Electric Power Components and Systems, vol. 30(8), 2002, pages 791-806

Numerical and experimental heat transfer studies on totally enclosed fan ventilated machines

Abstract

Accurate prediction of temperature distribution in an electrical machine at the design stage is becoming increasingly important. It is essential to know the locations and magnitudes of hot spot temperatures for optimum design of electrical machines. A methodology based on the finite element method to analyze the steady-state and transient thermal problems in Totally Enclosed Fan Ventilated (TEFV) machines has been developed. The axi-symmetric model adopted is formulated purely from dimensional data, property data, and published convective correlations. In the present work, system analysis of a TEFV machine comprised of rotor, stator, body frame, and end covers has been carried out. The model has been validated by heat run tests conducted on three TEFV motors of rating 3.7, 7.5 and 15 kW and one Totally Enclosed Non-Ventilated (TENV) motor of 5.7 kW. Stalled tests have been carried out on the TENV motor at voltages of 300, 360 and 415 V to validate the predicted transient temperatures.

Keywords — AC machine, experimental, fan ventilated, heat transfer, numerical