The Sealing Mechanism of a plain Rotary Lip Seal

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ABSTRACT

In this study, the pumping mechanism of the lubricant inside the lip region of a rubber plain rotary lip seal, NAK TCL 36*52*10, is studied experimentally and numerically. A direct numerical simulation model based on the film thickness equation proposed by Salant [4] has been developed. The commercial package CFD-RC? with a SIMPLEC numerical algorithm with the staggered-grid arrangement is employed to simulate the flow field around the contact region between the lip and the shaft in the environment of a pumping-rate test rig, where both air and oil sides are filled with oil initially. The streamline pattern and pressure field are examined. Complicate three-dimensional streamline topology is analyzed. The vortex generated next to the lip on the oil side rotates such to create an inward pumping effect. The pumping rates are calculated at shaft speeds, ranging from 2000 to 6000 rpm, and compared to the measured values from the test rig. Good agreement is observed. Both calculated and measured pumping rates increase as shaft speed increases. The current results demonstrate the validity of Salant ’s film thickness model. Other parameters in Salant ’s film thickness equation, besides the shaft speed, are also investigated to understand their effects on the pumping efficiency.

Keywords : 橡膠旋轉軸唇型密封元件 ; 油膜 ; 迴油率 ; 計算流體力學

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