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Boundary Layers: Unifying the Impact and Rolling EHL Point Contacts

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Abstract

Transient effects in elastohydrodynamic lubrication occur due to varying operating conditions and surface features moving through the contact. For rolling/sliding contacts the lubricated contact behaviour is determined by a unifying mechanism characterized by the inlet length (boundary layer). Roughness deformation depends on a single dimensionless parameter representing the ratio inlet length to wavelength. This behaviour is shown to generalize to the pure impact problem. The bell shaped film thickness near the periphery of the contact is directly related to the boundary layer velocity profile. Also, the waviness deformation under impact conditions is shown to depend on the same parameter as in rolling contacts when the rolling velocity is replaced by the local boundary layer velocity in the impact problem.

Key words: EHL, impact lubrication, amplitude reduction theory