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Improving Recovery Predictions from Fluvial and Shallow Marine Reservoirs Using Combined Boolean and Gaussian Facies Models

Using a case study of an immature UK North Sea field (Mid-Upper Jurassic, Callovian-Oxfordian age), a combination of stochastic modelling techniques is illustrated which has helped to improve the prediction of incremental recoveries and water-breakthrough timings within the field.

A workflow is described which has included iterating a suite of 3D-permeability models, each linked to appropriate facies, between the 3D geological model of the reservoir (static model) and the reservoir simulator (dynamic model). Results obtained from the simulator have also been passed back to the static model.

Two reservoir management issues formed the impetus for construction of the facies-based models:

 A stratigraphically older reservoir produces from low-moderate sinuosity, coastal plain channel sandstones. This production (1500 bopd) is currently occurring from one well only and injection support was identified as critical to sustain this production. Key objectives have been the estimation of sand connectivity and geometry within this channelised reservoir and predicting sweep patterns and incremental production profiles ahead of drilling an injector well. Boolean “object” modelling techniquies have been applied to this reservoir.

 An overlying shallow marine reservoir produces entirely from lower-mid/upper shoreface sandstones. These lie within a “fairway” between lower permeability transitional/offshore deposits and more proximal coastal plain facies. Producer and injector wells have been drilled roughly perpendicular to the shoreface facies belts. Due to the substantial decrease in permeability between lower shoreface and mid/upper shoreface belts as a result of reduction in pore size, realistic spatial models of these facies will influence the “sweep” and production profiles and prediction of water breakthrough. Truncated Gaussian Simulation as been used to model this reservoir.