NUMERICAL STUDY OF DEVELOPING LAMINAR FORCED CONVECTION OF A NANOFLUID IN AN ANNULAR HORIZONTAL PIPE

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Abstract. This study concerns the modeling and numerical simulation in 3D forced convection, laminar, a nanofluid consisting of water and nanoparticles in an annular horizontal pipe. The outer cylinder is subjected to a parietal imposed constant heat at the interface while the inner cylinder is considered adiabatic. The Navier-Stokes and energy equations governing this problem are solved by take account for the hydrodynamic and thermal behavior of the flow of nanofluid. The finite volume method is used for the discretization and integration of nonlinear differential equations with a pattern of spatial and temporal discretization of a second-order accuracy and a uniform mesh in the radial, angular and axial directions. The results shows that for the Reynolds numbers and Prandtl fixed, the dimensionless velocity profile for the laminar forced convection of a nanofluid consisting of water does not vary with the volume concentration of nanoparticles while the effect of the concentration of nanoparticles on the temperature of the mass is significant nanofluid. These results are consistent with those found in the literature. In general the use of nanofluids with a volume concentration of nanoparticles causes a very high increase in the coefficient of heat transfer by convection.

Keywords: Nanofluid**,** Numerical Study, Laminar Forced-Mixed Convection, Conduction heat Transfer, Annular pipe.