1.954	1.954
Specific Gravity		0.7547	0.7732	---	0.6586	---
Specific Gravity rel Air	(rel_to_air)	---	---	---	---	---
Comp Mole Frac (Helium)		0.000000 *	0.000000	0.000051 *	0.000000	0.000000
Comp Mole Frac (Nitrogen)		0.000000 *	0.000000	0.000730 *	0.000000	0.000000
Comp Mole Frac (CO2)		0.000000 *	0.000000	0.008214 *	0.000002	0.000002
Comp Mole Frac (Methane)		0.000000 *	0.000000	0.402506 *	0.000002	0.000002
Comp Mole Frac (Ethane)		0.000000 *	0.000000	0.231664 *	0.001099	0.001099
Comp Mole Frac (Propane)		0.000000 *	0.000000	0.267739 *	0.133798	0.133798
Comp Mole Frac (i-Butane)		0.000000 *	0.000000	0.022197 *	0.054830	0.054830
Comp Mole Frac (n-Butane)		0.000000 *	0.000000	0.040176 *	0.130051	0.130051
Comp Mole Frac (i-Pentane)		0.000000 *	0.000000	0.008541 *	0.052004	0.052004
Comp Mole Frac (n-Pentane)		0.000000 *	0.000000	0.007413 *	0.054812	0.054812
Comp Mole Frac (n-Hexane)		0.000000 *	0.000000	0.003360 *	0.056393	0.056393
Comp Mole Frac (n-Heptane)		0.000000 *	0.000000	0.001255 *	0.050369	0.050369
Comp Mole Frac (n-Octane)		0.000000 *	0.000000	0.000496 *	0.050939	0.050939
Comp Mole Frac (n-Nonane)		0.000000 *	0.000000	0.000135 *	0.035994	0.035994
Comp Mole Frac (n-Decane)		0.000000 *	0.000000	0.000050 *	0.034850	0.034850
Comp Mole Frac (n-C11)		0.000000 *	0.000000	0.000015 *	0.027752	0.027752
Comp Mole Frac (n-C12)		0.000000 *	0.000000	0.000005 *	0.022842	0.022842
Comp Mole Frac (n-C13)		0.000000 *	0.000000	0.000002 *	0.021753	0.021753
Comp Mole Frac (n-C14)		0.000000 *	0.000000	0.000000 *	0.018045	0.018045
Comp Mole Frac (n-C15)		0.000000 *	0.000000	0.000000 *	0.017930	0.017930
Comp Mole Frac (n-C16)		0.000000 *	0.000000	0.000000 *	0.014555	0.014555
Comp Mole Frac (n-C17)		0.000000 *	0.000000	0.000000 *	0.011930	0.011930
Comp Mole Frac (n-C18)		0.000000 *	0.000000	0.000000 *	0.012823	0.012823
Comp Mole Frac (n-C19)		0.000000 *	0.000000	0.000000 *	0.101011	0.101011
Comp Mole Frac (Benzene)		0.000000 *	0.000000	0.000218 *	0.003348	0.003348
Comp Mole Frac (Toluene)		0.000000 *	0.000000	0.000271 *	0.010538	0.010538
Comp Mole Frac (E-Benzene)		0.000000 *	0.000000	0.000124 *	0.012225	0.012225
Comp Mole Frac (o-Xylene)		0.000000 *	0.000000	0.000030 *	0.003539	0.003539
Comp Mole Frac (124-MBenzene)		0.000000 *	0.000000	0.000011 *	0.004035	0.004035
Comp Mole Frac (Cyclopentane)		0.000000 *	0.000000	0.000516 *	0.004314	0.004314
Comp Mole Frac (Mcyclopentan)		0.000000 *	0.000000	0.000843 *	0.013596	0.013596
Comp Mole Frac (Cyclohexane)		0.000000 *	0.000000	0.000942 *	0.017295	0.017295
Comp Mole Frac (Mcyclohexane)		0.000000 *	0.000000	0.000804 *	0.027325	0.027325
Comp Mole Frac (H2O)		0.000000 *	0.000000	0.001691 *	0.000001	0.000001
Comp Mole Frac (PathrmHE)		1.000000 *	1.000000	0.000000 *	0.000000	0.000000

* Specified by user.

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Case Name:	H:\QUOTES\Q2006·
Unit Set:	NewUser2
Date/Time:	Wed Sep 06 15:10:06 2006

Workbook: Case (Main) (continued)

Streams (continued)

Fluid Pkg: All

Name		WaterOut	Q-900	Q-901	Q-902	Q-903
Vapour Fraction		0.000000	---	---	---	---
Temperature	(F)	74.03	---	---	---	---
Pressure	(psia)	363.5	---	---	---	---
Molar Flow	(lbmole/hr)	6.661	---	---	---	---
Mass Flow	(lb/hr)	120.0	---	---	---	---
Std Ideal Liq Vol Flow	(barrel/day)	8.234	---	---	---	---
Heat Flow	(Btu/hr)	-8.176e+005	2.217e+006	1.572e+006	9.869e+004	1.123e+005
Molar Enthalpy	(Btu/lbmole)	-1.227e+005	---	---	---	---
Power	(hp)	-321.3	871.4	617.9	38.79	44.13
Std Gas Flow	(MMSCFD)	6.066e-002	---	---	---	---
Specific Gravity		1.009	---	---	---	---
Specific Gravity rel Air	(rel_to_air)	---	---	---	---	---
Comp Mole Frac (Helium)		0.000000	---	---	---	---
Comp Mole Frac (Nitrogen)		0.000001	---	---	---	---
Comp Mole Frac (CO2)		0.000068	---	---	---	---
Comp Mole Frac (Methane)		0.000000	---	---	---	---
Comp Mole Frac (Ethane)		0.000000	---	---	---	---
Comp Mole Frac (Propane)		0.000000	---	---	---	---
Comp Mole Frac (i-Butane)		0.000000	---	---	---	---
Comp Mole Frac (n-Butane)		0.000000	---	---	---	---
Comp Mole Frac (i-Pentane)		0.000000	---	---	---	---
Comp Mole Frac (n-Pentane)		0.000000	---	---	---	---
Comp Mole Frac (n-Hexane)		0.000000	---	---	---	---
Comp Mole Frac (n-Heptane)		0.000000	---	---	---	---
Comp Mole Frac (n-Octane)		0.000000	---	---	---	---
Comp Mole Frac (n-Nonane)		0.000000	---	---	---	---
Comp Mole Frac (n-Decane)		0.000000	---	---	---	---
Comp Mole Frac (n-C11)		0.000000	---	---	---	---
Comp Mole Frac (n-C12)		0.000000	---	---	---	---
Comp Mole Frac (n-C13)		0.000000	---	---	---	---
Comp Mole Frac (n-C14)		0.000000	---	---	---	---
Comp Mole Frac (n-C15)		0.000000	---	---	---	---
Comp Mole Frac (n-C16)		0.000000	---	---	---	---
Comp Mole Frac (n-C17)		0.000000	---	---	---	---
Comp Mole Frac (n-C18)		0.000000	---	---	---	---
Comp Mole Frac (n-C19)		0.000000	---	---	---	---
Comp Mole Frac (Benzene)		0.000000	---	---	---	---
Comp Mole Frac (Toluene)		0.000000	---	---	---	---
Comp Mole Frac (E-Benzene)		0.000000	---	---	---	---
Comp Mole Frac (o-Xylene)		0.000000	---	---	---	---
Comp Mole Frac (124-MBenzene)		0.000000	---	---	---	---
Comp Mole Frac (Cyclopentane)		0.000000	---	---	---	---
Comp Mole Frac (Mcyclopentan)		0.000000	---	---	---	---
Comp Mole Frac (Cyclohexane)		0.000000	---	---	---	---
Comp Mole Frac (Mcyclohexane)		0.000000	---	---	---	---
Comp Mole Frac (H2O)		0.999930	---	---	---	---
Comp Mole Frac (PathrmHE)		0.000000	---	---	---	---

Heat Exchanger Specification Sheet

1	Alco Gas & Oil Production Equipment Ltd.					Job No.	Q2006	
2	Customer					Ref No.		
3	Address	Calgary, Alberta				Proposal N		
4	Plant Location					Date	Sept.6/06	Rev. 0
5	Service of Unit	Feed/Bottoms Exchanger				Item No	E-400	
6	Size 8x 72		Type	NEN - HORZ	Connected in	1 Parallel		1 Series
7	Surf/Unit (Eff)	50 ft²	Shells/Unit	1	Surface/Shell (Effective)		50 ft²	

PERFORMANCE OF ONE UNIT

8	Fluid Allocation		**Shellside**	**Tubeside**
9	Fluid Name		Stabilizer Bottoms	Feed
10	Total Fluid Entering	lb/hr	19,398	20,845
11	Vapor		0	0
12	Liquid		19,398	20,845
13	Steam			
14	Noncondensable			
15	Fluid Vaporized or Condensed		0	76
16	Liquid Density (In/Out)	lb/ft³	39.932/40.689	44.733/44.054
17	Liquid Viscosity	cP	0.340	0.709
18	Liquid Specific Heat	Btu/lb-F	0.611	0.505
19	Liquid Thermal Conductivity	Btu/hr-ft-F	0.053	0.064
20	Vapor Mol. Weight (In/Out)		0.0/0.0	18.0169/21.2929
21	Vapor Viscosity	cP	0.0000	0.0670
22	Vapor Specific Heat	Btu/lb-F	0.000	0.342
23	Vapor Thermal Conductivity	Btu/hr-ft-F	0.000	0.018
24	Temperature (In/Out)	°F	288.6/264.9	74.0/100.0
25	Operating Pressure	psi(Abs)	93.495	363.482
26	Velocity	ft/sec	0.569	1.662
27	Pressure Drop (Allow/Calc)	psi	3.000/0.341	5.000/0.142
28	Fouling resistance	hr-ft²-F/Btu	0.001500	0.001500

29	Heat Exchanged	281,265 Btu/hr	mtd (corr)	189.693 °F	
30	Transfer Rate, Service	29.4	Clean	49.2 Btu/hr-ft²-F	

CONSTRUCTION OF ONE SHELL

31		**Shellside**	**Tubeside**	**Sketch**	
32	Design/Test Pres. psi	700/910	700/910		
33	Design Temp. °F	150	150		
34	No. Passes per Shell	1	1		
35	Corrosion Allow. in	0.0625	0.0625		
36	Connections In	1-2.0 300# RF	3.0 300# RF		
37	Size & Out	1-2.0 300# RF	3.0 300# RF		
38	Rating Intermediate				

39							
40	Tube No	44	OD 0.750 in	Thk 0.083	Length 6.00 ft	Pitch 0.93750 / 30.0°	
41	Tube Type		PLAIN 3/4" 14 Ga. Ave.	Material		SA-179 Smls.	
42	Shell	SA-106B	I.D 7.98 OD in	Shell Cover		n/a INT	
43	Channel or Bonnet		SA-106B	Channel Cover		SA-105	
44	Tubesheet-Stationary		SA-516-70	Tubesheet-Floating			
45	Floating Head Cover			Impingement Protection		NO	
46	Baffles Cross	CS	Type VERT-SEG	%Cut 35.2 (Area)		Spacing-cc	18.0
47	Baffles-Long			Seal Type			
48	Supports-Tube		U-Bend	Type			
49	Bypass Seal Arrangement			Tube-Tubesheet Joint		Rolled	
50	Expansion Joint			Type			
51	Rho-V2 Inlet Nozzle		1,528	Bundle Entrance	1,120	Bundle Exit	1,099
52	Gasket-Shellside			Tubeside		Floating Head	
53	Code Requirement		ASME Section 8, Divsion 1			TEMA Class	C
54	Weight/Shell			Filled with Water		Bundle	
55	Remarks:						
56							
57							
58							
59							
60							

Heat Exchanger Specification sheet

1	Alco Gas & Oil Production Equipment Ltd.					Job No.	Q2006-	
2	Customer					Ref No.		
3	Address	Calgary, Alberta				Proposal N		
4	Plant Location					Date	Sept.7/06	Rev. 0
5	Service of Unit	Stabilizer Reboiler				Item No	E-410	
6	Size 23x 168		Type	BHU - HORZ	Connected in	1 Parallel		1 Series
7	Surf/Unit (Eff)	1265 ft²	Shells/Unit	1	Surface/Shell (Effective)		1265 ft²	

PERFORMANCE OF ONE UNIT

		Shellside	Tubeside
9	Fluid Allocation		
10	Fluid Name	Stabilizer Bottoms	Hot Oil
11	Total Fluid Entering lb/hr	24,641	72,414
12	Vapor	0	0
13	Liquid	24,641	72,414
14	Steam		
15	Noncondensable		
16	Fluid Vaporized or Condensed	5,242	0
17	Liquid Density (In/Out) lb/ft³	41.116/39.932	47.111/48.268
18	Liquid Viscosity cP	0.357	1.003
19	Liquid Specific Heat Btu/lb-F	0.591	0.612
20	Liquid Thermal Conductivity Btu/hr-ft-F	0.053	0.077
21	Vapor Mol. Weight (In/Out)	52.7351/64.1413	0.0/0.0
22	Vapor Viscosity cP	0.0100	0.0000
23	Vapor Specific Heat Btu/lb-F	0.504	0.000
24	Vapor Thermal Conductivity Btu/hr-ft-F	0.014	0.000
25	Temperature (In/Out) °F	178.6/288.6	350.0/300.0
26	Operating Pressure psi(Abs)	93.295	33.498
27	Velocity ft/sec	0.924	1.017
28	Pressure Drop (Allow/Calc) psi	0.200/0.068	5.000/0.418
29	Fouling resistance hr-ft²-F/Btu	0.001500	0.002000

30	Heat Exchanged	2,217,870 Btu/hr		mtd (corr)	85.459 °F	
31	Transfer Rate, Service	20.5		Clean	30.7 Btu/hr-ft²-F	

CONSTRUCTION OF ONE SHELL

			Shellside	Tubeside	Sketch
33					
34	Design/Test Pres. psi		400/600	150/225	
35	Design Temp. °F		300	450	
36	No. Passes per Shell		2- Split	2	
37	Corrosion Allow. in		0.0625	0.0625	
38	Connections	In	2-4.0 300# RF	4.0 150# RF	
39	Size &	Out	2-6.0 300# RF	4.0 150# RF	
40	Rating	Intermediate			

41							
42	Tube No	223 U	OD 0.75 in	Thk 0.083	Length 14.00 ft		Pitch 0.93750 / 60.0°
43	Tube Type		PLAIN 3/4" 14 Ga. Ave.	Material		SA-179 Smls.	
44	Shell	SA-106B	I.D 23.25 OD in	Shell Cover		SA-516-70 INT	
45	Channel or Bonnet		SA-106B	Channel Cover		SA-105	
46	Tubesheet-Stationary		SA-516-70	Tubesheet-Floating			
47	Floating Head Cover			Impingement Protection		NO	
48	Baffles Cross	CS	Type VERT-SEG	%Cut 20.8 (Area)		Spacing-cc	12.0
49	Baffles-Long			Seal Type			
50	Supports-Tube			U-Bend	Type		
51	Bypass Seal Arrangement			Tube-Tubesheet Joint		Rolled	
52	Expansion Joint			Type			
53	Rho-V2 Inlet Nozzle		37	Bundle Entrance	45	Bundle Exit	211
54	Gasket-Shellside			Tubeside		Floating Head	
55	Code Requirement		ASME Section 8, Divsion 1			TEMA Class	C
56	Weight/Shell			Filled with Water		Bundle	
57	Remarks:						
58							
59							
60							

AIR COOLED EXCHANGERS, INC.

1201 S. 9TH - BROKEN ARROW, OKLAHOMA 74012
Ph (918) 251-7477
Fax (918) 258-1833
E-MAIL: MAILHUB@ACE-COOLERS.COM

COOLER PERFORMANCE SPECIFICATION

CUSTOMER	ALCO	**PROPOSAL NUMBER**	
REFERENCE		**DATE**	9/7/2006
MODEL	E84-12	**PAGE**	1

PERFORMANCE OF ONE UNIT

SERVICE	A800
FLOW	24247.0#/HR
FLUID	PRODUCT
TEMPERATURE IN, F	265.0
TEMPERATURE OUT, F	120.0
INLET PRESSURE, PSIA	90.5
PRESSURE DROP, PSI	2.6
DUTY, BTU/HOUR	1965000
CORRECTED MTD	51.0
BARE TUBE RATE	78.9
FOULING	0.00100
BARE SURFACE, SQ. FT.	488
TOTAL SURFACE SQ. FT.	7765

CONSTRUCTION

NO. SECTIONS	1
NO. TUBES/SECTION	254
LENGTH	12.0
NO. ROWS	4
NO. PASSES	6
COUNTERFLOW	
TUBE O.D. AND BWG	.625X16BWG
TUBE MATERIAL	SA214(WLD)
DESIGN PRESSURE, PSI	400
DESIGN TEMPERATURE, F	300/-20
NOZZLES-INLET	2-300RF
NOZZLES-OUTLET	2-300RF
HEADER TYPE	BOX W/PLUGS
HEADER MATERIAL	SA-516-70
ASME CODE STAMP	YES W/NB
GROOVED TUBE SHEET	YES
CORROSION ALLOWANCE	0.063
PLUGS, TYPE	SHOULDER
PLUGS, MATERIAL	SA-105
TURBULATORS	
ACCELERATORS	
LOUVERS	NO
STRESS RELIEVE	NO
NDE	BUTT WELDS
ADDITIONAL CODES	
CANADIAN REGISTRATION	AB
ADDITIONAL COUPLINGS	
BYPASS NOZZLE	
FINS	HYPERF MARINE

AIR DATA

INLET AIR, F	100.0	**ELEVATION, FT.**	3500
OUTLET AIR, F	136.5	**TOTAL SCFM**	49634

MECHANICALEQUIPMENT

NO FANS	1	**HP/FAN**	9.0	**RPM**	546	**DIA**	84
FAN	MOORE SERIES 24	**FAN MATERIAL**	ALUM	**NUMBER OF BLADES**	3	**PITCH**	17 DEGREES

V-BELT DRIVE BY (1) 10 HP 1800 RPM 460/3/60 TEFC ELECTRIC MOTOR

DRAFT TYPE	FORCED						
EST SHIPPING WEIGHT	6612	**WIDTH**	8.1	**LENGTH**	12.9	**HEIGHT**	7.2
ACCESSORIES	HAILGUARD. BUGSCREEN. MURPHY XP VIB. SWITCH						
FINISH ACE standard primer							