World Academy of Science, Engineering and Technology
International Journal of Electrical and Information Engineering
Vol:10, No:03, 2016

Rotor Radial Vent Pumping in Large Synchronous Electrical Machines

Authors : Darren Camilleri, Robert Rolston

Abstract : Rotor radial vents make use of the pumping effect to increase airflow through the active material thus reduce hotspot temperatures. The effect of rotor radial pumping in synchronous machines has been studied previously. This paper presents the findings of previous studies and builds upon their theories using a parametric numerical approach to investigate the rotor radial pumping effect. The pressure head generated by the poles and radial vent flow-rate were identified as important factors in maximizing the benefits of the pumping effect. The use of Minitab and ANSYS Workbench to investigate the key performance characteristics of radial pumping through a Design of Experiments (DOE) was described. CFD results were compared with theoretical calculations. A correlation for each response variable was derived through a statistical analysis. Findings confirmed the strong dependence of radial vent length on vent pressure head, and radial vent cross-sectional area was proved to be significant in maximising radial vent flow rate.

Keywords : CFD, cooling, electrical machines, regression analysis
Conference Title : ICEMPE 2016 : International Conference on Electrical Machines and Power Electronics
Conference Location : London, United Kingdom
Conference Dates : March 17-18, 2016