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Spiral Heat Exchangers

The Best Way for Energy Saving……

KUROSE CHEMICAL EQUIPMENT CO.,LTD.

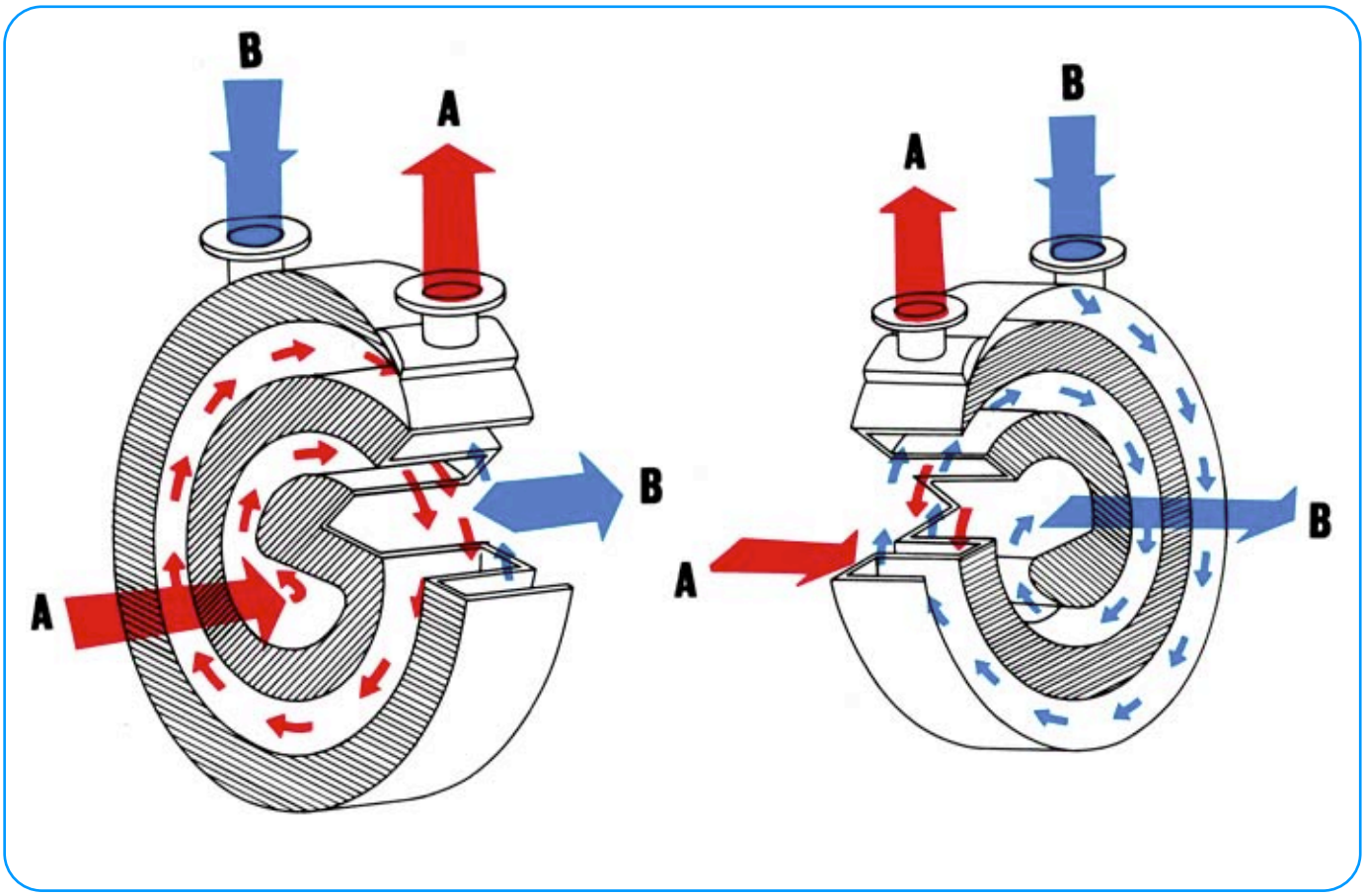
KUROSE Spiral Heat Exchanger

● Summary

Spiral heat exchanger is known as the best heating device for the purpose of energy saving as compared to the conventional heat exchangers. High heat transfer rates is available due to the fluid passes through the spiral type channels in completely counter current. It is almost clean without scale forming during performance and appears same flowing manner in both sides of channels which is different from the tubeside and shellside flow of tubular type Heat exchanger. Therefore, Spiraltype heat exchanger is suitable for the fluids in case of difficulties of cleaning, Moreover, as for the same heat transfer capacity is concerned. It is more compact and easy for installation than that of the tubular heat exchanger.

● Basic Principles

The fluid A enters at the center of the unit, flows from the inside outward along the spiral channel. At the other hand, the fluid B enters at the periphery and flows towards the center along the spiral channel. As result, the two fluid currents become counter currents entirely.



The Characteristics of Spiral Heat Exchanger:

1 Effective Employment of The Heal

- The high heat-transferred efficiency can be achieved because the fluid currents are in the true condition of entirely counter currents.
- Owing to the low-temperature fluid flowing utmost outside around, there is almost no heat loss occurred so that the insulation can be omitted.
- The condition of intermixing would not take place because the channels side to each other are sealed by gasket fitted completely
- There is a high heat-transferred efficiency between the small temperature difference fluids.

2 Excellent Heat Transmission

- The higher heat-transferred coefficient can be reached because the flowing fluids in both spiral channel possess the same property to the tube side of tubular heat exchanger, and the condition of side flow in the shell side of tubular heat exchanger is entirely not in existence.
- It is easy to generate the rotary current in the continuous curved spiral channels. Therefore, the heat-transfer rate is more superior to straight tubes.
- The rotary current possesses the function of scraping off the sedimentation solids, therefore, the fouling factor is extremely low.

3 Convenience for Maintenance

- The rotary current of spiral heat exchanger possesses the property of scraping off and spilling the sludge (solids). Even though scale stick on it, when the cross-section of the stuck part becomes smaller, the flowing speed would turns quick and brings the function of auto-cleaning into play owing to the one-way flows. Thereafter, it is unnecessary to dismantle for cleaning.
- In case there is need to take it apart for some other reasons, it is convenient for checking only to relax the screws and remove the cover, then the channels would show up entirely.
- It is not necessary to remove the cover in case of chemical cleaning.
- There is no condition of leaks in the structure due to the unit is welded entirely.

4 Equipment Space

- High capacity of heat exchanging can be obtained, through the smallest heat-transferred area due to the high total heat-transmission coefficient.
- The shape is artful and the design area occupies small because the rectangular heat-transferred board is designed to be folded into small capacity.
- The equipment area is less than 1/10 if compared with that of the tubular heat exchanger.

KSH－1 TYPE

Rotary Current for Both Circuits

The high-temperature fluid enters at the center of the unit, flowing along the spiral channels. After being cooled, it flows to the outward of the unit. The low-temperature fluid enters from the outside of the unit, flowing along the spiral channels, after being heated, it flows out from the center of the unit.

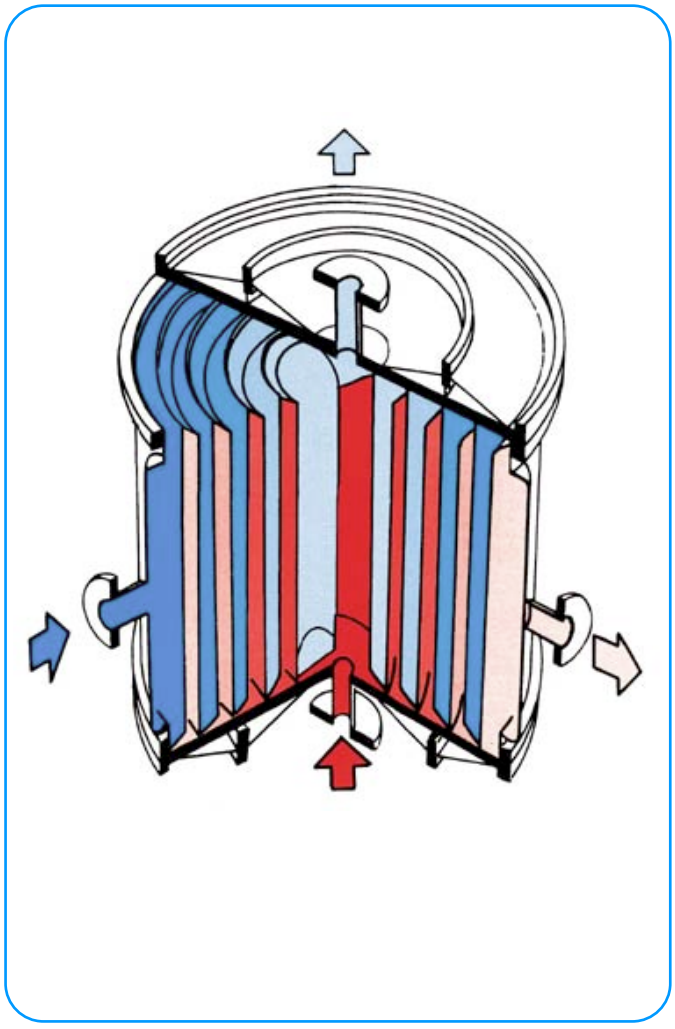
The quality of heat exchanging can be reached completely even though in the smallest difference of temperature because both fluids entirety become counter currents.

It can be placed horizontally if used in the conditions of waste water or the slurry with a large quantity of sludge. It can be equipped vertically if one end of the fluid is steamy and an outlet for cooled liquid would be arranged at the bottom of it.

The flowing speed on the part of channels stuck with sludge, would turn quicker and disperse the sludge out of the machine because the rotary fluid possesses the function of scraping off the sedimentation solid particles or sludge and taking them out.

Applied Example

Liquid-Liquid, condenser and gas cooler



KSH－2 TYPE

Rotary Current and Cross Current

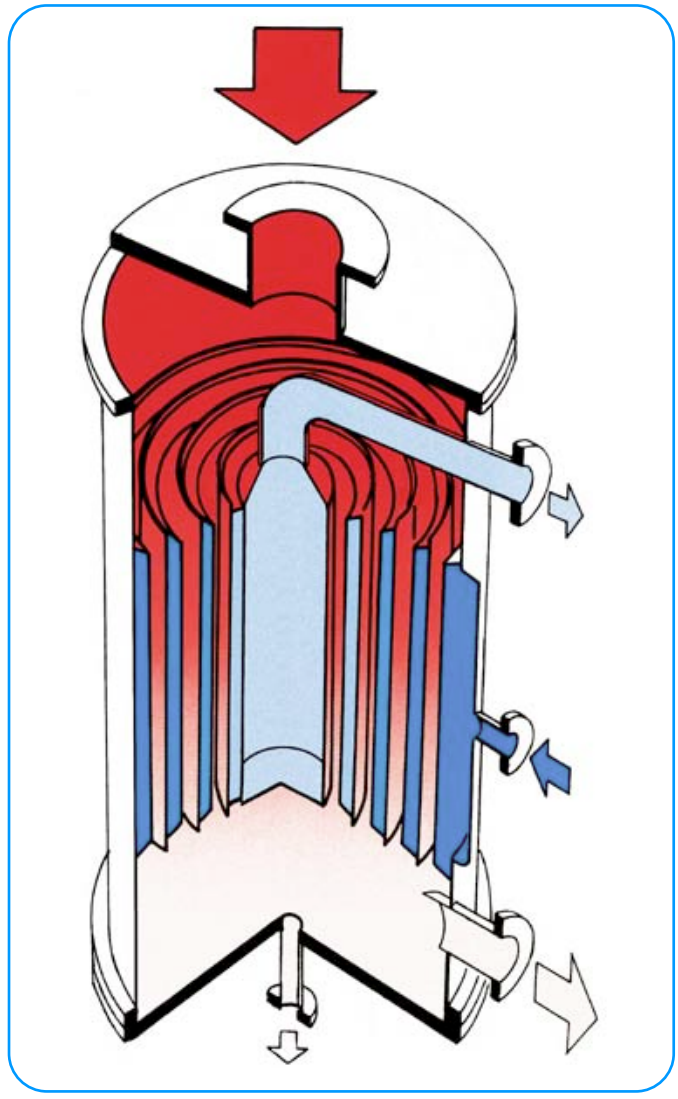
As same as I type, the low-temperature fluid enters from the outside of the unit. Flowing around the spiral channel and after being heated, it flows out from the central part. The high-temperature fluid enters from the upper part, flows across with the low-temperature fluid without rotary movement and flows straightly downward. This kind of style can be applied when there is large quantity of steam,the mixture of steam and gas or the mixture of steam and liquid

The heat exchanging can be carried out under the condition low pressure drop of the cross current and the rotary current in the quick speed. That is its advantage.

During the operation of liquid-liquid heat exchanging, this kind of type can be used in case the flowing quantity of one is far more greater than that of the other.

Applied Example

Condenser, reboiler, gas cooler and gas heater



KSH-3 TYPE

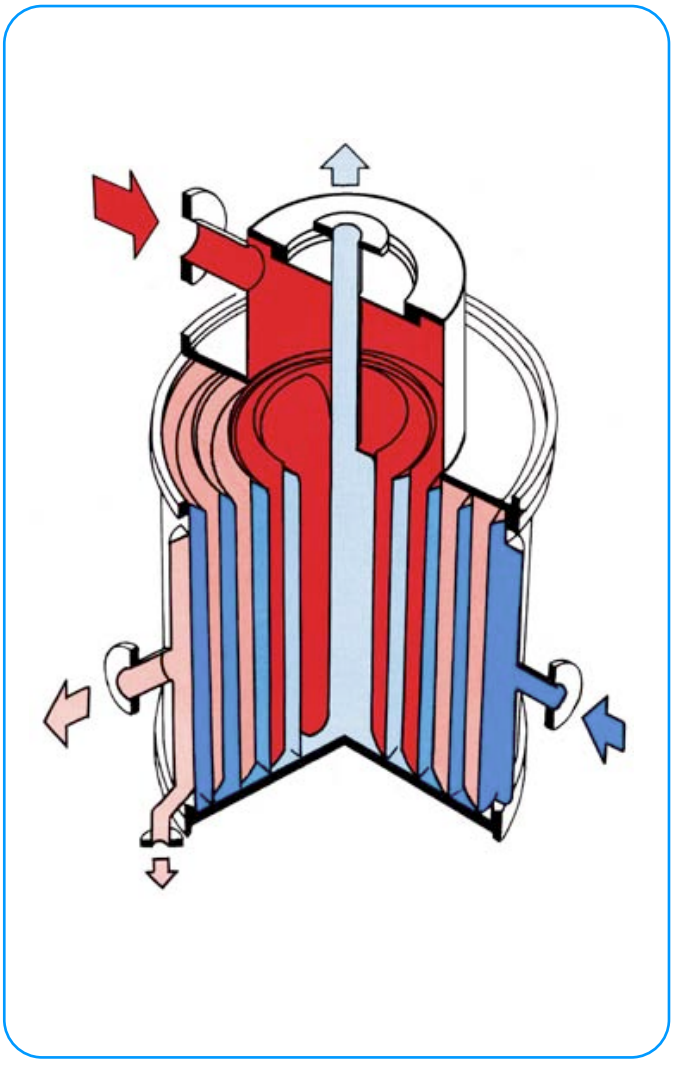
Rotary Current and Cross-Rotary Current

As same as 1 and 2 type, the low-temperature fluid flows into the central part from the outside round through the spiral channel. The high-temperature steam or the non-condensed gas enters from the upper part, crosses with the low-temperature fluid at the central division, flowing along the straight direction and condensed, and becomes rotary counter currents at the outside division and gets cooled.

The shape and size of the top empty part can be designed under the condition of making steam or gas kept better distributed. The condensed fluid can be easily separated and flow out with the cooled gas together from the outside shell through the bottom of the channel.

Applied Example

Condenser, cooler and evaporator



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Over-Head tower type

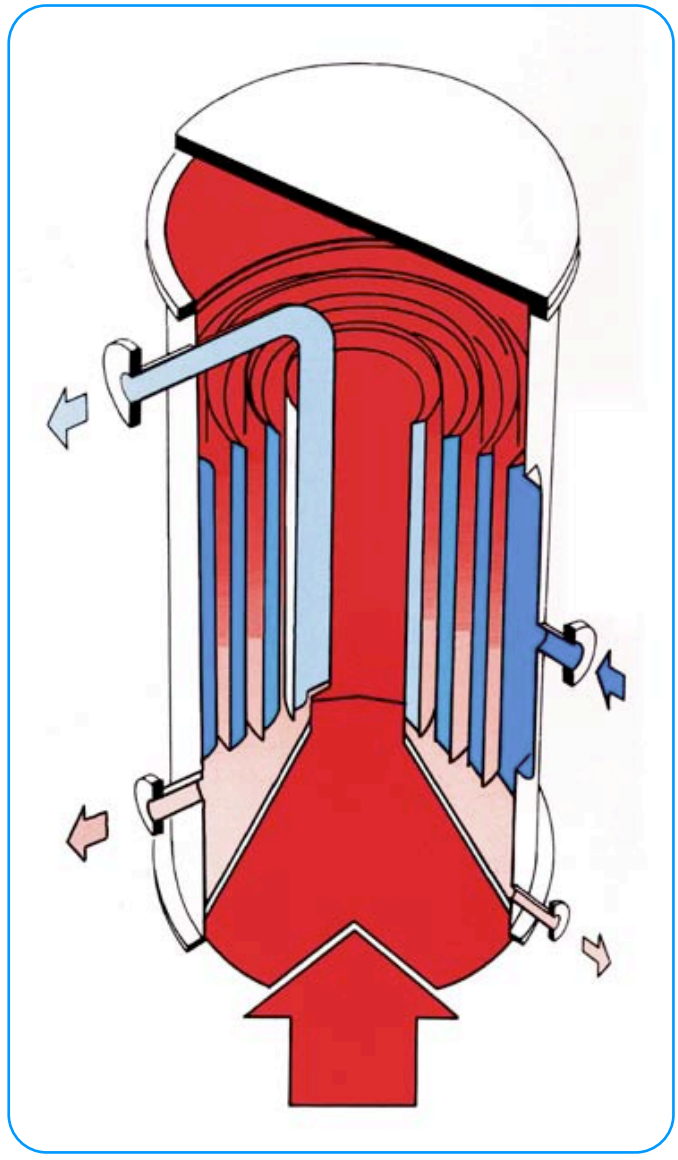
The cooler is directly installed on the upper part of the evaporator or the reactor unnecessary large pipe connection. The steam can be guided into the central tubes by the rotary current, cross current or by the way of combination of both currents.

The coolant enters from the outside round, moving in rotation, and out from the top of the central.

The condensate on the heat-transferred plate can be gathered into the condensate chamber to make the cooling reduced to the lowest degree. when the non-condensed gas is to be exhausted from the spiral tubes and subcooling meanwhile, the fluid from the central tubes turns to be the current or cross rotary currents.

The condensate can be taken out directly from the spiral part and also can be taken out after being gathered into the condensate chamber.

Applied Example Over-Head condenser



KSH Technology Data:

Heat-transfer area (per1shell) (m^2)	0.3～550
Max. liquid capacity (m^3/hr) gas (Nm^3/hr)	7,000 250,000
Operating Temperature (℃)	-196～450
Max. Pressure (MPaG)	2.5
Overall heat transfer coefficient Water / Water (kcal/m^2hr ℃)	1,000～2,500
Materials of construction	Titanium, Zirconium Hastelloy® Nickel Monel Stainless Steel (Include Duplex) High Alloy Steel
Design Code	ASME-U Manufacture License (China) High Pressure Gas Safety law Pressure Vessel Construction Code

Hastelloy® is the trade name of Haynes International Inc.

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