

Sequence Stratigraphy and Reservoir Characterization of the Kharai Formation Comparing Outcrop and Subsurface Data (Lower Cretaceous, U.A.E.)

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A new stratigraphic framework is proposed for the Lower Cretaceous Kharai Formation (Barremian) of the United Arab Emirates. This framework is based on integration of core and well-log data from a giant Abu Dhabi oil field with outcrop data from Wadi Rahabah, Ras Al-Khaimah.

The Kharai Formation (base lower “dense zone” to base upper “dense zone” = Hawar Shale) is part of the late transgressive sequence set of a second-order supersequence, built by two third-order composite sequences. Twelve fourth-order parasequence sets build into the two third-order composite sequences and show predominantly aggradational and progradational stacking patterns, typical of greenhouse cycles.

On the basis of faunal content, texture, sedimentary structures, and lithologic composition, fourteen reservoir lithofacies and eight non-reservoir (dense) lithofacies are identified from core. These same lithofacies are also identified in time-equivalent rock exposures studied in Wadi Rahabah. The analyzed lithofacies range from open platform, lower ramp to restricted platform subtidal to intertidal environments. Intensively bioturbated wackestone and packstone, and interbedded argillaceous limestone characterize the so-called “dense zones”. Locally, mudcracks, blackened grains, and rootlets are observed. The reservoir zones correspond to the late transgressive, and dominantly, highstand systems tracts characterized by parasequence sets that show shallowing-upward trends from open lagoon, burrowed skeletal wackestones to skeletal-peloidal packstones and algal, coated-grain grainstones/rudstones, and rudist, algal floatstones. Well-developed *Thalassinoides* firmgrounds (*Glossifungites* surfaces) indicate temporary cessation in sedimentation and cap several parasequence sets.

In outcrop, low-angle clinofolds that cannot be seen in core data are observed within the highstand systems tract of the upper third-order composite sequence. Integration of subsurface and outcrop data leads to more insightful and realistic geological models of subsurface stratigraphy.
