Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Numerical analysis of 3-D laminar natural convection heat transfer from solid vertical cylindrical heat sinks with straight longitudinal fins and comparison with horizontal heat sinks of the same configuration

DIBYENDU KONAR, Research Scholar, Dept. of Mechanical Engg., Indian Institute of Technology, Kharagpur - 721302, India., SHUBHAM MISHRA, Research Scholar, Dept. of Mechanical Eng., Indian Inst of Technology, MOHAMMAD ASIF SULTAN, VIDYADHAR KARLAPALEM, Research Scholar, Dept. of Mechanical Engg., Indian Institute of Technology, Kharagpur - 721302, India., SUBHRANSU ROY, Professor, Dept. of Mechanical Engg., Indian Institute of Technology, Kharagpur - 721302, India. — Of the various challenges facing the electronics industry, keeping components cool is utmost important, since overheating reduces the reliability and operating life of a device. Among various cooling methods, natural convection has been deemed fit owing to its distinctive advantages over forced convection. Longitudinal fins are generally used for vertical cylindrical heat sinks since the geometry eases air flow between successive fins. In the present study, CFD analysis of conjugate natural convection from such heat sinks have been carried out in the laminar regime. 15 different heat sinks modelling heat sinks of LED bulbs of dimensions obtained from literature have been developed. Effect of non dimensional fin spacing, fin length and Rayleigh number on the thermal resistance of the heat sink have been studied and values compared with those of horizontal sinks available in literature. It is observed that compared to the horizontal sink, the thermal resistance of the vertical sink is decreased by different percentages for different configurations. Contour plots to capture temperature profiles around the vertical heat sink have been developed. Correlations for Nusselt number have been formulated which are found to show appreciable agreement with computational data.

Dibyendu Konar
Research Scholar, Dept. of Mech Engg., Indian Institute of Technology

Date submitted: 05 Aug 2019 Electronic form version 1.4