

INTEGRATED PETROPHYSICAL EVALUATION OF THIN BED FORMATION: A CASE STUDY FROM FIELD OFFSHORE MALAYSIA**Diego Maya & Nizam Abu Bakar**

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Asset managers generally consider reasonable precise and accurate volumetrics to be important before taking decisions about exploring and producing hydrocarbon reservoirs. One of the many uncertainties that affect volumetrics is the true hydrocarbon saturation of thin bedded sand-shale sequences. Uncertainties related to thin bedded sequences may affect reservoirs by up to 50%, and often even more.

Modelling net pay in low-resistivity thin bedded pay zones is challenging. In wells drilled near perpendicular to bedding, conventional resistivity instruments measure the resistivity along bedding, the horizontal resistivity. The horizontal resistivity is dominated by the shale conductivity and consequently the true resistivity, ergo sand saturation, is significantly underestimated. In contrast, the measurement of the resistivity perpendicular to bedding, vertical resistivity is more sensitive to the resistive hydrocarbon bearing sand laminae.

Horizontal and vertical resistivity has been recorded in this local case study. A robust petrophysical model is constructed and shale and thin-bed sand volume, and true resistivity, was calculated. When integrated with the conventional Thomas

Steiber porosity model, a more accurate computation is obtained. Zones with low resistivity anisotropy may point to disturbed low productivity zones. The borehole resistivity image tool allows the identification and quantification of thin laminations; this information is integrated with petrophysical results in order to have a consistent earth model.

This paper discusses the integration of multi-component induction and borehole resistivity images into one enhanced and consistent earth model which allows accurate saturation modelling of thin bedded sand-shale sequences in a local Southeast Asia example. Conventional LWD resistivity showed low resistivity zones, potential misinterpreted as water bearing. The vertical resistivity computed by the multi-component induction tool clearly identified high resistivity intervals interpreted as hydrocarbon bearing zones. The petrophysical model quantified thin bed sand volume and true hydrocarbon saturation. The image data acquired in this well confirmed the laminated model and contributes to net-to-gross calculations. The results show net increase in pay of XX% (with no cut-offs) and XX% when conventional cut-offs are applied.