

Unlocking the Secrets of Fault Sealing: Lessons Learned from the Njord Field

Philipp Müller¹, Christan Hermanrud^{1,2}

¹Equinor ASA

²University of Bergen

Abstract

The study reported here addressed fault sealing at the Njord Field offshore in Mid Norway. It included an investigation of the regional fluid flow and introduced a novel approach for assessing the impact of burial depth and clay content on fault rock permeabilities. This approach is based on principles from electrical engineering, which is justified because Ohm's law and Darcy's law are mathematically identical. The acquired knowledge of fault permeabilities was used to investigate the relationships between fault permeability and fault-sealed hydrocarbon columns.

Water pressures decrease from NW to SE across the field, which appears to reflect subsurface water flow in this direction. The hydrocarbon contacts in individual segments are largely controlled by across-fault sealing but also by vertical hydrocarbon leakage from shallow segments.

Hydrocarbon column heights are primarily controlled by an equilibrium between the flow of hydrocarbons into segments and the across-flow of hydrocarbons out of the segments. This model implies that segments with large drainage areas and small fault surfaces available for across-fault flow out of the segments will likely hold comparatively large fault-sealed columns.