

치형수정된 기어구동계의 비선형 동특성 해석

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Nonlinear Dynamic Characteristics of Gear Driving System with Tooth Modification

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Abstract : To reduce the vibration of a gear driving system, the modification of gear tooth from the original involute gear profile is usually done in gear manufacturers. The quantity of the tooth modification has been decided on the basis of the interference between two gear teeth during gear meshing and the elastic deformation due to loading. However, the dynamic characteristics with tooth modification has to be investigated to avoid the instability from the Mathieu equation due to the variation of gear meshing stiffness and the nonlinearity due to gear backlash which results in sub- or super- harmonics in its responses or chaotic response. This research show the dynamic characteristics with various tooth modifications of the types and quantity of modifying profiles. As a results, better modification profile will be suggested for the smooth running gear driving system.

정렬불량에 의한 기어구동계 비선형 해석

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Nonlinear Analysis of Gear Driving System due to Misalignment

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Key Words : Misalignment, Gear Driving System, Automatic Transmission, Nonlinear Analysis, Transmission Error

Abstract : Even through the problem of misalignment is of great importance, not much work has been reported in the literature on the effect of misalignment on the vibrations of the gear-bearing systems. Therefore, the nonlinear dynamic characteristics of the gear driving system due to misalignment are investigated in this work. Transmission error for helical gear and bearing nonlinear stiffness is calculated. The equation of motion of the gear driving system is modelled using the time-varying gear meshing stiffness, bearing nonlinear stiffness, and bearing pre-load due to the housing deformation. Numerical analysis for the gear driving system show the result of misalignment effect - sub-harmonic component, bearing pre-load effect, and another nonlinear phenomenon. And the numerical analysis are verified by the experimental result.