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An Integrated Subsurface Approach to Heterolithic Reservoir Risk Reduction; Malaysia PM-304 Cendor Field Success Story

C.Y. McCants¹, Mohd. Khalid Jamiran¹, Stan Rae¹, and Yang Fairuz binti Abdul Aziz²

¹Petrofac (PM304 Malaysia) Ltd, ²Reservoir Seismic Services, Schlumberger

Seldom do operating companies and service companies fully implement an integrated approach to resolve subsurface risks. While there may be many reasons for this, resolution of this potential problem can bring demonstrable results. The successful development of the Malaysian PM-304 Cendor field, previously considered marginal, proves that complete integration between geology and geophysics, operating company and partners, and the inclusion of service companies as part of an integrated team, can significantly reduce subsurface risks. The Cendor field recently came on production ahead of schedule, under budget with well results that met or exceeded expectations. This was due in large part to the resolution of subsurface issues that had previously been considered an impediment to commercial exploitation.

Petrofac, as operator for Peninsular Malaysia PSC PM-304 developed a work program with a series of innovative risk reduction efforts, surface and subsurface, and adopted a 'can do' mentality which led to the Cendor field receiving FDP approval in record time, delivering first oil within 26 months from project conception (and only after 16 months from the FDP approval), as well as being significantly under budget. This could only have been achieved with the cooperation of the PM-304 partnership and selected service companies involved in the subsurface risk reduction efforts. While the integrated approach was initially met with guarded skepticism by some within the service company community, the practicality of the efforts was soon recognized by all involved. Fit

for purpose processes, a 'have to have' vs. 'like to have' mentality, plus open two-way communication created a constructive atmosphere where incorporation of cross discipline expertise resulted in an improved sub-surface interpretation. This led to a successful development drilling campaign on the Cendor field.

The Cendor field reservoir consists of a complex array of lower delta plain to estuarine set of heterolithic sandstone geo-bodies that were difficult to resolve based on traditional interpretative methods. Integration of an updated sedimentological study, 3D seismic reprocessing and a 3D simultaneous AVO inversion analysis resulted in an improved reservoir architectural model, such that the correct location of development wells could be ascertained. This paper illustrates examples of these integrated risk reduction exercises where the sum of the parts and process thereof is greater than the individual aspects within each of our disciplines. The Cendor field's commercial development within such tight time constraints is truly another Malaysian success story!