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PROCEEDINGS

The Thermo-Mechanical Coupling Dynamic Analysis of Gear-Rotor-Bearing System with Multiple Dynamic Clearances

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ABSTRACT

To accurately describe the dynamic behavior of a gear-rotor-bearing system, it is essential to consider the interplay between thermal effects and dynamics. Therefore, this study develops a real-time coupling model that integrates thermal and dynamic aspects of the gear-rotor-bearing system, which captures the combined effects of various nonlinear factors, including dynamic clearances caused by thermal deformation, thermoelastic coupling stiffness, non-uniform load distribution in bearings, and multi-meshing state of gear. Building on this model, the study introduces a stepwise coupled thermodynamic and dynamic joint solution method, which is used to evaluate the effects of thermal influences on dynamic characteristics, including vibration amplitude, dynamic behavior, thermal sensitivity, and meshing quality. The results show that the significant role of thermal effects in the dynamic behavior of mechanical system cannot be ignored. This research improves existing dynamic modeling and analysis methods for gear systems, offering theoretical insights that enable designers to comprehensively evaluate engineering factors and explore potential performance enhancements in gears.

KEYWORDS

Gear dynamics; thermo-mechanical coupling; joint solution; multi- meshing states; multiple clearances

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