

## Upper Hanifa regional exploration prospects of Saudi Arabia

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The Hanifa Formation in Saudi Arabia consists of a succession of carbonates, over 300ft thick that were deposited during the Late Jurassic, Oxfordian. It consists of a lower Hawtah Member and an upper Ulayyah Member. A Late Oxfordian age is based on the first appearance of the benthonic foraminifera *Alveosepta jacardi* and, within the upper part of the underlying Hawtah member, the extinction of the calcareous nannofossil species *Watznaueria manivitiae* (local) and *Stephanolithion bigotii* (local) together with an influx of *Ellipsagelosphaera britannica*.

A detailed study of the micropalaeontology, nannopalaeontology, biofacies, sedimentology and wireline log character of the uppermost parts of 35 cored wells distributed across the Kingdom has revealed a variety of depositional environments. The late highstand succession of the Formation displays a variety of biofacies and lithotextures, of which the grainiest host the Hanifa Reservoir. These are associated with stromatoporoid banks that developed on the flanks of intrashelf basins, although grain-dominated shoals within the lagoons also present reservoir potential. A range of palaeoenvironments has been determined, based on integrated biofacies and lithofacies that include shallow lagoon packstones and grainstones (foraminiferal dominated), deep lagoon wackestones and packstones (*Clypeina/Pseudoclypeina* dasyclad), stromatoporoid back bank packstones and grainstones (*Cladocoropsis mirabilis*), stromatoporoid bank crest grainstones and intrashelf basin flank mudstones and wackestones (foraminifera and spicule dominated with coccoliths).

A map depicting these palaeoenvironments, albeit in need of refinement from additional data points, reveals regions where sediments with potential reservoir fabric may have been deposited and therefore potential new exploration plays. Their juxtaposition to intrashelf locations where source rock may have accumulated provides exciting new prospects in areas hitherto uninvestigated for hydrocarbon reservoirs.