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Thermal performance of fly ash nanofluids at various inlet fluid temperatures: An experimental study

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Abstract

The article presents the heat transfer coefficient and the friction factor for the flow of water-base fly ash nanofluid in the concentration range of 0.5 to 2.0 vol%. Experiments are undertaken for flow in a horizontal copper tube subject to uniform heat flux in the Reynolds number range of 7000 to 45,200, for inlet fluid temperatures of 30, 45, and 60°C. The results revealed that in contrast to base fluid, nanofluids exhibit greater heat transfer coefficients which increase with concentration and fluid inlet temperatures due to augmentation in nanofluid thermal conductivity. The maximum amplification in Nusselt number and pressure drop of 67.4% and 11.9% are observed with 2% nanofluid concentration as compared to base liquid, for an inlet fluid temperature of 60°C and 30°C respectively. The values of Efficiency Index (EI) are evaluated for different concentrations and inlet fluid temperatures. Correlations are reported based on the experimental data for the estimation of dynamic viscosity, thermal conductivity, Nusselt number, and the friction factor of fly ash nanofluid

Keywords:

Indonesian coal, Ball milling of Fly ash, Water base nanofluid, Heat transfer coefficient, Pressure drop, Efficiency index

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