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Carbonate Diagenesis in a Sequence Stratigraphic Framework; Case study from Miocene Dam Formation, Eastern Saudi Arabia

Moaz Salih, Osman Abdullatif, Khalid Al-Ramadan, and Mazin Bashri

King Fahd University of Petroleum & Minerals, College of Petroleum Engineering and Geosciences, Geosciences, Saudi Arabia (m3az89@yahoo.com)

The Miocene Dam Formation in the Al-Lidam area of Eastern Saudi Arabia consists of a succession of mixed siliciclastic-carbonate sequences that were deposited during Miocene (Burdigalian) times. Stratigraphic equivalents of the Dam Formation occur as hydrocarbon reservoir intervals in the Arabian Plate. Reservoir quality of carbonate rocks is controlled by a combination of depositional setting and post-depositional diagenetic factors.

In this study, fifteen lithofacies were identified as they were deposited on a low angle dipping carbonate ramp, under supratidal, beach, intertidal and shallow subtidal conditions. Carbonate diagenesis has been examined using: thin-section petrography, SEM, XRD and cathodoluminescence. These analytical tools have shown that the intertidal lithofacies are influenced by extensive meteoric dissolution and minor cementation. Marine diagenesis was restricted to beach grainstone and subtidal lithofacies, in the form of aragonite and high magnesium calcite cement. Shallow burial conditions were inferred by grain contacts represented by point, suture and concavo-convex contacts. Mimetic dolomitization for the whole succession was also observed. Three fourth - order, shallowing upward sequences were identified in the study area, and they are separated by two sequence boundaries. A clear relation between sequence surfaces and diagenetic processes was observed; meteoric diagenesis and dolomitization increases upwards in each sequence. Porosity and permeability measurements have shown that the highest values are associated with the HST of each sequence, followed by the TST and the LST. The results of this

study can help in understanding of diagenetic processes, and consequently in developing better and more accurate predictions of the porosity and permeability distribution within hydrocarbon reservoirs.