

Untapped Hanifa Formation Potential in Deep Marine Settings

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ABSTRACT

The Oxfordian Hanifa Formation constitutes a remarkable hydrocarbon reservoir that extends across vast areas in the eastern part of Saudi Arabia. Understanding of the Hanifa Formation has evolved over time, which has recently added new dimensions to the exploiting of Hanifa resources. Regional sequence stratigraphic correlations have led to recognizing shelf-to-basin architecture, where shallow-marine, shelfal carbonate facies prograde and pinch out into deep-marine intrashelf basinal lime mudstones and source rocks. Oil accumulations in the shelfal Hanifa facies are represented by large structural traps that host major Saudi fields. Basinal Hanifa facies are marked by intermittent oil encounters that lack a solid geologic model to guide exploration efforts. Integrating core, petrophysical, biostratigraphic, and seismic data has shown the evolution of the Hanifa platform margin to be essential in identifying potential stratigraphic traps in the Oxfordian intra-shelf basin. This study classifies the Hanifa Formation into different lithofacies, constructs new depositional models, and configures a comprehensive sequence stratigraphic framework. The study results suggest the presence of reworked turbidite deposits that have been eroded during the Hanifa shelf exposure and redeposited as submarine fans encapsulated in deep-marine mudstones.