AP16

Upper Arab Reservoir Correlation in a Giant Gas Field in the United Arab Emirates: Integration of Core, Log, Borehole Image and Pressure Data

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The upper interval of the Arab Formation is a secondary reservoir objective in a major gas field currently under development in onshore Abu Dhabi, United Arab Emirates (UAE). This presentation will illustrate the impact of integrating core sedimentological descriptions, log response, borehole image and pressure data to develop a sequence-stratigraphic correlation of thin reservoir targets in the upper interval of the Arab Formation.

Historically the upper interval of the Arab Formation is defined as two reservoir-bearing units (the Arab A and B members) overlain by the regionally extensive anhydrite top seal of the Hith Formation. These subdivisions were based on lithostratigraphic correlations driven largely by porosity log trends. The Hith - Arab A/B comprises predominantly non-reservoir lime mudstones and anhydrites with thin inter-beds of reservoir quality limestone and dolomites. The Hith - Arab A/B interval undergoes rapid areal thickness variations as observed in central Abu Dhabi where it thins towards its easterly depositional limit.

The contact between the Arab A and B is gradational and clearly diachronous, becoming stratigraphically younger to the northeast. The basal Arab B generally comprises slightly thicker carbonate reservoir units. Pressure data has indicated that these limestones are most likely in pressure communication with the underlying lower Arab sequence. The Arab A carbonate units are more vertically discrete carbonate layers and tend to be more dolomitic. Well correlations and pressure data indicate that these carbonates are laterally extensive, encased within anhydrites. The upper layers of the Arab A show different pressure and fluid compositional regime. It is likely that they experienced different gas charge and fill histories.

A sequence stratigraphic-based correlation framework has been developed, with at least 13 high-frequency sequences recognized. These are typically characterized by a transgressive phase (limestone / dolomite) capped by a regressive phase (anhydrite). Early cementation and dolomitization can modify primary depositional surfaces. Despite this, minor discordances have been recognized by subtle dip changes from borehole image data and their significance for correlation is being evaluated.

The revised correlation framework has significant impact on mapping areal trends in reservoir facies, understanding reservoir connectivity and fluid property variations. Well design and depletion strategies are being modified to ensure optimal drainage of layers with different fluid and pressure regimes.