Poster 11

Technology integration for reservoir characterisation and optimized well planning at Larut Field — offshore Malay Basin

MELANIE J. RYAN AND CHRISTOPHER E. HARRIS

ExxonMobil Exploration & Production Malaysia, Inc.
Menara ExxonMobil
Kuala Lumpur City Centre (KLCC)
P.O. Box 10857
50728 Kuala Lumpur

The Larut oil and gas field, consisting of the Main, East, North and West fault blocks, is located offshore approximately 270 km north-northeast of Kerteh, on the east coast of Malaysia. The Larut 1 exploration well, drilled in the Main fault block, discovered the field in 1990. Subsequently, eight other wells were drilled to delineate the adjacent fault blocks. The initial 27 well development drilling programme started drilling in December 2001 with first oil production in February 2002. To date EMEPMI has completed a total of 19 wells.

This poster illustrates how seismically derived reservoir characterization studies have been used to provide valuable input into opportunity identification, well design and well optimization. The use of neutral networks and integrated well planning will be illustrated.

A 325 square kilometer 3-D seismic survey was acquired over the field in 1991. The original processing through 3-D post-stack migration yielded a data set that was moderate to good quality. This was used in the appraisal drilling and pre-development planning. In order to improve imaging, well optimization and risk mitigation, the original 3-D data set was reprocessed in 2002 through pre-stack time migration (Pre-STM). The full fold Pre-STM stack and the AVO volumes (near and far angle stacks are the data sets currently being used to support the development drilling programme.

Hydrocarbons occur in the late Oligocene to mid Miocene Group F, H, I and K shallow water sandstones. The main reservoirs occur within the Group I fluvial sandstones, comprised of stacked and individual channel sands. In some instances, such as the I40, these channels may be mapped directly from 3D seismic. Horizon keyed multivariate linear regression has been used to help characterize some of the major reservoirs. However, many reservoirs are unable to be mapped using conventional seismic techniques as the thickness of these reservoirs is below seismic resolution.

In order to extract more information from the 3-D seismic data, neural networks in Hampson-Russell's Emerge software are being used to aid the reservoir characterization of some of the more challenging intervals. Emerge is a software application that analyzes well log (e.g. porosity) and seismic data, finds linear/non-linear relationships between the well log and seismic data at the well, and subsequently uses these relationships to estimate a 3-D volume of the log values at all seismic trace locations. The seismic data may be conventional amplitude data or derived attribute volumes (e.g. P-Impedance or Instantaneous Frequency). Emerge can also use discriminant analysis, a mathematical clustering technique, to determine relationships in the seismic data that can be exploited to classify the seismic into discrete bins that share similar characteristics.

The first Emerge model was built using discriminant analysis to perform a lithology classification. A relative porosity volume was subsequently estimated, and both are being used in VoxelGeo for Geobody visualization and seed detection. The volumes may also be loaded.

Warta Geologi (Newsletter of the Geological Society of Malaysia), Vol. 29, No. 6, November-December 2003