GREASE FORMULATION, FILM THICKNESS AND FRICTION - INFLUENCE ON ROLLING BEARING TORQUE LOSS

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KEYWORDS

grease lubrication; film thickness, friction; roller bearing; torque loss

ABSTRACT

Experimental batches of Polypropylene and Lithium greases, thickened with PAO and Mineral oils, as well as their base and bleed-oils were tribologically characterized through film thickness measurements over a wide range of entrainment speeds on a ball-on-disc test rig using optical interferometry.

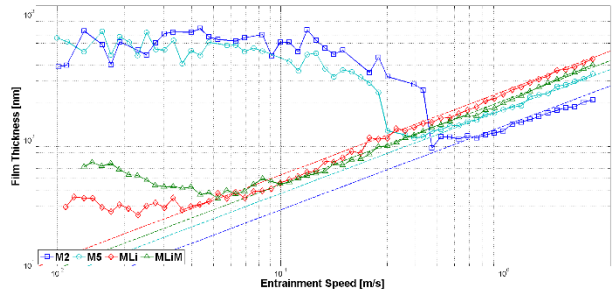
Under fully flooded conditions and low speed it was observed that thickener lumps enter the contact producing a high film thickness plateau. The transition speed or the "transition film thickness" at which the film thickness increases with decreasing speed is dependent on the thickener type, content and operating temperature. At moderate to high speeds, all the tested greases show a film thickness much higher than the base and bleed-oils, even though the bleed-oil's film thickness is closer to the grease's.

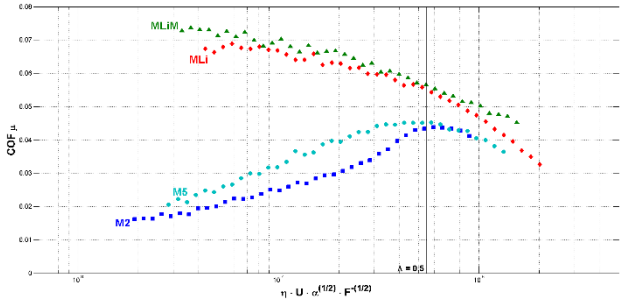
The same greases were tribologically characterized through traction coefficient and Stribeck curves at different operating conditions on a ball-on-disc test rig, ensuring that the contact was fully flooded. The tests were performed at constant load, but different operating temperatures while varying the slide-to-roll ratio (SRR) or the rolling entrainment speed.

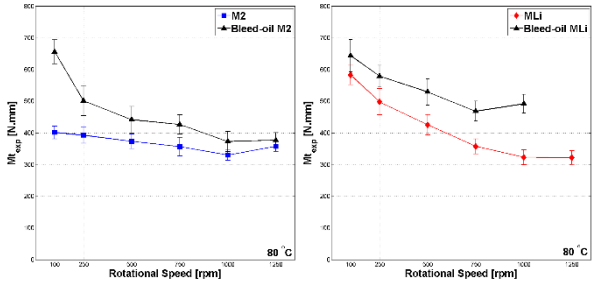
The results were correlated to the greases' formulation in terms of base oil viscosity, thickener and/or elastomer content. A relationship between the coefficient of friction (COF) of greases formulated with different thickener content was found and the thickener influence on the COF was addressed.

Experimental tests were performed in thrust roller bearings lubricated with the same greases. The friction torque was measured at constant temperature and load, while varying the rotational speed. The coefficients of friction under boundary and full film lubrication were numerically calculated through the optimization of a rolling bearing friction torque model to the experimental measurements.

The results show that the film thickness and friction behaviour of the greases at low and high speeds have a direct influence on the torque loss of thrust roller bearings.







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