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High Resolution Sequence Stratigraphic and Reservoir Characterization Studies of D-07, D-08 and E-01 Sands, Block 2 Meren Field, Offshore Niger Delta

Meren field, located offshore Niger Delta, is one of the most prolific oil-producing fields in the Niger Delta. The upper Miocene D-07, D-08 and E-01 oil sands comprise a series of stacked hydrocarbon reservoirs in Block 2 of Meren field. These reservoir sandstones were deposited in offshore to upper shoreface environments.

Seven depositional facies were identified in the study interval, based on their lithologic characteristics, wire-line log character and petrophysical properties. The highest quality reservoir deposits are cross-bedded upper shoreface sands. Calcite cements in lower shoreface facies significantly reduce porosity and permeability. Integration of core and wire-line log data allowed porosity and permeability to be empirically determined from bulk density. The derived equation indicated that bulk density values could predict 80% of the variance in core porosity and permeability values.

Three stratigraphic cycles were defined: a lower progradational cycle and two overlying retrogradational cycles. The progradational cycle consists of upward-coarsening delta front to upper shoreface facies, whereas the overlying retrogradational cycles fine upward from middle to lower shoreface deposits that are overlain by offshore marine shales. Limited core data and the relatively small area of investigation place serious constraints on stratigraphic interpretations. Two possible sequence stratigraphic interpretations are presented. The first interpretation suggests the deposits comprise a highstand systems tract (E-01 interval) that is overlain by a transgressive systems tract (D-08 and D-07 sands). A lowstand systems tract is restricted to an incised valley fill in the southeastern end of the study area. The alternate interpretation suggests the progradational deposits comprise a falling stage systems tract that is overlain by a transgressive systems tract. The best quality reservoir sands are found in the progradational E-01 interval.