GEOPHYSICS PAPER 11

REGIONAL ROCK PHYSICS APPLICATION FOR IMPROVED UNDERSTANDING OF THIEF SANDS IN OFFSHORE SARAWAK BASIN

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Seismic data play a crucial role for hydrocarbon exploration. The seal integrity analysis is required for carbonate prospects ranking in Sarawak basin. The overlying capping shale has intercalated sands, which are termed as thief sands. The fluid content of these sands indicates seal breaching. Therefore, fluid characterization of thief sands may help to characterize reservoir seal and in-turn for prospect ranking. . These sands are quite shallow with depth range from 800-1500m. The recorded well logs are quite scarce and never analysed petrophysically in past. Reliable density and sonic(P&S) well logs along with relative amplitude preserved pre-stack data is very crucial to understand the seismic character of thief sands. The shale abundant columns at shallow depth drilled with overbalanced mud weight, induced large washouts and affected recorded well log curves. The density correction for washout zones is a must otherwise misinterpretation of seismic reflectivity may give an AVO pitfall.

In general, conventional petrophysical analysis targeted for reservoir interval. However, to characterize shallower shale sections, a re-look on well logs conditioning is necessary before any further analysis. More than 25 wells widely distributed in Sarawak basin were selected for regional understanding of capping shale characteristics in terms of rock physics analysis. Input logs were quality checked for consistency and necessary corrections applied before putting them as input for rock physics modelling. Suitable rock physics model constructed to synthesized missing logs and poor quality logged interval. Gassmann fluid substitution modelling applied to understand the fluid effect on rock properties. Rock physical analysis for elastic and density logs indicates that brine and hydrocarbon bearing sands are harder than shales in the Sarawak basin.

The well log based forward modelling indicates that the sands always have high P-impedance than shales. The forward modelling results conform to the seismic amplitude variation in sands and shales. The seismic responses of sand tops are represented with positive reflectivity contrast and with dimming amplitudes of angle/offsets. The rock physics modelling and seismic well calibration helped us to delineate thief sands using pre-stack seismic analysis. The workflow and seismic analysis results will be presented in the paper.

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