Proceedings of the 11th International Conference on Quality and Dependability
Sinaia, Romania, September 24th-26th, 2008
ISSN 1842-3566
Pages 121-127

Defect Diagnosis of Rolling Element Bearings using Morlet Wavelet Filter

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Abstract
Detection and diagnosis of rolling element bearing defects of rotating machinery is necessary to prevent their malfunctioning and failure during operation. The localized defect in a rolling element bearing generates periodic impulses with a time period corresponding to the characteristic defect frequency. These impulses having relatively low energy are spread across a wide frequency band, which may be modulated and masked by noise and low frequency effects in the measured vibration signal. Wavelet transform is a variable resolution time-frequency analysis method capable of revealing the presence of impulses submerged in the vibration signal. A method for optimization of Morlet wavelet filter (MWF) using kurtosis is presented in this paper. The optimized MWF can be used to detect localized bearing defects from vibration signals. The effectiveness of the proposed procedure is demonstrated using simulated vibration signal of bearing with a defect in rolling element. Denoising of signals from ball bearings with rolling element defect and inner race defect are also performed. These results obtained with optimized MWF and discrete wavelet transform (DWT) are then compared. The application of optimized MWF for diagnosis of bearing faults has been demonstrated using simulated and actual signals.

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