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Digital Wellsite Sonic Data

Includes shear data computed using new, robust algorithms for immediate QC at the wellsite

Applications

- Stress direction and regime
- Log verticalization
- Stimulation design
- Natural fracture analysis
- Lateral landing point identification
- Seismic ties

Benefits

- Immediately know where data can be applied across operations or where further processing is needed to address borehole or geological conditions
- Quickly identify stressed, layered, fractured, or damaged formation characteristics

Features

- Sonic Scanner* acoustic scanning platform's digital advisor report generated immediately after logging to summarize log quality and identify zones where further analysis is warranted
- New algorithm to determine shear slowness from dipole using data-driven model
- No dependence on mud slowness
- Capability to handle anisotropic shales or altered formations
- Automatic frequency band and time window setting
- Reliable dipole anisotropy product available at wellsite
- Real-time QC flag using signal coherence and rock physics model

Gather essential sonic data for in-time decisions at the wellsite

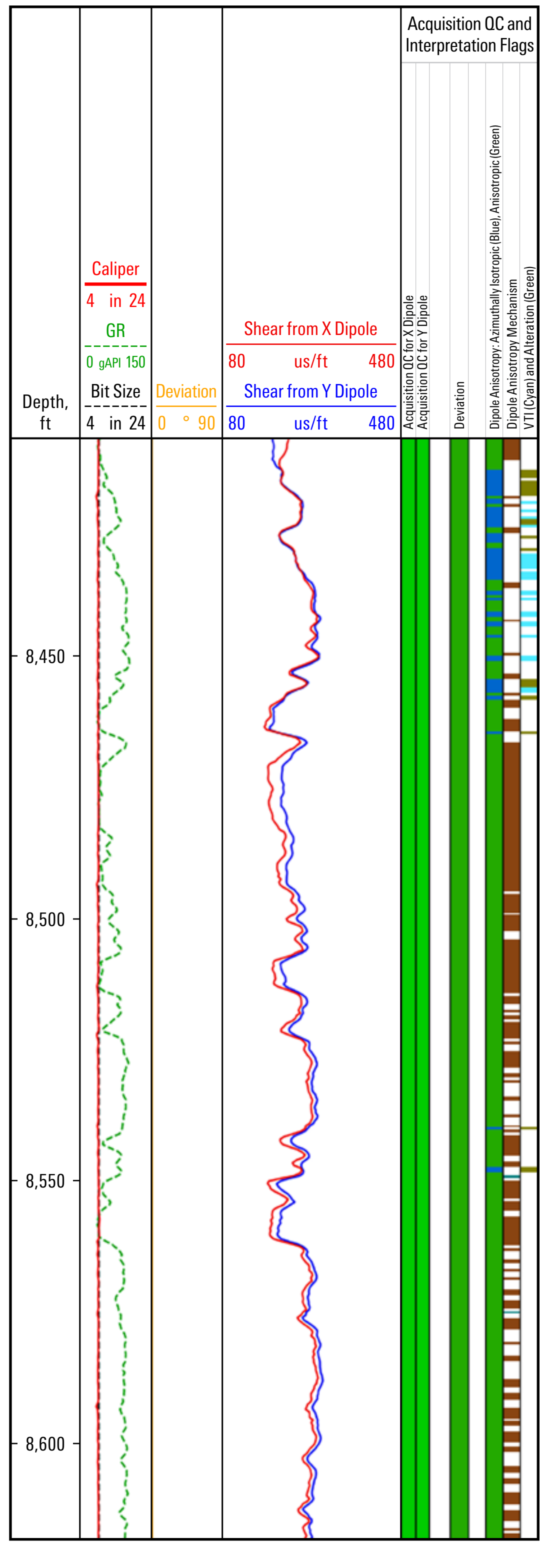
Sonic data is commonly acquired in most wellbores for a variety of applications, including seismic tie, porosity, input to lithology determination, fracture detection, gas detection, and geomechanics models. Typically, sonic data is routinely reprocessed and quality controlled by an expert prior to application.

The updated data-driven algorithm applied while logging can provide robust shear slowness with a quality control flag to minimize turnaround time on QC and possible reprocessing (Fig. 1 and Fig. 2). This data-driven model has fewer user parameters and is more reliable in layered, stressed, or damaged formations. The QC flag is determined using the coherency of the signal and an industry-standard rock physics model for theoretical validation.

Dipole anisotropy can immediately indicate where horizonal stresses are imbalanced or give an indication of open natural fractures. In deviated wells, the shear wave differences are a clear indication of shale layering and potential for seismic or AVO velocity model inaccuracies. Interpretation of the environmental slowness parameter can indicate the type of anisotropy to immediately provide further insight.

Obtain valid dipole anisotropy results at the wellsite

With the updated shear inversion and more flexible dipole anisotropy frequency filters, you can obtain reliable dipole shear anisotropy results at the wellsite.



P- and S-Dipole Inversion QC

Acquisition QC for X dipole	99.1% pass	0.9% warning	0.00% fail
Acquisition QC for Y dipole	98.9% pass	1.1% warning	0.00% fail
Acquisition QC for X and Y dipole combined	99.8% pass		
Dipole anisotropy	82.6% anisotropic	17.4% azimuthally isotropic	
Dipole anisotropy mechanism	1.4% intrinsic	49.2% stress	
VTI and alteration	12.5% alteration	4.5% VTI	

Figure 1. Sonic Scanner platform dipole shear results show indications of stress-induced anisotropy with alteration for a well offshore Asia. The shale intervals also indicate vertical transverse isotropy (VTI) anisotropy. A summary of the acquisition QC and interpretation flags is provided: The acquisition indicates valid shear and compressional data given the coherence and within the limits of the rock physics model.

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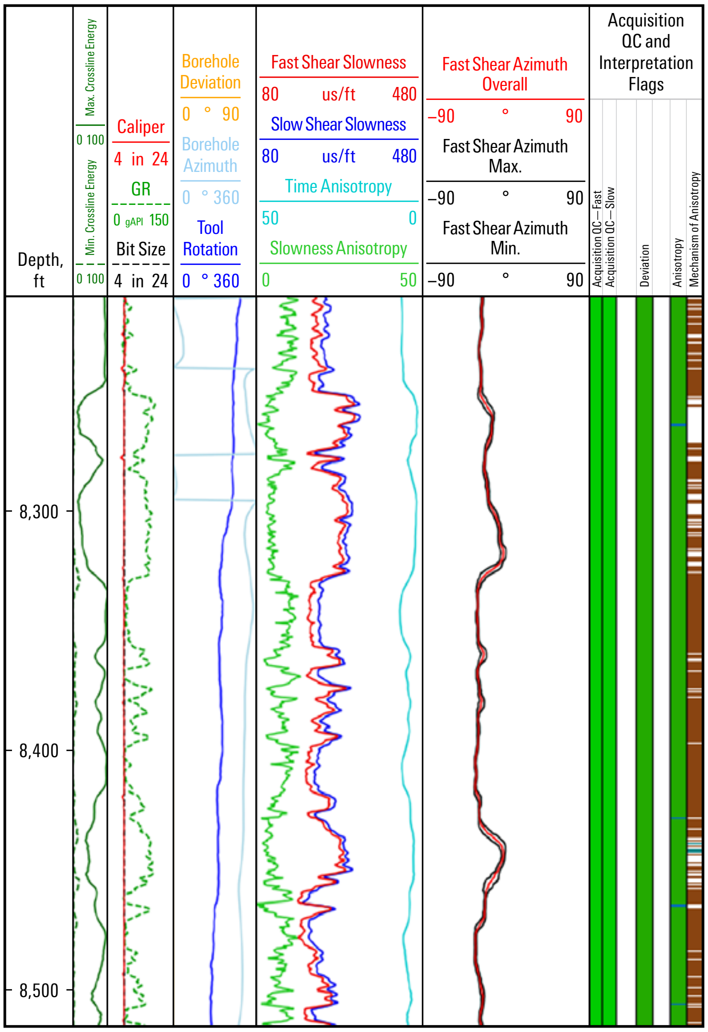
The digital advisor generated from the Sonic Scanner platform provides a simple QC, so you can check whether the fast shear slowness is less than the slow shear slowness and assess the mechanism.

The fast shear azimuth can then be displayed to, for instance, determine the direction of maximum horizontal stress (Fig. 3) and the V_P/V_S ratio as a function of the compressional slowness (Fig. 4) to identify fluids and lithology.



Anisotropy Dipole Inversion QC

Acquisition QC—fast	100.0% pass	0.0% warning	0.00% fail
Acquisition QC—slow	100.0% pass	0.0% warning	0.00% fail
Acquisition QC—fast and slow combined	100.0% pass		
Anisotropy	99.0% anisotropic	1.0% azimuthally isotropic	0.0% warning
Mechanism of anisotropy	1.4% intrinsic	49.2% stress	

Figure 2. The dipole anisotropy results for the same logged interval showing a consistent shear polarization direction with valid fast and show shear slownesses. The summary of the QC for the dipole anisotropy indicates that most of the section shows stress-induced anisotropy, which was also confirmed using the dispersion analysis.

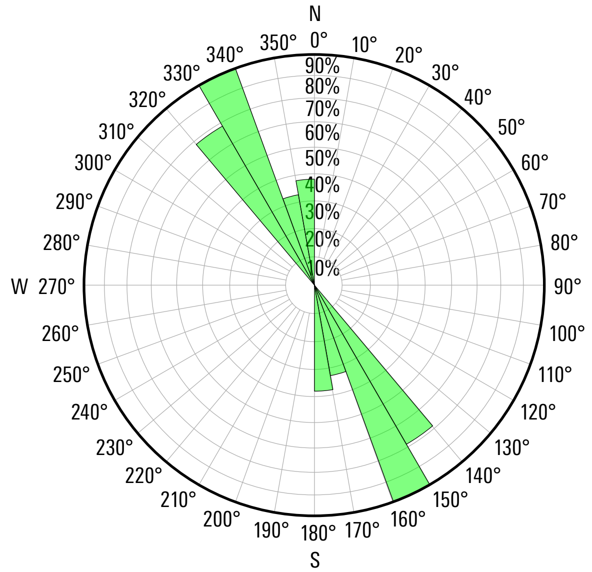


Figure 3. Fast shear azimuth for dipole anisotropy >5% indicates for this example the maximum horizontal stress direction.

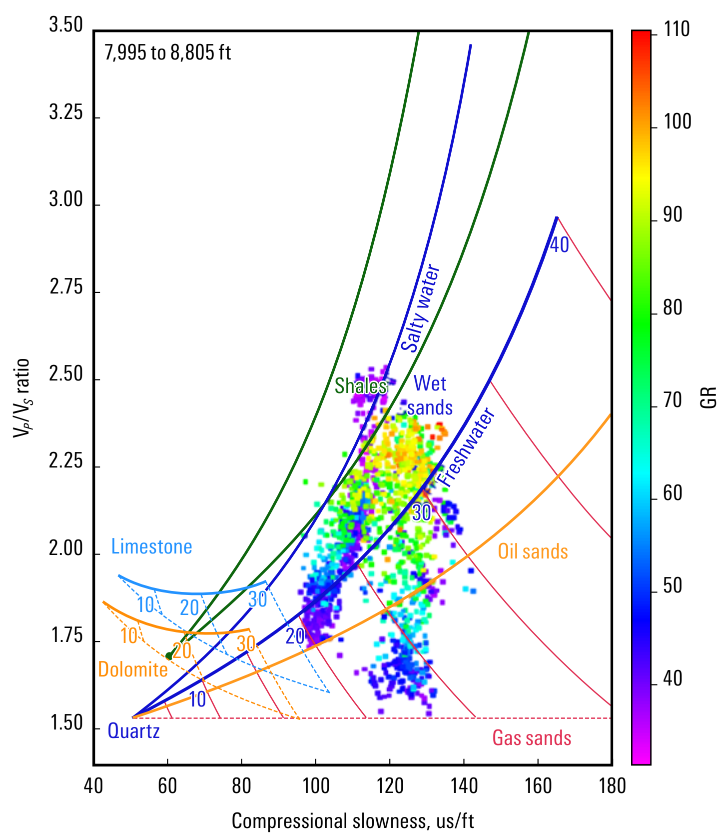


Figure 4. This crossplot illustrates changes in V_p/V_s for the respective lithologies (color is a function of shale content) as a function of the compressional slowness. The crossplot is also often used to discriminate light hydrocarbon-bearing intervals from water-bearing intervals.

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