Journal Article Volume 184, International Journal of Thermal Sciences Pages 1 - 17

A study on the effect of fin pitch variation on the thermal performance of a bus duct conductor

Abstract

The numerical results of this work provide an optimum design for a three-dimensional natural convection heat sink on the bus duct conductor's casing. The size of the fin pitch is regarded as a design variable. Using ANSYS FLUENT, a numerical model that closely resembles the experimental setup was created. The experimental data were compared to the IEC 60439-1 and IEC 60439-2 standards as a benchmark. Five potential fin pitch sizes (s1 = 1.0 mm, s2 = 1.5 mm, s3 = 2.0 mm, s4 = 3.0 mm, and s5 = 4.0 mm) were taken into consideration. It was shown that as the fin pitch gap size is reduced, the average surface temperature falls. According to the investigation, conduction resistance increased while convective resistance reduced as the fin pitch gap size grew. The overall heat resistance did, however, rise. The optimal fin pitch size, s1 = 1 mm, outperformed the other fin pitches in terms of thermal performance. The current numerical analysis expects an improved knowledge of the influence of fin pitch on a bus duct conductor's thermal performance.

Keywords

Bus duct conductor; Computational fluid dynamics; Fin pitch; Heat sink; Heat transfer