Subsurface Reservoirs Imaging through Characterization and 3D Modeling

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ABSTRACT

The crux of subsurface reservoir imaging is about the building of comprehensive 3D model of the subsurface at initial reservoir conditions, followed by a continues update of this 3D model through refined understanding from additional static and field performance data and other information collected throughout the history of reservoir production. The fact of the matter is that the best validation of subsurface imaging at the field scale tends to take place at the advance stages of the reservoir maturation.

During earlier stages, however field-scale reservoir performance can be mitigated by:
1) a strong conceptual modeling of the geology and the physics of the reservoir,

2) an integration of multi-disciplinary information and knowledge, beyond just data interpretation, and

3) probabilistic static reservoir modeling.

This abstract presents a practical and an applied methodical workflow of modeling the geology and petrophysics of subsurface reservoirs at the full-field scale. The presentation of this workflow emphasizes each of the spatial dimensions (1D, 2D and 3D) of the subsurface hydrocarbon reservoirs. It is carried out from the perspective of stratigraphic, structural, petrophysical and geophysical characterization independently and interdependently at the conceptual and semi-quantitative levels. While the presented workflow incorporates all available data, static and dynamic, the question raised here is whether these integrated reservoir-imaging steps mitigates or adds uncertainty prior to history matching and full field fluid flow simulation.