

Integrated Geostatistical and Simulation Model for Optimizing the Oil Recovery Factor in the U1-3 Sands, Melones Field, Eastern Venezuelan Basin

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The Melones field is located in eastern Venezuelan basin. Its production started in 1957 by the well MM-407. An integrated study for this Field was performed to characterize the six highest producing intervals through geostatistical analysis. The structure is a gentle north-dipping monocline cut by east-west trending normal faults. Unconsolidated reservoir sands in the Miocene Oficina Formation (U1U-U1L) were deposited in coastal and deltaic depositional environments, whereas those in the underlying Oligocene Merecure Formation (U2U-U2L-U3U-U3L) were deposited by fluvial systems.

Available data for this study includes facies and petrophysical evaluation logs, 3-D seismic interpretation, core analysis and 24 instantaneous seismic attributes. A high resolution modeling grid was built using corner-point geometry. The final grid covers 500 Km² and has a total number of cell of 250 millions.

Facies modeling was performed by combining the Truncated Gaussian Simulation algorithm to describe sub-environments and coast lines, GMPP Simulated Annealing object based modeling to describe the stacked fluvial-channel fill and marine bars, and the Sequential Gaussian Simulation algorithm with trends for petrophysical modeling.

Multiple realizations of different object sizes were evaluated using flow simulation to select the most representative model. The distribution and spatial variation of petrophysical properties within each facies was taken from 344 wells. The resulting geostatistical realizations reproduced the conceptual sedimentological model.

This is the first full-field geostatistical model to honor the reservoirs heterogeneities. The result of the dynamic modeling stage was the optimization of the oil recovery factor to develop the estimated reserves of 340 MMSTB.