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Process and Criteria for Determining Seal Controls on Trap Fill

To evaluate seal controls on trap fill we first interrogate the structural interpretation and characterize structural and stratigraphic uncertainty. Pay zones are then identified via integration of well logs, tests and pressure data. The basic "container" for each reservoir is defined as accurately as possible. Next, potential connectivity points (e.g., fault leaks or stratigraphic connections) are identified. The hydrocarbon distribution can now be described in context of this fill and spill framework, in which fluid level, compartment and connectivity constraints are honored. Seal analyses are then applied in a systematic process of elimination until the most likely controls on fill are identified. If fill occurs beyond a juxtaposition leak point, and the additional fill is greater than the magnitude of structural or stratigraphic uncertainty, fault zone seal is invoked.

Evaluation of the seal controls of a suite of traps can be used to develop risking and sizing methodologies for a play. We illustrate with an example from the Southern North Sea Rotliegende gas play. In this study, 30 fault traps were analyzed. Twenty-two were found to have economic gas accumulations. Trap fill of these 22 accumulations is controlled primarily by sand-on-sand fault juxtaposition leakpoints. However, a few of the gas accumulations require sand-on-sand fault seal. Some "sealing" fault segments are associated with structural complexity, and minor changes in interpreted throw could eliminate perceived sand-on-sand seals. With this approach, we determined that sizing and risking of fault traps in the Rotliegende play should be based primarily on fault juxtaposition. Additional but limited gas column below the conventional juxtaposition leakpoint may occur in the highside fill case.