

Compact Welded Plate Heat Exchanger Solves Leakage Problems in HF-Catalyzed Alkylation

MAXCHANGER® unit withstands corrosive attack of dissolved hydrofluoric acid, with higher efficiency and in one-third less space than an S&T unit.

The alkylation plant in a Mexican refinery uses the hydrofluoric acid catalysis process. The original plant design used a 10-ft-long (3-m) shell & tube exchanger for heating the caustic solution with steam. The solution contained trace amounts of hydrofluoric acid, which is highly reactive, corrosive and hazardous.

Ten years fighting leaks

The S&T exchanger presented the refinery with multiple problems: The unit took up too much space, and its low efficiency required excessive steam. Since it was made from carbon steel, the S&T unit suffered continuing corrosion damage. Most significantly, corrosion caused the unit to sustain leaks in both channels. The leaking caustic solution with its hydrofluoric acid represented a hazard to nearby people and equipment.

These problems persisted unresolved for 10 years, since the start-up of the refinery.

Efficiency saves space and materials costs

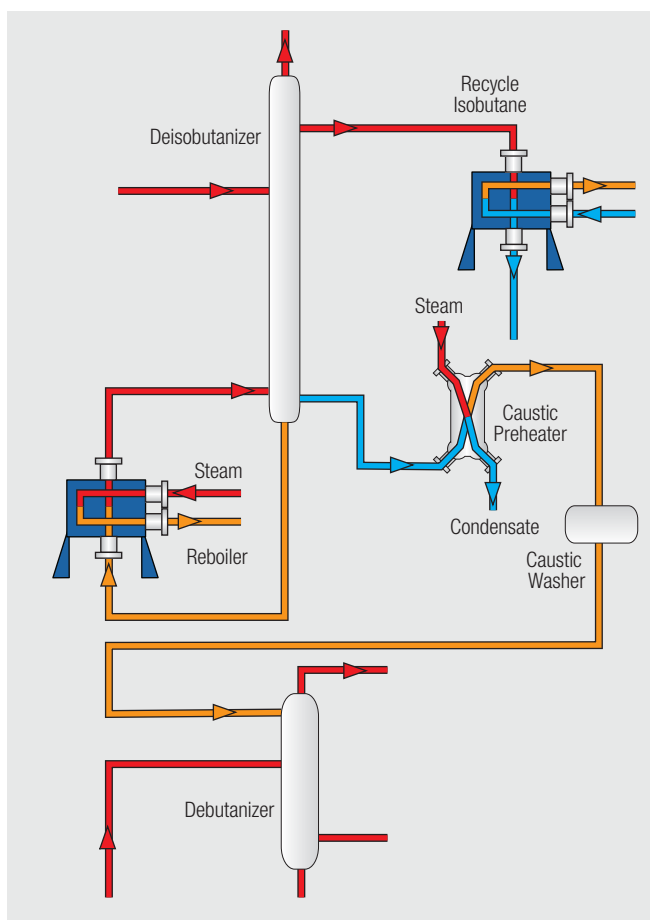
The refinery called upon Tranter representative Soluciones en Transferencia de Calor, S.A. de C.V. (Soltrac) for a solution to the S&T exchanger problems. Soltrac specified and recommended a Tranter MAXCHANGER® Model MX-07 welded plate heat exchanger with Monel 400 alloy plates.



The MAXCHANGER was configured with 2-in. (5-cm), 600-lb (272-kg) RFSO flanges at inlets and outlets of both channels.

Because of the high efficiency of its dimpled plate heat exchange surfaces, the MX-07 was only one-third the length of the original S&T. This also helped reduce the materials cost of the exchanger, which used high alloys to solve the corrosion and leakage problems with the carbon steel S&T unit.

The MAXCHANGER unit installed with plenty of room to spare in the process layout. After months in service, the unit continues to perform with no signs of corrosion or leakage.



A MAXCHANGER used as a caustic preheater in place of a shell & tube HE has reduced both footprint and maintenance.

Caustic Solution Heater Process Conditions

	Hot Side: Steam		Cold Side: Caustic Solution	
	Inlet	Outlet	Inlet	Outlet
Total Fluid Flow, lb/hr (kg/hr)	929.09 (421.43)	~	22,891 (10,383)	~
Liquid/Steam/Water	NA/929.09 (421.43)/NA	NA/NA/929.09 (421.43) ^a	22,891 (10,383)/NA/NA	22,891 (10,383)/NA/NA
Temperature, °F (°C)	297 (147)	297 (147)	111 (44)	150 (66)
Liquid/Vapor Density, lb/gal (kg/litre)	NA/0.02 (NA/0.002)	7.68/NA (0.92/NA)	8.57 (1.03) ^b	8.57 (1.03) ^b
Liquid/Vapor Specific Heat, Btu/(lb•°F) [kJ/(kg•°C)]	NA/0.47 [NA/1.97]	1.07/NA [4.47/NA]	0.95 [3.97] ^b	0.95 [3.97] ^b
Thermal Conductivity (Liquid/Vapor), Btu/(hr•ft•°F) [W/m•°C]	NA/0.02 [NA/0.03]	0.39/NA [0.68/NA]	0.370/NA ^b [0.64/NA]	0.370/NA ^b [0.64/NA]
Viscosity (Liquid/Vapor), cP	NA/0.01	0.19/NA	0.710/NA ^b	0.710/NA ^b
Latent Heat, Btu/lb (kJ/kg)	912.89 (2,123.38)	912.89 (2,123.38)	0 (0)	0 (0)
Inlet Pressure, psig (barg)	49 (3.4)	~	~	~
Pressure Drop, psi (bar)	~	~	8.5 (0.6)	~
Design/Test Pressure, psig (barg)	80/104 (5.5/7.1)	~	80/104 (5.5/7.1)	~
Design/MDMT Temperature, °F (°C)	322 (161)	~	322 (161)	~
Heat Exchanged, Btu/hr (kW)	848,161 (248.6)	~	~	~
LMTD, °F (°C)	165.2 (91.8)	~	~	~
Transfer Rate (Clean/Service), Btu/(ft ² •hr•°F) [W/(m ² •°C)]	1173/752 [6,660/4,270]	~	~	~

^aThis is a condensing application. There were no noncondensibles.

^bCaustic properties measured at average wall temperature.

Plates: Monel 400, 16 gauge

Inlets and Outlets: 2 in. (DN50), 600 lb (41.3 barg) RFSSO

ASME Code stamped at 80 psig (5.5 barg), 321.6°F (160.9°C)

Note: Tranter is not a process system design company. Accordingly, Tranter is not liable for heat exchangers that fail when employed in substandard system designs. Buyers should consult professional process design engineers.

Tranter reserves the right to change technical specifications for its equipment at any time.



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