

Prospect Identification using AVO Fluid Prediction, Relative and Field-Based Elastic Inversion in Sarawak, Malaysia

Van de Coevering, Norbert¹, Muhammad Fauzi², Rusdinadar Sigit², Reza Lasman² (1) CGG Asia Pacific, Kuala Lumpur, Malaysia (2) Murphy Sarawak Oil, Kuala Lumpur, Malaysia

Murphy Sarawak has approximately 10,500 km² exploration acreage and acquired the block in 2001, after which several hydrocarbon fields have been discovered. The main reservoirs in this basin are Middle to Early Miocene deltaic sands ranging from 1000 to 2000 meters depth. In this paper we focus on one field and the innovative prospecting workflow that was applied. The work started by understanding the AVO response of the major hydrocarbon reservoirs in the nearest well D through fluid substitution and forward modeling, for which a shear sonic log was estimated using nearby wells. Then this knowledge was implemented to rapidly high-grade the prospect and predict the most likely fluid content, using the seismic gathers. A Relative Elastic Inversion (REI), which can be used as an alternative to AVO for exploration, reduced the risk further. This REI is compared with a Field-based Elastic Inversion (FEI), performed using well D only. Tying it to well M of the discovery shows the value of the FEI. This well did not exist at the time of the inversion and has encountered gas, oil and water as predicted.

This work indicates that AVO signatures should be used as an integral part of seismic interpretation to predict hydrocarbon occurrences, despite the failures in the past. Caution must be put up front to minimize possible false AVO response. REI can be used at a large scale for exploration purposes – it is an alternative to seismic AVO. It should be followed by smaller-scale FEI for further reservoir characterization.