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啮入冲击对直齿轮弹流润滑的影响

The influence of approach impact load on elasto-hydrodynamic lubrication of involute spur gears

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中文关键词: [啮入冲击](#) [直齿轮](#) [时变弹流](#) [非牛顿流体](#) [热弹流润滑](#)

英文关键词: [approach impact load](#) [spur gear](#) [transient EHL](#) [non-newtonian fluid](#) [thermal EHL](#)

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中文摘要:

考虑齿轮啮入冲击载荷, 曲率半径、卷吸速度沿啮合线随时间的变化以及温度场的影响, 用非牛顿流体的Ree-Erying润滑模型, 利用多重网格法模拟了轮齿从啮入到啮出整个时间历程中油膜压力、膜厚和温度分布的变化, 对比分析了啮入冲击载荷与平稳载荷对渐开线直齿轮时变非牛顿热弹流润滑结果的影响。数值结果表明, 啮入冲击载荷只对啮入初始阶段的油膜压力、膜厚、温度有很大影响, 最小膜厚和最大压力都发生在冲击载荷的最大峰值载荷时刻, 所以齿轮的啮入冲击对齿轮保持良好的润滑状态是不利的。

英文摘要:

Based on the multi-grid (MG) method for solving the pressures, the multi-level multi-integration (MLMI) approach for evaluating the elastic deformations, a sequential column sweeping scheme for solving the energy equations, A full transient non-Newtonian thermal elasto-hydrodynamic lubrication(EHL) solution of an involute spur gear is obtained under approach impact load, which takes into account the variation of equivalent curvature, entertainment velocity and load on time along the line of action, considers the lubricant thermal and rheological effects as Ree-Erying fluid and the gear tooth surface is assumed to be smooth. The influences of load spectrum, which the load is carried by one pair of teeth and two pairs of teeth repeatedly, and the approach impact load when the teeth come into action on the EHL pressure, film thickness and oil temperature rise are analyzed in the paper. The results show that the approach impact load can strongly influence the approach point maximum pressure, oil temperature rise and minimum film thickness. The maximum pressure, the maximum friction coefficient, the highest oil temperature and the minimum film thickness all occur in the vicinity of approach point immediately after the impact load was feed. The approach impact load is seriously harmful to the gear lubrication.

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