

A study on the effect of the number of fin valleys on the thermal performance of a bus duct conductor

Abstract

This paper presents a finite volume-based simulation study on the effect of the fin valley's number on the thermal performance of a bus duct conductor. A numerical model that closely mimics the experimental setup was developed using ANSYS FLUENT. The experimental data were used as a benchmark and followed the IEC 61439-1/2 standards. Five fin valley numbers were considered: $s_1 = 2$, $s_2 = 3$, $s_3 = 4$, $s_4 = 5$ and $s_5 = 6$. It was determined that the average surface temperature decreased as the number of fin valleys increased. From the analysis, it was observed that as the number of fin valleys increased, convection heat transfer improved as a consequence of enhanced surface Nusselt number. The best number of fin valleys was $s_5 = 6$, exhibiting superior thermal performance over a lower number of fin valleys. This study is expected to provide a better understanding of the fin valley's effects on the thermal performance of a bus duct conductor's casing.

Keywords

Bus Duct Conductor; Computational Fluid Dynamics; Fin Valley; Heat Sink; Heat Transfer