# Effect of Circumferential Pressure Grooves in Non-Load-Carrying Regions on the Dynamic Performance of Elliptical Bearings (Postprint)

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## Abstract

To investigate the nonlinear dynamic effects of circumferential pressure oil grooves in the non-load-carrying region of elliptical hydrodynamic bearings and oil supply pressure on the bearing-rotor system, this study establishes a computational model applicable to grooving and oil feeding in the non-load-carrying pads of hydrodynamic elliptical bearings through an improved separation of variables method, obtains the variation characteristics of oil film pressure with eccentricity ratio at different length-to-diameter ratios, and analyzes the influence of circumferential oil groove width and oil supply pressure on bearing-rotor dynamic characteristics. Grooving without pressure oil supply in the non-load-carrying region of elliptical bearings has a minor influence on system stability; increasing the groove width and oil supply pressure within the groove can effectively suppress the half-frequency whirl component of the rotor in the bearing. When the groove width is 0.3 times the load-carrying pad width and the oil feeding pressure is increased to 0.8 MPa, the half-frequency whirl amplitude of rotor vibration is significantly reduced, the rotor vibration amplitude is noticeably decreased, and the rotor critical speed can be increased from 5300 r/min to 8400 r/min.

## Full Text

## Preamble

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*Note: Figure translations are in progress. See original paper for figures.*