

Rotary heat exchanger

High efficiency heat exchange under solid-phase formation systems such as latent heat storage materials and hot spring water

Overview

The rotary heat exchanger has a structure in which a fixed blade is in sliding contact with a rotary cylinder. Therefore, the temperature boundary layer (boundary film) of the heat transfer surface on the rotary cylinder is removed, and the fluid inside and outside the rotary cylinder can continuously exchange heat with high efficiency. In addition, even in the system where the solidification layer such as the scale is likely to occur (Hot spring water, polluted water, etc.), the solidification layer is always removed, and stable operation can be realized.

In the conventional rotary heat exchanger, since only one side in the axial direction of the rotary cylinder is supported, there is a problem that the gap between the rotary cylinder and the fixed blade is likely to occur due to the run-out of the rotary cylinder, and the boundary film and solid phase are likely to remain. In addition, a rotary heat exchanger with both sides support has been devised, but the difficulty is that the rotating mechanism is immersed in the fluid, so it is unsuitable for the system with solid phase formation.

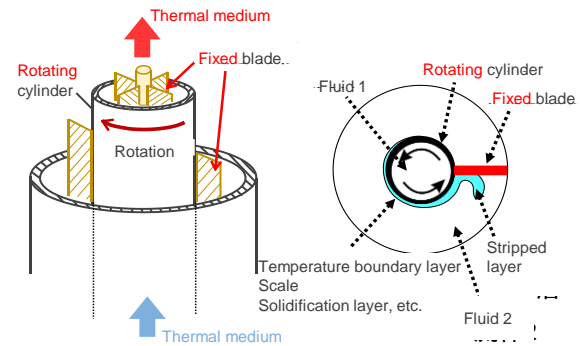
In response to the above problems, the inventors have developed a mechanism (* (2)) in which the rotating mechanism on both sides touches only the clean fluid, and have created an invention that contributes to the practical application of the rotary heat exchanger such as a combination (* (1)) with a latent heat storage material.

Product Application

- It can be widely utilized for the cascade use of heat, and is particularly advantageous for solid-phase formation systems such as latent heat storage materials and hot spring water. For example,
 - Thermal energy from hot spring water is stored and used in related facilities
 - Storage of solar concentrated heat used in agricultural houses
 - Heat storage and transportation of industrial waste heat etc.

IP Data

IP No. : (1)JP6630946, US11060800, (2)WO2021/199905
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← Conceptual diagram of a rotary heat exchanger

The higher the rotational speed, the better the heat transfer performance (overall heat transfer coefficient)

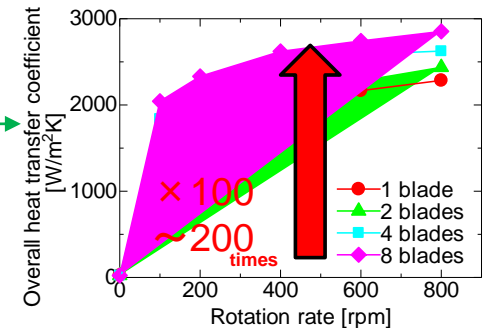
Heat transfer rate Q (Exchange calorie)

$$Q = U A \Delta T \quad (\text{W}), (\text{J/S})$$

Overall heat transfer coefficient Heat transfer area Temperature difference

When a solid phase is formed on the heat transfer surface, heat transfer is severely inhibited, and heat exchange is not possible. Since the solid phase can be continuously removed by the rotating cylinder and blade, the heat transfer rate is dramatically improved.

Solid layer stripping system (latent heat storage)



Related Works

- [1] <https://emira-t.jp/special/17178/>
- [2] Energy 2020 Vol. 205 Pages 118055
- [3] ISIJ International, accepted (Vol. 62, No. 12)

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