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Tribology International

Volume 29, Issue 1, February 1996, Pages 51-59

ISSN: 0301679X
CODEN: TRIBIB
DOI: 10.1016/0301-679X(95)00034-2
Document Type: Article
Source Type: Journal

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An experimental evaluation of squeeze film dampers without centralizing springs

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Abstract

Squeeze film dampers are an effective device for vibration attenuation and stabilization of high speed rotating machinery. Such dampers are either supported by centralizing springs, or are unsupported, the rotation of the journal of the damper being prevented by 'dogs'. The latter design is more compact but transient solution procedures often need to be adopted to determine the steady state motion of the damper. Theoretical investigations indicate that for such unsupported dampers, if there is a steady state solution, it may possess synchronous, subharmonic and superharmonic components, as well as multiple solution possibilities. Such predictions are evaluated experimentally, using a flexible horizontal rotor. This paper describes the salient features of the experimental rig, and evaluates experimentally the extent of the validity of the theoretical predictions. Good agreement between theory and experiment is obtained provided the 0-film rather than the π -film cavitation model is adopted.

Language of original document

English

Index Keywords

Engineering controlled terms: Damping; Machine components; Machine vibrations; Rotating machinery; Rotors

Engineering uncontrolled terms: Flexible horizontal rotor; Squeeze film dampers; Steady state motion; Vibration attenuation

Engineering main heading: Mechanical control equipment

References (13) [View in table layout](#)

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