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Research Article

Film Thickness Analysis for EHL Contacts under Steady-State and Transient Conditions by Automatic Digital Image Processing

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Abstract

The knowledge of the film thickness values is very important in lubricated contacts to verify the lubrication conditions. Optical interferometry is one of the most used methodologies for film thickness and shape determination of Elastohydrodynamic-lubricated contacts. An image processing programme has been developed for the analysis of white light interferograms. The programme, based on the analysis of the hue channel, has been developed in order to process big amounts of images, as often generated under transient conditions. The measurement range is currently limited to a maximum film thickness of 0.7 μm . The programme has been used for analysing several images recorded in tests carried out with a ball on disc contact under steady-state as well as transient conditions for different velocities and slide-to-roll ratios. Under transient conditions, the entraining velocity is varied with a sinusoidal law for two different frequencies. The results obtained evidenced an asymmetric reduction of the film thickness when increasing the percentage of sliding, both for stationary and transient conditions. Under transient conditions with increasing test frequency, film thickness loops of increasing amplitude have been found that reduce their amplitude more when the ball is running faster than the disc. Squeeze and thermal effects can explain the results obtained.

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