Reservoir Characterisation of the Arab Formation (Upper Jurassic),
offshore Abu Dhabi (United Arab Emirates).

Kate Garrick 1; Matthieu Deville de Periere 1; Quintin Davies 1, Ghassan Al-Jefri 2, Hamdan Al-Menhali 2, Ibrahim Al-Tamimi 2, Meriem Bertouche 1 & Andrea James 1

1 Badley Ashton and Associates - Winceby House - Winceby - Horncastle - LN9 6PB - Lincolnshire - UK
2 ADMA-OPCO

Corresponding authors: kategarrick@badley-ashton.co.uk // matthieudevilledeperiere@badley-ashton.co.uk

Correlation and prediction of reservoir quality variability/heterogeneity within shallow carbonate ramp deposits of the Arab Formation has previously proved challenging. This study presents the results of an integrated reservoir characterisation (including sedimentology, reservoir quality assessment and openhole logs response) of the Arab Formation Members X1 to X4 in a major oil-bearing reservoir located in the offshore Abu Dhabi. Lithofacies associations, coupled with the broad lithological characterisation (anhydrite, dolomite and limestone) provide fundamental descriptors for the depositional architecture and model as well as for subsequent reservoir quality analysis. Calibration of lithofacies associations with the openhole logs enabled extension of the sedimentological framework into the uncored intervals/wells. Recognition of key surfaces and vertical facies stacking patterns derived from core observations facilitate the development of a robust sequence stratigraphic framework. Overall, the succession shallows upwards from micritic mid-ramp deposits to anhydrite-rich facies deposited within a supratidal environment, and can be divided into eleven 4th order cycles that group into three 3rd order cycles, each defining a transgressive (flooding) and regressive event. This sedimentological database enabled production of facies trend maps for each of the 4th order cycles, that provide a better understanding of the lateral facies variability across the field but also of the vertical migration of facies belts. The resulting data provide important constraints on geobody geometry and lateral facies development for the update of the static geological model. Furthermore, the lateral distribution of reservoir quality within the 3rd and 4th order sequence stratigraphic cycles is investigated to provide a better understanding of the impact of the coupled sedimento-diagenetic influences on reservoir behaviour and distribution. Reservoir quality analysis, based on conventional core analyses data coded by lithofacies and lithofacies associations, provides an assessment on the influence of primary pore fabrics and subsequent diagenetic modifications (such as dolomitisation, pore-filling calcite/anhydrite cementation, dissolution) on pore system development.

Neutron/density log responses are coded by core-based lithofacies associations to calibrate and assess the predictability of the later within uncored intervals (production of electrofacies), but also in order to provide a diagnostic method for identifying intervals of improved reservoir quality in uncored intervals elsewhere in this reservoir.