

New Directions in EHL from Realistic Rheology

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In recent years, a new approach to understanding the processes of EHL film formation and EHL friction has emerged. The pressure, temperature and shear dependences of the viscosity of the liquid, which may be measured in viscometers, have been employed in calculations to test our current understanding and provide new insight where current understanding fails. This approach is in contrast to the previous practice of adjusting the parameters of simple models to obtain agreement with experiment. Some recent findings include:

1. At least for light loads and small sliding speed, friction (as well as film thickness) may be calculated accurately from pressure and shear dependence of the viscosity.
2. The scale and load sensitivities of the central film thickness can be much greater than the classical prediction when the viscosity is shear-dependent in the inlet.
3. The scale and load sensitivities of the central film thickness can be even greater than the prediction based upon shear-dependent viscosity and the discrepancy can be shown to result from mechanical degradation for at least one liquid.
4. There are situations in concentrated contact lubrication for which the piezoviscous response is linear at inlet pressures and simulations have provided agreement with experimental film measurement for this case.