

Improvement of Heat Transfer for DC Motor Windings

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Abstract:

Temperature rise due to energy losses in the windings can reduce the performance of a motor as well as its service life. High temperature will damage the insulation on the windings and can eventually cause a short circuit that will permanently destroy the motor. Two different modifications which are internal modification and external modification will be implemented on a DC motor in order to improve the heat dissipation rate. Internal modification is responsible to improve the heat transfer rate between the windings and the casing while on the other hand, external modification will improve the heat transfer rate between the casing and the ambient air. In order to come out with effective strategies to improve the rate of heat transfer of a DC motor, different components temperature in a DC motor will be studied thoroughly to understand which component in a DC motor is affected the most by the heat waste produced when current is allowed to flow through the windings. Three different designs for heat sink which is also the external modification will be analysed in this paper to understand the relationship of their respective geometry and their heat transfer performance. By allocating the same amount of material for each heat sink modification, we can identify which design can increase the natural heat convection of the DC motor by the largest margin. Furthermore, comparison between the internal modification and external modification are studied to determine which method is more effective in removing the heat waste generated by the windings.

Keywords: DC Motor; Heat Transfer; Winding; Thermal Conductivity; Casing; Heat Sink; Convection

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