Discussion of a paper entitled "Formation of lubricant film in rotary sealing contacts : Part 2. A new measuring principe for lubricant film thickness" by A. Gabelli and G. Poll"

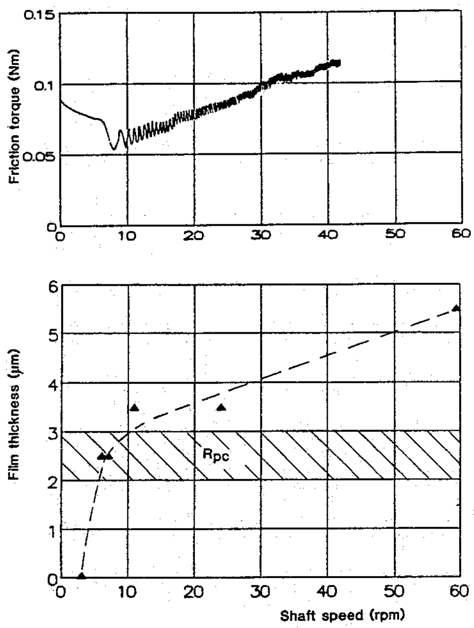

Fig. 13 Minimum film thickness, combined roughness R_{pc} of shaft and seal and friction torque versus speed

compete with the fluorescent technique. The disadvantage in the present configuration is the fact that the complex axial profile of the lubricant film cannot be recorded simultaneously but only by axial displacement of the transducers. This would demand further miniaturization. On the other hand, there are the following advantages:

- The input and output signal are transmitted by the same device (no separate optics for ingoing and outcoming light).
- High resolution over a wide range of film thickness.
- The seal counterface keeps its original surface microgeometry (no optical transparency required).

Initial measurements have already given important information about the behaviour of the lubricant film under a radial rotary seal lip. Moreover, experimental measurements compared well to theoretical predictions of part I (Gabelli et al., 1990).

Extended measurements with a variation of various parameters are in progress, to provide a deeper insight into the mechanisms governing the lubrication of rotary lip seals.

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DISCUSSION

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The authors are to be congratulated for contributing a new method of film thickness measurement. This technique has already been proven valuable for measuring lip seal film thickness and may well be applied to several other tribological situations.

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In their various optical studies have the authors observed cavitation streaks in the lip seal fluid film such as have been observed by Nau in mechanical face seals? How would magnetic resistance fluid film thickness measurement respond to such cavitation, either as stationary with respect to the magnet or moving tangentically with the fluid? Have dynamic fluctuations of output been observed? Can one distinguish between output caused by cavitation from signal noise?

Authors' Closure

The authors would like to thank the discusser for his remarks. In recent investigations, G. Poll et al. (1992), we were indeed able to observe indications of cavitation in the fluid film of the sealing contact. As the measurement of the film thickness, using a magnetic fluid, detects the volume of the fluid and averages over an area larger than the cavitation spots, it is not possible to distinguish between cavitation and other effects:

- If cavitation should occur while the distance between the surfaces remains constant, it would appear as if the film thickness was decreasing.
- If cavitation should occur while the surfaces become further separated, it would appear that too small an increase or even a constant film thickness is indicated.

Both conclusions about film thickness would be affected by error, which is indeed a shortcoming of this method, as for most others. Furthermore, because of the averaging character of the measurements and the induced alteration of the film thickness, we see no possibility of correlating dynamic fluctuations of the measuring signal to cavitation.

On the other hand, it should be considered that the calibration of the transducer in a dynamic condition similar to that of the application, see section 6 of the paper, should provide a fairly good compensation for the effect of uniformly distributed cavities or air bubbles present in the magnetic oil volume of the fluid film gap.

Additional Reference

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