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Chen, G., Yale, D., Huang, X., Xy, S., Finn, C., and Boitnott, G. (2006) "Stress-induced Velocity Anisotropy of Unconsolidated Sand Under Realistic Reservoir Stress Conditions" Proceedings of 2006 SEG Annual Meeting, 1-6 October, New Orleans, Louisiana.

Abstract

Ultrasonic velocity measurements were made on dry and oil saturated samples/cores of unconsolidated sands to investigate the stress-induced velocity anisotropy under realistic reservoir stress conditions. Instrumentation was arranged to simultaneously measure five velocities (axial P, axial S, radial P, radial S polarized radially, and radial S polarized axially) and the axial and radial deformation of the samples in a single run. Within the experimental uncertainties, the measurements show:

(1) Stress-induced velocity anisotropy in unconsolidated sands could be a major contributor to the azimuthal shear wave anisotropy observed in sonic logs from some of the West Africa wells;

(2) Stress-induced velocity anisotropy is stress-path dependent;

(3) P-wave stress-induced anisotropy is stronger than S-wave stress-induced anisotropy;

(4) Vp/Vs ratio could increase or decrease with increasing stress;

(5) For dry samples, P-wave velocity is related to the stress component in the direction of wave propagation, whereas S-wave velocity is related to the average of the stress components in the directions of wave propagation and particle motion.

However, large uncertainties still exist in the exact amount of stress-induced velocity anisotropy. More measurement data are needed for better reservoir characterization where stress regimes are non-hydrostatic.

Contact NER for more information.