

机床传动丝杠的动力分析 Dynamic Analysis of the Machine Drive Screw

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摘要: 把机床传动丝杠简化为承受预拉伸力和移动力作用的旋转Timoshenko梁, 综合考虑了陀螺效应、预拉伸力和移动力对丝杠振动的影响, 以及丝杠两端轴承的支承作用, 建立了弹性支承条件下丝杠的频率方程, 利用拉格朗日方程建立了丝杠的动力学模型, 利用振型叠加原理和隆格-库塔法求解, 分析了系统参数对丝杠涡动转速和横向振动的影响。The drive screw was simplified as a rotating Timoshenko beam bearing the pre-tension force and moving forces, and the frequency equation of the screw with the elastic end supports was derived under considering the effect of gyroscope, the pre-tension force, the moving forces on the screw vibration, and the bearing stiffness. The dynamic model of the drive screw was established using Lagrange equation, and was analyzed adopting the mode superposition and Runge-Kutta method to calculate the transient response. Eventually, the effect of the system parameters on the whirl speed and lateral vibration was studied to supply a base for designing the drive system.

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