

MODELING AND ANALYSIS OF RELATIVE FATIGUE LIFE UNDER 3D MIXED LUBRICATION IN MARINE HELICAL GEARS

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Mixed Lubrication ; Rolling contact fatigue ; Surface topography ; Helical gears

ABSTRACT

The helical gears of marine diesel engines work in a harsh mixed lubrication environment with lubrication-contact coexistence for a long time. Tooth surface stress concentration and micro-pitting corrosion caused by local rough peak contact are difficult to avoid. It will even shorten the contact fatigue life of helical gears. This report comprehensively considers the influence of real machined surface roughness and transient conditions of helical gears, establish a 3D dynamic stress and relative fatigue life calculation model of helical gear pair under mixed lubrication and obtain the oil film thickness, oil film pressure distribution under mixed lubrication conditions. It is also gain three-dimensional dynamic stress distribution and relative fatigue life under different measured machined surfaces. The results showed: affected by the surface roughness of the real machining, the helical gear is in a mixed lubrication state for a long time, and the lubrication state is relatively bad. Besides, the honed surface and shaved surface film thickness is relatively low, which make the tooth surface micro convex body direct contact and the overall Von Mises stress is higher. This induces the honed surface and shaved surface have a smaller relative fatigue life than the polished surface. In addition, the Von Mises stress of helical gears increases and the relative fatigue life decreases under low speed and heavy load conditions. Finally, in order to prolong the service life of helical gears, the polished surface should be selected as much as possible.

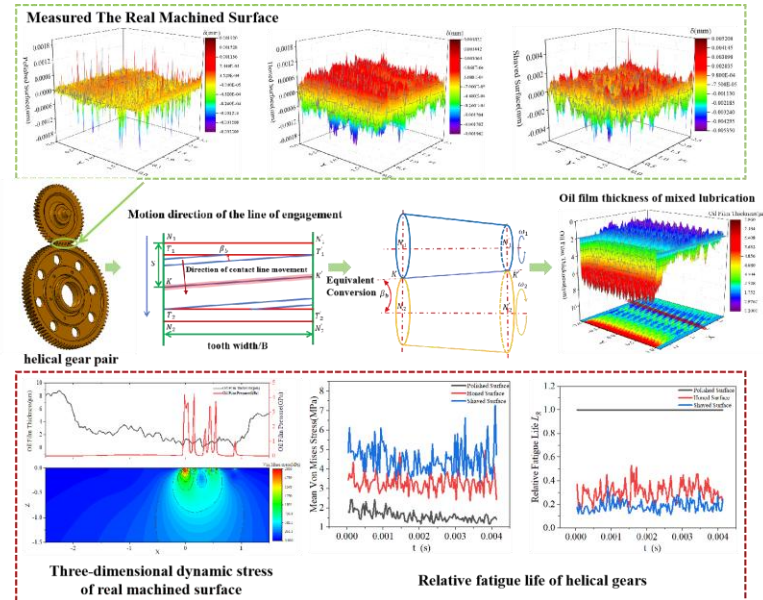


Fig.1 Modeling and analysis of relative fatigue life of helical gears under mixed lubrication conditions

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