Evaluation of a DC Motor Temperature Response Characterization Method Under Different Sampling Interval

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Abstract A fast and simple diagnostic tool is necessary to reduce the cost of preventive maintenance in industrial settings. Being the main actuator in industry, motors and generators need regular monitoring on their state of health. Temperature response characterization of the motor can be a promising solution if reference temperature characterization is documented in the early phase of assembly and commissioning. Temperature response characteristics of a motor that can be considered as a first order response are characterized by its steady-state temperature T_{ss} and time constant τ. These characteristics can be collected and compared to the reference at regular time intervals to diagnose any eventual fault in the motor. This study analyzes an algorithm that characterizes the temperature response collected from a Brush DC motor. The time interval δt, and the temperature resolution δTemp are the two determining parameters in the algorithm. The results found that the larger δt and the smaller δTemp give a more precise steady-state temperature deduction. With the choice of (δt, $\delta Temp$) = (300 s, 0.05 °C), the steady-state temperature was deduced by the algorithm with an error of 0.235%. However, the opposite, smaller δt and the larger δTemp can give a percentage of that steady-state temperature that could potentially be used to reduce the time of diagnosis. For the MY1016 DC motor, the choice of (δt, $\delta Temp$) = (50 s, 1.5 C) allows a diagnosis reduction time of 5895 s, attaining 64% of the steady-state temperature.

Keywords Temperature response · Electrical machine · Steady state · DC motor · Fault diagnosis

1 Introduction

In industrial settings, it is necessary to identify any fault in machines and equipment. It is much better if it is part of a preventive regular process to avoid lengthy and costly downtime. Electrical motors and generators are known to be the main

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