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Improved Reservoir Management of a Mature Heavy Oil Field Through an Integrated Multi-Disciplinary Approach, LL-04 Field, Lake Maracaibo, Venezuela

The LL-04 Field is located in the northeastern Lake Maracaibo and is part of the prolific Bolivar Coast Fields. Since its discovery in the late 1920s this field has produced over 518 MMBO from shallow (<3000 feet), unconsolidated fluvial and fluvial deltaic sandstones of the Miocene Lagunillas and La Rosa formations. Production is complicated by the heterogeneous nature of the sediments, low oil gravity (12-19 degree API) and water channeling. A multidisciplinary team consisting of engineers, geologists, geophysicists and petrophysicists was assembled to characterize and simulate the field. The objective of the team was to develop a reservoir management plan for the LL-04 Field that would increase daily production and ultimate recovery. Available data included 3-D seismic, open hole logs from over 600 wells, 4 cores and production and pressure measurements. All available data were used and honored in the interpretation process. Pressure measurements and production history were combined with the seismic interpretation, log analysis, core descriptions, log correlations and deterministic mapping to define the reservoir compartments. Seven independent reservoir compartments or regions were defined in the field and the original oil in place (OOIP) was increased by 44% as a result of this rigorous study. Over 80 workover/recompletion candidates and 25 areas for infill drilling were identified. A recent horizontal drilling program has resulted in a very successful development program.