

Barrier Assessment Analysis Multivariable Threshold Cement Evaluation

RAPID DATA PROCESSING TO REVEAL BOND QUALITY AND IDENTIFY THE TOTAL CEMENT IN PLACE

FASTER DECISION MAKING

The Halliburton Barrier Assessment Analysis multivariable threshold cement evaluation workflow addresses cement evaluation challenges quickly, enabling easier decision making. It identifies qualified barriers in a well using cement bond data and predefined parameters. Barrier definition criteria are input and qualify whether the cement bond log information meets or surpasses the set thresholds and specifications. The Barrier Assessment Analysis workflow is notably valuable to asset decommissioning and new well drilling, where critical decisions regarding well-barrier integrity can result in improving operational efficiencies.

BENEFITS

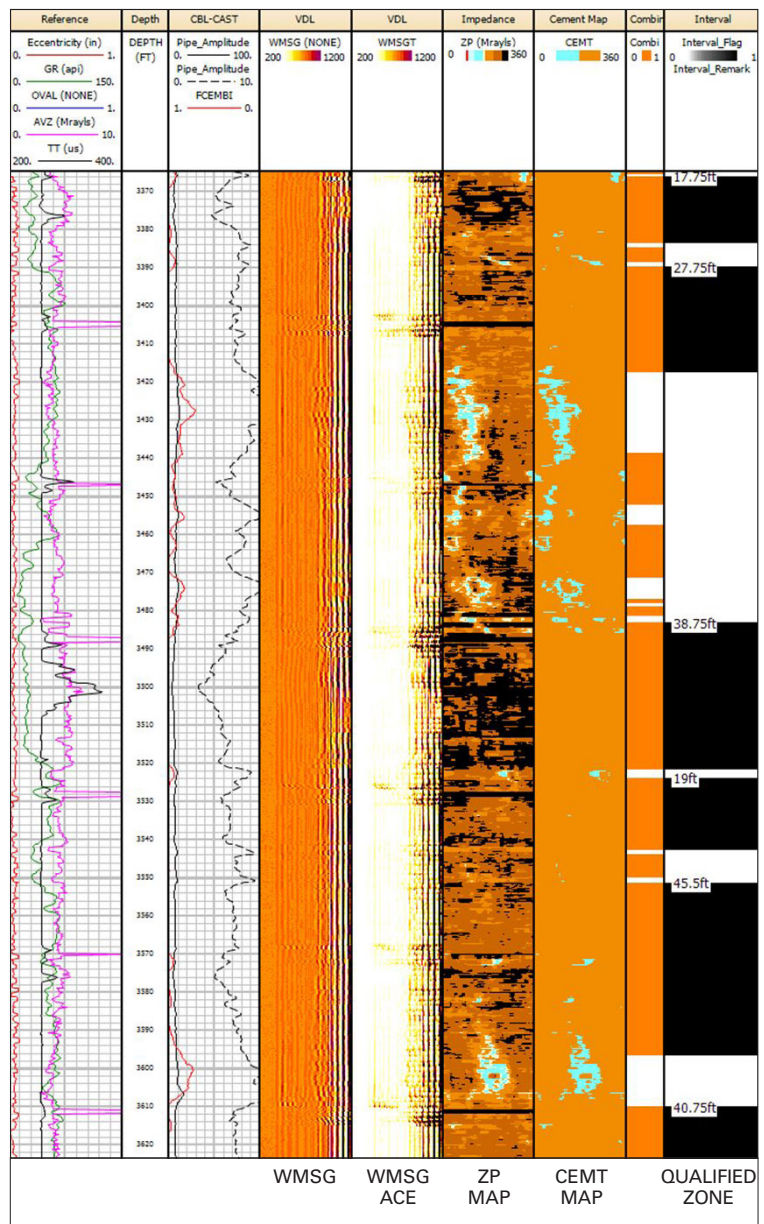
- » Give confidence in the quality and quantity of cement in place
- » Enable faster decision making through clearer results
- » Remove ambiguity when determining if remedial work is required
- » Reduce customer operational expense

FEATURES

- » Determine quantity of cement bond in near-real time
- » Assess the well against a defined criteria or operator standard
- » A succinct summary page accompanies every analysis

HOW IT WORKS

The algorithm filters raw and derivative acoustic data through a predetermined definition of good cement based on log responses to discriminate well intervals that possess proper cement bond and designated vertical coverage.



An example log showing areas of qualified zones (in black) dictated from criteria set by customer. These shaded areas, on the right-hand side, are considered constitutes to isolation barriers as they fall within the parameter restrictions.

TOOL STRINGS AND DATA

The workflow can be applied to data from a wide variety of logging tools and data, including:

- » Circumferential Acoustic Scanning Tool (CAST™)/Cement Bond Log (CBL) service
- » CAST/BSAT service
- » CAST/Radial Bond Tool (RBT) service
- » RBT service
- » BSAT service
- » CBL service

EXAMPLE OF ACCEPTABLE CRITERIA FOR QUALIFIED BARRIERS

The example shown, on the left-hand side, features thresholds set to meet customer and/or regulatory criteria:

- » AMP – CBL pipe amplitude
- » FCEMBI – Circumferential coverage of cement bonding
- » ECC – Tool eccentricity
- » ZAVG – Average impedance

An assessment was made against a criteria of 100-ft MD of acceptable cement and a 10-ft MD continuous interval.

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RESULTS FROM ANALYSIS

Company:
Well: Example
Field:
Unit Set: ft

Input Curves	Source
Threshold 1 Curve	AMP
Threshold 2 Curve	FCEMBI
Threshold 3 Curve	ECC
Threshold 4 Curve	AVZ

Parameters	Value
Top of Search Window	3130
Base of Search Window	3960
Minimum Cement Required	100 ft
In search window look for at least one continuous interval of	15 ft
Minimum height of cement from search window to contribute to total count	3 ft

Parameters for Zone 1	Value
Top of Zone	3365 ft
Base of Zone	3675 ft
Threshold 1 Parameters (AMP)	
Cutoff	< 8
Sensitivity	+/- 0.5
Threshold 2 Parameters (FCEMBI)	
Cutoff	> 0.85
Sensitivity	+/- 0
Threshold 3 Parameters (ECC)	
Cutoff	< 0.2
Sensitivity	+/- 0
Threshold 4 Parameters (AVZ)	
Cutoff	> 3
Sensitivity	+/- 0

Continuous Intervals:

Interval of	45.5 ft
Starts at	3551.25
Ends at	3596.5

Interval of	40.75 ft
Starts at	3610
Ends at	3650.5

Interval of	18.75 ft
Starts at	3652.25
Ends at	3670.75

Continuous Intervals:

Criteria	Met?
Continuous Interval	YES

Summation of Total Threshold Meeting Cement:

Summation Window	Depth
Start of window	3960
End of window	3130

The criteria summations listed below were only carried out within this window

Criteria	Met?
100 ft cement	YES
Total of criteria-meeting cement	252.75 ft
Total of criteria-meeting cement of at least 3 ft	248.75 ft

Total: 252.75 ft of criteria-meeting (including discontinuous) cement in window, of which 248.75 ft is made up of segments of at least 3 ft

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