



Well integrity

Solutions

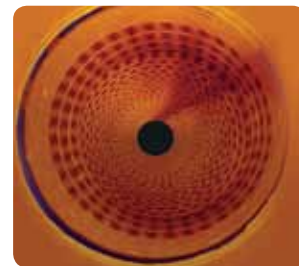
SYSTEM OVERVIEW



QL43 ABI
Ultrasonic cased hole imager



ALT logger - Logger suite
Acquisition system



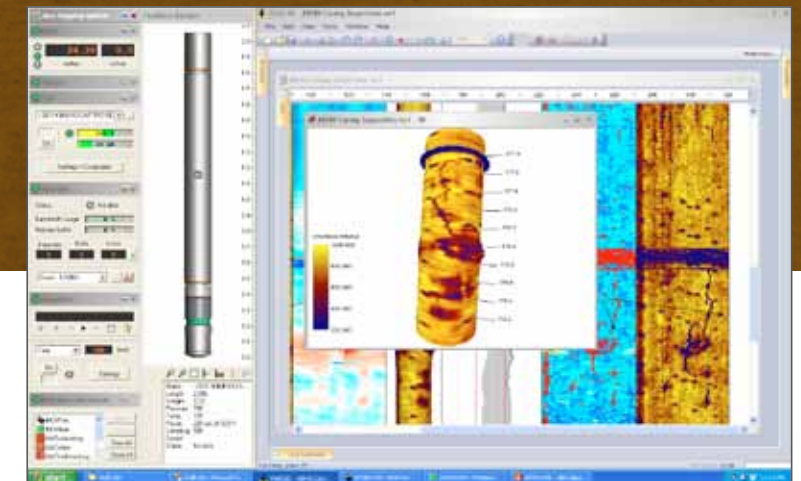
WellCAD®
Processing software

Since the company's foundation in 1993, **Advanced Logic Technology** has grown to become a globally recognized leader in developing solutions for the borehole logging industry.

With more than 20 years experience and holding patents in technology, the company has built a solid reputation for the design and production of state of the art **imaging tools** (acoustic and optical televiwers) and high-end data acquisition systems & software.

Since its first release in 1993, **WellCAD®** has provided support to the daily work of thousands of people dealing with borehole data. **WellCAD®** handles the entire data loading, log editing, analysis and presentation workflow. The modular architecture of **WellCAD®** allows users to easily activate expert modules to build a package tailored to their exact requirements and make it an attractive solution for small scale companies as well as large multinational corporations

ALT LOGGER ACQUISITION SYSTEM

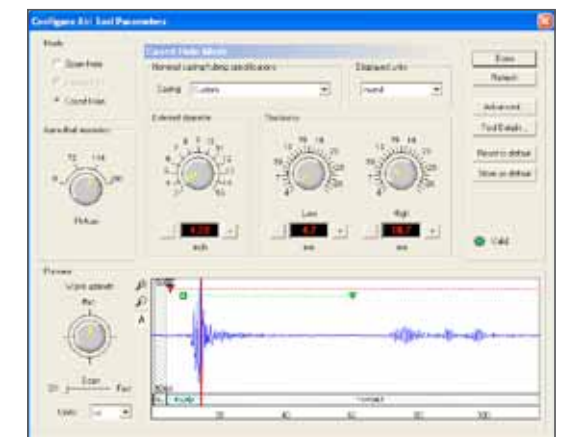


The ALTLogger is a modular and flexible acquisition system. Its standard configuration is optimized for the ALT tool telemetry protocol and provides high telemetry performance when running borehole logging tools on multi and single conductor cables. Its architecture allows easy integration of additional telemetry modems to support equipment from other vendors.

Whether mounted into a 19" rack or used in a light weight portable configuration the ALTLogger offers the unique combination of versatility, ruggedness and ease of use.

ALTLogger systems are operated worldwide in a diverse range of applications supporting also the Oil & Gas requirements.

Our systems are delivered with the LoggerSuite/ WellCAD® software package for acquiring and presenting your data sets in the most efficient manner.



QL43 ABI ^{NEW}

Ultrasonic cased hole imager

Technical specifications

Diameter	43mm (1 11/16)
Length	1.77 m (70")
Weight	10kgs
Max temp	170°C ^{NEW}
Max pressure	800 bar

Field exchangeable acoustic head*





Acoustic sensor	fixed transducer and rotating focusing mirror
Focusing	Collimated acoustic beam
Frequency	1.2 MHz - 0.5 MHz
Caliper resolution	0.08mm (0,003")

Deviation sensor	3 axis accelerometer
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Operating conditions

Cable type	mono, four-conductor, seven-conductor, coax
Compatibility	ALTlogger / Bbox
Digital data transmission	
Telemetry	variable baudrate telemetry according to cable length/type e.g : 7500 m (24600 ft) – 5/16" mono - 62500 bps 1800 m (5900ft) – 1/8 " mono – 222000 bpS
Logging speed	variable function of resolution, wireline and surface system required
Centralisation	
Borehole fluid	water based mud, brine, oil oil based mud not applicable

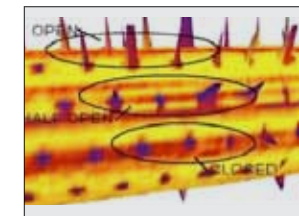
Field exchangeable acoustic head

	OPEN HOLE & CORROSION QL43 ABI HEAD OHCO-L 5" 1/2 x 15" depending on borehole conditions with a minimum of 5 mm thickness
	CORROSION SMALL PIPE DIAMETER QL43 ABI HEAD CO-S 2" 7/8 x 5" 1/2 depending on borehole conditions with a minimum of 3 mm thickness
	CEMENT ^{NEW} QL43 ABI HEAD CE-L 5" 1/2 x 15"
	CEMENT SMALL PIPE DIAMETER ^{NEW} QL43 ABI HEAD CE-S 2" 7/8 x 5" 1/2

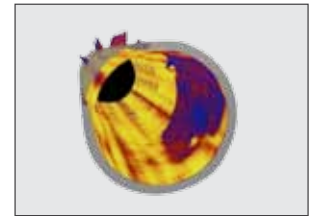
APPLICATIONS



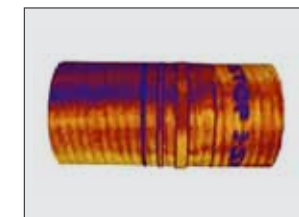
Perforation position & aperture



Internal/external casing surface imager



Internal casing diameter



External casing diameter



Applications

Casing inspection

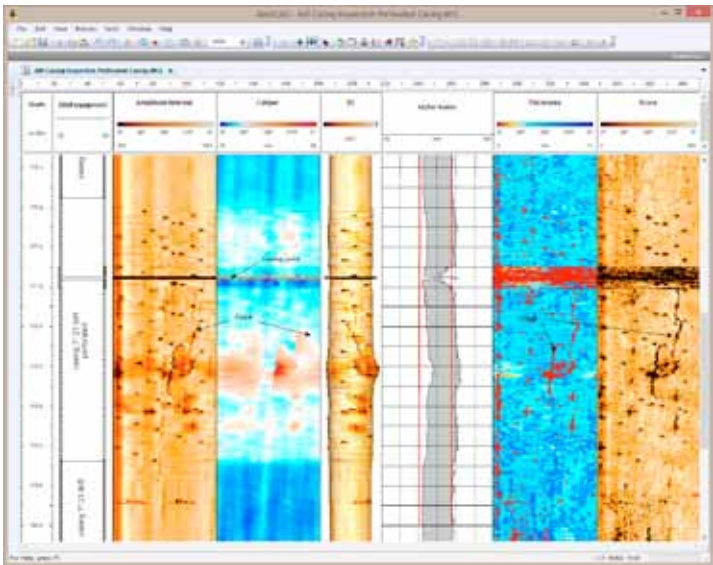
- Inside & outside diameter
- Casing thickness & corrosion rate
- Scale & hole detection
- Casing defects
- Casing wear & deformation
- Metal loss indicators

Cement evaluation ^{NEW}

- Cement location
- Cement channeling

FIELD DATA CASING INSPECTION

FIELD DATA CEMENT EVALUATION NEW



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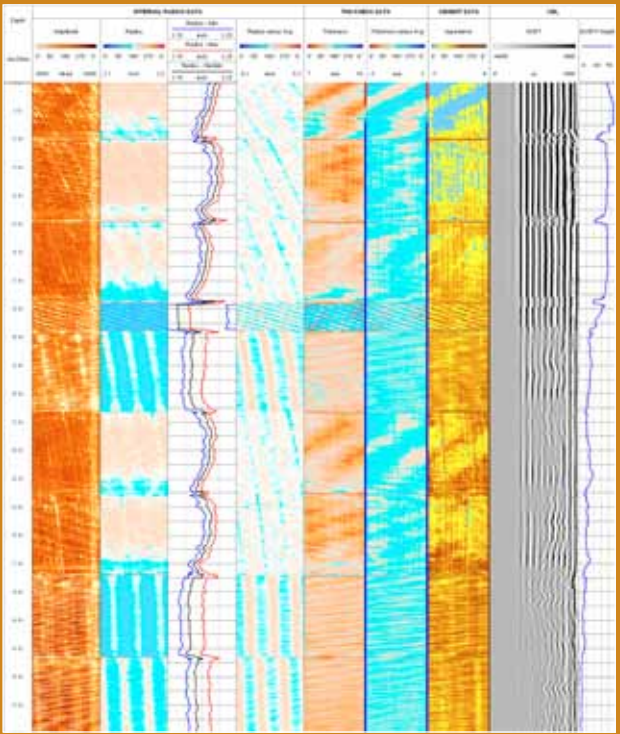
Inspection of a 7" casing (23lbs/ft) with the QL43-ABI and OHCO-L acoustic head

Image log azimuthal resolution:
72 pts over the circumference (6.9 mm – 0.27")

Image log vertical resolution:
3mm (0.12")

Features demonstrated:

- Image log of the inside of the 7" casing
- Casing inner diameter measurement – casing geometry and 3D visualization
- Steel thickness measurement
- Perforations and cracks induced by the blasting operations



New developments in ultrasonic processing, together with availability of downhole processing power permitted the improvement of the thickness measurement and implementation of cement bond imaging

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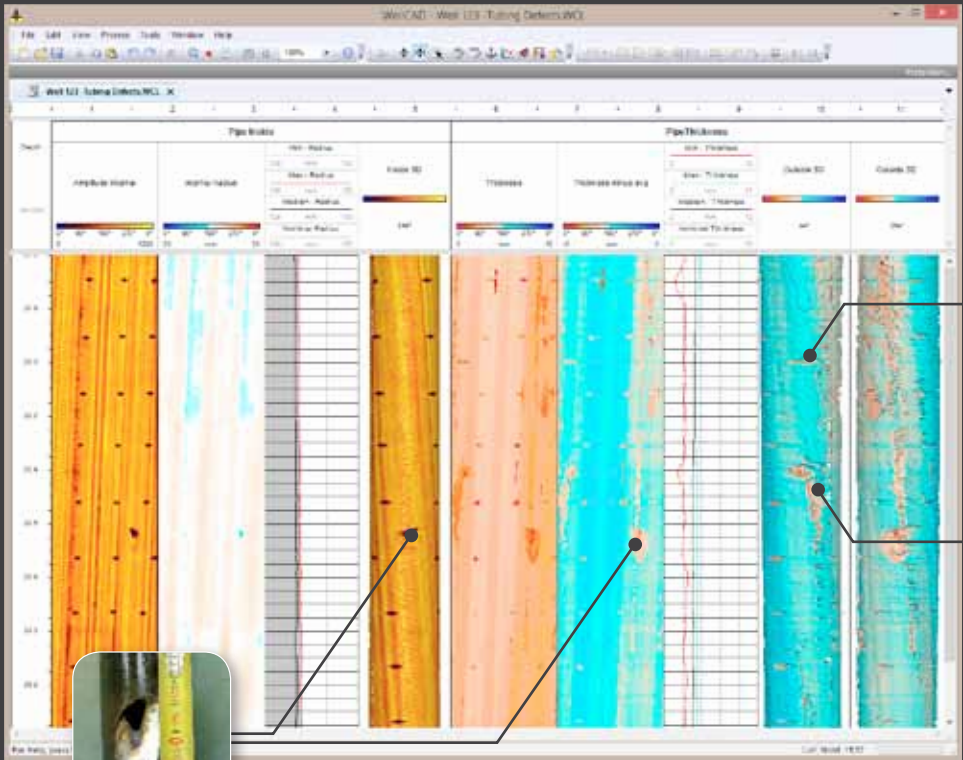
Ultrasonic logs recorded in a perforated 2 7/8" tubing with the CO-S acoustic head model.

Image log azimuthal resolution: 144 pts over the circumference (1.31 mm – 0.05")

Image log vertical resolution: 3mm (0.12")

Features demonstrated:

- Image log of the inside of the 2 7/8" tubing
- Tubing inner diameter measurement – tubing geometry and 3D visualization
- Steel thickness measurement
- Perforations



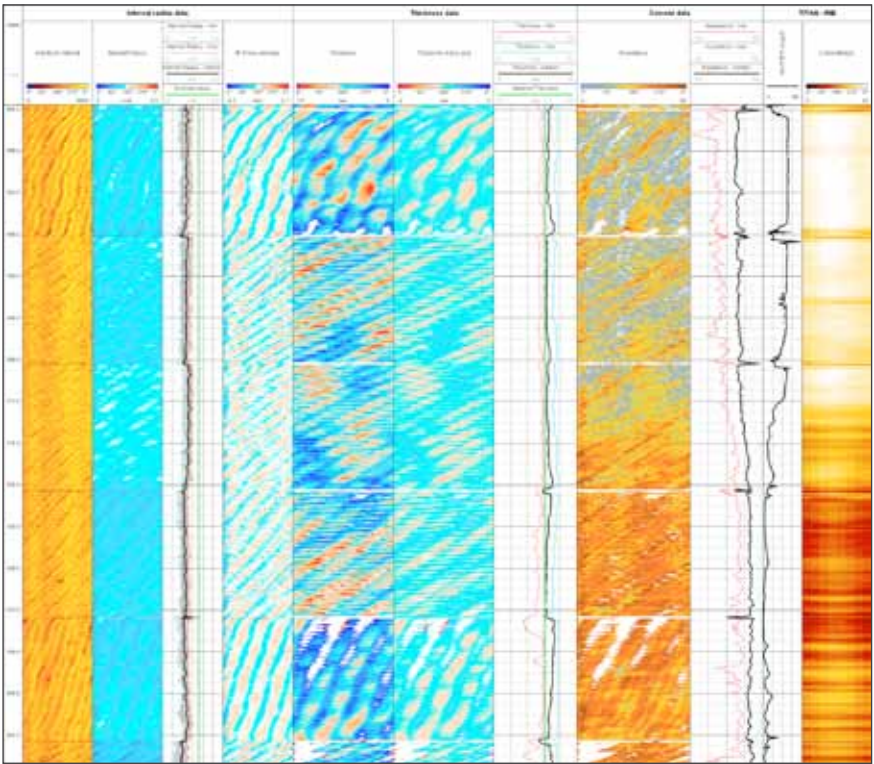
Defect#3



Defect#1



Defect#2



◀ ◀ ◀

Cement evaluation and distribution behind a 7" casing. Comparison log with radial CBL.

Image log azimuthal resolution: 72 points over the circumference (6.9mm – 0.27")

Image log vertical resolution: 5mm (0.2")

Features demonstrated:

- Image log of the inside of a 7" casing
- Casing inner diameter measurement
- Steel thickness measurement and corrosion evaluation
- Cement distribution showing cement quality and channels
- Cement acoustic impedance log
- Comparison with radial CBL

Defect#1 : 1.0cm (0.39") planar cut on casing external surface

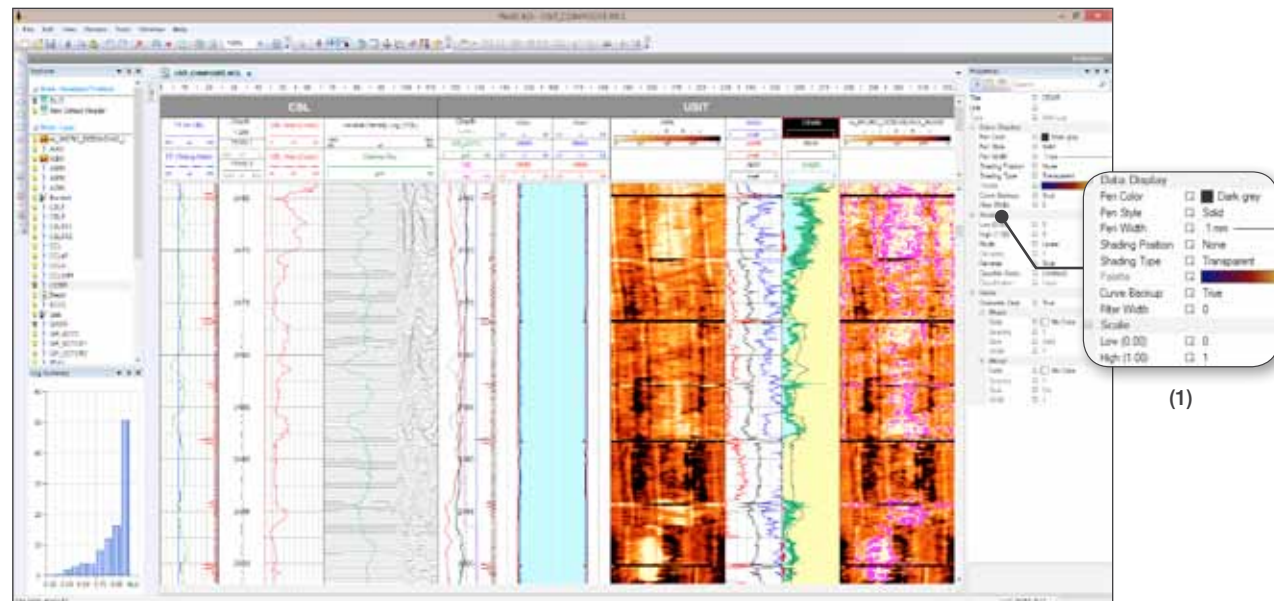
Defect#2 : 3.0cm (1.2") planar cut on casing external surface

Defect#3 : 10.0cm (3.9") oblique cut intersecting the inner casing surface – hole size: 2.5cm (1")

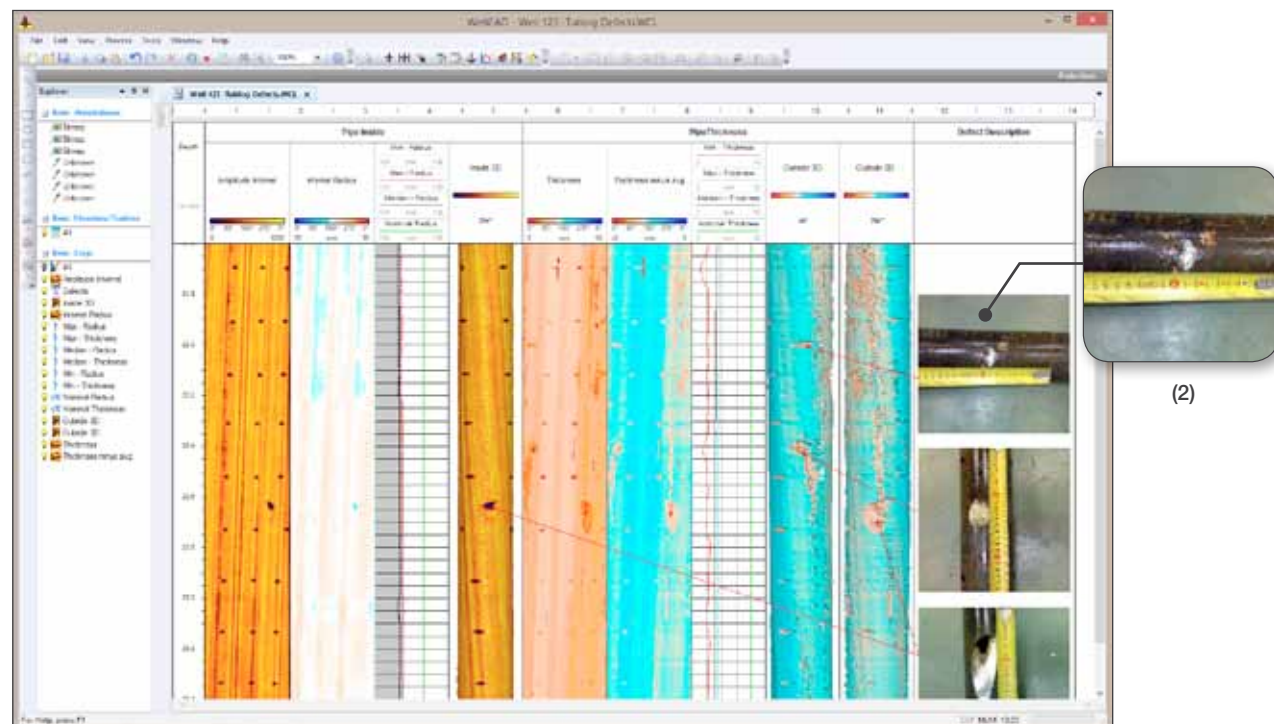


WELLCAD® V5.0 FOR WELL INTEGRITY DATA

Tool manufacturer independent toolbox for casing
and cement evaluation data



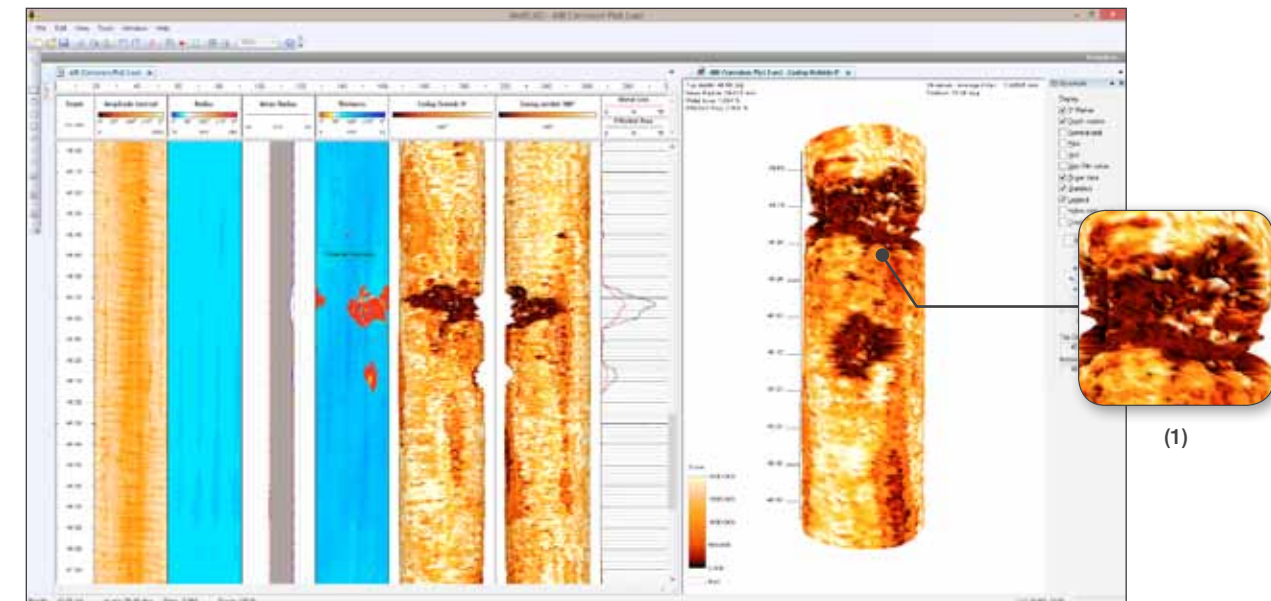
WellCAD® main view showing a cement bond composite plot. Data imported from DLIS files.



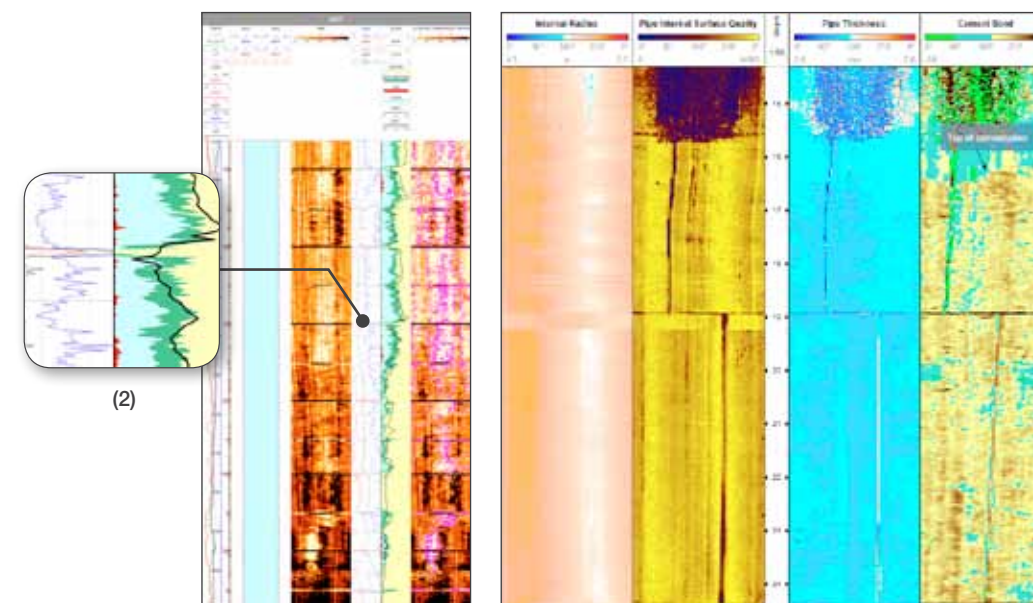
Report with description of tubing defects in WellCAD® using 2D,
3D data representation and annotations.



ULTRASONIC CASING AND CEMENT EVALUATION



Track 2 + 3 show the surface quality and traveltime derived radius image of pipe inside. In track 5 the pipe wall thickness image is presented. The data presentation is completed with 3D views of the defect on the pipe outside. The WellCAD workspace provides an integrated an interactive 3D viewer (on the right).



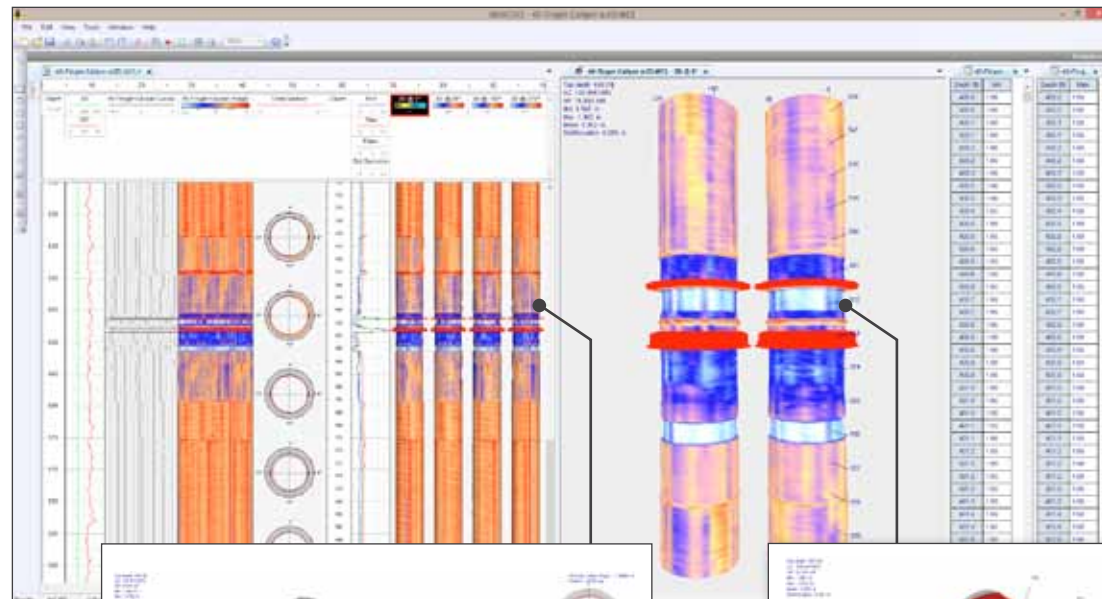
Cement bond examples from Schlumberger and ALT tools

- (1) Comprehensive data presentation settings including custom value to color maps.
- (2) Floating text and bitmap annotations referenced by depth. A dedicated Annotation Editor allows control of data i/o.

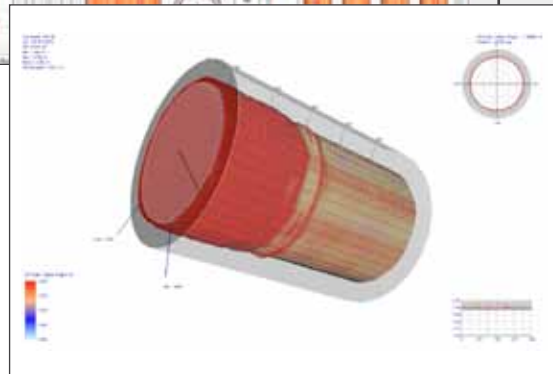
- (1) Fully interactive 3D viewer integrated into the WellCAD workspace and directly linked to the 2D data display.
- (2) Interval and Multi Log Statistics for array or single point data (min, max, mean, median, mode, std. deviation, sum, area, quartiles,...).



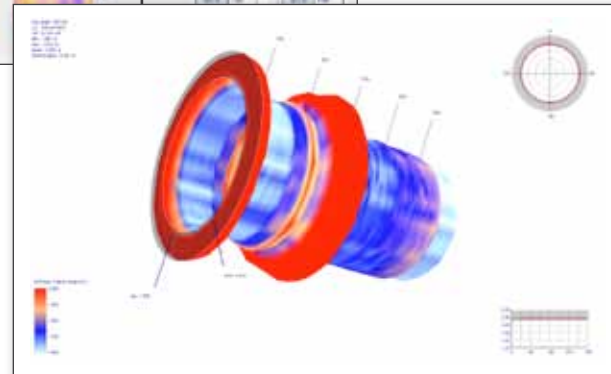
MULTI ARM CALIPER



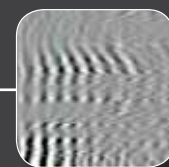
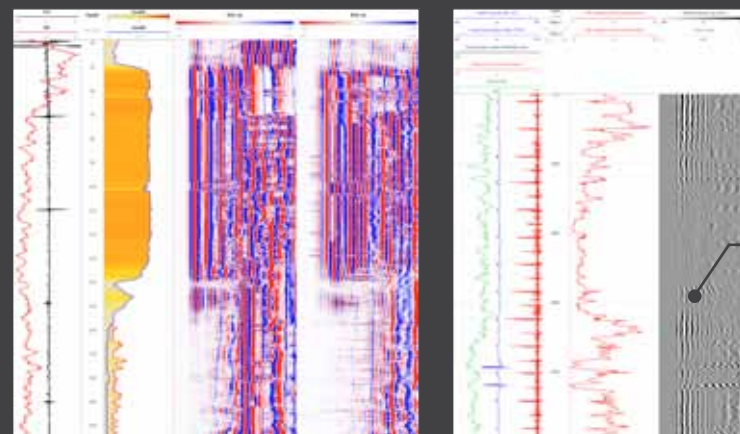
PMIT multi arm caliper data processed in WellCAD® and displayed in 2D and 3D workspaces.



3D View with synthetic pipe overlay



CEMENT BOND LOGGING (CBL)



(1)

Fixed and Sliding Gate derived CBL data (WellCAD® processed) along with VDL from different receivers (left). CBL data import from industry standard DLIS file (right).

(1) More than 27 data container types to choose from including wiggle, b/w and custom color map vdl.



WELLCAD® SPECS*

Data Import

- Industry standard LIS and DLIS files
- LAS 2.0 and custom ASCII files
- WITSML
- Custom and vendor specific formats

Data & Graphic Export

- Industry standard LIS and DLIS files
- LAS 2.0, LAS 3.0 and ASCII files
- Custom Formats
- PDF, CGM, JPEG, TIF, PGN, ...

Interactive 2D & 3D Data Presentation

- Configurable display of curves, patterns, symbols, text, zone markers, hierarchical columns, color coded array data, wiggle traces, vdl, photographs, well schematic, cross sections, ...
- Overlay of annotations (text, pictures, callouts, operational symbols) organized in multiple layers
- Unlimited number of data containers to store and manage single point, interval and array data
- Customizable layout templates
- Tabbed or floating multi window graphical and tabulated data display
- Selection of application appearance schemes
- Integrated interactive 3D viewer
- Audit trail for each data set recording each processing step
- Customized headers and trailers

Data Processing

- Log editing: filter, resampling, bad trace or data interpolation, depth shifting (block, stretch & squeeze), merge or slice, math editor for curves, volume calculation, deviation data processing
- MFC: conditional testing, centralization, statistics, data re-orientation, metal loss, volume calculation, 2D & 3D cross sections
- CBL: filter algorithms, first arrival picking algorithms, amplitude extraction (fixed and sliding gate), data calibration
- Ultrasonic: centralization, conditional testing, filter algorithms, fluid velocity computation, travelttime to caliper, thickness calculation, metal loss, data re-orientation, statistics, 2D & 3D cross sections synthetic pipe overlay
- Copy and paste between WellCAD and EXCEL (and vice versa)
- Automation module for batch processing, custom processing algorithms or report creation

System Requirements

- Supports Win 2000, Win XP, Win 7, Win 8 and Win 8.1,
- Min. Intel Pentium III or equivalent, min. 512 MB RAM, min. 250 MB disk space

Support & Training

- WellCAD is fully documented and installs with a context sensitive help system. Support is provided via email, phone and in online meetings. Public workshops as well as customized training sessions are provided worldwide.

* This is an extract of the WellCAD specs suitable for Well Integrity data. For a full description of WellCAD and its various add-on modules for wellsite geology, core description, image & structure analysis, automation, multi well correlation,... please contact sales@alt.lu.



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