

# Halliburton Technology Helps Identify Annular Shale Barriers for P&A Operations

## STANDARD MONO-CONDUCTOR CEMENT EVALUATION TOOLS AND ROBUST DATA PROCESSING HELP CLIENT AVOID COSTLY REMEDIAL WORK

NORTH SEA, NORWAY

### CHALLENGE

- » Identifying shale annular barriers efficiently with standard cement evaluation tools

### SOLUTIONS

- » Deploy the Halliburton Circumferential Acoustic Scanning Tool – Mono-Conductor (CAST-M™) service in combination with the Radial Cement Bond Tool (RBT-M) and Multifinger Imaging Tool (MIT) to log the cement and shale annular barrier
- » Develop a robust road map for identifying and quantifying the shale annular barrier

### RESULT

- » Halliburton was able to identify the shale barrier and allow the client to continue with the plug and abandonment operation without the need for any remedial work

### OVERVIEW

Shale can cause major problems during drilling and casing running operations. However, shale can prove extremely useful during plug and abandonment (P&A) operations, particularly if there are concerns regarding the cement bond quality. Identifying shale barriers can help the customer avoid costly and time-consuming remedial work.

In this case, local regulations covering P&A operations permit the use of formations as an annular barrier as long as they meet certain criteria on the logged data.

To save rig time, an innovative and efficient approach to barrier assessment is essential in the P&A market.

### CHALLENGE

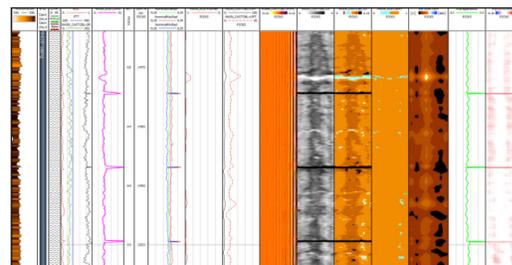
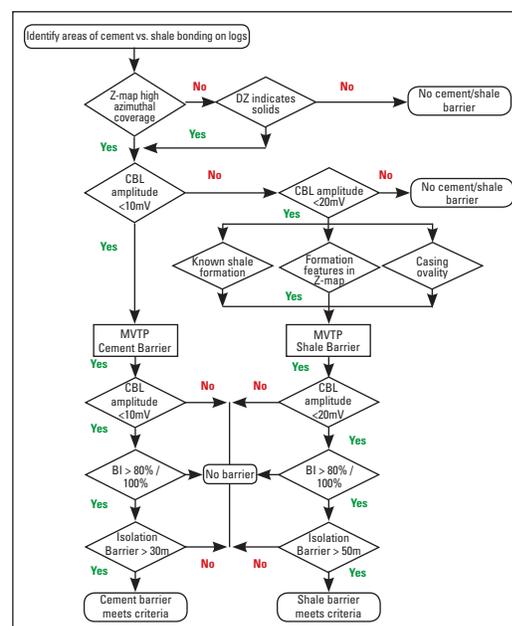
Can we use standard cement evaluation logging tools to quantify both the cement in the annulus and any shale barrier in one run?

The client required a quick turnaround of shale barrier competence to enable them to continue seamlessly with their operations.

### SOLUTIONS

Halliburton proposed the use of the CAST-M™/RBT-M/MIT tool string to log the cement and shale in one run. The CAST-M tool allowed high-resolution analysis of the annular material using mono-conductor wireline, a clear advantage over our direct competitor.

The CAST-M tool was also enabled to store the raw waveforms in the downhole tool memory to give Halliburton the highest resolution possible. By running the



The high-level road map allowed for a quick analysis of the cement and shale barrier by looking for shale formation features in the CAST-M™ impedance map and ovality in the casing inspection data acquired simultaneously.

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RBT-M tool in combination with the CAST-M tool, Halliburton was able to provide a secondary radial map that added extra confidence in the results.

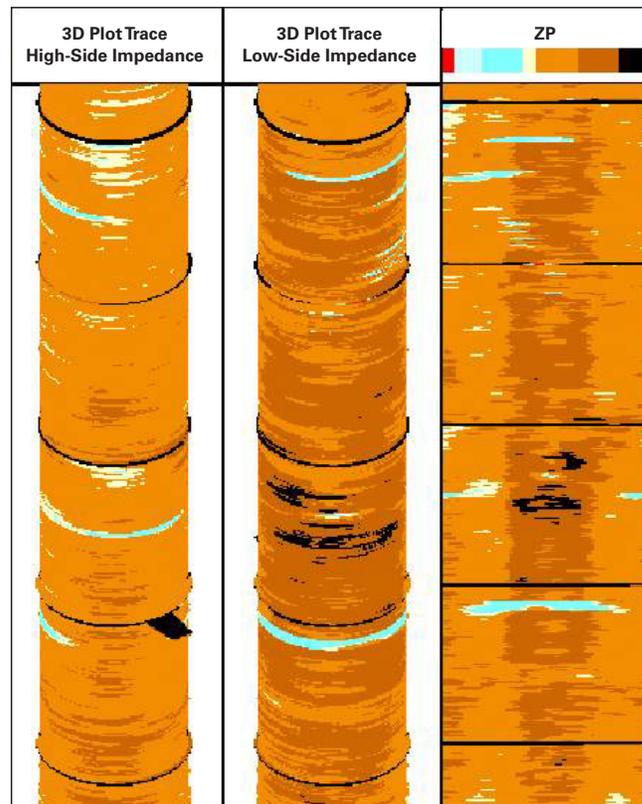
In close collaboration with the client, the Solutions Advisor designed a comprehensive road map for identifying and quantifying the shale barrier. Using the Halliburton Multi-Variable Threshold Processing (MVTP) methods, the cement evaluation data could be efficiently analyzed.

**RESULT**

The Halliburton cement evaluation tool string (CAST-M/RBT-M/MIT combination) was able to successfully identify the cement and displaced shale in the annulus in one run. The combination of the CAST-M impedance map and the RBT-M cement map provided extra confidence in the azimuthal shale coverage.

The shale identification road map, along with MVTP, allowed the log analyst to quantify the shale barrier and demonstrate to the client that they had enough competent shale to act as a barrier for P&A. A quick-turnaround analysis was performed by Formation Evaluation and Reservoir Solutions (FERS) so that the client could decide on the forward plan before the logging tools were even rigged down.

As a team, we collaborated together to move quickly and effectively to the next step of the operation.



The 3D plots showing shale barrier throughout the area creating a seal/barrier for P&A.

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