

Influence of Shield Positions on Thermo/Fluid Performance of Pin Fin Heat Sink

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Abstract : In heat sinks, the flow within the core exhibits separation and hence does not lend itself to simple analytical boundary layer or duct flow analysis of the wall friction. In this paper, I present some findings from an experimental and numerical study aimed to obtain physical insight into the influence of the presence of the shield and its position on the hydraulic and thermal performance of square pin fin heat sink without top by-pass. The variations of the Nusselt number and friction factor are obtained under varied parameters, such as the Reynolds number and the shield position. The numerical code is validated by comparing the numerical results with the available experimental data. It is shown that, there is a good agreement between the temperature predictions based on the model and the experimental data. Results show that, as the presence of the shield, the heat transfer of fin array is enhanced and the flow resistance increased. The surface temperature distribution of the heat sink base is more uniform when the dimensionless shield position equals to 1/3 or 2/3. The comprehensive performance evaluation approach based on identical pumping power criteria is adopted and shows that the optimum shield position is at $x/l=0.43$ where energy is saved.

Keywords : shield, fin array, performance evaluation, heat transfer, energy

Conference Title : ICFMT 2014 : International Conference on Fluid Mechanics and Thermodynamics

Conference Location : Sydney, Australia

Conference Dates : December 15-16, 2014