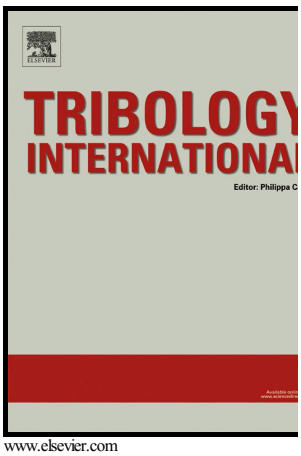

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Effect of grooved shaft on the rotary lip seal performance in transient condition: Elasto-hydrodynamic simulations

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Abstract:

It is generally accepted that reverse pumping from the air-side to the liquid-side of rotary lip seals is coupled to lip asperities shearing deformation due to hydrodynamic effect. Recently, to enhance this rate, new shaft designs with oblique grooves have been manufactured, but only two computational models were performed up to now: by defining a textured shaft with simple analytical functions, or by using a measured groove geometry from a 3-D micrograph. The weak point of both models is assuming the lip as a smooth surface to make the problem stationary.

Therefore, this work aims at performing a numerical parametric study of a grooved shaft in transient conditions and, also, comparing numerical results and experiments between a steady case and the current model.

Consequently, simulations show that the oblique grooves on the shaft improve significantly the reverse pumping. In addition, the current model predicts better reverse pumping comparing to a stationary model, and the friction torque is overestimated with a smooth lip surface.

Key words: Lip seal, EHL; grooved shaft; reverse pumping; friction torque.