DUTCH PETROPHYSICAL SOCIETY

DPS presents: QI and Geomechanics

September 20, 15.30, KIVI Prinsessegracht 23, 2514 AP Den Haag

Quantitative Interpretation of Sonic Compressional and Shear Logs for Gas Saturation in Medium Porosity Sandstone

Maciej Kozlowski, Halliburton

Gassmann equations (Gassmann, 1951) are used to calculate seismic velocity changes that result from variations in reservoir fluid saturation. These equations became predominant in the analysis of a direct hydrocarbon indication from seismic data through their use in analyzing the compressional to shear velocity ratio, Vp/Vs. This Vp/Vs ratio is used in many industry analyses, such as the amplitude variation with offset (AVO) analysis developed by Castagna et al. (1993). Multiple authors have since published a variety of Vp/Vs seismic interpretation techniques that use empirical relationships with Vp, Vs, and porosity terms. Unfortunately, however, there is a gap in the use of Vp/Vs relationships in petrophysical interpretation.

Rock-physics Anisotropy and its Applications in Geomechanics

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Recent years more and more complex wells have been drilled, quite often through depleted formations. NPT due to losses or stuck events can have significant impact on the project economics. Comprehensive geomechanical model can highlight potential hazards and allow to take early actions to mitigate issues.

Elasticity and particularly its anisotropy is a vital part of the comprehensive geomechanics model. As it will be shown, it has dramatic impact on the horizontal stresses profiles. Presentation demonstrates anisotropic elasticity modeling process.

The suggested workflow exploits Reuss, Upper and Lower Hashin-Shtrikman bounds for various cases of dispersed clay modeling. Each of the bounds corresponds to specific dispersed clay textures, like clay cementation, pore filling etc. These textures are classified and tied to the corresponding bounds. The rock anisotropy is modeled by Backus averaging of shaly sands with dispersed clay as a first component and laminated clay as a second component. The degree of anisotropy is controlled by the volume of laminated clay and its elastic moduli. The model is calibrated through several rock-physics cross-plots. The most optimal way is to calibrate model with measured velocities in vertical and horizontal wells.

Free entrance, please RSVP by e-mail: info@dps-nl.org