Seismic Inversion Methodology and Application for Lithology Prediction

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ABSTRACT

During the early stage of exploration of an area, usually there is little well information, or only a few wells limited to the structure highs. For the most part of the area of interest, seismic stacking velocity generally can provide a more accurate and reliable constrain for the ultra-low frequency trend in seismic inversion. The low-frequency trend model will significantly affect the pseudo impedance values of the result of seismic inversion, especially when using the inversion results in lithologic interpretation.

The processes of the application of stacking velocity in seismic inversion are wavelet extraction, geologic framework building, low-frequency model building and parameter optimization for constrained sparse spike inversion. The important steps of the process of low-frequency model building are the quality control of velocity data and the ensuring consistency between the regional compaction trend and the velocity models.

We have applied this approach to appraise the hydrocarbon potential of the Tungyintao Basin in identifying the low impedance effect of gas sand in the shallow formation, and predicting the development of alluvial fan facies for the syn-rifting sediments. This technique is also useful in evaluating the quality and distribution of potential reservoirs, for prioritizing exploration leads and prospects.