Biogenic Influences on Resource Quality Within the Upper Cretaceous Nise Formation, More Basin, Norwegian Sea

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Recent work increasingly demonstrates that bioturbation can play an important role in production geology. Reservoir petrophysics can be modified by bioturbation, and biogenically-induced textural heterogeneities can result in permeability enhancement or diminishment in clastic and carbonate rocks. Four cores within the Upper Cretaceous Nise Formation (Norwegian continental shelf) are studied in order to assess the relationship between bioturbate fabric, and permeability and porosity distribution. A total of four facies associations are identified. Sediment accumulation for the facies associations is the result of alternating fine- and coarse-grained sedimentation within a distal platform setting. Therein, biogenically-enhanced permeability distributions range between bioturbated sandy facies through to sparsely burrowed mudstone media with discrete sand-filled burrows.

Petrographic assessments and spatial imaging via MicroCT scanning show that porosity is strongly influenced by the location and nature of bioturbation. This occurs in two ways: (1) as reoriented and homogenized fabrics in highly bioturbated media; and, (2) through the imposition of coarser grained sediment in tunnels and shafts in otherwise fine-grained strata. These modifications constitute selective fluid flow pathways within the studied interval. The effectivity of these bioturbate flow networks is assessed through numerical modeling based on determining the pore distribution of selected samples. The modeling of fluid flow within bioturbated intervals may aid in the optimization of secondary recovery methods and the selection of future drilling targets in similar biogenically altered intervals in the area