Seismic Inversion and Net Sand Estimation in Deep Water Turbidite Sands, Bonga Fields, Offshore Nigeria

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Summary

Lateral prediction of net pay sands and the uncertainty of these predictions play a fundamental role in the life cycle of hydrocarbon production from exploration through field development. To this end, quantitative seismic inversion and attribute based methods are playing a key role in the lateral prediction work process flow. In this presentation, we present some of the challenges, assumptions, strengths and weaknesses associated with the methodologies and their impact on Static and Dynamic modeling and commercial drivers for the deep water turbidite Fields, offshore deepwater Nigeria.

The OML 118 block is located 120 km offshore Nigeria and lies in water depths ranging from 900 to 1500 m. The area is characterized by N-S trending shale ridges and diapers separated by shale withdrawal synclines. It is operated by Shell Nigeria Exploration and Production Company Limited (SNEPCo), under a PSC arrangement, on behalf of the license holder, the Nigerian National Petroleum Exploration (NNPC), with Esso, Agip and Total. Bonga turbidite reservoirs were deposited in a range of deepwater depositional environments. These include: incised channel fill complexes, channel-lobe, and amalgamated channel or channel/levee systems. To date, several wells have been drilled encountering primarily oil in reservoir levels of Miocene age. Attribute based methods and Multi-stack simultaneous inversion results are used in detailed reservoir characterizations and are the basis for subsequent dynamic flow simulations of Bonga.

A blind test was performed by estimating net sand prior to the drilling of one of the Bonga appraisal wells. The predicted net sand thickness from the multi-stack inversion results gave a good match to the net sand thickness encountered at the well, clearly demonstrating the reliability of multi-stack inversion in lateral prediction. Currently, most of the static and dynamic models that are built use inversion results for the majority of the reservoir sands in greater Bonga area. The proposed inversion scheme and methodologies are also being implemented at various projects within Shell Technology E & P.