Plug Flow Reactor

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Envifab offers a wide range of static mixer element for the continuous mixing, with a focus on optimum product quality, while featuring high production flexibility, and low operating costs. Plug flow reactors allow analyses of chemical reactions under defined conditions. The plug flow reactor model (PFR, sometimes called continuous tubular reactor, CTR)..

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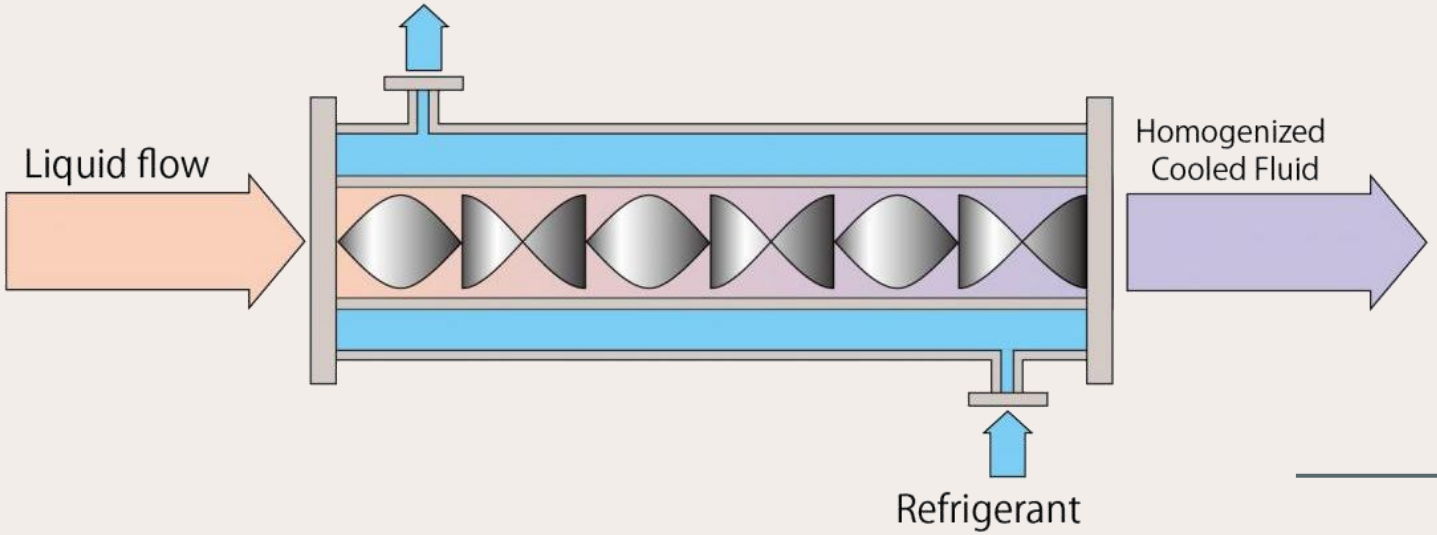
In PFR number of static mixer are connected/looped each other in series connection. Each Static mixer are having higher and controllable heat transfer ratio. Each static mixer tube has the different designed elements for the continuously mixing and heat Transfer.

All designed PFR static mixers have the individual flow control valves which is helps to mention the flow rate out cooling / heating media to maintain the internal temperature to reaction inside the pipe. Our PFR tube have individual temperature sensor to control the temperature during the process, Additional dosing point to add the another chemical or process liquid during the in line process.

Heat Transfer



In an empty pipe, viscous material in laminar flow will exhibit no radial mixing where material will exit the pipe in virtually the same position as where it was introduced into the pipe. Without element only wall side heat transfer process is done only. So, Envifab Provide the various static mixing elements can be installed in the PFR depending on the heat transfer application. These elements increase the heat transfer from the product to the tube wall. As well Envifab Provide the helix arrangement between static mixer and Jacket to increase the residence time for better heat transfer. Static Mixer elements produce a more uniform, consistent transfer process, with three to seven times greater heat transfer rates than empty tubes alone.

Main benefits

- High and controllable heat transfer rates
- High conversion and reduction of by-products
- No inert system or solvents required
- Consistently uniform product quality through excellent control of temperature-time history
- Excellent plug flow behaviour and thus narrow residence time distributions
- Combination of mixing and efficient heat removal, thereby maintaining high driving forces for reaction
- Suppression of side reactions
- No dead zones, thus facilitating a fast transition of products and process conditions
- Inherently safe design
- No rotating parts, thus minimized maintenance costs
- Low energy consumption, therefore overall low operating costs
- Control of the residence time distribution with a minimum reactor volume required.

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Application

- Heat removal and temperature control during process.
- Polymer production
- Chemical industry
- Petrochemical industry
- Fibre industry
- Pesticides Manufacturing Industry
- Pharma Industry

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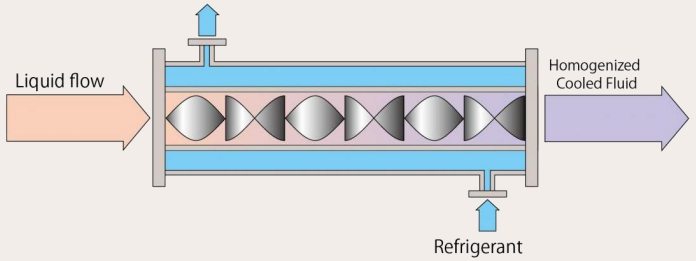
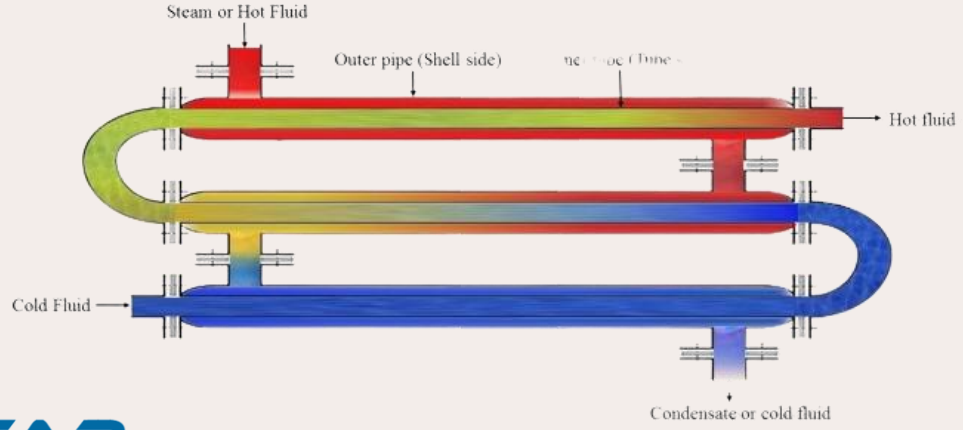
Double Pipe Heat Exchanger

A double pipe heat exchanger consists of two concentric pipes, one inside the other. The inner pipe carries one fluid, while the outer pipe (or shell) carries another fluid in the opposite direction. The fluids exchange heat through the wall of the inner pipe, which acts as a conductive barrier. and the inner pipe (tube-side) is either a bare pipe or more commonly a pipe with longitudinal fins, providing additional surface area for heat exchange.





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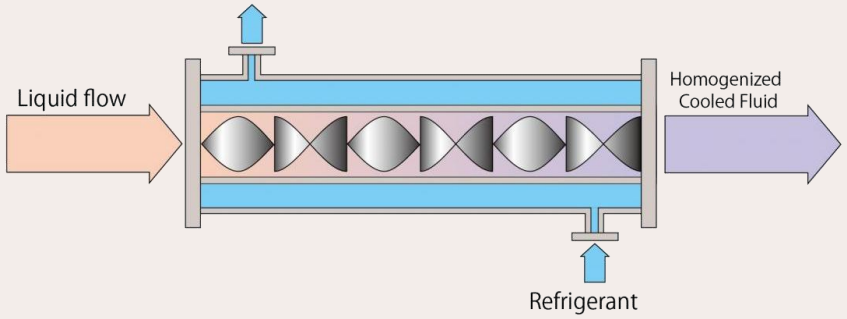
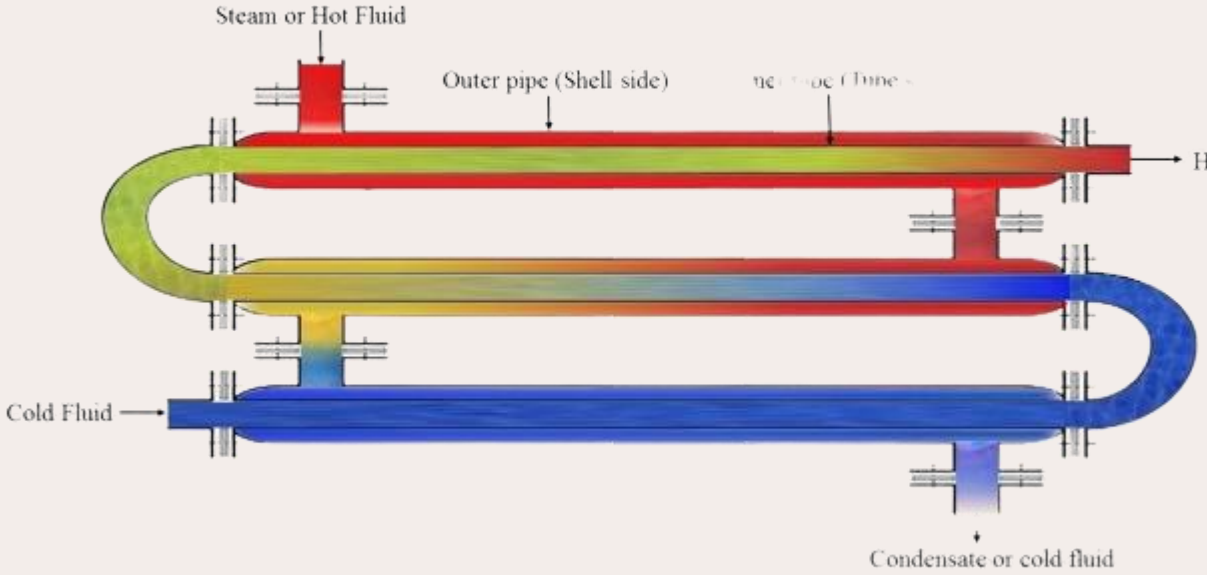
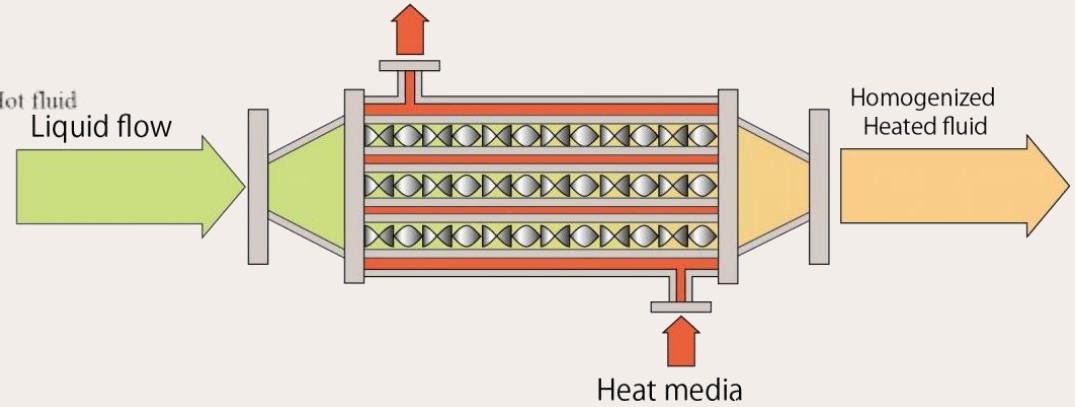
Heat Transfer







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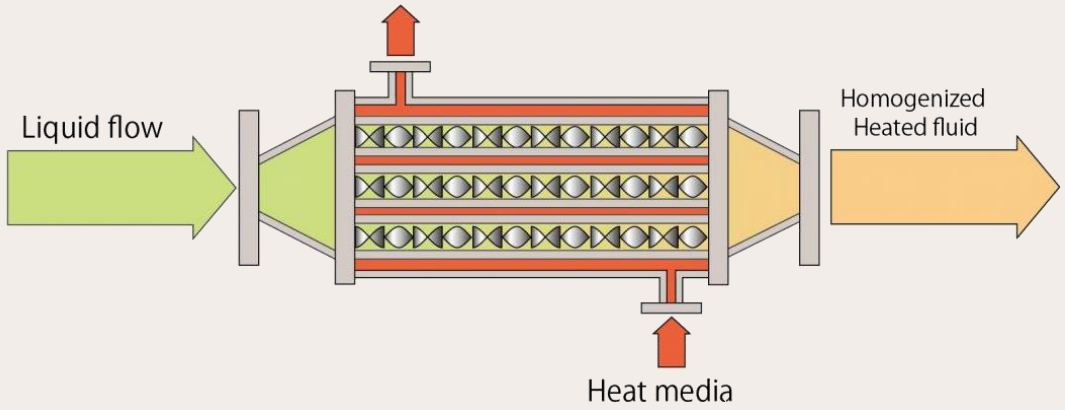
Heat Transfer

A double pipe heat exchanger can also have multiple inner pipes or a bundle of tubes to increase the heat transfer area. The inner pipes can also have longitudinal fins to enhance the heat transfer coefficient. A double pipe heat exchanger can be arranged in a U-shape or a straight shape, depending on the space available and the desired performance.



Double-pipe exchangers may be operated either co-currently or counter-currently, changing the heat exchange driving force (LMTD). More commonly they operate counter-currently to maximize the heat exchange.

The compact design with longitudinal finned tubes creates ample surface area for heat transfer, benefiting fluids with low heat transfer coefficients. (like most gases).

The design of double-pipe heat exchangers offers further benefits due to its construction since the U-shape bend in the hairpin design creates an allowance for thermal expansion of the fluid. The modular construction of the exchanger offers the ability to increase capacity of heat exchange by the introduction of more sections.

Advantage

- Simplicity: A double pipe heat exchanger has a simple design that is easy to construct, operate, and maintain. It does not require complicated baffles, seals, or gaskets that can cause leakage or failure.

- Flexibility: A double pipe heat exchanger can handle a wide range of fluids, temperatures, pressures, and flow rates. It can also be easily modified or expanded by adding or removing sections of pipes.

- Reliability: A double pipe heat exchanger has a high thermal efficiency and a low pressure drop. It can also withstand thermal expansion and contraction without causing stress or damage to the pipes.

- Cost-effectiveness: A double pipe heat exchanger has a low initial cost and a low operating cost. It does not require frequent cleaning or replacement of parts

Application

A double pipe heat exchanger can be used for various industrial processes that require heating or cooling of fluids. Some examples are:

- Oil and gas: A double pipe heat exchanger can be used to preheat crude oil before distillation, to cool down natural gas after compression, or to recover waste heat from flue gases.

- Pharmaceutical: A double pipe heat exchanger can be used to control the temperature of various processes such as fermentation, crystallization, and drying.

- Food and drink: A double pipe heat exchanger can be used to pasteurize milk or juice, to chill beer or wine, or to cook or sterilize food products.

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