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Interpretations of Near-Marine and Fluvial Deposits Affect the Development and Consequent Production at Zuata Field, Orinoco Heavy Oil Belt, Venezuela

A depositional model and its implications for production are presented herein for the Oficina Formation in the Zuata area of the Eastern Venezuelan Basin. Reservoir characterization of the varied fluvial and near-marine depositional systems is based on mapping of rock and microfossil facies from six early Miocene sequences. We make three key conclusions, which impact how the reservoirs are managed. First, the lower 4 sequences in the Oficina succession were highly-amalgamated, prograding fluvial sands deposited in the upper coastal plain, whereas sequences 5 and 6 are aggradational and more-highly influenced by marine processes that occurred on the lower coastal plain. Hence, the lower Oficina sands are widespread and well-connected, while upper Oficina sands are aerially confined and contain siltstone interbeds that act as permeability barriers. Second, because reservoir sands were deposited in numerous fluvial and near-marine environments, the geometry and interconnection of specific sand bodies varies vertically between sequences, and laterally within sequences. Third, younger fluvial systems do not deeply incise older flood plain and fluvial deposits, thus maintaining effective barriers to vertical drainage. Results of the reservoir characterization study are better delineation of oil-bearing sandstones, improved understanding of reservoir drainage, and refined calculations of recoverable oil-in-place. This study was achieved by integrating 3-D seismic with 146 vertical and 241 horizontal wells, including analyses from cuttings, >2000 sidewall cores, 4 full cores, and fluid samples. Petrozuata C.A., the field operator, uses the reservoir characterization model for planning new wells, evaluating water encroachment, and reconciling production histories from producing wells.