A stationary thermal model for smooth air-gap rotating electric machines

J.I. Pérez Arriaga; J.G. Kassakian

Abstract-

A steady state heat transfer model applicable to rotating electrical machines with non salient poles is presented. Several cooling options are accounted for, ranging from the totally enclosed machine running in a high vacuum to the open ventilated one with axial and radial ducts. Sophisticated cooling systems, such as gas or water cooled windings, are not considered. The model includes such unusual levels of detail as radiation heat exchanges and prediction of the actual hot spot temperatures of the iron and windings. Peripheral results are the temperatures at other representative points and complete maps of the conduction, convection and radiation heat exchanges.The resultant computer program may be used either to check the temperature rise constraints for a given design, or as a tool to analyze the performance of the cooling system of an actual machine or proposed design. Parametric studies can be easily performed, showing the sensitivity of the temperature rises and heat exchanges to variations of a particular dimension, loss, flow rate or material property.

Index Terms-

Citation:
Pérez-Arriaga, I.J.; Kassakian, J.G. "A stationary thermal model for smooth air-gap rotating electric machines", A stationary thermal model for smooth air-gap rotating electric machines, vol.3, no.4, pp.285-303, April, 1979.