

## SEAL FAILURE RELATED TO BASIN SCALE PROCESSES

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Seal failure analysis is frequently performed on the basis of local observation, such as analyses of single faults or cap rocks, without consideration of basin scale processes at large. This approach may possibly result in neglectance of important factors, and thus to inferior results.

We have analysed leakage of fluids from pressure compartments on the basis of large scale processes, which are responsible for porosity reduction, overpressure generation, faulting and hydrofracturing. The analysis was based on well data (relationships between overpressure and porosity of reservoir and cap rocks), basin modelling, mass balance considerations and observations of seismic data. Most of these data were derived from the Northern North Sea and Haltenbanken areas offshore Norway.

It was concluded that all pressure compartments leak fluids during burial, provided that the temperatures are high enough to initiate thermally activated diagenetic processes. These processes proceed irrespective of fluid pressure in the (clastic) rocks we have investigated. Accordingly, the critical issues in sealing analysis here are not whether such compartments leak, but rather a) where the pressure compartments leak, b) which processes are rate-limiting the fluid outlet, and c) which fluid types leak first. Inspection of seismic data, analysis of stress history and analysis of retention capacities at basin scale resulted in recognition criteria for the operating processes, which could be linked to varying trap integrity characteristics for regions and individual reservoirs in the study area.

As the operating processes which result in various forms for fluid leakage should be universal, it is hoped that the recognition criteria which were derived in the present study are also applicable elsewhere. If this is the case, then application of these criteria should result in safer prediction of trap integrity also outside the Norwegian continental shelf.