Failure Prediction of a Motor-driven Gearbox in a Pulverizer Under External Noise and Disturbance

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ABSTRACT

Participants in the Asia Pacific Conference of the Prognostics and Health Management Society 2017 (PHMAP 2017) Data Challenge were given measured vibration signals from motor-driven gearboxes used in pulverizers. Using this information, participants were requested to predict failure dates and the faulty components. The measured signals were affected by significant noise and disturbance, as the pulverizers in the provided data worked under actual operating conditions. This paper thus presents a fault prediction method for a motor-driven gearbox in a pulverizer system that can perform under external noise and disturbance conditions. First, two fault features, an RMS value in the higher frequency zones (HRMS) and an amplitude of a period for high-speed shaft in the quefrency domain (QA_{HSS}), were extracted based on frequency analysis using the higher and lower sampling rate data. The two features were applied to each pulverizer based on results of frequency responses to impact loadings. Then, a regression analysis was used to predict the failure date using the two extracted features. A weighted regression analysis was used to compensate for the imbalance of the features in the given period. In addition, the faulty components in the motor-driven gearboxes were predicted based on the modulated frequency components. The score predicted by the proposed approach was ranked first in the PHMAP 2017 Data Challenge.