

Thermal Analysis of Sealed Electromagnetic Relays Using 3-D Finite Element Method

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Abstract—Up to now, it is difficult to test the inner temperatures of sealed electromagnetic relays. In this paper, the temperature distribution of a sealed electromagnetic relay is obtained by using 3-D finite element analysis. The quality of thermal simulation results depends on the accuracy of both the modeled heat sources and heat sinks. Due to the high performance requirements of sealed electromagnetic relay it is interesting to know not only the temperatures of the conducting parts but also the thermal impact on the plastic components. Therefore, the non-metallic parts of the sealed electromagnetic relay (including the air within the device) are now part of the model. In order to improve the accuracy of simulation, the contact radius is calculated in advance. The relationship between convection heat transfer coefficient and temperature and how to consider connecting wires boundary condition are also researched here. Finally, the temperature distribution of a sealed electromagnetic relay is obtained by this method. Comparisons with experimental results prove its validation.

Keywords—thermal analysis; sealed electromagnetic relay; finite element method