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Mixed Convective Heat Transfer of Flow around a Radial Heat Sink

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Abstract : This work presents the numerical results of the mixed convective heat transfer of a three-dimensional flow around a radial heat sink composed of horizontal circular base fitted with rectangular fins. The governing equations of mass, momentum, and energy equation are solved by the finite volume method using the commercially available CFD software Fluent 6.3.26. The circular base of the heat sink is subjected to uniform heat generation; the flow enters through the sides of the heat sink around the fins then the heat is transmitted from the base to the fins afterwards the fluid. In this study two fluids are utilized, in the first case, the air for the following Reynolds numbers Re=600,900,1200 and a Grashof number $Gr=3.7x10^6$, in the second case a water based nano fluid for which two types of nano particles (Cu and Al_2O_3) are carried out for Re=25 and a Richardson number $Ri=2.7(Ri=Gr/Re^2)$. The effect of the number of the fins of the heat sink as well as the type and the volume fraction of nano particles of the nano fluid were investigated. Results have been presented for N=15 and N=20 fins. The effect of the nano particles concentrations and the number of fins on the temperature in the heat sink and the Nusselt number has been studied.

Keywords : heat sink, mixed convection, nano fluid, volumetric heat generation
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