

Reservoir Heterogeneity of the Mishrif Formation, Rumaila Field, Southern Iraq

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ABSTRACT

The Upper Cretaceous Mishrif Formation is part of a large shallow epeiric carbonate platform developed on the Arabian plate. The Mishrif has a high economic importance as it contributes to the large hydrocarbon accumulations in the giant oil fields of southern Iraq. Results from a series of sedimentological, diagenesis, chemo/ biostratigraphic studies and an interpretation from a new 3D seismic volume have been used to construct a new sequence stratigraphic framework and highlight lateral heterogeneities.

The Mishrif has been divided into 5 third-order sequences (Mhf1-5). The lower 3 sequences (Mhf1-3) comprise the mB reservoir unit. The mA is separated from the upper 2 sequences (Mhf4-5) by a major sequence boundary.

The lower part Mishrif Formation (Mhf1) is comprised of a margin shoal complex developed on top of deeper water mud-wackestones of the Rumaila Formation. Shoal deposits formed in subtle progrades of basal wacke-packstones coarsening upwards to echinoderm/rudist grainstones. The shoals are overlain by lagoonal carbonates (gastropod wacke/packstones with benthic forams) that fine upward to lagoonal mudstones with dissolution pipes and localised karst features (Mhf 2/3). Two major platform-interior shoal trends interrupt the succession. The top of the mB is capped by several exposure surfaces in the proximal part of the platform with hardgrounds to the south. After exposure of the platform, nodular mudstones with planktonic forams were deposited during re-flooding. Shallow platform carbonates with benthic forams and a large coral build-up established in the north of the field (Mhf 4) and are locally overlain by tidal flat and lacustrine carbonates (Mhf 5). To the south these pass into bioturbated and organic-rich laminated mudstones deposited in an intra-platform basin. The end of Mishrif carbonate deposition is marked by a major regional sequence boundary (well developed paleosols and karst features in the north).

Establishing a detailed sequence stratigraphic and depositional framework is vital to understand the distribution of rock types and sweep efficiency in the reservoir. In addition, dynamic data combined with sedimentological and diagenesis analysis helped identify high-perm zones in the reservoir. Finally the interpretation of the 3D seismic provided new insights into the distribution of depositional elements i.e. tidal channels, deltas and the orientation of the main facies belts.