

Comparative study of fluid flow and thermal transfer between usual fluids and nanofluids in a heated horizontal pipe

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Abstract

The purpose of this study is the investigation and the comparison of thermal performance of conventional heat transfer fluid and nanofluid flowing in a horizontal tube submitted to uniform heat flux. Three dimensional Navier-Stokes governing equations with appropriate boundary conditions have been solved using numerical finite volume method. Grid independence test has been done to choose the most suitable grid. The obtained numerical results have been validated with experimental and numerical results available in the specialized literature. The results show a significant change in thermal and fluid dynamic fields. There is also a considerable increasing in mean temperature of the nanofluid as well for wall temperature at variable volume fraction values. However, the local Nusselt number is in good agreement with experimental data. This numerical study shows that the use of nanofluid has a direct effect on heat transfer in horizontal tubes according with the results published by researchers and proves also that nanofluid offers a promising alternative over conventional heat transfer fluid

Key words: Nanofluid, Usual fluids, Fluid flow, Heat transfer, Numerical simulation, Horizontal pipe.