

## **Seismic Attributes for Prediction of Reservoir Architecture and Hydrocarbon Prospectivity: A Case Study of Zubair Formation in Bahrah Area, North Kuwait**

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### **ABSTRACT**

The spectral decomposition for seismic thin bed reservoir characterization (Partyka et al, 1999) and the seismic inversion (Pendrel, 2001) for mapping the distribution of clastic reservoir facies, play an important role in identifying the hydrocarbon accumulation. The interpretation of PSDM seismic data, in a structurally complex area and the use seismic semblance, amplitude variance attribute and its visualization are crucial to understand the fault system as well as hydrocarbon entrapment condition. In this paper, seismic attributes are pragmatically used to analyze the gross depositional environment of the Zubair Formation to mitigate the challenges of reservoir facies distribution in Bahrah area, North Kuwait.

A sequence stratigraphic approach was adapted to understand the reservoir characteristics of Zubair Formation, which was deposited on a fluvial to coastal deltaic environment. The PSTM and PSDM seismic data covering ~385 km<sup>2</sup> was used to carry out the project. The structural mapping using PSDM data exhibits anticlinal features with subtle highs and lows; the structure accompanied with seismic amplitude variance, coherency based semblance attribute shows the NW-SE, NE-SW and E-W orientations of the faults. The post stack seismic inversion was carried out using PSTM seismic data to obtain the P-impedance volume. The well logs and the petrophysical interpretation showed the lowering of the P-impedance across the sand facies interval identified with the lowering in the gamma ray log. These are tied with the inverted seismic data in the relative P-impedance domain within estimated seismic frequency band (5-65 Hz). The spectral decomposition methodology was adapted to understand the characteristics thin sand features within Lower Zubair (LZ) and Middle Zubair (MZ) interval. The analysis of whole range of frequency (5-65 Hz) evident with 55 Hz dominant higher frequency amplitude distribution depicts the thin sand facies distribution in MZ and LZ interval.

Thus, the P-impedance property against the reservoir sand facies facilitate to characterize the Zubair sand distribution as deltaic deposits. The spectral characteristics improved the understanding of the MZ and LZ thin bed depositional pattern. Moreover, the structural interpretation supports the understanding of traps and reservoir architecture. Based on this study, several potential exploration areas have been identified; and exploratory drilling locations have been proposed.