Paper 5

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The use of 3D seismic in Baram Delta Operations, Sarawak

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PETRONAS Carigali Sdn. Bhd. (Baram Delta Operations), under a joint venture agreement with Sarawak Shell Berhad, operates 9 producing fields in the Baram Delta, offshore Sarawak. During the last few years, 3D seismic has been acquired over the four largest fields with the purpose of improving the structural definition and hydrocarbon prediction in order to optimise the hydrocarbon inventory and further development of these fields.

The 3D seismic data quality is adversely affected by the presence of:

i) seismic anomalies related to shallow gas and complex (near) surface geology,

ii) non-optimum data coverage in obstructed areas (with production installations) which required undershooting.

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Of particular concern is the seismic velocity distortion resulting from the above seismic anomalies. Due to the geological complexity, the impact of the these velocity effects cannot be easily quantified. In addition, the presence of lateral velocity variation has further complicated the seismic interpretation. It has been demonstrated that depth conversion based on simplistic velocity models are untenable.

To further enhance the added value of the 3D seismic data, BDO has concentrated on two crucial issues. Firstly, an integrated geophysical and geological approach is applied in velocity modelling using a combination of checkshot/VSP data with horizon compatible stacking velocities, calibrated to well data. The utilisation of computerised mapping techniques has greatly facilitated the application of this data- and time-intensive modelling.

Secondly, extensive use of seismic attributes, in particular amplitude analysis, has shown some very promising results in the delineation of hydrocarbons, notably in areas where conventional interpretation is complicated by the seismic anomalies.

This paper focuses on the various usages of 3D seismic in Baram Delta fields, highlighting the main technical problems and challenges, and demonstrating the added value of using an integrated geophysical/ geological approach in the identification of further appraisal and development opportunities, and in maximisation of the hydrocarbon inventory.