Characterizing flow behavior from thin Tight Mauddud Reservoir of the Greater Burgan Field: Integration of Oil Fingerprinting and Production Data

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Abstract

The complexity and heterogeneity of the thin, tight Mauddud carbonate in the Greater Burgan Field makes it challenging to characterize and develop this formation. In the study reported here, we have taken advantage of substantial advances in production data analysis and oil fingerprinting technology to conduct a more advanced reservoir analysis.

The Mauddud carbonate reservoir is sandwiched between two massive clastic reservoirs, the Wara and the Burgan. The formation is mostly composed of calcarenitic limestone with intervals of 5-10 feet of good oil reservoir. Average porosity is 18% with low permeability ranging from 1 to 10 mD, characteristics which made this reservoir a candidate for horizontal drilling. However past production results have varied significantly among wells, a fact which previously raised the concern that perhaps the well paths of some lateral wells in this carbonate may be inadvertently tagging the adjacent, more permeable, clastic reservoirs. If that were the case, then production from the adjacent clastic reservoir could be augmenting the production from some of the wells intended to be completed solely in the carbonate. Considered in total, the results from previous development strategies for this reservoir did not meet expectations.

Methodology adopted by multidisciplinary teams is to integrate oil fingerprinting laboratory analysis with dynamic data to deliver a greatly improved representation of this carbonate reservoir. These results enabled an understanding of current production performance and a predictive capability for future performance. Results from geological and engineering findings were integrated with available dynamic data. The study of dynamic data, combined with the geochemistry results allowed the recognition of well flowing regimes that cannot be attributed solely to the matrix or to the fracture contribution. This approach allowed us to distinguish (1) wells which are flowing from solely the Mauddud carbonate from (2) wells which are flowing from a different reservoir due to the well path crossing briefly out of the Mauddud. We were also able to identify areas where there is lateral communication in the Mauddud reservoir and where there is production from matrix or fractures. Our new understanding of the relationship between matrix characteristics, fracture distribution, oil fingerprint characteristics, and well production will enable a development strategy that more efficiently exploits this important reservoir.