Abstract Submitted
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Temperature Variations in Lubricating Films Induced by Viscous Dissipation[1] FARSHAD MOZAFFARI, RALPH METCALFE, Univ of Houston — We have studied temperature distributions of lubricating films. The study has applications in tribology where temperature-reduced viscosity decreases load carrying capacity of bearings, or degrades elastomeric seals. The viscosity- temperature dependency is modeled according to ASTM D341-09. We have modeled the film temperature distribution by our finite element program. The program is made up of three modules: the first one solves the general form of Reynolds equation for the film pressure and velocity gradients. The other two solve the energy equation for the film and its solid boundary temperature distributions. The modules are numerically coupled and iteratively converged to the solutions. We have shown that the temperature distribution in the film is strongly coupled with the thermal response at the boundary. In addition, only thermal diffusion across film thickness is dominant. Moreover, thermal diffusion in the lateral directions, as well as all the convection terms, are negligible. The approximation reduces the energy equation to an ordinary differential equation, which significantly simplifies the modeling of temperature –viscosity effects in thin films.

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