QL40-FWS-S

Full Waveform Sonic

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The QL40 Full Waveform Sonic tool - QL40 FWSS - is mainly dedicated to the water, mining and geo-technical industries. Its design makes it ideal for cased-hole applications, open-hole applications, and fracture identification.
Sonic logs are widely used, often in combination with other logs, to provide porosity, permeability and geo-mechanical properties of the formation. Under suitable borehole conditions and lithology, compressional (P), shear (S), Stoneley and tube wave arrivals can be detected.

The QL40-FWSS tool is optimized for this application. It implements a high energy source generated by a ceramic-piezoelectric transducer which excites the formations. Real time display and analysis of the recorded full wave forms are performed by the tool.
The QL40-FWSS is supplied as a bottom sub of the Quick link (QL) product line and can be combined with other QL40 tools to form a tool string or it can be run as a standalone tool.

The tool can only be operated in a fluid-filled hole. Logging speed depends on tool configuration and acquisition parameters.

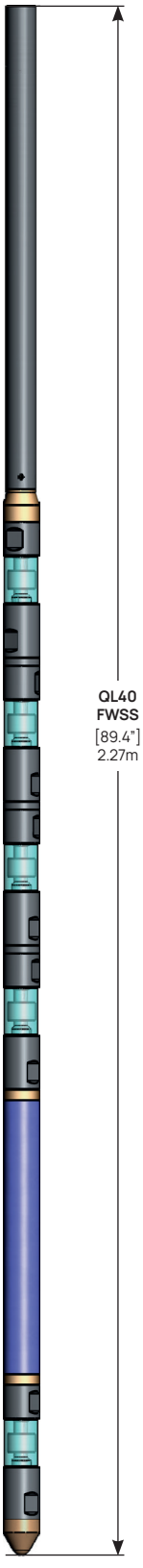
Application

CASED HOLE

- Cement bond logging (CBL)

OPEN HOLE

- Porosity evaluation
- Permeability
- Lithology identification
- Variation of rock strength
- Calculation of rock mechanical properties (elastic moduli, Poisson's ratio, shear modulus, Young's modulus, Bulk modulus and compressibility[1])
- Identification and hydraulic characterization of fractures



Tool

Diameter : 50mm (2")
Length : 2.27m (89.4") (1Tx-4Rx configuration)
Weight : 18kg (39.7 lbs)
Temp : 0 - 70°C (32 - 158°F)
Max. Pressure : 200bar (2900psi)

Sensor

Transducers : Ceramic piezoelectric with 15 kHz resonant frequency
Sonic Wave Sampling Rate : Normal Mode : 4 µs
Extended Mode : 20 µs
Sonic Wave Dynamic Range : 16 bits
Sonic Wave Sample Length :
Normal Mode : up to 4 ms
Extended Mode : up to 16 ms

Orientation sensor

Cable type : Mono, multi-conductor, coax
Compatibility : Scout Pro / Opal (Scout / Bbox / Matrix)
Digital data transmission Telemetry : Variable baudrate telemetry according to cable length/type & surface system
Logging speed : Variable. Function of Sonicwaves sampling rate and lenght, wireline and acquisition system
Centralisation : Required
Borehole conditions : Fluid-filled borehole
Open or cased borehole

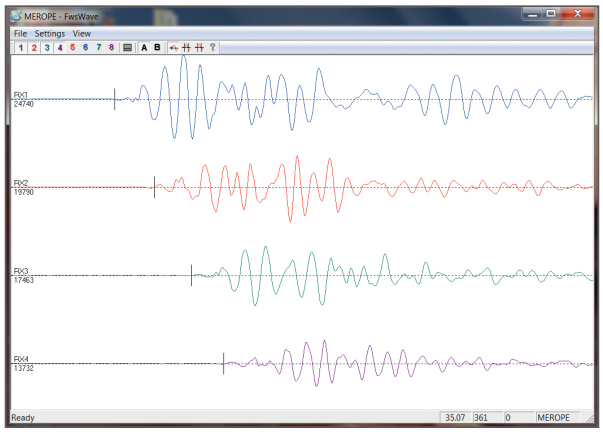
[1] When combined with density measurement (QL40-DEN)

Principle of measurement

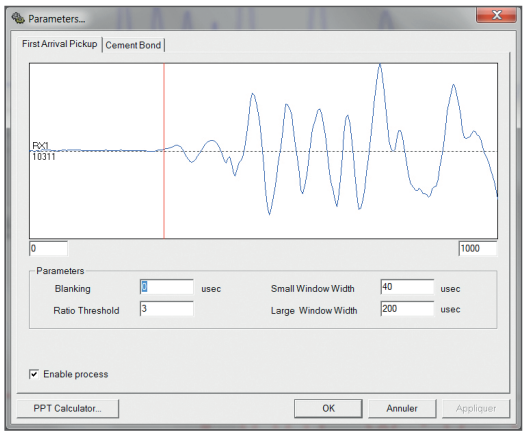
During logging, a series of high frequency sonic impulses are emitted by the tool. Following their passage through the borehole fluid and formations, they are detected by receivers at various distances from the transmitter. At each receiver the arriving waveform is digitally sampled according to a set of predefined tool configuration parameters (sample rate, sampling period).
The digitized waveforms are subsequently transmitted to the surface acquisition and recording system.

Measurement features

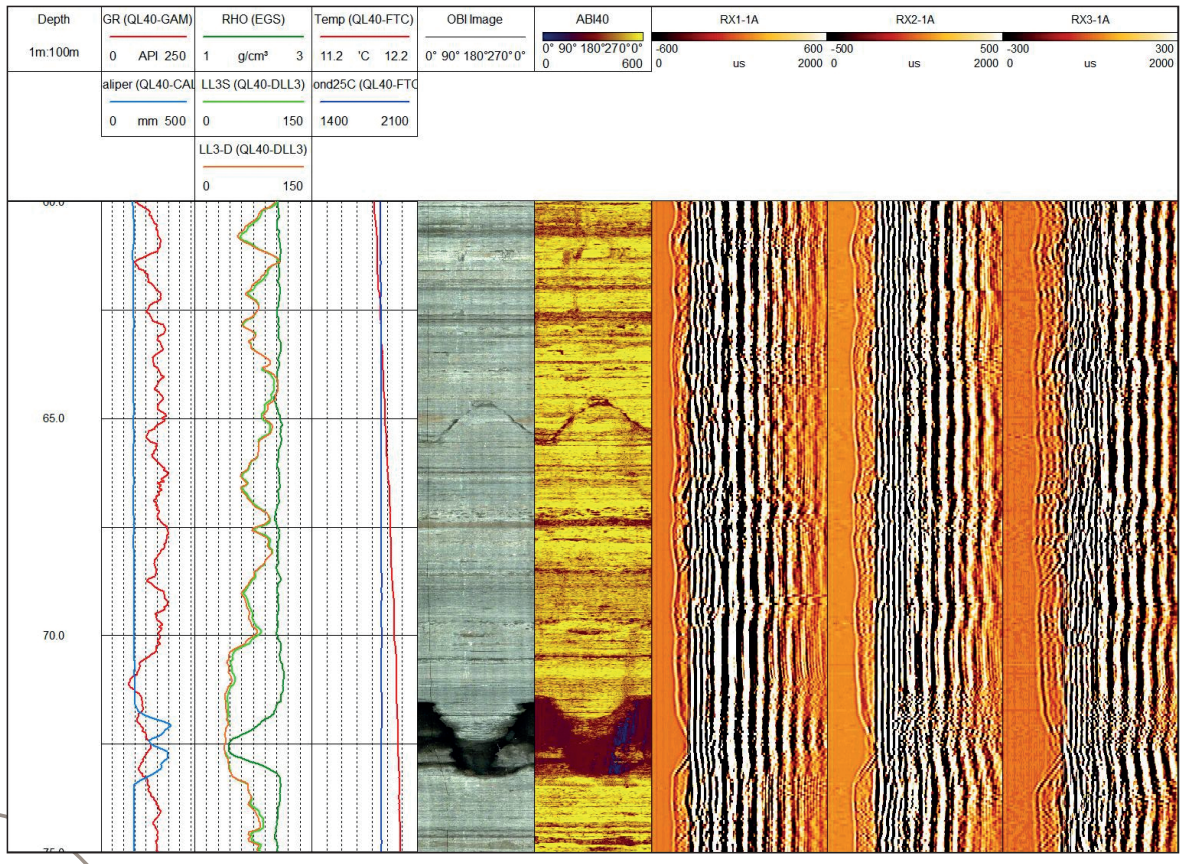
- Full waveform per receiver (VDL or wiggle)
- Real time P-wave velocity or slowness
- Real time CBL processing
- Additional post processing module recommended in WellCAD



Full Waveform browser



FWS processor : first arrival/CBL settings
for real time proccessing



Log example WellCAD browser and FWS module