

Foresee the Unforeseen: Modeling West Baram Delta Overpressure

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PETRONAS Carigali and Shell Sarawak Berhad commenced a drilling campaign in SK307 in 2011 that constituted the first HPHT wells to be drilled with a 15K capacity rig in the West Baram Delta. Understanding regional overpressure behaviour will allow more accurate modelling of the pore pressure behaviour for future HPHT exploration opportunities and robust well planning.

Data from 62 West Baram Delta wells (MDT/RFT, Mudweight, Kick, FIT and LOT) indicates that the onset of overpressure occurs at different depths within these wells, which is both controlled structurally and stratigraphically.

Seismic velocity overpressure modelling was undertaken in 25 wells using both VP_VES Tau transform and Eaton exponent methods. Using a Tau function, it was observed that seismic velocities under predict the overpressure build-up. There is a large variation in Eaton exponents required to calibrate wells in the broader West Baram Delta and location specific exponents must be applied. A large number of 3D seismic datasets covered the area of interest and it was observed that short cable data (3km) have limited use with poor match to well data. Datasets

with 4.5km cable length demonstrated more robust tie to the modelled wells.

Under-compaction overpressure was identified as the predominant overpressure mechanism in the region. Under-compaction was driven by the rapid sedimentation underneath the prograding delta. In the southern West Baram Delta, late inversion resulted in unloading due to the structural overprint. Observation showed a significant pressure increase beyond the under-compaction trend in some wells which was inferred as inflationary overpressure. Prediction of this overpressure mechanism was difficult due to limited expression of seismic velocities and log responses.

The development of an integrated geological model incorporating all available well and seismic data underpins the prediction of overpressures in exploration prospects. Subsequently, this will significantly influence the well and subsurface target locations, well casing design (casing type and setting depth), mud weight program, evaluation and well monitoring program for well planning.