FUNDAMENTAL ASPECTS OF FRICTION IN STARVED EHL CONTACT

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ABSTRACT
Present machine design is driven by demand to increase machine components efficiency to fulfil a vision of sustainability society development. For successful engineering design, it is necessary to predict friction in lubricated concentrated contact. Despite large amount of research made on friction, our capabilities of fluid film friction modelling are still limited.

Common assumption is that main part of sliding friction is produced in the central zone while contact inlet has practically no significant effect on friction. Nevertheless, it was already shown that friction at starved contact is significantly increased. Severe starved contact represents a situation when size of contact inlet is limited, therefore, film thickness is thinner. Under rolling-sliding conditions, lubricant inside contact are exposed to higher shear rate.

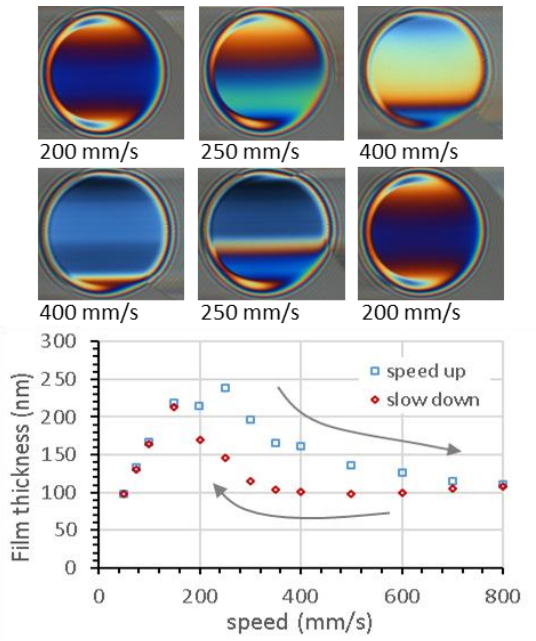

Fig.1 Film thickness and several interferograms from ramp up and down experiments.

Figure 1 shows results of film thickness and several interferograms obtained by thin film optical interferometry technique under 10% slide/roll ratio and 0.6 GPa of Hertzian pressure. The speed was ramped up and down. The film thickness exhibits hysteresis due to starvation which is depends not only on speed but also on time. In Figure 2, there is plotted coefficient of friction depending on shear rate which was derived from measured film thickness. It can be seen that data of friction for speeds up and slow down phases forms single curve.

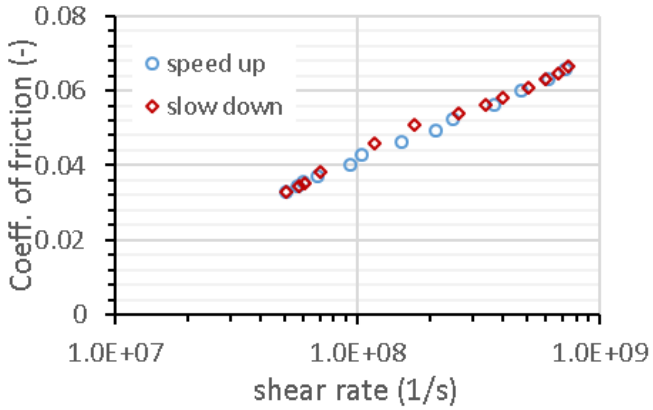

Fig.2 Friction data of measurement in Fig. 1

In this paper the friction of starved contact is analyzed in more detail. Film thickness and friction are measured in-situ. Experimental data for starved and fully flooded contacts are compared for different speeds, slide/roll ratios and loads. Such comparison could depict possible effects of lubricant temperature rises, universality of limiting shear stress and role of conditions in contact inlet on friction produced in central zone. This contributes to better knowledge of lubricant in-contact rheology and lubrication of elastohydrodynamic contact.