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Traction Behavior of Linear Piezo-Viscous Lubricants in Rough Elastohydrodynamic Lubrication Contacts

Authors : Punit Kumar, Niraj Kumar

Abstract : The traction behavior of lubricants with the linear pressure-viscosity response in EHL line contacts is investigated numerically for smooth as well as rough surfaces. The analysis involves the simultaneous solution of Reynolds, elasticity and energy equations along with the computation of lubricant properties and surface temperatures. The temperature modified Doolittle-Tait equations are used to calculate viscosity and density as functions of fluid pressure and temperature, while Carreau model is used to describe the lubricant rheology. The surface roughness is assumed to be sinusoidal and it is present on the nearly stationary surface in near-pure sliding EHL conjunction. The linear P-V oil is found to yield much lower traction coefficients and slightly thicker EHL films as compared to the synthetic oil for a given set of dimensionless speed and load parameters. Besides, the increase in traction coefficient attributed to surface roughness is much lower for the former case. The present analysis emphasizes the importance of employing realistic pressure-viscosity response for accurate prediction of EHL traction.

Keywords : EHL, linear pressure-viscosity, surface roughness, traction, water/glycol
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