THE IMPORTANCE OF UNDERSTANDING DEPOSITIONAL MODEL IN BUILDING PREDICATIVE 3D NUMERICAL GEOLOGICAL MODEL OF HYDROCARBON RESERVOIRS

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ABSTRACT

Numerical 3D geological models are an important tool for reserve estimation, field development and management as well as economic assessment studies. These numerical models are built utilizing subsurface information obtained from multiple sources such as drilled wells data and 3D seismic surveys. This information is gathered at different measurement scales and represents different aspects of the reservoir. Therefore the challenge that is faced, frequently, by 3D geological modelers is how to reconcile these data and construct a representative model with high confidence.

The solution to this challenge is to base model building workflow on the understanding of the 3D depositional architecture model. The importance of depositional model comes from the knowledge that it defines the plumbing of the reservoir and the petrophysical property trends to capture different scale of heterogeneities. This requires an understanding of the 3D depositional model prior to the start of the numerical modeling, which necessitates that a comprehensive reservoir characterization is carried out and completed before the numerical modeling task. In addition, understanding the uncertainties associated with inputs in the reservoir characterization process and their dependencies is critical to quantify potential output ranges, associated uncertainties and sensitivities. This methodology requires the involvement of the 3D geological modeler from the early stages of the reservoir characterization project planning. This will ensure that the 3D geological model ingredients are ready prior to the start of numerical modeling process.

This paper shows a detailed reservoir characterization workflows that ends in building a sound depositional model. Next, it illustrates the importance of this approach by comparing two 3D numerical models that are built using the same input data from a carbonate reservoir. The first one is nested with a strong depositional model, while the other is based on statistical analysis. To further illustrate the differences, multiple realizations from each model are performed and contrasted, to show potential petrophysical property ranges.

Keywords: *Model, reserve, depositional, carbonate, workflow*