TETRA TECH RPS ENERGY | TRAINING

N529: Well Integrity Cement Evaluation

Instructor(s): Gary Frisch

Format and Duration

Classroom - 0 Day
Virtual - 3 Sessions

Summary

The evaluation of cement bonding and zonal isolation is a challenge that the oil and gas industry face as wells are drilled deeper and within more hostile environments. This seminar will cover the use of both sonic and ultrasonic tools to determine the presence or lack of a cement sheath. The quality of the cement sheath is not only important for completion efforts but may also be needed to satisfy regulatory requirements. The cement Basic tool theory, quality control, interpretation of field logs, and methods of evaluating both complex cements and difficult environments will be covered. Both new and well abandonments cement examples will be examined and evaluated.

Business Impact: The understanding of cement bond logs and their use will allow operators to maximize the economic life of the well from the initial completion to abandonment. The correct evaluation of the cement sheath will provide confidence in the environmental and safety of the wellbore for the desired completions.

Learning Outcomes

Participants will learn to:

1. Evaluate and QC of standard cement bond log; radial and segmented cement bond log and ultrasonic and rotating bond logs.
2. Examine cement evaluation logs to determine TOC and channels.
3. Determine complex completions and cements using computer programs or processes.
4. Distinguish common pratfalls in cement evaluation.

Training Method

This is a classroom or virtual course comprising a mixture of lectures, discussions, case studies, and workshop exercises.

Course Content

1: Tools Covered

- Sonic
  - Cement Bond Log (CBL)
  - Radial Bond Log (RBL)
  - Segmented Bond log (SBL)
- Ultrasonic
  - Scanning Ultrasonic (USIT, CAST-V)
  - Newest Generation Ultrasonic (ISOLATION SCANNER.CAST-I)

2: Standard cement evaluation for the covered tools

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- Calibrations
- Quality Control
- Interpretation of field logs

3: Environmental effects on logs responses for the covered tools

- Thin cement sheaths
  - Third interface echo
- Microannulus
- Borehole shape
- Fast formations
- Cement curing time

4: Advanced cement evaluation

- Derivative analysis
  - Raw Data
- Composite

5: Advanced Waveform Analysis

- CBL
- Multiple waveforms
- Radial
- LWD

6: Interpretation of supplied logs

7: Sophisticated analysis

- Well abandonment
- Multistring
- Shale barrier

The specific subjects below could be incorporated as part of the workshop

Understanding the Isolation Scanner tool, sensors and output signals ("ABC for dummies")

- Isolation Scanner tool technicalities & specs (show some pictures and sketches)
- Generic understanding of how the IS ultrasonic and acoustic sonic tools work, and outputs signals/units
  - AI vs FA

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  - VDL vs CBL
  - Third Interface Echo
  - CCL
- Measurement units of output signals
- Resolution of tools/outputs
- Cement Bond Log
- Bond Index (Techlog)
- Solid-Liquid Gas Map (Techlog)
- Annular Content (Techlog)

Log quality control

- Tool calibration (including output value sensitivity)
- Free Pipe calibration (including input parameters needed for correct log output)
  - How, where and what? Execution of the free pipe calibration?

Log interpretation with practical examples

- Cement vs formation vs liquids (annulus content)
- Mix of cement and formation vs clean cement (including definition of TOC)
- Thresholds for a hydraulic sealing cement and/or formation barrier.
- Do industry standards exist and are they defined worldwide
  - Defining "High", "Moderate to High", "Moderate" and "Low" quality bond.
  - Definitions are based on what? Does any standards exist or papers or documentation best practice/cut-offs to use for (CBL, AI, FLEXATTN? and combinations thereof?)
- Effects and examples of:
  - Eccentricity
  - casing wear / poor quality casing
  - Connections
  - Annulus fluid type
  - Deviation
  - Pressures inside casing
- Logging annulus between casings (higher uncertainty?)
- How to use the "Third interphase Echo" in the interpretation
- Show examples of deformed and poor quality casing e.g. ovality, holes
  - The most trustable output parameters (ranking; example AI vs VDL etc)?

Practical understanding

- What defines the logging speed?
- What will be the tripping speed if not logging?
- Risk involved attempting logging if the casing is "tight" or partly "tight"?
- Intro to other available CBL/IS/Cased hole logging analysis software?

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Student Presentations

- Discussion and solution of their own “problem” log