The Identification of Lithology in Channel Bodies Using Differential Compaction in Blocks 25a & 25b, Columbus Basin, East Coast, Trinidad

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Abstract

The ability to predict the lithology present within channel features based on the analysis of seismic data would be a major advancement in the way reservoir prediction is carried out. In this study, the lithology of channels present within predominantly shaly sections in Blocks 25a and 25b, Columbus Basin, Trinidad were analysed.

A mathematical model built during the study based on depth and typical porosity curves, identified that the compaction-driven height change between the edge of the channel and the point of highest channel relief is dependent on the sand-shale ratio present. The ratio of height change to the channel thickness gives a compaction ratio that is unique for different sand-shale ratios. A plot of compaction ratio vs depth gives us the ability to predict the lithology expected within channels seen on seismic.

A post-processing seismic tool, referred to as SeisneticsTM, was used to thoroughly examine the 3D seismic data and rapidly locate a number of channel systems present in both blocks, that were shown to be consistent with the parameters developed by the mathematical model. Well log and velocity data can be used to calibrate the height differences to actual lithologies within channels, and prove that the mathematical model is an accurate predictor of lithology based on height variations.

The application of this new model is expected to be of great significance in the calculation of oil and gas volumes, the determination of reservoir prospectivity and the prediction of the occurrence of uplift and overpressure. This calibration can be further refined by considering the effects of pressure and the under-compaction of the shales and sand.