# MODELLING OF SURFACE CRACK PROPAGATION UNDER LUBRICATED ROLLING SLIDING CONTACT

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## KEYWORDS

***EHL, Modelling in tribology, Rolling contact fatigue, Surface crack propagation***

## ABSTRACT

This paper undertakes a thorough numerical investigation into the intricate dynamics between lubricants and surface-breaking cracks occurring in rolling-sliding conditions. The primary objective is to advance our understanding of the damage caused by rolling contact fatigue—a pervasive challenge encountered in machine components such as bearings and gears operating in lubricated rolling-sliding environments. In addressing this complex transient phenomenon involving fluid-solid interaction, an advanced coupled solid-fluid Finite Element (FE) model is introduced. This model is intricately designed to study the detailed flow and pressurization of lubricants within surface-breaking cracks under elasto-hydrodynamic lubrication (EHL) conditions. The parametric study encompasses crucial factors, including lubricant viscosity, crack geometry, and the magnitude and velocity of contact loads, systematically exploring their impacts on both the quantity and pressure of lubricants infiltrating the surface crack.

The numerical simulations unveil a noticeable reduction in lubricant pressure at the crack mouth when a surface crack initiates. Furthermore, significant observations indicate that in cases where the crack is relatively short, the crack mouth remains consistently open, preventing the entrapment of lubricant. A meticulous examination is carried out to evaluate stress intensity factors at the crack tip, providing pivotal insights for the subsequent analysis of crack propagation under lubricated rolling-sliding conditions.