Awakening Barton: Multiple Scenario Modelling

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The Barton Field is one of the mature oil fields in SM-EP located offshore Sabah, approximately 220-km northeast of Labuan Island with a water depth of 130 ft. The 3 main reservoirs (G, H, and I) are developed from two mini platforms and a total of 13 producing wells. Barton has been producing with gas lift under natural depletion since April 1982 (20 years of production) with a drive mechanism governed by good gravity segregation and moderate aquifer support. The reservoir pressure from this primary depletion development has decreased from 1058 psi to 550 psi.

The reservoir characteristics of the field, and its current condition as a mature, relatively low-pressure field, make it a suitable candidate for a secondary recovery project through pressure maintenance, provided the subsurface complexities are well understood. Subsequently, an integrated modeling exercise, through building of multiple geologic realisations, was launched to assess which of the pressure maintenance options, such as gas injection, hybrid gas and water injection and water injection, would give the best results in terms of recoverable reserves and associated economics.

An opportunity framing exercise has identified two groups of uncertainties in the form of structural (structural interpretations and quantifications, fault identifications and sealing capacity) and reservoir geological (facies identifications, correlations, sandbody geometry and orientation) uncertainties. These key uncertainties are mapped and captured systematically in a series of 3D realisations and modeling workflow. Integration of the latest results from cores, biostratigraphy, seismic, juxtaposition-plot, bubble-plot, and pressure data as well as analogues formed a sound technical basis for the current modeling.

Five out of a total of twenty-two realisations were successfully history-matched. The results thus used for the basis for evaluating developments options, of which water injection is identified to be the most optimal. The first well of Phase 1 of the 2-phase Barton Filtered Minimal Seawater (BTFMS) project will be drilled in Q4 2004.

Good and constant communication between team members and geologists in a ‘ring-fenced’ environment as well as the availability of a powerful 3D modelling tool (PETREL) are parts of the enabling factors to the success of the study. This study is an example of how multi-disciplinary integrated approached helps in proper handling of uncertainties, which leads to a robust field development plan.