

An Integrated Study of a Defined Unayzah a (Tinat Member) Stratigraphic Pinchout, and the Implication for Future Gas Exploration

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ABSTRACT

In this study, a stratigraphic framework for Unayzah A is demonstrated to predict reservoir quality at the flank of a paleo-structure in our area of interest. The observations highlighted in the abstract are specific to the area of interest and not necessarily the case everywhere. Well penetrations at the crest of the structure encountered poor reservoir quality with marginal marine deposits. Petrophysical logs, core data, and seismic data were used to develop the geological model that explains the reservoir absence at the crest, and the potential reservoir development on the flanks. The existing stratigraphic nomenclature of Unayzah A is divided into Tinat and Wudayhi members. The facies of the Tinat member is dominantly composed of Eolian dunes, interdunes, and sand-sheet facies. The Wudayhi member is mainly comprised of laminated silt and shaly sand with some localized Eolian, tidal, and tidally influenced deposits; and are typically nonreservoir. The Tinat member is generally thicker, more porous, and laterally more extensive, which makes it a better exploration target. Based on Unayzah well penetrations in the area of interest, the simplified division of Unayzah A into Tinat and Wudayhi members is not easily applicable to log analysis. Therefore, we use only core data and palynology data to distinguish between Tinat and Wudayhi members. The first outcome of this study confirms that the well penetrations at the crestal part encountered the nonreservoir Wudayhi member. In addition, we observe seismic terminations at the flanks of the structure, which could be indicative of the stratigraphic pinchout of porous Tinat reservoir facies. These findings helped to locate exploration wells with improved chances of finding reservoir sweet spots.