

## Waterflooding Optimization with Coupled Static-Dynamic Simulations

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### Summary

The clastic reservoir presented has been producing oil under primary drive for the past 20 years. Waterflooding is being considered as a means to enhance oil recovery. Waterflooding is an important method of improving recovery at a low cost, but successful waterflood performance requires both a good reservoir description and an optimized placement of wells in the most prospective areas of the field on a geological basis.

The complex structural and stratigraphic nature of the formations of interest, in conjunction with historical well performance indicates significant reservoir compartmentalization. An accurate characterization of the nature and location of flow barriers in the reservoir will precede a successful waterflood development plan.

Major faults and horizons have been mapped seismically, but not enough was known to explain the compartmentalization observed from the well pressure and production data. A high resolution structural and stratigraphic model was created from a geophysical interpretation along with well correlations making use of implicit modeling techniques. The model was then populated with lithofacies and petrophysical properties. Completion and production history were integrated and streamlines were simulated to assess the dynamic incremental waterflood response. Through many iterative loops, the structural & stratigraphic interpretations were updated based on the dynamic response character in order to improve history matching of a natural bottom water drive and pressure performance. Implicit modeling coupled with streamline simulation enabled a rapid loop between the static and dynamic model update. The model was then used to identify location of unswept oil and to plan an infill drilling program to optimize the waterflooding program, identify water injection requirements and inform an economic analysis for the project.

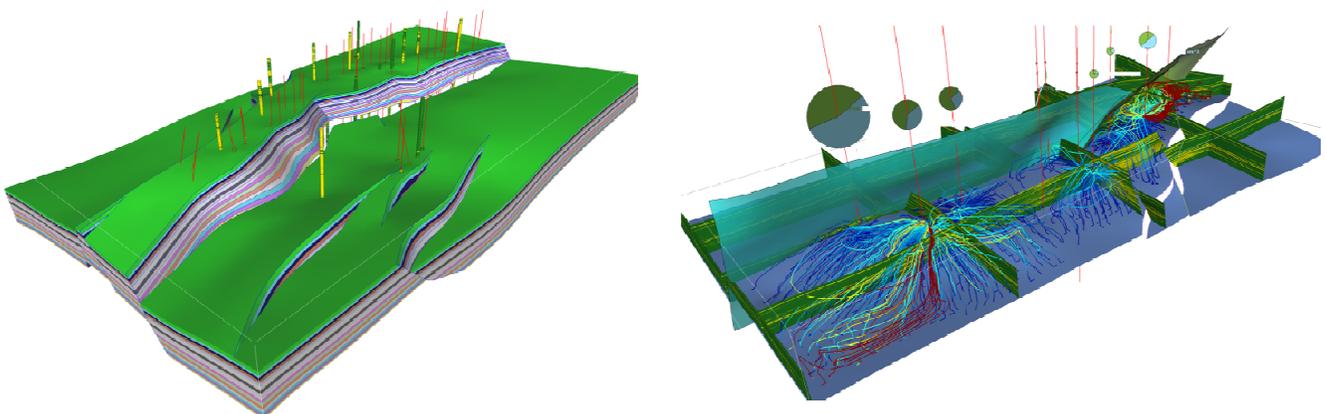


Figure 1: 3D view of faulted horizons and wells (left)  
and of the static reservoir model with streamlines with oil and water production at the wells (right).