

Using Pressure Data to Characterise Fault Seal – Examples from the Upper Rhine Graben in France and North West Shelf of Australia

James Underschultz, CSIRO Petroleum (ARRC), 26 Dick Perry Ave, Technology Park, Kensington, Perth, WA 6151, Australia, phone: 61-8-6436-8747, fax: 61-8-6436-8555, james.underschultz@csiro.au and Claus J. Otto, Basin Hydrodynamics Group, CSIRO Petroleum, ARRC, 26 Dick Perry Avenue, Kensington, WA6151, Australia.

Pressure data viewed in vertical pressure profiles and hydraulic head distributions within individual and stacked reservoirs lead to identification of fault leakage and sealing. The evaluation is supported by formation water chemistry and temperature variations in the reservoir.

The Upper Rhine Graben is an intermontane rift basin and an example of how normal faults redirect and focus fluids in the subsurface. Two regional fluid flow systems converge towards the graben centre where flow is ascending mainly through faults. Due to the discontinuously sealing nature of the faults, rising fluids are deflected into permeable strata juxtaposed the fault plane. Flow directions within the aquifers are perpendicular to the structural grain suggesting that the permeability of the faults is often higher than that of the aquifers. A combination of juxtaposition and variable fault zone properties determine the portion of flux up the fault and into the juxtaposed aquifers.

The Griffin oil and gas field is located in Cretaceous sands of a fault bounded structural trap in the Barrow sub-basin on the North West Shelf of Australia. It provides a field-scale example where formation pressure data can be used to evaluate fault seal. The hydraulic head in the aquifer at the base of the oil shows a discontinuity across the bounding faults. Pressure data from the various wells penetrating the oil pool can be used to track free-water level that shows variations due to hydrodynamic drive. The pressure data also points to variable oil-water contacts across the pool linked to variations in capillarity.
