

Dynamic Characteristics of Two- stage Gear Transmission System with Typical Faults

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Abstract: Taking the two-stage fixed-axis spur gear transmission system as the research object, this paper calculated the time-varying mesh stiffness of gears with typical faults (oblique crack, through crack, tooth surface fracture, tooth surface pitting, etc.). Considering the influence of fault factors on the two-stage gear transmission system, established the model of the two-stage gear transmission system, and obtained the dynamic characteristics of the two-stage gear transmission system with typical faults. The study showed that a fault appeared on the gear, the tooth surface contact characteristics of the gear have changed, and the change of the tooth surface contact characteristics causes the gear time-varying mesh stiffness. During the mesh process of gear teeth, the impact on the tooth surface increased the amplitude of the system dynamic load, the quenching and tempering phenomenon occurs in the frequency domain. Among the typical faults, the dynamic load fluctuation caused by crack and tooth surface fracture was the most obvious, and the influence of tooth surface pitting corrosion on the system was relatively weak. The fault tooth appeared in the primary (high speed stage) and had obvious influence on the high speed stage, while the fault tooth appeared in the secondary (low speed stage) and had great influence on both stages of the gear system. The conclusions of this paper can provide an effective theoretical basis for fault diagnosis.

Keywords: Gear system; Mesh stiffness; Typical failure; Dynamic characteristics