New Technologies for Quantitative Reservoir Characterization in the Absence of Seismic: The Wilcox and Beyond

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Abstract

Predictions of reservoir type, areal distribution, heterogeneity, and connectivity are significant subsurface challenges and are essential for accurate production forecasting. This challenge is amplified in situations where seismic data does not have the capability to detect the reservoir (e.g., deep, tight, subsalt) such as in the case of the Paleogene Wilcox strata in the Gulf of Mexico. Innovative new technologies have been specifically developed to constrain predictions of reservoir variability without dependency on high-resolution seismic data to directly address these considerable business challenges. These new technologies include quantitative workflows for identification of reservoir type, and critically, the reservoir characteristics that control heterogeneity and connectivity using only 1D well data. Critically, these workflows leverage quantitative analytical approach of pattern recognition and classification well data for objective characterization of heterogeneity. Improvements in identification and understanding of critical factors has resulted in more geologically accurate reservoir models, reduced uncertainty/risk related to reservoir connectivity and improved forecasting of EUR. Novel machine-learning based technologies have also been developed to derive cognitive insights from complex subsurface data, particularly with respect to characterization and prediction of the subsurface heterogeneity. They have provided unique insights into the stratigraphic variability and the reservoir heterogeneity impacting pressure depletion and production results and constraining the uncertainty of reservoir continuity. Collectively, these technologies are providing quantitative recognition of reservoir type, heterogeneity evaluations, and advanced

correlation workflows that enable more robust analog benchmarking, early-risk element identification, and enhanced performance predictions. Importantly these workflows and technologies are applicable to all clastic, carbonate, and unconventional reservoirs.