

Discrimination of Reservoir from Non-Reservoir Using Simultaneous Inversion Technique – A Case Study from Kuwait

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ABSTRACT

Simultaneous inversion is a method that integrates multiple partial angle stack seismic data, geological interpretation and well log data to generate acoustic and shear impedance data volumes. These resulting volumes have higher resolution than the input seismic data due to removal of wavelet effects. The process works by removing the wavelet from the seismic data, converting seismic interface properties into layer properties and integrating a low frequency model. The results of simultaneous inversion are rock properties such as P-impedance, S-impedance and Vp/Vs constrained to well data. The simultaneous inversion algorithm utilized in this study determines the optimum combination of P-impedance, Vp/Vs and density derived from the seismic angle stack data. The use of the angle stacks simultaneously results in reduced sensitivity to noise in the input seismic data. The Burgan field, located in the Southeast of Kuwait is one of the largest oil fields in the world. The field is an ovate dome covering some 500 km² with a slight elongation striking north. The Burgan Formation is composed of well sorted, rounded, medium to coarse-grained sandstones and siltstones with an average porosity of 20% in the third sand layer and 23% in the fourth sand layer. The Wara Formation consists of sandstones, siltstones and shales with average porosity of 24%. The objective of this study was to perform reservoir characterization of the Wara and Burgan Formations in order to differentiate the reservoir and non-reservoir lithologies. The study area is in the Burgan field located onshore in the Southeast of Kuwait. Hundreds of wells drilled in this field proving the presence of hydrocarbons in the Wara and Burgan Formations in the Middle Cretaceous interval. The mapping of the reservoir sands in these formations improved by utilizing the spatial coverage of the 3D seismic data. The results from simultaneous inversion show that the reservoir and non-reservoir lithologies can be differentiated using the combination of P-impedance and Vp/Vs .