Xaminer® Array Sonic Tool (XAST™) Service

ULTRA-RELIABLE CROSSED-DIPOLE SONIC TOOL

OVERVIEW

The Halliburton Xaminer® Array Crossed-Dipole Sonic Tool makes it easy to determine fast and slow shear-wave travel times and their orientation in the formation. With the XAST™ service, you can calculate minimum and maximum principal stresses and stress field orientation by combining oriented slowness data with overburden and pore-pressure data. This information is vital for geomechanical analysis, wellbore stability, and production enhancement-treatment design.

Sonic anisotropy and the orientation of the anisotropy can be used to determine the orientation of natural fractures. Sonic attributes such as P-wave slowness, fast and slow shear-wave travel time, identification of compressive fluids in the pore space, and anisotropy orientation allow for better 3D seismic analysis.

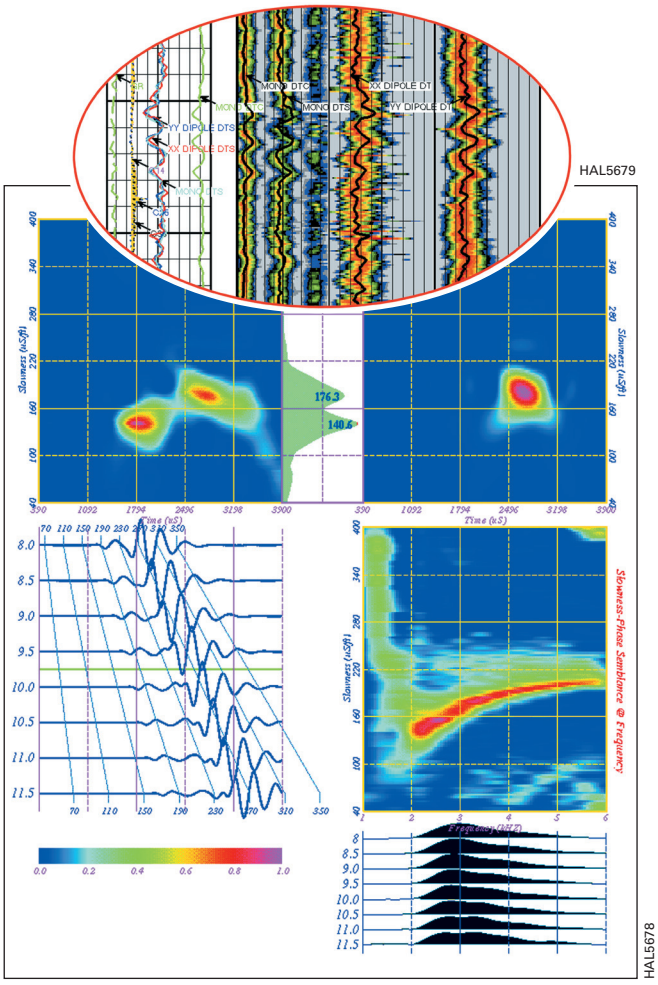
THE PRODUCT OF SUPERIOR TECHNOLOGY

The Halliburton XAST service provides simultaneous monopole and crossed-dipole sonic information. P-wave and S-wave slowness can be obtained in formation conditions ranging from poorly consolidated high-porosity gas-saturated sandstones to low-porosity carbonates. The flexural wave energy is propagated from two low-frequency, on-depth, crossed-dipole bender-bar sources.

The low-frequency flexural wave travels at the true shear slowness of the formation. The flexural-wave data dispersion analysis provides information about both the near and far fields. The broadband MP source provides information about fast formations and Stoneley data in slow formations.

BENEFITS

- Long-spaced monopole and broadband dipole sources for sonic slowness measurements in both the near and far fields
- Broadband 8-level, quad-receiver array for high-quality waveform data; all 128 waveforms for each set of transmitter firings are recorded at the surface for advanced waveform processing
- Can be combined with all LOGIQ openhole tools
- On-depth, low-frequency bender-bar source provides a clean source signal:
  - No need for dispersion corrections for slowness determination
  - No depth shifting of waveform data for anisotropy analysis
- Drillpipe-conveyed operations are possible

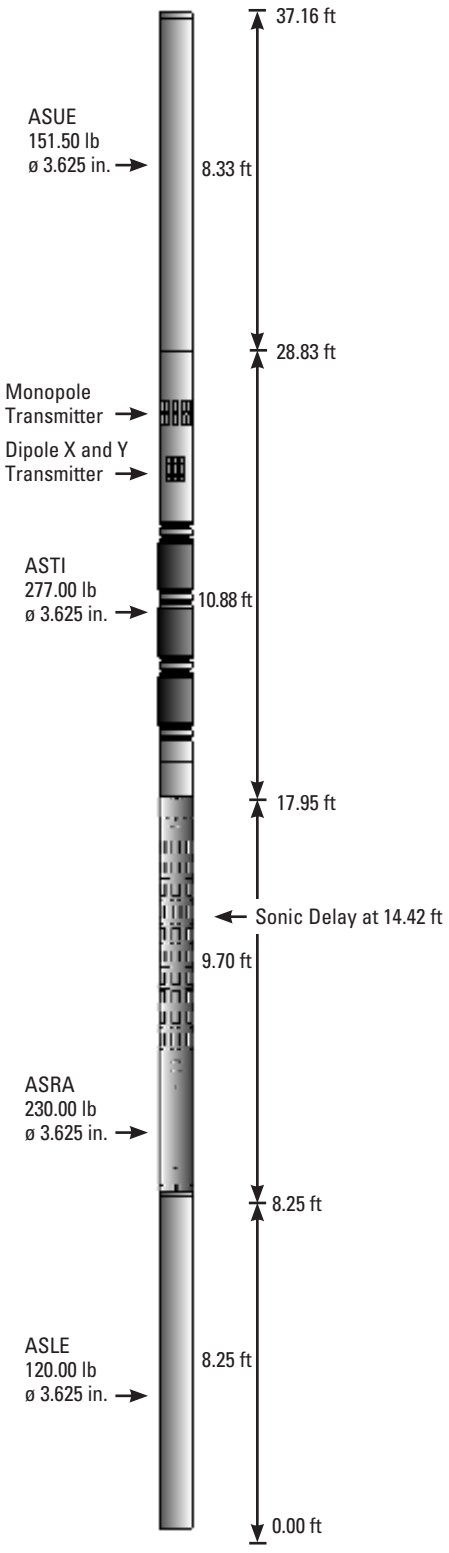


This is an example of a semblance diagnostic plot of the waveform data from the eight waveforms. In the circle is a section of a log showing monopole P-wave slowness and semblance quality, monopole-refracted shear-wave slowness and semblance quality, X-X dipole slowness and semblance quality, and Y-Y dipole slowness and semblance quality.

Xaminer® Array Sonic Tool (XAST™) Specifications

	Standard		DeepSuite™
Maximum Temperature	350°F (177°C)		
Maximum OD	3.625 in. (92.1 mm)		4.4 in. (111.8 mm)
Maximum Pressure	20,000 psi (138 MPa)		35,000 psi (241 MPa)
Minimum Hole	5 in. (127 mm)		6 in. (152.4 mm)
Maximum Hole	16.0 in. (406.4 mm)		
Makeup Length	37.16 ft (11.33 m)		
Weight	778 lb (352.9 kg)		1317 lb (597.4 kg)
Borehole Conditions			
Borehole Fluids	Saltwater, Freshwater, Oil		
Recommended Maximum Logging Speed	2 spf: 30 ft/min (9 m/min) 4 spf: 15 ft/min (5 m/min)		
Tool Positioning	Centralized		
Hardware Characteristics			
Source Type	Piezoelectric (Monopole); Benderbar (Dipole) X and Y Dipole sources at same depth		
Number of Receivers	32 (8 rings of 4 receivers)		
Receiver Type	Piezoelectric Cylinders		
Receiver Spacings	0.5 ft (15 cm)		
Firing Rate	1/sec		
Digitizing Interval	Monopole: 20.32 µs; Dipole: 40.63 µs; Stoneley: 40.63 µs		
Samples per Sensor	Monopole: 512, Dipole: 512, Stoneley: 512		
Measurement Bandwidth	Monopole: 5 to 20 kHz; Dipole: 0.5 to 10 kHz; Stoneley: 0.5 to 5 kHz		
Combinability	All LOGIQ® tools		
Measurement			
Principle	Δt_p, Δt_s, and Δt_{St}		
Range	Δt_p 40 to 250 µs/ft, Δt_s 60 to 600 µs/ft, Δt_{St} 185 to 500 µs/ft		
Vertical Resolution	0.5 ft		
Depth of Investigation	1 to 3 ft		
Primary Curves	Full waveforms (from Monopole, Dipole, and Stoneley firings) Δt_p, Δt_s (X & Y), and Δ_t Stoneley		
Secondary Curves	Poisson's ratio, Formation Anisotropy, Integrated Traveltime (ITT)		
Calibration			
Primary	N/A		
Secondary	Internal check		
Wellsite Verifier	N/A		
Physical Strengths*			
	Tension	Compression	Torque
Receiver Array (ASRA)	30,000 lb (133.44 kN)	5,000 lb** (22.24 kN)	600 ft/lb (813.36 Nm)
Isolator	30,000 lb (133.44 kN)	5,000 lb** (22.24 kN)	600 ft/lb (813.36 Nm)
Electrical Specification			
Tool Power	200 VDC		
Current	400 ma in Log Mode		
Measure Points			
	Measurement	Measure Point	Referenced from
	Δt_p, Δt_s, Δt_{St}	14.42 ft (Center Array)	Bottom of ASLE

* Strengths apply to new tools at 70°F (21°C) and 0 psi (0 MPa) and are limited by the ASRA.
** 5,000 lb in boreholes > 8 in.; 7,000 lb in boreholes from 6 to 8 in.; 9,000 lb in boreholes < 6 in.



For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com

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