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# Stochastic Geomodel to Understand Reservoir Heterogeneity: A Case Study from Sequoia Field, Offshore Nile Delta, Egypt

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## ABSTRACT

Building an accurate static model is critical to understand the reservoir heterogeneity, maintain the production, and optimize new wells locations. The stochastic modeling approach proved significant efficiency as a new and accurate modeling tool. In this case study, we applied the stochastic modeling approach to Sequoia field. The Sequoia Field is a Pliocene gas field, offshore Nile Delta, Egypt. The field is a delta slope, multi-stacked canyon systems with complex turbidity channel-levee deposits. The canyon-fill consists of sandy channels, levees, crevasse splays, overbank deposits and slumps with multiple fills and incision episodes. The reservoir architecture commonly is the first priority in a stochastic reservoir model and is usually described in terms of different facies to rock types. The Geomodel grid layout was made considering the geological realism. It was constructed from the beginning not to be upscale at the end, on a scale grid design of increment 200x200x2m mean, with around 4 hundred thousand cells. This increment was selected in such a big field to preserve the heterogeneity of the field with respecting to run time and the maximum number of the cell could be run in a dynamic model. The new model built has been used to calculate in-place volumes for Sequoia Field. The integrated structural framework of the model was made using the time and depth converted seismic horizons which used to create horizon model in time and depth domain. And the fault sticks were used to create the fault model and eventually the fault surfaces within the reservoir. The facies volume fractions were calculated from wells and considering the gross rock volumes from magnitude maps and inversion volumes. The channel trends were generated out of the voxels created from the inversion products. The reservoir properties like porosity water saturation volumes were modeled stochastically and co- simulated using correlation coefficients biasing to the facies property. Thin bed corrections were made. Hence the in-place volumes were calculated. The Stochastic geomodel optimizing on the grid resolution, incorporating interpretations from a new interpretation of seismic and inversion data and all well log analysis to match history, provide better water predictions and planning of additional wells if needed. This model will be the basis for dynamic modeling and will help in any further field development planning.