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Numerical investigation on non-Newtonian fluid flowing in heat exchanger with different elliptic aspect ratios and helical angles

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Abstract

In this paper, the heat transfer and flow performance of the non-Newtonian fluid on the shell side of heat exchanger combined with elliptic tubes and helical baffles were numerically investigated, different helix angles and helical aspect ratios were studied to improve the heat exchanger's overall performance. An aqueous solution with 3.0% weight fraction of carboxymethyl cellulose (CMC) was selected as the working fluid, which was a kind of non-Newtonian fluid with low viscosity and good stability. The results showed that the increasing aspect ratio improve the heat transfer, but also lead to higher pressure drop. The heat exchanger with aspect ratio between 2.5 to 3.0 has the best heat transfer and flow performance. For the helical angle, both the heat transfer rate and pressure drop increase with the smaller angle. Thermal performance factor (TPF) is

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