

Vibration Analysis and Condition Monitoring of a Rotating Mechanical System

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Abstract

Rotating machinery is widely used in industrial applications, and unexpected mechanical faults can lead to equipment failure, production losses, and maintenance costs. Vibration analysis provides an effective non-destructive method for monitoring the operating condition of rotating mechanical systems. This study investigates the vibration characteristics of a rotating system under different operating conditions. Vibration signals are collected using an accelerometer or suitable vibration measurement device at different rotational speeds and operating conditions. The measured signals are analysed in both the time and frequency domains to identify changes in vibration amplitude and frequency characteristics. The study focuses on identifying abnormal vibration patterns associated with potential mechanical conditions such as imbalance, misalignment, or other common rotating-system faults. The results can be used to establish a condition-monitoring approach for early fault detection and predictive maintenance. The proposed methodology has potential applications in industrial machinery, pumps, motors, turbines, and other rotating equipment.

Keywords: vibration analysis, condition monitoring, rotating machinery, fault detection, predictive maintenance, accelerometer, frequency analysis, mechanical systems.

