GREASE FLOW BASED ON A TWO-COMPONENT MIXTURE MODEL

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ABSTRACT
Greases are complex materials that are widely used as lubricants in tribology. Despite the increasing sophistication of models for many tribological materials and applications, those for grease are not much different than in the 1960s. The likely reason, as pointed out by Cann [1], is that there is little agreement among researchers as to the basic physical mechanisms at work.

Greases consist of a thickener of a fibrous material or a porous polymer, impregnated with a base oil. Roughly stated, the function of the thickener (the lower layer of Fig. 1) is to hold the lubricant mixture in place, and the function of the oil in the upper layer is to provide the lubrication itself. In this work, grease layer is considered to be a two-component mixture: a highly viscous non-Newtonian thickener and a base oil. The interaction between the two components is the porous media mixture law of Darcy-Brinkman [2].

The figures illustrate some preliminary results of this study.

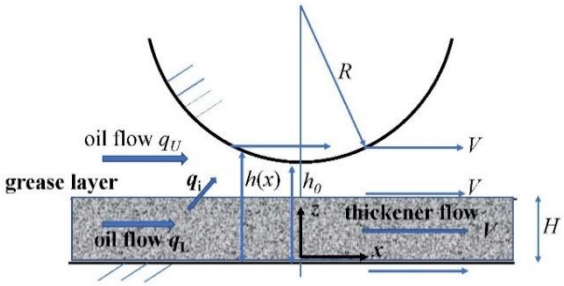

Fig.1 Schematic of grease layer in cylinder/plane rolling contact. The gap contains a lower grease layer (thickener plus oil) supplying an upper oil film.

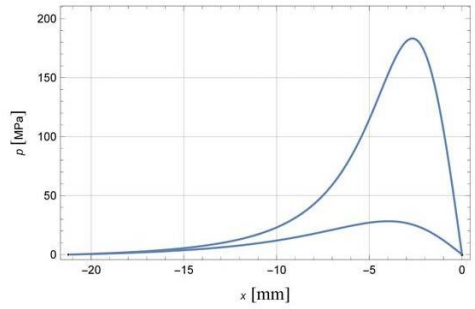

Fig.2 Pressure profiles in rolling contact, two cases. For the lower curve, the gap is pure oil; for the upper curve, a grease layer is present.

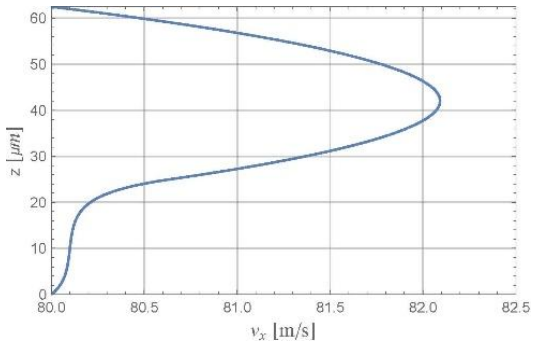

Fig.3 Typical oil velocity profile in rolling contact at a location of negative pressure gradient. Upper portion of the curve is pure oil, the lower portion is oil flow in thickener.

REFERENCES
[1] Cann P, Tribology Series, 48, 1996, 573-581.
[2] Brinkman H, Applied Scientific Research,1, 1949 27-