Simulation and Experimentation on the Contact Width and Pressure Distribution of Oil Seals

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ABSTRACT

The relative motion between two mating parts of machinery always generates heat from friction. The lubrication oil serves as a medium not only to reduce the friction but also to enhance heat dissipation. In order to contain the lubrication oil, lip seal is a most frequent sealing part used in these applications. This thesis aims to study the contact width and contact pressure of the seal lip under the various interference fits between the shaft and seal. The contact force associated with the pressure was used to estimate the generated heat due to friction. Thereby, this frictional heat flux was employed to analyze the temperature distribution within the rubber seal. According to the temperature distribution, the thermal deformation of the seal and the concern of material ageing can be examined. Since the use of a seal with a shaft under allowable dimension tolerance is foreseeable, the fit with different degrees of interference was studied in this thesis. On the other hand, a simple apparatus to measure the contact width and contact pressure on the contact lip area under different diameters of shaft was designed and fabricated. The contact width and contact pressure were distilled from the press mark of a pressure-sensitive film. The measurements were used to demonstrate the feasibility and accuracy of the proposed set up.

Keywords : oil seal, interference fit, contact width, contact pressure, pressure-sensitive film

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