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Abstract

Modal analysis of non-rotating structures using wavelet transforms is well established area of research. However, advantages offered by wavelet transforms have not been explored to identify modal parameters of rotating structures. In this study the wavelet based method for estimating speed dependent damping and natural frequencies of a Multi Degree of Freedom (MDOF) rotor bearing systems is presented. Hilbert transform based method to estimate the modal properties is used to validate the wavelet based analysis. The filtering property of wavelet transform is explored to identify the modal parameters corresponding to individual modes of the rotor. A finite element model based simulated results have been presented along with experimental results on a test rotor to illustrate the proposed method. It is observed that for the rotor on fluid film bearings the damping ratio decreased with respect to the excitation frequency. And, for the rotor on rolling element bearings the damping remained nearly constant.

Keywords: Modal parameters, Rotor bearing systems, Wavelet transforms, FEM.

1. Introduction

When applied to stationary structures, modal analysis is well understood. Rotating machinery impose special challenges while obtaining modal parameters. Theoretical modeling of machines with rotating components is difficult, due to the presence of uncertainties related to the operating and boundary