USING AN FE PACKAGE TO ANALYZE MODAL BEHAVIORS OF PLANETARY GEARINGS CONSIDERING BEARING AND MATERIAL STIFFNESSES

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Abstract

This paper investigates the modal characteristics of planetary gear systems using a finite element (FE) package of general purposes. Using the proposed continuous geometric model, effects of Young's modulus and supporting bearings of components in the gearings may be more effectively analyzed. Firstly, directly using tooth profile equations generated by a rack cutter, high quality elements of gears are parametrically and automatically created. Thus, dynamic models of gear systems are constructed. After assigning adequate analyzing boundary conditions and gear contact, structural natural frequencies and modal shapes are obtained using LS-DYNA. Besides, dimensionless slope is defined to evaluating the changing rates of natural frequencies to stiffnesses. Then, influences of individual or systematical supporting bearing stiffnesses on gearing modal characteristics are investigated. Besides, essential of carrier material stiffness is discussed. Several conclusions relating the modal characteristics to material and bearing stiffnesses are resulted. The proposal approach in this study may benefit the dynamic analyses of wide types of planetary gearings.

Keyword：Planetary gearing Stiffness, Modal analysis, Natural frequency, Finite element, Young's Modulus