
This version is available at https://strathprints.strath.ac.uk/59087/

Strathprints is designed to allow users to access the research output of the University of Strathclyde. Unless otherwise explicitly stated on the manuscript, Copyright © and Moral Rights for the papers on this site are retained by the individual authors and/or other copyright owners. Please check the manuscript for details of any other licences that may have been applied. You may not engage in further distribution of the material for any profitmaking activities or any commercial gain. You may freely distribute both the url (https://strathprints.strath.ac.uk/) and the content of this paper for research or private study, educational, or not-for-profit purposes without prior permission or charge.

Any correspondence concerning this service should be sent to the Strathprints administrator: strathprints@strath.ac.uk
Design optimisation of swellable elastomeric seals using advanced material modelling and FEM simulations

Yevgen Gorash\textsuperscript{*}, Alan Bickley\textsuperscript{1} and Francisco Gozalo\textsuperscript{1}

1 – Dep. of Mechanical & Aerospace Engineering, University of Strathclyde, Glasgow G1 1XJ, UK
2 – Weir Advanced Research Centre, Technology and Innovation Centre, Glasgow G1 1RD, UK
3 – Weir Oil & Gas, Weir Rubber Engineering, Salt Lake City, UT 84119, USA

Emails: yevgen.gorash@strath.ac.uk, alan.bickley@weir.co.uk, francisco.gozalo@weirminerals.com

---

**Stapmade™ Swellable Packers**

Swellable elastomeric seal is a type of specifically engineered packer that swells upon contact with ambient fluids, providing active control of annular fluid flow in a packer, borehole, and/or annulus. This dynamic interference seal is engineered to swell in a controlled manner to provide a high radial force and effective annular seal.

High-quality elastomers form the core of the life of the packer.

- Proprietary elastomer compound provides predictable swell when in contact with specific fluid regimes.
- High compressibility and toughness enhance reliability.

Fluorine-free and low density.

---

**Introduction & Objectives**

Swellable elastomeric seals are used in a variety of oil and gas applications, including well testing, completion, and stimulation. They are particularly useful in situations where traditional seals may not function properly. The design optimization process involves integrating an advanced material model comprising both hyperelasticity and moisture swelling. This model is critical for predicting the behavior of the seals under various conditions.

---

**Shape optimisation with Tosca Structure**

Benchmark problem for leakage and extrusion

Robust Simulation of Swellable Packers

---

**FE-simulation of Pressure penetration & leakage in packer**

---

**Discussion**

**References**

---

**References**