

Acoustic Emission Techniques in Monitoring Low-Speed Bearing Conditions

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Abstract : It is widely acknowledged that bearing failures are the primary reason for breakdowns in rotating machinery. These failures are extremely costly, particularly in terms of lost production. Roller bearings are widely used in industrial machinery and need to be maintained in good condition to ensure the continuing efficiency, effectiveness, and profitability of the production process. The research presented here is an investigation of the use of acoustic emission (AE) to monitor bearing conditions at low speeds. Many machines, particularly large, expensive machines operate at speeds below 100 rpm, and such machines are important to the industry. However, the overwhelming proportion of studies have investigated the use of AE techniques for condition monitoring of higher-speed machines (typically several hundred rpm, or even higher). Few researchers have investigated the application of these techniques to low-speed machines (< 100 rpm). This paper addressed this omission and has established which, of the available, AE techniques are suitable for the detection of incipient faults and measurement of fault growth in low-speed bearings. The first objective of this paper program was to assess the applicability of AE techniques to monitor low-speed bearings. It was found that the measured statistical parameters successfully monitored bearing conditions at low speeds (10-100 rpm). The second objective was to identify which commonly used statistical parameters derived from the AE signal (RMS, kurtosis, amplitude and counts) could identify the onset of a fault in the out race. It was found that these parameters effectually identify the presence of a small fault seeded into the outer races. Also, it is concluded that rotational speed has a strong influence on the measured AE parameters but that they are entirely independent of the load under such load and speed conditions.

Keywords : acoustic emission, condition monitoring, NDT, statistical analysis

Conference Title : ICWMEE 2018 : International Conference on Waste Management and Environmental Engineering

Conference Location : Melbourne, Australia

Conference Dates : February 01-02, 2018