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ICOM'08

Editors

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MACHINE CONDITION MONITORING AND FAULT DIAGNOSIS USING SPECTRAL ANALYSIS TECHNIQUES

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ABSTRACT

There is need to continuously monitor the conditions of complex, expensive and process-critical machinery in order to detect its incipient breakdown as well as to ensure its high performance and operating safety. Depending on the application, several techniques are available for monitoring the condition of a machine. Vibration monitoring of rotating machinery is considered in this paper so as develop a self-diagnosis tool for monitoring machines' conditions. To achieve this a vibration fault simulation rig (VFSR) is designed and constructed so as to simulate and analyze some of the most common vibration signals encountered in rotating machinery. Vibration data are collected from the piezoelectric accelerometers placed at locations that provide rigid vibration transmission to them. Both normal and fault signals are analyzed using the singular value decomposition (SVD) algorithm so as to compute the parameters of the auto regressive moving average (ARMA) models. Machine condition monitoring is then based on the AR or ARMA spectra so as to overcome some of the limitations of the fast Fourier transform (FFT) techniques. Furthermore the estimated AR model parameters and the distribution of the singular values can be used in conjunction with the spectral peaks in making comparison between healthy and faulty conditions. Different fault conditions have been successfully simulated and analyzed using the VFSR in this paper. Results of analysis clearly indicate that this method of analysis can be further developed and used for self-diagnosis, predictive maintenance and intelligent-based monitoring.

1. INTRODUCTION

Condition monitoring of machinery is essential to prolong effective machine life, achieve the overall system reliability, minimize maintenance cost and ensure consistent and desirable product. This procedure can often allow the early detection of potentially catastrophic faults that may be very expensive to repair. It also allows the implementation of condition based maintenance instead of a failure based one.