

The Impact of Fault Properties on Reservoir Production Behaviour

Onyeagoro, U.O., F.F. Van der Vlugt, and S.J. Naruk, Shell International Exploration and Production, Houston, TX

Faults are important elements in the production behaviour of hydrocarbon reservoirs. Recently, compartmentalisation of deepwater reservoirs has become an important issue and faults have been identified as one of the key contributing factors. Also, compartmentalisation was identified as a key strategic theme because it is considered to be an important contributor to surprises encountered in recent development projects.

Faults are represented conventionally in production flow simulation models using transmissibility multipliers to capture the fault rock properties. The transmissibility multiplier, single number between 0 and 1, is a function of all the physical variables that combine to baffle flow between fault-offset cells. Whether hydrocarbons will flow at significant rates across faults will influence well counts, well placement, and ultimate recovery.

In the context of fluid flow, the most important features of a fault are the throw, the fault thickness, the permeability reduction inside the fault, and the increased entry pressure for the non-wetting phase. The transmissibility of the flow connections across the fault is based purely on the geometry and the properties of the host rock. To get a geologically consistent description of the effect of the fault on fluid flow, the thickness of the fault zone and the impact on permeability and entry pressure are incorporated in consistent, systematic ways, in order to isolate their impacts on production behaviour.

Accurate characterizations of the faults have yielded more realistic and more economic highly deviated and horizontal wells across faults, robust field development plans with clear economic advantages, and successful history matches.