Sequence Stratigraphy and Facies Analysis of the Subsurface Late Jurassic Arab-C & Sub-C Reservoirs, Khursaniyah Field, Eastern Saudi Arabia

Emad A. Busbait [1] and Taury Smith [2]
[1]Saudi Aramco, Dhahran, Saudi Arabia.
[2]Smith Stratigraphic LLC, Albany, NY.

These are the results of a study that was focused on facies analysis and development of a high-resolution sequence stratigraphic framework of the Upper Jurassic Arab-C & Sub-C Members in Khursaniyah Field, Saudi Arabia. The study area was located several hundred kilometers landward of the late Jurassic margin with the Tethys.

From landward to seaward, the facies and interpreted environments include: anhydrite (sabkha and salina), muddy and grainy stromatolites (tidal flats), thrombolites (inner lagoon), fine peloidal grainstone (outer lagoon), ooid grainstone (shoal), and ooid-intraclast-mollusk rudstone (foreshoal). The Arab C and Sub-C are composed of two composite sequences that can be subdivided into six high frequency sequences. The composite sequence boundaries are interpreted to be somewhere within the upper part of the evaporite units and the maximum flooding surfaces were picked in the middle of the coarsest most open marine carbonate facies. The sequences generally coarsen upward in the lower TST as higher-energy shoal facies backstep over lagoonal, tidal flat and sabkha facies, are coarsest in the maximum flooding interval and then fine upward as shoal facies are capped by finer and/or muddier lagoonal, tidal flat and/or sabkha facies in the HST.

The Sub-C reservoir is made up of two high frequency sequences, each of which is composed of multiple fining-upward cycles. The Arab-C composite sequence is made of four high-frequency sequences. Cycle boundaries are picked at the base of the coarsest facies and the top of the finer facies; where a landward shift in facies is interpreted.

The sequence stratigraphy shows that the Khursaniyah structure was tectonically active during the deposition of the Sub-C and Arab-C reservoirs. During the deposition of the first two sequences, the structure appeared to subside at a higher rate in the south, while during the deposition of the second two sequences, the structure appears to have subsided faster in the north. During deposition of the upper two sequences; the structure subsided equally at nearly the same rate across the field.

This study is improving the understanding of the Arab-C and Sub-C Reservoirs stratigraphic framework. The work also resulted in improved application of the geocellular model for optimization of the field development plan and well placement.