The Wafra Maastrichtian Reservoir, Partitioned Neutral Zone (Saudi Arabia and Kuwait) – Reservoir Description, Stochastic Modeling, and Dynamic Simulation

Meddaugh, W. Scott[1], Stewart Griest[1], Dennis W. Dull[1], Raymond A. Garber[1], Arturo J. Contreras[2], Ritesh Sablock[1], W. W. (Bill) Todd[1] (1) Chevron Energy Technology Company, Houston, TX (2) The University of Texas at Austin, Austin, TX

The Maastrichtian reservoir is one of five prolific oil reservoirs in the giant Wafra oil field. Maastrichtian oil production is from subtidal dolomites that average 15% porosity and 30 millidarcies permeability though porosity values up to 40% and permeability values over 1,000 md are common. Discovered in 1959, the Maastrichtian reservoir has produced less than 1% of its 1.5 billion barrels of low API, high sulfur oil in large part due to reservoir heterogeneity.

The carbonates were deposited on a very gently dipping, shallow, and restricted ramp setting that transitioned between normal marine conditions and restricted lagoonal environments. The Maastrichtian interval is part of the Aruma Group (Tayarat Formation) and is divided into an upper and lower portion by the Second Maastrichtian shale. The lower interval consists largely of peloidal mud-lean dolopackstones and minor grainstones deposited under humid conditions during a transgressive phase that evolved into a high stand. The upper portion consists of dolorudstones and dolofloatstones alternating with peloid-rich, fine-grained dolo-stones that grade upward into argillaceous dolowackstones and dolopackstones deposited during a relative high-stand under arid conditions. Ten high frequency sequences have been correlated across the field.

A detailed geostatistical model of the reservoir constrained by the sequence stratigraphic interpretation and stochastic seismic inversion shows the layered and compartmentalized nature of the reservoir and demonstrates that paleotopography had a critical influence on depositional facies and subsequent dolomitization. Analysis of FMI data enabled a fracture characterization to be incorporated in the dynamic model of the reservoir.