Consideration to Data Driven Solutions for the Acquisition of New Marine 3D Seismic Data

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ABSTRACT

In the current climate of low oil prices and the desire of exploration and production companies to improve return on investment (ROI), how do we get more from our seismic data? The simple answer is acquiring the right data to meet the objectives.

The advantages of multi-azimuth data in salt provinces (due to the complex ray paths) are well documented and yet we are still unable to image properly certain features and are challenged with imaging below the salt. With increased focus on the subsalt prospectivity, the requirement is to provide greater certainty to field and reservoir size and to de-risk long term investment; accurate and reliable imaging becomes increasingly important.

Utilizing salt models driven by existing seismic data we investigated optimizing acquisition parameters through the application of full waveform modeling. An illumination study was conducted using 3D ray based modelling (NORSAR™) with unrestricted offsets and azimuths and 2D finite difference modelling of various cable lengths to arrive at a defined solution for new data acquisition.

The basis for this study is the complex Kepler salt and prolific hydrocarbon resources of the Mississippi Canyon region of the US Gulf of Mexico. The area selected has a well-defined salt interpretation, which provides credible input from which to evaluate results. The study area has been sequentially covered by 2D, narrow azimuth (NAZ) 3D, wide-azimuth (WAZ) 3D, and multi-wide azimuth (MWAZ) 3D marine data. Although the resultant acquisition configurations have produced a reliable velocity model, limitations still exist. Each data volume enhances the information provided compared to the previous images of the complex salt structures and associated sediments; however, poorly imaged areas still exist. Using this starting velocity model, the study focuses on illuminating a flat and regionally dipping surface below the salt as target horizons for validation of the results. Observations and statistics on the two planar subsalt surfaces show implications of complex ray paths and associate acquisition configurations when attempting to image subsalt structures. Results from the study demonstrate that ad-

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vanced 3D acquisition configurations can optimize imaging results and lead to improved prospecting and de-risking of prospects.