Sequence Stratigraphy and Reservoir Development of the Khuff Formation of the Arabian Plate

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The Middle Permian (Capitanian) to Early Triassic (Induan) Triassic Khuff Formation is a prolific gas reservoir of the Arabian Plate. It is composed of mainly shallow- water carbonates and evaporates, representing a second-order transgressive- regressive sequence, which is composed of seven third-order composite sequences (KS1-KS7). The maximum flooding surface of Khuff Sequence KS4 (Khuff MFS4 at ca. 258 Ma) is interpreted to also represent Khuff second-order maximum flooding. The transgressive system set of the Khuff second-order sequence starts with Khuff Sequence KS7 and ends at the Khuff maximum flooding surface of Khuff Sequence KS4 (Khuff MFS4). The highstand systems set starts on top of Khuff second-order maximum flooding surface and ends at the Top Khuff Formation (top of Khuff Sequence KS1).

The transgressive systems set (Khuff sequences KS7, KS6, KS5 and transgressive systems tract of Khuff Sequence KS4) is characterized by relatively thick anhydrite intercalations. The highstand systems set (Khuff Sequences KS1, KS2, KS3, and highstand systems tract of Khuff Sequence KS4) is more carbonate dominated and anhydrite intercalations are thinner, less common, and mostly restricted to Khuff Sequence KS1. Widespread layers of salina-dominated (subaqueous) anhydrite can locally and regionally (Middle Anhydrite) be used as marker horizons. This marker anhydrite may also act as a barrier to vertical fluid flow, and also be used in many areas to subdivide the Khuff into informal parts or members. The Khuff Formation is a complex sequence of dolomite, limestone and anhydrite. Dolomite is the dominant lithology of the formation. The development of the systems of fractures in many reservoirs in the Gulf region has significantly enhanced permeability values. Local thickness changes of the Khuff Formation may be attributed, at least in part, to infra-Cambrian salt movements, while lithofacies variation represent major transgressive-regressive cycles related to climatic and eustatic sea-level fluctuation.