To find an electrical machine’s power loss from its temperatures – through inverse thermal approach

Title of the dissertation
Inverse Thermal Analysis of Electrical Machines

Contents of the dissertation
The field of inverse modelling attracts a tremendous amount of scientific interest. From an electrical engineer's point of view, there are great benefits to applying inverse problems to their particular field of study. Thermal analysis is a vital step in the design process of an electrical machine which ensures that the temperature rises during its operation stay within the prescribed limits. The processes of heat transmission in rotating electrical machines are well understood and can be modelled well. However, identifying all the components of power loss in electrical machines through measurements is difficult.

The temperatures measured in the motor relate directly to the power loss generated in it. Thus, inverse mapping the temperatures to their sources (power losses) can in turn help quantify them and deepen the understanding of loss generation and distribution in the machine. This dissertation investigates the feasibility of inverse thermal mapping to obtain losses of an induction motor using its analytical and numerical models. This study shows the impact of the number and nature of measurements as well as the extent of measurement errors on the results. It also presents a possible way of segregating the total measured loss into its components through the application of inverse thermal modelling.

Field of the dissertation
Electromechanics

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Electronic dissertation

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