Theoretical Analysis for Dynamic Characteristics of Gear System Considering Tooth Profile Error and Nonlinear Tooth Stiffness

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Abstract

In recent years, the gear devices have been used in high speed rotation areas due to electrification of cars. It is considered that the eigenvalues of the gear shafts affect the vibration of the gear system due to the high speed rotation of the gears. There have been many theoretical studies on the dynamic characteristics of gear pairs. However, there have been few research reports calculated bearing load fluctuation considering the shafts and bearings. Therefore, in this research, the vibration characteristics in the gear system including the shafts and bearings are clarified theoretically. The meshing of the gear pairs is expressed by a spring-mass system of a single degree of freedom system, tooth profile error and nonlinear tooth stiffness are taken into consideration. In addition, the gear shafts is modeled by the Euler-Bernoulli beams supported by the springs, and numerical calculation is performed.

Keywords: Gear, Vibration, Gear System, Nonlinear, Profile Error