# TRANSPORTATION OF LIQUID AND DISSOLVED GAS AND THEIR DEPENDENCE ON SURFACE TOPOGRAPHY IN RADIAL SHAFT SEAL

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## KEYWORDS
***Surface topography; Fluid lubrication; Modelling in tribology; Seal***

## ABSTRACT
The sealing function of radial shaft seals originates from the hydrodynamic force to pump oil back at narrow gap between a seal lip and a shaft. This hydrodynamic effect is produced by surface roughness on the lip surface. Previous experiments revealed that surrounding gas in one side of the seal is transported to the other side, and that his occurred through convection of gas dissolved oil, as shown in Fig. 1. Further study demonstrated that simple protrusions produced disturbance and gave rise to axial flow of oil and transportation of gas, which did not occur with a smooth surface.

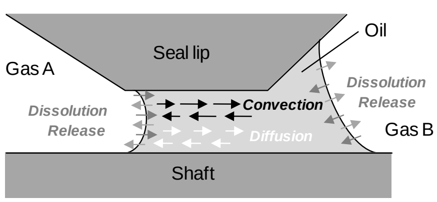


Fig.1 Gas transportation at seal lip

In this study, a numerical analysis is made in order to understand the effect of surface roughness on the axial flow of oils and transportation of dissolved gas. Random asperity models are made to represent variations in asperity spatial distribution. The flow between a rigid rough stationary surface and a rigid smooth moving surface is solved by the finite-difference method. The rate of gas transportation is obtained by assuming convection of the oil and boundary films at gas/oil interfaces. The results show that the asperity spatial distribution affects the direction and rate of the oil flow, and the flow rate of gas. No clear relationship can be found between the oil flow and gas transportation. Properties of surface roughness that control oil and gas flow are discussed.

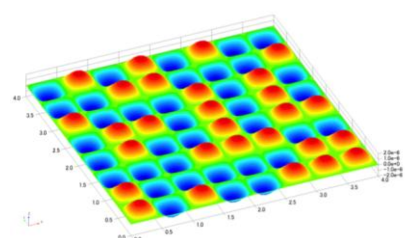

Fig. 2 Random distribution model

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