


Scrape Surface Heat Exchangers

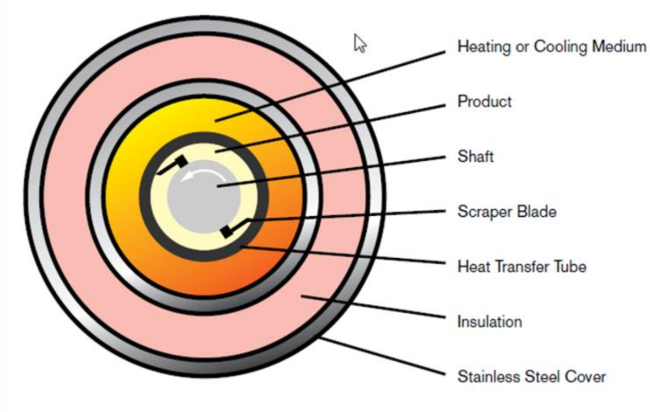
Types of Heat Exchangers

There are many different designs and layouts for heat exchangers, but in sanitary processing, shell and tube are the most common, followed by plate-and-frame and scrape-surface heat exchangers.

Plate-and-Frame HEX	Recommended for thin, low viscosity fluids, no particulates, $
Shell-and-Tube HEX	Recommended for thin to semi-viscous products with or without particulates; can be used for high pressure applications, $$
Scrape Surface HEX	Recommended for viscous (>1000 cps) products or products that are difficult to process, $$$

Scrape Surface Heat Exchangers

The high efficiency and productivity of a scrape surface heat exchanger results from a simple concept; heat or cool continuously moving product by providing a large heat transfer surface for a small amount of product in a confined space. This is mainly used for heating or cooling with high-viscosity products, products with particulates, aseptic processes, crystallization processes, evaporation and high-fouling applications.



Inside, a mutator shaft rotates within a tube. The product passes through an annulus formed by the shaft and heat transfer tube (light yellow). Heating or cooling medium flows in a jacket (orange). The unit is insulated (pink) to minimize energy loss and protect personnel. A stainless steel cover protects the insulation.

Long running times are achieved due to the continuous scraping of the surface, thus avoiding fouling and achieving a sustainable heat transfer rate during the process.

Three configurations exist for the tube and shaft: concentric, eccentric and oval.

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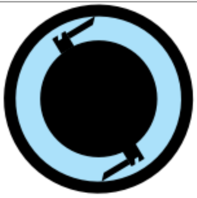
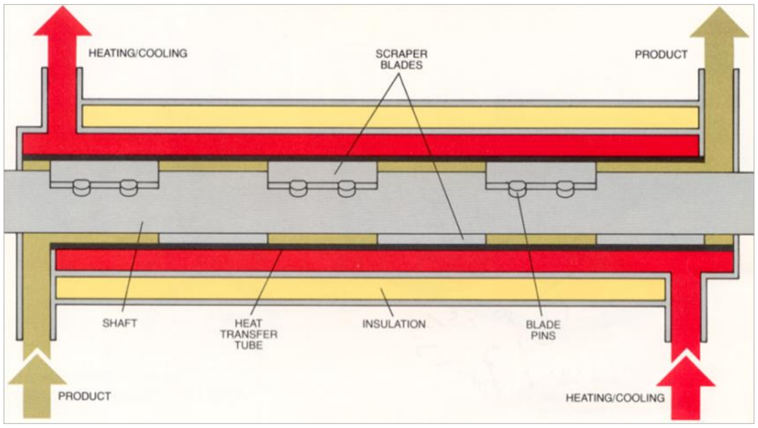
		
Concentric – used for most applications; the shaft is mounted in the center of the heat transfer tube	Eccentric – recommended for viscous and sticky products; design increases product mixing, eliminates mass rotation and reduces the mechanical heat load.	Oval – used for extremely viscous products; eliminates product channeling within the tube, reduces mechanical heat by a double cam action of the blades and balances the internal forces to prevent shaft deflection.

Heat Transfer Tube – Thermal conductivity and wall thickness are key design considerations in selecting heat transfer tubes. Tube wall thickness is precisely engineered to minimize heat transfer resistance while maximizing structural stability.

- Pure nickel tubes provide high thermal conductivity. The inside of the tube is hard chrome plated, then honed and polished to a smooth finish for resistance to wear from scraper blades and abrasive products.
- Chrome-plated carbon steel tubes provide high thermal conductivity at reduced cost for products like peanut butter, shortening and margarine.
- Stainless steel tubes specially designed for enhanced heat transfer are offered for acidic products and to provide flexibility in the use of cleaning chemicals.

Scraper Blades – scraper blades are arranged on the shaft in staggered rows. The blades are held on the shaft by strong, durable, specially designed “universal pins,” which are welded to the shaft. There are no threaded areas to cause product build-up. These pins allow quick, easy blade removal and replacement. A variety of blade materials are available, including new metal-detectable plastic blades.

Shaft – The amount of time the product is within the heat exchanger for a given rate is controlled by the volume of the unit. Small-shaft heat exchangers provide a large annulus for longer residence time. They handle lumpy products and those having large particles. Large-shaft heat exchangers provide a smaller annulus for high velocity and turbulence with high heat transfer rates and short product residence time in the unit.



In operation, the product enters the cylinder at the bottom and flows upwards. The heating or cooling medium travels in a counter-current flow through a narrow annular channel. The rotating shaft has blades which continuously scrape product film from the heat transfer tube wall, thereby enhancing heat transfer, and agitating the product to produce a homogenous mixture

This design preserves product quality by providing a larger flow area, gentler product handling and reduced pressure drop across the inlet. The food product finally leaves the cylinder at the top. Both product flow and rotor speed can be varied to suit the particular properties of the product in the cylinder.