

Experimental on Free and Forced Heat Transfer and Pressure Drop of Copper Oxide-Heat Transfer Oil Nanofluid in Horizontal and Inclined Microfin Tube

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Abstract : In this paper, the combined free and forced convection heat transfer of the Copper Oxide-Heat Transfer Oil (CuO-HTO) nanofluid flow in horizontal and inclined microfin tubes is studied experimentally. The flow regime is laminar, and pipe surface temperature is constant. The effect of nanoparticle and microfin tube on the heat transfer rate is investigated with the Richardson number which is between 0.1 and 0.7. The results show an increasing nanoparticle concentration between 0% and 1.5% leads to enhance the combined free and forced convection heat transfer rate. According to the results, five correlations are proposed to provide estimating the free and forced heat transfer rate as the increasing Richardson number from 0.1 to 0.7. The maximum deviation of both correlations is less than 16%. Moreover, four correlations are suggested to assess the Nusselt number based on the Rayleigh number in inclined tubes from 1800000 to 7000000. The maximum deviation of the correlation is almost 16%. The Darcy friction factor of the nanofluid flow has been investigated. Furthermore, CuO-HTO nanofluid flows in inclined microfin tubes.

Keywords : nanofluid, heat transfer oil, mixed convection, inclined tube, laminar flow

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