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论文

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线接触零件部分热弹流润滑油膜厚度公式

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A NEW FILM THICKNESS FORMULA FOR PARTIAL THERMAL ELASTOHYDRODYNAMIC LUBRICATED LINE CONTACTS

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摘要

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摘要 采用弹性流体动力润滑理论和部分弹性流体动力润滑理论的分析方法,对弹流及部分弹流润滑线接触问题进行数值求解。通过联立求解结果,分析了接触表面间油膜厚度随载荷、滚动速度、滑滚比和进油温度等因素的变化规律,获得不同工况条件下的油膜厚度值,并依此提出一种新的油膜厚度公式。新公式考虑了热效应及表面粗糙度效应影响,可用于高温、高速、重载工况。计算结果比Dowson-Higginson油膜厚度公式更符合于实验数据。

关键词: 弹性流体动力学 润滑 热效应 表面粗糙度

Abstract: A numerical solution to the problem of elastohydrodynamic and partial elastohydrodynamic lubricated line contacts is presented in this paper with the use of analytical method. By solving the average Reynolds equation, the nominal film thickness equation, the viscosity and density equation of lubricant, the energy equation, etc. simultaneously, the effects of operating state parameters such as load, entrainment rolling speed, slide-roll ratio as well as inlet temperature of lubricant on the oil film thickness between contacting surfaces are analysed. The values of oil film thickness under different operating conditions are also obtained and a new film thickness formula is accordingly put forward. The new formula which takes account of thermal effect and surface roughness effect can be used in severe operating conditions such as elevated temperatures, high speeds and heavy loads. The calculating results of the new formula are more accordant with the experimental results than those of Dowson-Higginson's formula and therefore the new formula can be applied in the study and design of machine elements of line contacts instead of Dowson-Higginson's one.

Keywords: elastohydrodynamic lubrication thermal effect surface roughness

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