
High Frequency Inter-bedding of Dune and Extradune Sediments in the Cambrian Amin Formation in North Oman: Control on Reservoir Properties (with Analogues from Modern Sediments of Oman)

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The Amin formation is a thick sequence of quartzose sandstone with chert pebbles that is widely distributed in Oman. Despite this rather uniform aspect, the Amin sandstones of North Oman have a wide range of reservoir quality, with the best rock commonly occurring as thin layers. This intercalation of very good reservoir with poor reservoir is the result of high-frequency intercalation of dune and extra-dune sediments. Additionally, local re-cycling of aeolian sands into fluvial and playa depositional systems has enhanced reservoir quality in some places.

The root causes of these patterns are not well understood. The phenomenon of small scale intercalation of dunes with extra-dune sediments may have occurred due to rapid movement of dunes across low-relief terrains during a time of limited accommodation space. This process appears to have occurred most widely during deposition of the youngest Amin sediments, with the result that the best reservoir is often near the top of the formation. Additionally, secondary porosity and fracturing appear to be a strong driver of reservoir quality, in both fluvial and aeolian sediments.

The effect of primary facies on reservoir quality is so strong that at present, with limited well control, the depth-porosity curve shows an increase in quality with depth below surface. This is due in part to the presence of aeolian dunes, or re-cycled aeolian sands in the most deeply buried Amin.

Modern sediments of Oman provide instructive analogues for most of the facies in the Amin, including high-frequency inter-bedding of dune and extradune sands. These include the dune-fluvial system of the Wahiba Sands along Wadi Batha, and sabkha sands of the Huqf and the Umm As Samim.
