
Sequence Stratigraphy of the Permo-Carboniferous Unayzah Reservoir in Saudi Arabia and Its Correlation with Oman

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The Unayzah Reservoir occurs in the thick Permo-Carboniferous siliciclastic sequences of Saudi Arabia. It is a large-scale heterogeneous reservoir, extending between the Khuff Formation and the Pre-Haradh (Hercynian) unconformity. It is divided into four formations which are separated by regional unconformities.

The Haradh Formation in the lower part consists of fine- to coarse-grained, well-sorted but silica-cemented sandstone. It is formed as braid delta and cold desert eolianites during glaciation. It correlates with the Al-Khalata Formation in Oman.

The Jawb Formation consists of dark gray shale, sandstone, and diamictite facies deposited in a marine and marginal marine environments during the deglaciation period. It correlates with the Rahab Shale, Basal Sandstone, and the Haushi Limestone in Oman.

The Unayzah Formation occurs between the Pre-Unayzah and Pre-Ash-Shiqqah unconformities. It is a typical red-bed facies, consisting of conglomerate, sandstone, mudstone, siltstone, nodular anhydrite, and caliche facies. It was deposited in alluvial fan, braided stream, hot desert eolian, and playa systems under arid- to semiarid climate. It correlates with the Middle, and the lower part of the Upper Gharif Formation in Oman.

The Ash-Shiqqah Formation forms the upper part of the Unayzah Reservoir, overlain by the Khuff Carbonates. It is divided into the lower and upper members through a type-1 sequence boundary (break-up unconformity). The lower Member is transgressive on the Unayzah Formation and consists of interbedded shallow marine sandstone and coastal plain shale facies. It correlates with the upper part of the Upper Gharif Formation. The Upper Member consists of conglomerate(lag), sandstone, and carbonaceous shale facies, deposited as incised valleys and associated lowstand deltas. It correlates with the Basal Khuff Clastics in Oman.
