

CEMENT INTEGRITY EVALUATION

DRL041

COURSE OVERVIEW

The cement sheath behind the casing is the first barrier between the reservoir and the surface. Any failure, either during the placement or in the first hours following the cement job, can lead to catastrophic consequences related to safety and costs related to safety and environment. The cement sheath integrity is also a key factor controlling the life of the well. The development of fluid migration paths in the annulus or fractures can dramatically shorten the life of the well and reduce its value. Therefore, it is extremely important to understand and control drilling, cementing, and well completion parameters, all of which can affect the integrity of the cement sheath for the entire life of the well.

Various techniques exist to evaluate the cement integrity, either directly or indirectly. All of these techniques (hydraulic pressure signature, material balance, LOT/FIT, injection tests, and cased hole logs) have their advantages and limitations in the assessment of the cement sheath. An integrated approach towards cement evaluation can result in improved barrier evaluation. The use of these methods, either individually or through an integrated approach, requires an understanding of the data acquisition techniques, including the factors that affect the quality of the measurements.

Course participants will take part in a detailed review of the cementing processes, cement sheath evaluation, and discussion of various measurement methods and interpretation techniques. Remedial cementing theory and practical application of squeeze methods will be covered so that if the primary cement job is not successful the participants will understand how to repair or correct a cement integrity failure.

COURSE OBJECTIVES

Upon successful completion of this course, participant will be able to:

- Understand the critical parameters for any cementing operation
- Select displacement rates for effective mud removal
- Understand how to repair or correct a cement integrity failure
- Read and perform interpretation of cement bond logs
- Understand special cement systems
- Identify the proper ways to evaluate a cementing job using non-logging techniques
- Understand and recognize the challenges of any cementing program
- Select casing hardware for successful cementing operations

WHO SHOULD ATTEND

Drilling, production, and completion engineers.

COURSE DURATION

5 Working Days

COURSE OUTLINES

1. Pre course evaluation

2. Introduction to Cementing Operations Overview

- Different sections of the well (casing sizes, Threads, accessories and hardware)
- Primary cementing (Equipment and procedures)
- Cement Manufacturing
- Difference between manufacturing construction cement and Portland cement
- API cement
- Cement hydration process
- Effect of PSD, Temperature, Pressure etc. on cement behavior
- One stage cement job
- Two stage jobs
- Liner cementing
- Squeeze cementing
- Cement head and wiper plugs
- Calculations: Volume of cement slurry, number of Skts, mix water, additives, displacement volumes required
- Calculator for all parameters of the cement job
- Pressures during and at end of displacement
- Criteria for successful cementing Mud removal, temperature prediction, slurry design
- Criteria for successful cementing execution & Evaluation

3. Mud Removal and Cement Placement

- Lost circulation
- Cementing horizontal wells
- Cement laboratory equipment
- Rheology and its application in oil well cementing
- Flow modules and mud removal
- Spaces and washes
- Cement placement: turbulent and laminar flow
- Special cement systems

- Engineered particle size cements
- Salt cementing
- Thixotropic cement systems
- Light weight cements
- Foam cement

4. Annular Fluid Migration and Cement Defects

- Consequences of gas migration, Paths for gas migration
- Cement slurry to solid transition effects, Migration prevention
- Flow path effects

5. Mechanical Properties of Set Cement, Lab Testing, and Use of Ultrasonic Imaging Tool

- Overview of mechanical properties of solids, Laboratory testing of cement
- Important properties for long term integrity, Ultrasonic imaging tool (USIT)

6. Remedial Cementing

- Applications of Remedial Cementing
- Remedial Cementing Techniques
- Downhole Tools for Remedial Cementing
- Remedial Cementing Program Design
- Remedial Cementing Through Coiled Tubing
- Advanced Remedial Cementing Technologies

7. Special Purpose Cements

- Salt cementing
- Gas migration control
- Foamed cement
- Engineered particle slurry cements
- Lost circulation
 - Selecting appropriate slurries
 - Stage cementing, squeezes, and plugs
 - Preventing gas migration, gas control
 - Cementing equipment

8. Cement Quality Evaluation

- Cement quality evaluation logs (cement bond logs)
- Overview of sonic and ultrasonic logs

- Examples of CBL/VDL Log displays and evaluation of cement quality
- CBL VDL: pros and cons
- The bond indexes
- SCMT: slim cementing mapping tool
- Ultrasonic tools: USIT
- Ultrasonic log USIT over sonic log CBL
- Cement logs summary
- Examples of CBL/VDL log displays and evaluation of cement quality
- Major hazards on a cementing operation
- Risk assessment
- Safety hazards related to a cementing operation

9. Post course evaluation.

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