

Hybrid Welded Plate Heat Exchanger Multi-Phase • Large Capacity • Flexible Design Configuration

Industries Using Hybrid HX

- **Upstream Oil and Gas** - Crude Stabilization, Gas Dehydration, Gas Sweetening (i.e. Lean/Rich Amine)
- **Petrochemicals** - Ethylene Glycol or Oxide, Bisphenol, Phenol, Caprolactam
- **Chemicals** - Chlor-Alkali, Urea, Ammonia, Ammonia-Nitrate, Fertilizer, Bio-Diesel
- **Steel Making** - Flushing Liquor Waste Heat Recovery, Coke Plant Light Oil and Wash Oil, Ammonia Recovery, Blast Furnace, Slag Quench, Primary and Final Cooler, Waste Water, Treatment
- **Power Generation** - Steam Condenser, Feed-Water Pre-heater, Flue-Gas Heat Recovery

Process Challenge

Certain processes require phase change and/or management of high viscous, aggressive fluids to minimize clogging, deposits and reduced thermal performance due to fouling.

Minimize clogging with a complete “free flow” tube side process channel. Fabrication is a fully welded process plate pack with a tube side channel gap of 0.30” for difficult processes and clean side plate gap of 0.12” for clean vapor or liquid fluids allowing for phase change.

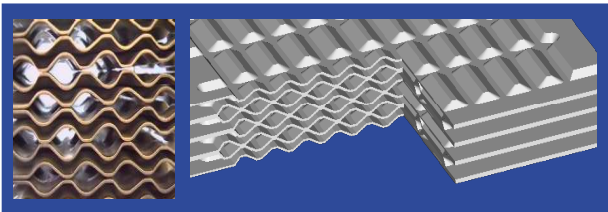
Design Parameters

Multiphase - Condensation or Evaporation

A single pass on the plate side and multiple passes on the tube side allows more control for multiphase designs. Either condensation or evaporation can be designed due to the flexible structure of the Hybrid. Condensation can be easily drained by gravity when the Hybrid HX is configured in the vertical position.

Low Pressure Drop

The correct number of passes combined with the correct number of channels on both the tube and plate sides can achieve the required pressure drop at both sides of the Hybrid HX. Flexibility in the placement of inlet and outlet nozzles adds to the Hybrid HX capability to meet low pressure drop requirements.



Internal Welded Plate Pack Design

Heat Recovery

The use of elongated dimples in the plate pattern promote higher heat transfer to increase efficiency. A close temperature approach is achieved with a high number of passes on the tube side and plate side.

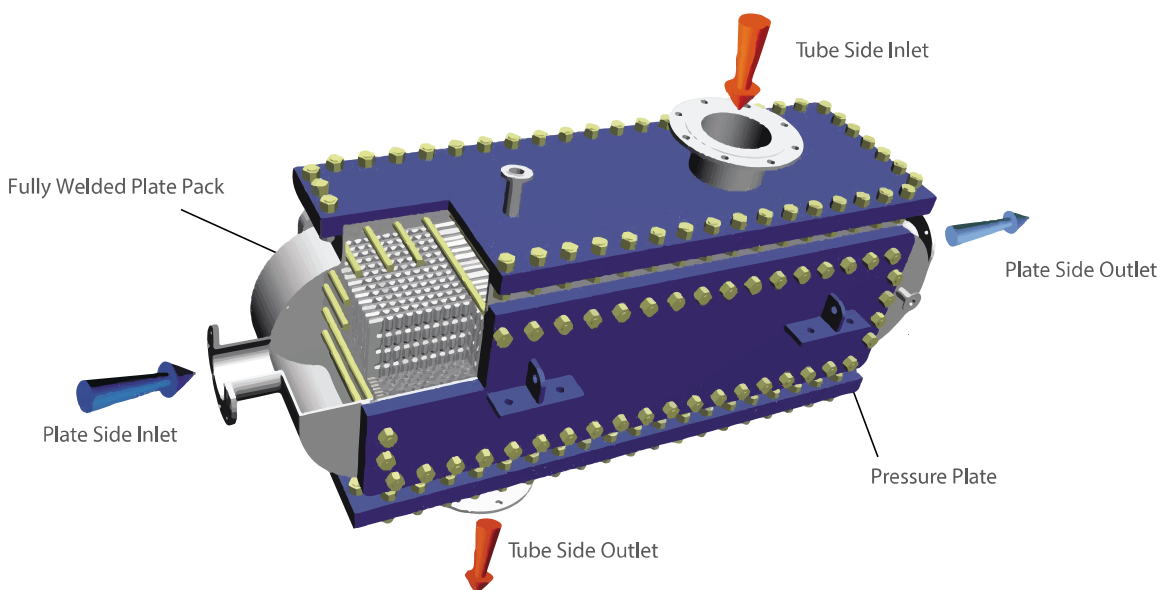
Features of the Fully Welded Hybrid Plate HX

- **Wide Application Range**
- **Pressure Design Up to 870 PSIG**
- **Fully Welded Tubular Process Fluid Channels**
- **100% Free Flow Process Channel Mechanical Cleaning**
- **Multi-Phase Fluid Applications (Vapor or Liquid)**
- **Channel Flow: Counter Current or Cross Current**
- **Close Approaching Temperature**
- **Flexible Mechanical Design for Nozzle Orientations**
- **Large Thermal Capacity:**
 - » **20,000 ft.² Plate Area for Fluids**
 - » **150,000 ft.² Plate Area for Air Cooled Option**
- **Compact Size with Small Footprint**
- **Vertical or Horizontal Orientation**
- **High Pressure Drop Design Options**
- **ASME Sect. VIII PV “U” Stamp**



Installed Gas Processing Hybrid Heat Exchanger

Fully Welded Plate Pack Hybrid Heat Exchanger



Exploded View

Orientation Can Be Designed to be Horizontal (as shown) or Vertical to Reduce Footprint

Mechanical Specifications	Hybrid	
Max Temperature:	650 °F	350 °C
Min Temperature:	-4 °F	-20 °C
Approach Temperature:	1.0 °F	1 °C
Max Pressure:	870 psi	6 MPa
Allowable Pressure Differential:	90 psi	0.62 MPa
Allowable Pressure Drop:	30 psi	0.21 MPa
Max Gap Distance:	0.30 in	8 mm
Plate Thickness:	0.06 in	1.5 mm
Max Channel Velocity:	6.5 ft./s	2 m/s
Max Surface Area Per Unit:	20,000 ft. ²	2,000 m ²
Avg. Heat Transfer Coefficient:	1,056 Btu/hr. ft. ² °F	6,000 W/m. ² °C
Available Materials:	ASME Sect. VIII "U" Stamp • 304 • 316L • Ni-Alloy	
Orientation:	Vertical • Horizontal	
Typical Fluid Applications:	Aggressive Media • High Viscosity	
Benefits:	Multiple Inlet/Outlet Nozzle Configurations • 1 Hybrid = 3 SHE's	
Typical Application:	Cooling • Heating • Condenser • Evaporator • Re-Boiler	
Cleanability:	Process Fluid Side • Clean Fluid Side • CIP	
* Note:	Subject to Material, Application, and Fluid	



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