Yibal Field, Oman: an Integrated Approach to Reservoir Characterisation

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Yibal Field, Oman produces from the Cretaceous Upper Shuaiba Formation. A reservoir quality evaluation integrating sedimentology, petrology, core analysis, sequence stratigraphy, borehole image analysis and field-wide correlations was used to determine the depositional and diagenetic controls on reservoir quality and identify relationships between the development of firmgrounds, low porosity streaks, water fingers and production behaviour.

Overlying the mid/outer ramp Lower Shuaiba sediments, the Upper Shuaiba was deposited as a series of prograding sediment wedges in a LST that is subsequently overlain by the transgressive mudrocks of the Nahr Umr Formation. The pore system throughout the Upper Shuaiba is dominated by micropores created by meteoric and burial fluids. Increased porosity and permeability development near the top of the formation is due to dissolution by a combination of fluid types. Sporadic enhancement of porosity deeper in the formation is due to a combination of depositional and diagenetic factors. A series of better-cemented horizons, termed low porosity streaks (LPS), have been identified in the field. Some of these streaks correspond to depositional/diagenetic features such as argillaceous-rich and/or firmground horizons. Adjacent to some of these horizons are intervals of enhanced porosity that are interpreted to have formed by the interaction of the LPS with migration of burial fluids up faults and fractures.

The boundaries of some of the identified reservoir zones correspond to observed LPS/argillaceous/firmground horizons. These horizons may serve as baffles to flow and the adjacent intervals of enhanced porosity development may serve as possible thief zones. Since both types of flow unit are related in part to depositional features, their distribution may be more confidently predicted than features that are controlled by diagenesis alone. In such a scenario, higher concentrations of unproduced hydrocarbons may occur in intervals of relatively low reservoir quality that lie in between intervals with enhanced porosity.