

PROCEEDINGS

Transient Analysis and Nonlinear Tribo-Dynamics of Marine Offset-Halves Journal Bearing Under Step Loading

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ABSTRACT

Although offset-halves journal bearings (OHJBs) are widely used in marine powertrains, the research on nonlinear tribo-dynamics is still limited, particularly under dynamic loading. To overcome such limitations, this study proposes a novel dynamic model that couples the influences of step load and thermoelastohydrodynamic (TEHD) effect. Based on the numerical model, a transient TEHD analysis for dynamically loaded OHJBs is done. Moreover, a modified stability criterion is developed. Nonlinear behaviors and transient stability of OHJBs under step load are systematically studied. The correlations of bearing characteristics such as the maximum film temperature, minimum film thickness, maximum film pressure, journal orbits, and time-varying dynamic coefficients with the step load are explored. The results reveal that increasing the applied load has a distinct impact on the transient performance of OHJBs. Further, the influence factors such as TEHD effect, offset, and varying lubricants on transient responses are investigated. In addition, the evolution mechanisms of two typical lubricants on the transient stability of OHJBs are revealed. This study enriches the design and application of dynamically loaded bearings.

KEYWORDS

Transient analysis; offset-halves journal bearings; dynamic loading; modified stability criterion

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