

Increased Oil Production and Reserves Using Lobe-Based Stratigraphic Interpretation: The Meren Waterflood Example

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Meren Field, one of Chevron Nigeria Limited's (CNL) oldest assets, is also her largest producer and biggest water flood project. The field has produced over 1.2 billion barrels of oil from 1967, with 1.1 billion barrels of water injected since 1984. The Meren reservoirs mainly composed of laterally continuous shoreface deposits with very high sand content with net-to-gross approaching 1.0 at instances.

Recent infill drills have highlighted an increase in the occurrence of multiple flow units in reservoirs that have been previously produced and managed as a single tank. The development of the production-induced secondary flow units appear to be due to subtle stratigraphic barriers in the reservoirs which, with production and water flooding, have now been magnified such that the reservoirs can be subdivided into lobes with distinct fluid contacts. These barriers can be very subtle in log signature, such as a finer-grained or slightly shalier sand or silty layer, so correlation across the reservoir can be a challenge. Preferential movement of water into cleaner "sweet" zones likely also contributes to the reservoir partitioning.

Using standard top and base structure maps to compute remaining reserves with a single oil-water-contact (OWC) is no longer adequate. To capture reservoir heterogeneity and complexity, detailed correlation and mapping of internal markers is now routinely conducted, and remaining oil in place is computed using contacts identified in the individual lobes of the reservoir. These lobe-based remaining oil maps have led to the identification of significant volume of potential by-passed oil and a number of infill development wells and recompletion opportunities have been identified.

In a recent example, four new lobes, each with different contacts were identified in the Meren G-02/MR-21 reservoir. The remaining oil in place volume computed using the lobe-based approach is about 40% greater than previously estimated, increasing from about 25 MMBO to 36 MMBO. A new drill has now been planned to target 23.0 MMBO of previously by-passed oil.

This poster presentation using the G-02/MER-21 as a case study, highlights the significant differences in the volumetrics computed using the lobe-based approach and the traditional method which assumes a tank-like sweep of the reservoir.