

Quantitative Estimation of Directional Permeability Barriers as a Reservoir Heterogeneity – A New Approach Using Synthetic Core

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Abstract

One of the major challenges in reservoir characterization is to estimate the effective porosity and the permeability of the reservoir due to reservoir heterogeneity. Often the vertical and the horizontal permeabilities are not considered separately in 3D geo-cellular models and in the reservoir simulations. Conventional reservoir modeling extrapolates all of the small-scale data to full-field scale data without considering the impact of the small-scale geological details, and therefore carries forward inherent errors into the reservoir predictions as a consequence of ignoring the reservoir heterogeneity. Most reservoirs are geologically complex and heterogeneous and that greatly influences reservoir performance.

A case study is taken from a Cold Heavy Oil Production with Sands (CHOPS) field. An innovative method of reservoir heterogeneity estimation has been introduced to illustrate the complex reservoir heterogeneity honouring all of the small-scale geological details in the 3D geological model. This detailed near-wellbore modeling through a synthetic core can provide the realistic quantitative volumetric assumption of the production prediction and improve the Enhanced Oil Recovery (EOR) processes.