Latest Generation LWD Sonic Tool: Multipole Acoustics Measurements in Horizontal Wells from Offshore West South Africa

Saeed Mohammed [1] and John Crowe [2]
[1]*Drilling & Measurement, Schlumberger, Luanda, Angola.*
[2]*Chevron, Luanda, Angola.*

Logging While Drilling technology has progressed swiftly in recent time to address the need for saving rig time, making real-time informed decisions for drilling efficiency and risk managements, and accurate well placement. LWD sonic measurements provide information for timely analysis of borehole stability problems, drilling optimization, and assisting with pore-pressure prediction and well to seismic tie. Most of these applications have relied on the measurements of formation compressional slowness due to the difficulty in obtaining shear slowness in the LWD environment, especially in unconsolidated formation. Formation Shear, where present in logging while drilling sonic data can complement compressional measurements for advanced applications (AVO Analysis, Geomechanics, Completion, Lithology and Gas Detection). This paper will demonstrate the advances that have been made in the new LWD Sonic tool as well as evaluating the measurements for both shear and compressional for two horizontal wells in West South Africa.

A new LWD sonic tool is being developed to address the challenges in obtaining shear measurements in unconsolidated formations. Requirements of the new tool are robust measurements of compressional and shear slowness regardless of the formation type (slow, fast and intermediate), thus enabling advanced sonic applications. The tool can acquire multipole modes (monopole and quadrupole with 48 sensors (12 axial and 4 azimuthal positions. It has a large acoustic aperture with a short inter-receiver spacing that enhances the slowness processing in terms of quality and resolution. The tool has a large downhole computing capability, enabling more complex processing and leading to broader applications in real time.

Field test data acquired in two horizontal wells in West South Africa show that the tool can acquire high-quality waveforms in a wide frequency band , providing reliable compressional and shear slowness in the formations penetrated by the boreholes. Formation Compressional and Shear Slowness from the monopole was transmitted real time. Shear data is present in the monopole dataset and formation shear slowness was extracted from the monopole waveforms in addition to the quadrupole waveforms where possible. Monopole Shear is not continuous all through the logged interval due to variation in formation types (slow to fast formations) but it was possible to obtain continuous shear measurements from the quadrupole.