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SONIC WAVEFORM SIGNATURE ANALYSIS FOR RESERVOIR EVALUATION

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A number of properties of the sonic waveform such as amplitude, phase, frequency and velocity of the various wave types (compressional, shear and stoneley waves) are grouped together in a waveform display. By means of sonic attribute analysis (SONATA*), it becomes possible to decompose the amplitude information from the phase or frequency information, which adds another dimension to waveform interpretation.

Several properties of the full waveform sonic have been analysed in various lithologies and borehole environment (open hole, cased hole, water base and oil base mud). These are :

- Compressional and shear envelopes (instantaneous amplitude) and their ratio,
- Compressional and shear transit times and their ratio,
- Stoneley energy and frequency behaviour.

The examples highlight the following various applications :

1. Fluid differentiation i.e. gas vs oil and gas vs water.
2. Formation strength for mechanical properties of rocks.
3. Determination of natural fractures.
4. Fracture height determination in case of induced fractures.
5. Lithology differentiation.

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