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Re-evaluation of Oil and Gas Migration in the Northern North Sea Area by 3D Basin Modeling

Three-dimensional basin model (JNOC's SIGMA-3D) was applied to the Northern North Sea area to evaluate oil and gas generation, migration and accumulation. The advantage of 3D basin modeling is to enable quantitative evaluation on oil and gas charges to each trap. The results indicated that the upper Jurassic source rock started oil generation from the Cretaceous age in deepest part of the Viking Graben. These oils were migrated downward to the middle Jurassic Brent carrier bed due to pressure reversal created by overpressure in the source rocks. The oils reached structural highs along the Brent sandstone in the Cenozoic age. Since the simulated oil and gas saturation in the Brent sandstone are consistent with existing oil and gas fields, this down migration due to overpressure in deepest part of the Graben is main migration story. In order to confirm this hypothesis, we also conducted the simulation without overpressure in the source rock, which revealed that most of oil and gas generated can not accumulate in the Brent sandstone and instead leak to shallower formations.