Superchanger heat exchanger

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abstract

This paper contains a condensed description of recent developments in heat exchangers and improve efficiency in heat transferring. The superchanger heat exchanger is designed to provide maximum efficiency in transferring heat from one liquid to another or from steam to liquid.[2] Their applications are in Energy exchanges, Pulp & Paper, Metals, Chemicals, Food & Beverage, Oil & Gas and Miscellaneous manufacturing. The refrigeration processes can function as Flooded evaporators, Direct expansion evaporators, Liquid cooled condensers, Desuperheated, Subcoolers and Oil coolers. We've discussed about every 6 cases in this paper. Efficiency, Cost effectiveness, High performance, Minimal maintenance and Service are demanded by every industry and commercial or governmental entity in today's highly competitive, technological world.plate and frame heat exchangers have demonstrated their superiority in satisfying these demanding needs over other types of heat exchangers – and the best of plate and frame are Tranter SUPERCHANGER units. Superchanger heat exchangers are daily performing critical duties in a wide variety of applications around the world. Tranter's SUPERMAX and MAXCHANGER welded heat exchangers offer distinct advantages of plate heat transfer efficiency, due in large measure to the turbulent flow created by the corrugated patterns of their plates.[4] The SUPERMAX welded plate heat exchanger handles liquids, gases and two-phases mixtures at perssures to 1,000-plus psig (68-plus barg) and at very low and high tempretures. If prime application considerations include a variety of connection locations, space and single-material design, the MAXCHANGER is extremely versatile.[4]

Keywords: Superchanger, Refrigeration, Transferring, Supermax, Maxchanger

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1) Introduction

Optimum performance is a promise tranter, Inc., has been fulfilling for many decades with superchanger(lazerweld) plate &frame heat exchangers.[1]

Tranter specialized in solving heat transfer problems in a variety of industries , from oil & gas to metals to pulp & paper. Our complete engineering and manufacturing expertise brings you equipment that meets the highest standards of design excellence and quality workmanship.

The SUPERCHANGER (LAZERWELD) heat exchanger is designed to provide maximum efficiency in transferring heat from one liquid to another or from steam to liquid. They are in successful operation in a variety of applications for the food, dairy, beverage, pharmaceutical, chemical, industrial, HVAC, and power markets and widely accepted in industrial refrigeration market.

Components of the energy intensive refrigeration cycle are changing rapidly to maximize the commercial payback and thermal efficiency. Frick fulfills this need for efficiency with our LAZERWELD plate heat exchangers. They have proven reliability and high performance as both evaporators and liquid cooled condensers.[3]

As liquids flow counter-currently through the channels between the plates, the cold liquid becomes warmer and the hot liquid cooler.most units are designed for a one-pass/one-pass flow arrangement, resulting in all nozzles being installed on the stationary end frame, which facilities simpler piping arrangments and easier disassembly.

2) Applications

Energy

1)solar collector fluid isplation

2)heat recovery in co-generation facilities

3)turbine cooling in power plants

4)geothermal water isolation

5)isolation and "free cooling" in HVAC

6)heat recovery from boiler blowdown

7)district chilled water coolers

Pulp & paper

1)heat recovery from de-inking effluent

2)jacket water cooling in black liquor recovery process

3)heating white water in paper mills

4)cooling bleach solutions

Metals

1)hating phosphatizing solutions

2)acid coolers

3)cooling ammonia liquor at coke plants

4)cooling anodizing solutions

5)heating of electrolyte solution in copper mills

6)cooling quench oil

7)heating and cooling plating solutions

Chemicals

1)waste heat recovery from condenser water

2)heating or cooling jacket fluid for chemical reactors

3)heating and cooling chemical solutions

Maritime

1)lube oil cooling

2)cooling engine jacket water

3)heating ship service water

Food & beverage

1)heating wash water

2)heating and cooling sugar solutions

3)ethanol distillation

Oil & gas

Heat recovery from lean to rich amine solutions

Miscellaneous manufacturing

1)preheat make-up water in photo processing

2)paint coolers

3)heating and cooling kaolin slurries

The refrigeration processes

Laserweld plate heat exchangers are used in a number of different refrigeration applications. They can function as:

1)flooded evaporators

2)direct expantion evaporators

3)subcoolers

4) liquid cooled condensers

5) oil coolers

6) desuperheated

1-Flooded evaporation

A flooded evaporator has liquid refrigerant, at its saturation point, fed into the lazerweld plate evaporator.the heat from the liquid being cooled causes the refrigerant to boil in the heat exchanger.in most cases, the basic system uses gravity to feed the refrigerant from a separator vessel and the difference in density of the two phase refrigerant causes it to flow through the heat exchanger and return to the separator.[4] This is referred to as a natural recirculation or thermosyphon system.

The lazerweld plate condenser cools and condenses the high pressure superheated vapor back to a liquid.

2-Direct expansion evaporation

In a direct or dry expansion system the refrigeration is fed directly to the lazerweld plate heat exchanger without the use of a separator.although theoretically a dry expansion evaporator may have a lower coefficient of performance, one can normally compensate for this by adjusting the heat transfer area and thus keep the system design simple with a significantly lower physical height.

The choice between such a system and flooded system is driven by economics and technological suitability, expect where a particularly close tempreture approach rules out dry expansion. The dry expansion system offers a lower cost and a lower system refrigerant charge. A vast majority of current lazerweld plate heat exchanger installations are flooded although use of dry expansion is increasing with the arrival of newer more reliable technology.[1]

3-Subcoolers

The subcooler application has the ability to enable or disable the control of the expansion valve based on entering liquid tempreture. When the entering liquid tempreture rises above your specified control enable setpoint, the application enables the control of the leaving liquid tempreture and superheat.when the entering liquid tempreture falls below the control enable setpoint minus your specified deadband, the application disables the control of the subcooler and the expansion vavle fully closes.

The subcooler application has a master enable digital input.if the application sees an off value on the input, the subcooler is disabled and the valve fully closes. If this input is left disconnected, the application interprets that as an enable signal.[3]

4-Liquid(water) cooled condensers

Alfa laval's shell and tube condensers represent the optimal solution for all the application where HFC condensation is required. Water cooled chillers and heat pumps for air conditioning or industrial cooling in combination with several types of processes.commercial and industrial refrigeration plants with water condensation.on-board or all the other applications where sea, lake or river water is available.[2]

Benefits & features

a) high performance due to special design finned Cu and Cu/Ni tubes and tube geometry.
b) 9 different condenser series for a total of the correct solution for each application.
c) the only shell and tube condenser series
d) 2 passes & 4 passes version
e) easy installation
f) desuperheat version
g) all the models can be opened for inspection & maintenance
h) solution for applications with fresh water & sea water
i) all the most diffused pressure vessel are available approvals as a standard specific approvals available on request.
j) every single condenser is pressure leak and tested befor delivery ensuring top quality products.

5-Oil coolers

Theory and application of shell & tube water oil coolers

Two fluids, of different starting tempretures, flow through the water oil cooler.one fluid flows through the internal tubes and other flows around the tubes inside the shell. Heat is transferred from one fluid to other through the tube walls, either from inside the tubes to the surrounding fluid or vice versa.

Installation and maintenance

The olaer shell & tube water oil coolers may be installed vertically or horizontally but both fluids must circulate counter current flow.the cooler could be installed in the return line to the tank or in a closed circuit, and bypass isolating be set in place to allow for maintenance. Consult your nearest olaer distributor for complete operating and maintenance booklets if not received along with the product.[5]

6-Desuperheaters

In typical process plants,process steam is usually superheated,or heated to a tempreture and the actual tempreture aof the steam is called 'superheat'.

Desuperheated steam is more efficient in the transfer of thermal energy, consequently desuperheaters are used to bring the outlet degree of superheat closer to that of saturation.

Desuperheaters reduce the temperature of superheated process steam by introducing finely atomized cooling water droplets into the steam flow. As the droplets evaporate, sensible heat from the superheated steam is converted into latent heat of vaporization.[5]

3) Maximum performance, minimal space and low volume holdup

The heat transfer plated are the heart of the lazerweld heat exchanger providing reliability, efficiency and economy of operation.these plates are stamped in a corrugated design pattern to induce turbulent flow, then laser welded together in pairs at the flow perimeter, minimizing liquid bypass at the edges via a patented plate design system.the refrigerant flows through this welded plate channel and the fluid to be cooled is in the gasketed channel.the only gasketing in contact with the refrigerant is the circular port ring at the plate entrance and exit. Since the plates are welded pairs, the heat exchanger can easily be expanded should your duty requirements change in the future. Simply add more plate pairs to increase the refrigeration tonnage. Every heat transfer plate size is pressed and laster welded.we stock 304ss, 316ss and titanium plate materials for faster delivery of new units and/or for spare parts.[3]

Plates are made of a variety of different alloys including 304 or 316 stainless steel, incoloy 27-7Mo, Hastelloy C2000, titanium and other ductile alloys.

Gasket materials include neoprene and a selection of NBR's and EPDM's.FDA compliant gaskets are also available for certain direct product chilling duties.

Welded pairs are aligned in a rigid, polyurethane painted carbon steel frame through the use of a top carrying bar and bottom guide bar as illustrated. Plates have an integral hanging eye to facilitate installation and maintain proper plate alignment and support within the frame.

Units can be designed for full vacuum up to 450 PSIG and tempretures from minus 40F to 350F.[4]

4) Conclusions

Today’s ethanol plants require a high degree of thermal integration technology. Heating and cooling of liquids is at the core of the ethanol production process. Capturing surplus process heat and reusing or redirecting it to other areas of the plant significantly reduces energy requirements and costs.

5) Nomenclature

HVAC = heating, ventilation, and air conditioning

HFC = Hybrid fiber-coaxial

NBR = Nitrile butadiene rubber

EPDM = ethylene propylene diene monomer

FDA = Food and Drug Administration

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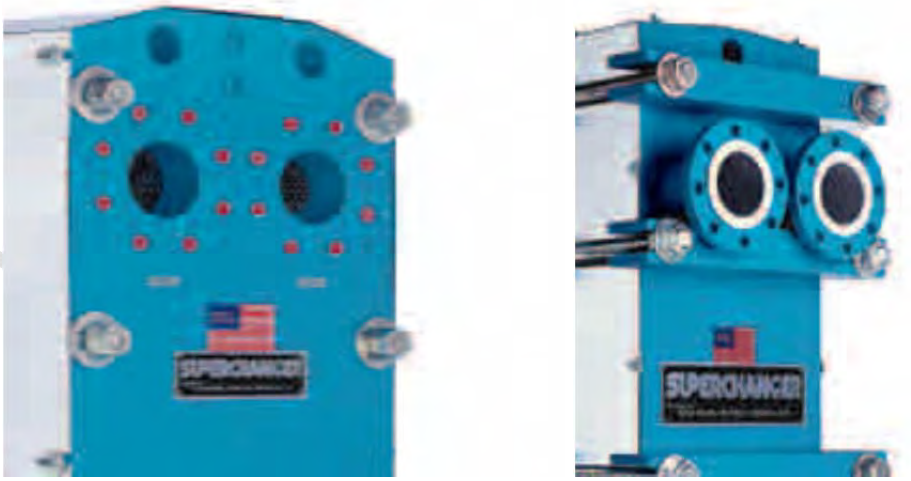

Figure 1:

Frame choices include studded or flanged ports and solid or reinforced frames