

## **Overlooked Reserves in Stringers, Thin Beds and below Known Contacts**

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### **ABSTRACT**

Awali anticline is an asymmetrical N-W trending structure with a number of stacked and producing reservoirs at various intervals. The petroleum system of the field is controlled by the relationship between the high quality reservoirs and a few major seals. The number and the extent of productive reservoirs in the field along with their fluid contacts is defined by these sealing intervals and a collapse zone which acts a major seal bypass conduit. This relationship is essential in understanding the potential for finding new accumulations in the Jurassic and Cretaceous sections on the anticline and its flanks.

A large number of live and residual oil shows in the Cretaceous sections is indicative of drastic vertical changes in the oil-water contacts (OWC) caused by major seal failures and subsequent hydrocarbon drainage. These changes created potential residual oil zones (ROZ) below the established commercial accumulations. The vertical and horizontal extents of these ROZs were estimated using residual oil shows, well tests and other data. These zones present a huge potential that can be targeted through suitable EOR methods and by further developing surface facilities to mobilise the residual oil in place and to handle large volumes of produced water. Reassessment of established contacts with upgraded petrophysical parameters and cut-offs can help in accurately defining the extents of OWC and ROZ and thereby in adding previously overlooked reserves.

In addition, a relatively cost effective and manageable risk opportunity to increase production would include targeting carbonate thin beds and stringers. Several carbonate stringers and thin beds ranging between few to tens of feet thick are found in the Hith and Arab anhydrites and Ahmadi shales. These are laterally extensive and can be correlated across the field and beyond. Petrophysical modeling along with strong mudlog and core shows indicate possible bypassed pay with both good porosity and high oil saturations. Compared to the relatively thicker reservoirs in the field, these beds being thin tend to have OWCs that extend further out than those of the Jurassic and Cretaceous accumulations. Additionally, the increased likelihood for structural trapping in these thin beds through small displacement faults can further increase the potential for commercial production beyond the established limits of the accumulations on the anticline.