

Thermal Performance Analysis of Nanofluids in a Concentric Heat Exchanger Equipped with Turbulators

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Abstract : Turbulent forced convection heat transfer and pressure drop characteristics of Al₂O₃-water nanofluid flowing through a concentric tube heat exchanger with and without coiled wire turbulators were studied experimentally. The experiments were conducted in the Reynolds number ranging from 4000 to 20000, particle volume concentrations of 0.8 vol.% and 1.6 vol.%. Two turbulators with the pitches of 25 mm and 39 mm were used. The results of nanofluids indicated that average Nusselt number increased much more with increasing Reynolds number compared to that of pure water. Thermal conductivity enhancement by the nanofluids resulted in heat transfer enhancement. Once the pressure drop of the alumina/water nanofluid was analyzed, it was nearly equal to that of pure water at the same Reynolds number range. It was concluded that nanofluids with the volume fractions of 0.8 and 1.6 did not have a significant effect on pressure drop change. However, the use of wire coils in heat exchanger enhanced heat transfer as well as the pressure drop.

Keywords : turbulators, heat exchanger, nanofluids, heat transfer enhancement

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