Modeling bearing temperature of DC machine in no-load condition using transfer function

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ABSTRACT
Bearing is a critical component in an electrical machine which get continuous monitoring and included in scheduled predictive maintenance. The temperature of the bearing is a valuable information that may allow early fault detection, lubrication assessment and overloading indication of the system driven. Using the temperature measurement of the bearing and comparing it to a baseline temperature in real-time will allow early warning of any eventual fault. This paper proposes a thermal model for the bearing in a brushed dc machine, developed using transfer function that will predict the temperature increase contributed specifically by speed variation. The transfer function was found by identification using experimental temperature of the bearing at a speed ranging from 20% to 100% of its rated speed while being at no-load. The result shows that the first order transfer function was found to be the best with a model identification MSE error of less than 0.23. The slight variation on the poles of the system indicates that the thermal system of the bearing inside an electrical machine does not obey exactly the LTI hypothesis.

KEYWORDS
Bearing; Thermal analysis; Transfer function; Condition monitoring; Brushed dc machine

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