Poster 3

Barton geological modelling: synergies with history matching

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Barton field is located within the structurally complex in-board area, offshore North Sabah. The hydrocarbon is contained within a ca. 1,500 ft thick sequence of Lower Coastal Plain sandstones and shales, belonging to the Middle Miocene, Stage IVA. The main reservoir bodies comprise channel, crevasse splay, mouthbar with minor shallow marine incursion, whereas floodplain shale forms reservoir seals and barriers.

The field commenced production in 1981. To-date some 28% of the field reserve has been produced and reservoir pressure is observed to decline rapidly. Based on material balance studies, the "do nothing option" resulted in this field quitting economic production in 2012. Reservoir management studies into optimising oil recovery and identifying means to sustain economic production beyond 2012 to maximise the profitability of the venture are ongoing. This work involves 3-D static and dynamic simulation modelling studies.

This paper presents the static modelling aspect of the modelling study. The model is primarily aimed to (1) generate a detailed description of the reservoir geometry and properties of Barton Main reservoirs (Stage IVA, F/G/H/I sands), (2) validate field STOIIP and (3) identify key subsurface uncertainties that could have adversely impact the Enhanced Oil Recovery schemes.

The main features of this static modelling study is the identification sand packages, which were used to assist in the correlation and the use of neural net approach to identify lithofacies from wireline log. Although sand-to-sand correlation is generally problematic for these channelised bodies in Barton, sand packages which is characterised by sand-rich at top and shale at base can generally be correlated with ease. These sand-rich intervals represent channel complexes and are extensive fieldwide. Likewise, the shale layers at the base of unit are also extensive. Within the channel complex, however, the geometry of the intra-shales is less predictable. As these intra-shales can form barrier/baffles to fluid flow and may have detrimental impact field performance, they were modelled as sensitivities.

Overall, the Barton rock model shows complicated reservoir development. The top of the model comprises succession of poor net-to-gross unit (F sand) overlying relatively high net-to-gross reservoir packages (channel complexes of the G and H2 sands). A shale dominated layer which appear to be present fieldwide (H1 sand) separate the sand-rich G and H2 reservoir packages. The base of the model is dominated by low net-to-gross I sand. Within the I-sand, two sand-rich layers (channel complexes) is also present.

This paper outlines the various aspects of the modelling study, key assumptions and also the outcome of the model.