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Perspective

Mechanism of Heat Exchangers in Heat Transfer and Fluid Flow

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DESCRIPTION

Heat exchangers are devices that transfer heat from one fluid to another without mixing or blending them. The fluids are partitioned by a high thermal conductivity wall. The thickness of the wall is designed to prevent the fluids from mixing or coming into direct interference with one another. A working material that rejects or absorbs heat from the liquid being treated is included in the process. The process's main effect is the cooling or heating of the fluid stream. There are an infinite number of heat exchangers, with new ones being produced annually as technology advances and metal characteristics evolve.

Convection in fluids and thermal conduction are applied in heat exchanger transmission. The heat transfer coefficient, often known as the U factor, is an expression of Newton's law of cooling and is the starting point for the discussion of heat exchanger design. Engineers also analyze the mean temperature difference (LMTD) to determine the temperature driving force for heat transfer. Fluids might have the same or distinct phases (for example, liquid-to-liquid or vapor-to-liquid), which are also taken into account.

Classification of heat exchanges

A heat exchanger is a type of heat transmission device. They are two types recuperative and regenerative exchangers.

- Recuperative Heat Exchangers.
- Regenerative exchangers.

Finned tube heat exchanger or air cooled heat exchanger (suitable for air/gas to fluid): Finned tube heat exchangers are frequently utilized in industries that exhaust hot gases for heat recovery. The heat in the gas is transferred to a liquid, which is usually water or thermal oil. The heated liquid can then be utilized in an application that would ordinarily require much more energy to heat. Chemical applications, petrochemical cooling, steam cooling, textile processing, grain drying, concrete curing, paper manufacturing, and food processing all benefit from ACHEs. Because air is the most often utilized process fluid on the planet, ACHEs have a wide range of applications.

Shell and tube heat exchanger (suitable for fluid to fluid/fluid to gas): These designs are frequently applied in high pressure applications, but they can also be employed in vacuum conditions when a strong structure is needed. A finned tube bank could not be as effective at containing hot gases as a shell and tube system, especially if the gases are toxic, dangerous to human health, or must be prevented from being released into the atmosphere. Shell and tube heat exchangers are frequently used in the chemical, oil, and gas sectors.

Plate heat exchanger or gasket plate heat exchanger (suitable for fluid to fluid/fluid to vapour): Plate heat exchangers are most frequently used in liquid-to-liquid applications, such as the heating of cold mains water to produce clean hot water from hot process water that contains chemicals or impurities. Plate heat exchangers or gasket plate heat exchangers are useful in district heating systems because they let individual homes consume the right amount of hot water from a centralized supply. Where the two liquids cannot combine, plate heat exchangers can also be used to cool oils using water.

CONCLUSION

Equipment termed heat exchangers is used to transfer heat from a hot fluid to a cold fluid. They perform a crucial role in the process by regulating the temperature of the more valuable fluid that will be used later on. The fluids may consist of various phases that can change into one another. They could be in close proximity or be divided by a conductive wall. The same set of thermodynamic principles regulates that heat exchangers function. In heat exchangers, thermal energy is always saved. Heat always moves from a fluid with a higher temperature to one with a lower temperature. In a heat exchanger, conduction and convection work in concert to transfer heat. Heat exchangers can have four different flow configurations: cross flow, co-current or parallel flow, and hybrid flow. Regenerative and recuperative heat exchangers are the two primary classes of heat exchangers. Separate flow routes for the two fluids are incorporated into the design of recuperative heat exchangers. In regenerative heat exchangers, both of the fluids are in direct contact with a heat storage medium.

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