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Dynamic analysis of ball bearings due to dents in inner and outer race

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In present paper, the nonlinear dynamic responses of ball bearings due to dents in races are analyzed. A mathematical formulation has been derived using Hertzian elastic contact deformation theory at the contact points of rolling elements and the races. At the contact points between rolling element and races, nonlinear spring and nonlinear damping are considered. The mathematical formulation results in two coupled equation of motion and the numerical integration technique Newmark-β with the Newton–Raphson method is used to solve the nonlinear differential equations, iteratively. The effect of dents in rolling element bearings on the nonlinear vibrations of rotor bearing system is investigated. Dents are considered on the inner race as well as outer race. The results are shown in fast Fourier transformations and Poincaré maps. The results predict discrete spectrum with specific frequency components for the inner and outer races. Numerical results obtained from the simulation are validated with respect to those of prior researchers.

Biography

Vinay is currently a PhD student in the Mechanical Engineering Discipline at Indian Institute of Information Technology, Design and Manufacturing Jabalpur, India. He received his master's degree from Vellore Institute of Technology, Vellore, India in 2007. His research interests include vibration, fault diagnosis, design and manufacturing.

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