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Claude Sejourne¹, James Bridges², Alan Huffman² (1) TotalFinaElf, 64000 Pau, France (2) KSI, Houston, TX

Impact of Shale Anisotropy on Pore Pressure Prediction Before Drilling Using Predict/Anaseis

Most pre-drill pore pressure prognoses are based upon the estimation of interval velocity from seismic. Generally, pore pressure is computed as a function of overburden gradient, formation velocity and a normal compaction trend.

Formation velocity is derived from the interpretation of velocity data in 2D or 3D to create a set of Vrms. The velocity picking is then transformed into raw interval velocities which must then be corrected for seismic bias. The major source of bias between Dix and vertical velocities is shale anisotropy.

Interval velocity uncertainty due to these biases is commonly 5-10 % and can reach 20% (corresponding to an error of up to 0.2 emwg/cc in predicted pore pressure).

A new software called DRILLWORKS/ANASEIS has been developed to correct for anisotropy and other biases using models developed and field proven by TFE. This software, developed by Knowledge Systems, Inc. (KSI) allows raw interval velocity correction for : - Dix's approximation, - trace displacement while recording, - seismic time origin and offset biases, - shale anisotropy. In exploration, empirical methods linked to experience are used to evaluate formation anisotropy. These models are built on a three-parameter compaction calculation which is the consequence of the Wyllie formula and the Rubey and Hubert law. This software has already resulted in a significant reduction in pore pressure uncertainty. It can be utilized with real time data during the well to increase drilling efficiency and safety.