# Integrated Field Study to Optimize Production at Chad

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## Abstract

Kome Field in Chad produces relatively heavy oil (17-24o API) from braided fluvial reservoirs that were deposited in the Doba Basin during the Late Cretaceous. Permeability ranges from 10s to 1000s of milli-darcies, and permeabilities in the 3-5 Darcy range are common. Kome field is a faulted, anticlinal closure with stacked reservoirs and multiple oil-water contacts. Field start-up was in 2004, and a peripheral water flood was implemented shortly after. Poor mobility ratios (unfavorable fractional flow) and high permeability zones have resulted in high water cuts with relatively low recovery rates (<20%) to date. Multiple options are being evaluated to improve sweep and recovery over field life, including targeting of lower permeability reservoirs with higher remaining oil (commingling results in preferential flow from higher permeability reservoirs), alternative injection and completion strategies, and Enhanced Oil Recovery (polymer and alkaline floods). To underpin these evaluations, a multidisciplinary "foundational study" was initiated in 2014 to better understand remaining oil distribution. The study consisted of four phases 1) generation of testable, alternative hypotheses to explain remaining oil saturations, 2) optimization of data, including surveillance and Formation Evaluation data (saturation model update), 3) testing of hypotheses through data integration (MDT, PLT, saturations) and mechanistic reservoir modeling, and 4) validation of concepts through field pilots (down-spacing and EOR pilots) and non-resistivity based saturation logging. A key challenge is that the density and resistivity of oil and water are very similar at Chad, resulting in uncertainty in saturation and water cut allocation in commingled wells. Uncertainty was reduced through data integration, update to the log based saturation models, and focusing on higher confidence data (MDT, total liquids, PLTs, core). Initial results support the hypothesis that the highest remaining oil saturations are in lower net to gross reservoirs due to commingling. Within the lower net to gross reservoirs, results support the hypothesis of variable vertical and areal sweep due to variations in geology and injection history. Saturations are more favorable in structurally higher positions (greater distance from oil water contact), and water is preferentially moving along the base (higher remaining oil saturations in higher stratigraphic positions). Study results are being used to 1) target single zone completions in lower net to gross reservoirs to improve sweep, 2) prioritize drilling opportunities in more favorable structural and stratigraphic locations, and 3) develop alternative completion strategies to avoid bottom water (e.g. completing above shale baffles to avoid bottom water). Work is ongoing to evaluate results from field pilots (down-spacing, EOR, FE) and to continue testing of concepts via real time drilling and completion activities.