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Effect of localized defect on intermittent chaotic behavior of high speed rolling rearing

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This paper is focused on accurate performance prediction due to localized defects (like spalls) of microns level on the bearing components, which is essential to the design for high performance. The presence of chaotic behavior is demonstrated using experimental vibration data. Experimental set up of rotor bearing system is developed exclusively with localized defect of 300X300X100 μm. To capture the bearing dynamics a nonlinear mathematical model is developed earlier. The numerical simulations of the model agree with the experimental evidence and provide in- sight into the bearings chaotic response in a wide range of rotational speeds. The results are presented in the form of bifurcation diagrams, envelop spectrum of Hilbert transform and Poincarè maps for individual defects of bearing components. The bearing chaotic behavior is quantized using the Lyapunov exponent. The basic routes to periodic, quasi-periodic and chaotic motions for different localized defects are determined. The current study provides a powerful tool for design and health monitoring of machine systems.

Biography

D.H.Pandya is pursuing Ph.D. (Vibration & noise control) from IIT roorkee. He has published more than 5 papers in various referred journals.

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