Dynamic Analysis of Rotor Systems with Angular Contact Ball Bearings Subject to Axial and Radial loads

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ABSTRACT

This paper presents a dynamic analysis method for rotor systems with angular contact ball bearings. The dynamic characteristics of angular contact ball bearings are significantly influenced by the reaction forces to applied loads. However, the reaction forces are hard to determine for indeterminate rotor-bearing systems. This paper proposes a finite element model and a new iterative algorithm for general, indeterminate rotor systems with angular contact ball bearings subjected to axial and radial loads. An improved bearing model is adopted which is originated from the Harris's bearing dynamic model and is extended for including centrifugal forces due to the ball and inner ring. Two examples are provided to validate and illustrate the proposed method. Through the examples, the dynamics of rotor systems with angular contact ball bearings subjected to axial and radial loads are also investigated. The experimental and numerical results prove that the proposed method is useful for the dynamic analysis of rotor systems with angular contact ball bearings.

Keywords: Spindle, Angular contact ball bearing (ACBB), Indeterminate system, Finite element method (FEM), Radial load, Axial load.