



Case Study

Wide Gap

Heat Exchanger

Client: Process design firm providing engineering, manufacturing, installation, facilities management serving various industries including; food & beverage processing, waste water, carbon capture, bio-based processing, mining and metals, oil, gas, and chemical processing.

FOOD INGREDIENT PROCESS WELDED WIDE GAP PLATE HEAT EXCHANGER

WEIGHT REDUCTION

76% Unit Weight reduction from 32,500 lbs to approximately 7,700 lbs., with flexible design features.

VOLUME REDUCTION

48% Unit Volume reduction from approximately 640 cu. ft. to 334 cu. ft. with compact dimensions.

FIRST COST SAVINGS

25% Hybrid first cost savings approximately 50% vs. Box & Tube. Higher efficiency at lower capital cost.

EFFICIENCY INCREASED

40% Hybrid design increases the efficiency and multi-phase thermal exchange.



The Engineering Challenge

"Gum", a food ingredient thickener exists as a long chain chemical molecule. Gum production forms sticky balls that may be as large as 1/2 to 3/4 inches. These sticky Gum balls can accumulate in the heat exchanger as they agglomerate and quickly clog a typical heat exchanger.

Client engineering challenge was finding a heat exchanger that would allow free flow of the sticky Gum balls while maintaining product flow at the required thermal performance.

Moreover, client required engineered solution that evolved by utilizing an approximation method for heat exchanger design optimization to incorporate pump data for a final system design.



Baseline Design Data Approximated

Design Data	Unit	Hot Side	Cold Side
Fluid	-	Waste Water	Spent Alcohol
Volume Flow Rate	lb/hr	196,000	137,000
Capacity	MMBTU/lb	4.12	4.12
Temp (in/out)	Deg. F	195/174	121/156
Test Pressure	PSI	275	275
Viscosity	Cp	0.35	0.64

FOOD PROCESSING PLANT HEAT EXCHANGER APPLICATION

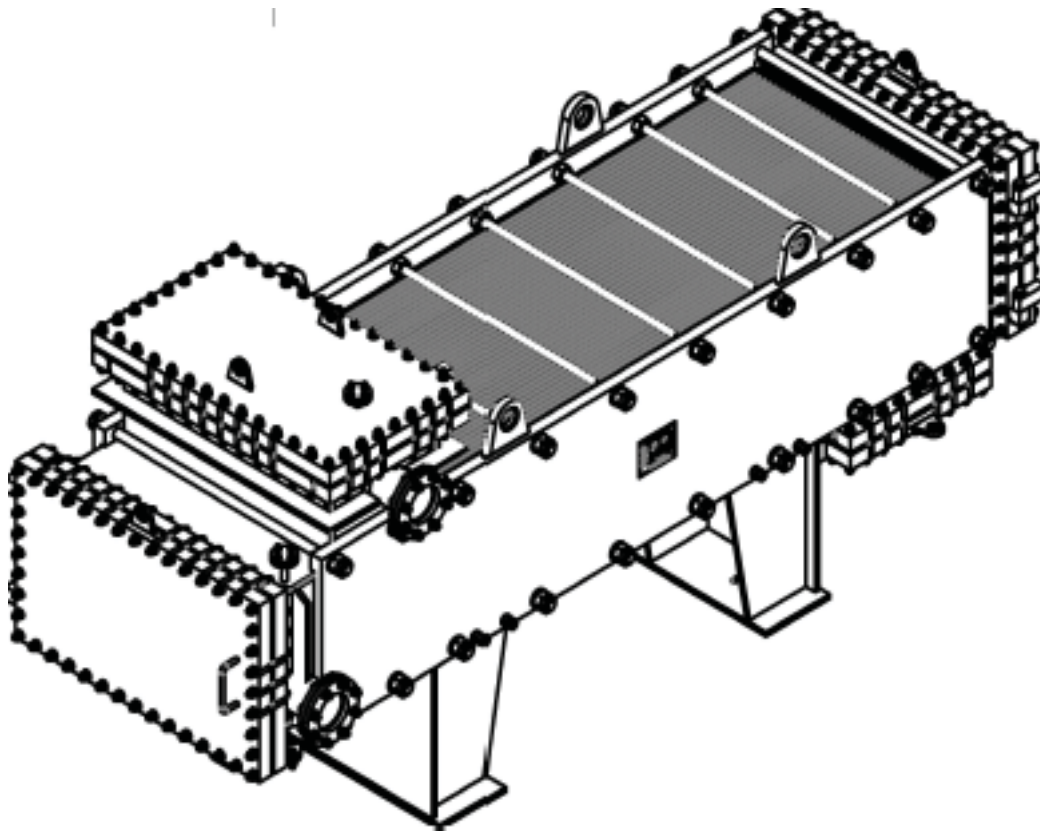


Lone Star Thermal Engineering - All Welded Wide Gap Heat Exchanger Selection - ASME "U"

The thermally and energy efficient, multi-pass heat exchanger features a 3/4 inch gap spacing for the process flow. The process flow and heating media channels are both free flowing with no obstructions. Further, the heat exchanger can be mechanically cleaned in place. Moreover, if needed, cleaning can be completed with solvent chemicals to remove accumulated product.

Furthermore, cleaning operations are required less frequently with the Wide Gap Heat Exchanger than with other heat exchangers that can require weekly cleaning. Due to the wide gap multi-pass design, there is no loss of thermal efficiency of the heat exchanger due to a large thermal plate spacing that forms the Wide Gap.

ALL WELDED WIDE GAP HEAT EXCHANGER



Mechanical Specifications	All Welded Wide Gap Heat Exchanger			
Design Side:	Hot Waste Water	Hot Waste Water	Cold Spent Alcohol	Cold Spent Alcohol
Temperature In:	195 °F	100 °C	121 °F	50 °C
Temperature Out:	174 °F	79 °C	156 °F	69 °C
Design Temperature:	300 °F	149 °C	300 °F	149 °C
Test Pressure:	260 psi	1.8 MPa	260 psi	1.8 MPa
Working Pressure:	210 psi	1.45 MPa	210 psi	1.45 MPa
Allowable Pressure Drop:	9.60 psi	0.066 MPa	2.40 psi	0.017 MPa
Plate Thickness:	0.08 in	2.0 mm	0.08 in	2.0 mm
Surface Area Per Unit:	700 ft.	63 m	700 ft.	63 m
Selected Material:	ASME Sect. VIII "U" Stamp • 304L SST			



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