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Stochastic Model of the S5-T Sand, Melones Field: A New Image of an Old Heavy Oil Reservoir

The Melones field is located in the Oficina Mayor area, Eastern Venezuelan basin. A stochastic model of the S5T-MM412 oil reservoir (11° API) was built using one core and 267 wells in a 180 km² area. The OOIP is 826 MMBN and remain reserves 62 MMBN. The lower Miocene section ("S5" and "T" sands) is defined as a progradational/aggradational unit capped by the transgressive shales of the S4 unit. Four short-term cycles or parasequences were correlated, representing progradation and aggradation cycles of a deltaic complex. Five depositional facies were identified and mapped in 267 wells: distributary channels, mouth bars, distal bars, splays and shale. Core plugs were analyzed and 5 petrofacies were identified and extrapolated to 120 uncored wells with modern well logs. The structural framework consists of twenty faults, mostly normal and trending east-west and northeast-southwest.

Sedimentologic, petrophysic and structural models were used in RMS to generate tridimensional equipropable models that honor the geometry and vertical/lateral variations of facies and their petrophysical properties. The reservoir architecture was defined using channel direction, shoreline location, sedimentary bodies and their geometry. Petrophysical values were interpolated in each facies. Ten models of five millions cells were generated, upscaled to a coarser grid (400000 cells) and exported to a thermal simulator to analyze the production history match. These models will serve as the basis for a development plan design and associate risks analysis for the reservoir. The new models indicate a considerable increase in OOIP, corroborated by the material balance.