Paper 2

Identifying infill opportunities using time-lapse seismic technology at Irong Barat field: a case study

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This paper describes the results of a collaborative project between EPMI, Petronas/ Carigali and ExxonMobil Upstream Research Company in Houston. The project investigated the use of time-lapse analysis of legacy 3D seismic data to aid identification of infill opportunities

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in the Irong Barat field within the Malay Basin. Identification and capture of infill opportunities is critical for maximizing and optimizing reservoir management in this mature field.

The Irong Barat field lies approximately 175 km offshore Peninsular Malaysia in about 60 m of water. The field was discovered in 1979 and began production in September 1983. The first 3D seismic survey was acquired in early 1984 and a repeat survey using both OBC and streamer technologies was acquired in 1998. The main reservoir is the H-50 sandstone, a complex fluvial channel system, of Mid-Miocene age.

The depletion mechanism for the main fault block is gas cap expansion through gas injection. Production is via 3 rows of producers with 2 gas injectors. Gas injection began in late 1984.

ExxonMobil's approach to time-lapse seismic analysis is an integrated model-based approach, where the synthetic seismic response derived from a production history-matched reservoir simulation is compared with the actual seismic response. Before the synthetic and actual seismic response can be compared, the repeatability of the actual seismic data needs to be optimized to take account of differences that are due not to changing reservoir conditions, but to differences in acquisition and processing. In order to minimize these differences, or to improve the repeatability between the two data sets, the baseline survey data is equalized to the monitor survey. The equalization procedure involves several processing steps to balance the amplitude, phase, bandwidth and spatial positioning of the events in the baseline and monitor surveys. Once this is done, the resulting differences between base and monitor surveys can be investigated, compared with the synthetic differences and reconciled via integration with surveillance and production history data. Via this integrated approach between geoscience and reservoir engineering disciplines, updates to the reservoir model can be examined and opportunities identified.

In this project, a number of areas of potential bypassed oil have been identified. Current work is underway to examine these opportunities in line with the ongoing infill-drilling program and with forecast production from the existing production wells.