Summary

This course covers the range of cased hole services available to assist in maximising production and well integrity. Topics focused on include formation evaluation behind casing including pulsed neutron tools; production logging in single phase, multi-phase and horizontal wells; cement bond logging; perforation design and optimisation and corrosion measurement and prediction. It addresses the needs of multi-disciplinary teams in planning the acquisition of cased hole logging data to evaluate existing wells in the context of planned well interventions.

Improved understanding of the services available and their applications can lead to greater efficiency in data acquisition campaigns and ultimately, maintaining or improving production.

Learning Outcomes

Participants will learn to:

1. Assess which openhole tools can be utilised in a cased hole environment and any special considerations in their interpretation.
2. Understand the basic physical principles and tool technologies of pulsed neutron tools, the different acquisition modes and their interpretation, and their use in time lapse reservoir monitoring.
3. Categorise the tool technologies of various production logging tools and their interpretation in single phase flow, multi-phase flow and horizontal well scenarios.
4. Differentiate cement bond logging tools, interpret the resulting data, and have an awareness of the application of advanced cement bond evaluation services.
5. Examine the factors affecting production optimisation in conventional reservoirs.
6. Compare and contrast the options and limitations relating to perforating gun design and selection.
7. Understand the basic physical principles and tool technologies of the various casing integrity evaluation services and how they may be used to evaluate casing damage and deformities.

Duration and Training Method

A two-day classroom course that uses a combination of lectures and self-contained exercises. Where appropriate the client’s own data can be incorporated into case studies or exercises.

Who Should Attend

This course is designed for engineering and operations personnel who are involved in cased hole logging campaigns.

Prerequisites and Linking Courses

There are no formal prerequisites for the class, however a basic awareness of well logging tools and techniques and petrophysics is assumed.

Course Content
This course is intended to address the needs of multi-disciplinary teams in planning the acquisition of cased hole logging data to evaluate existing wells in the context of planned well interventions. It is also intended to give participants the basic knowledge required to evaluate historical data that may be available so that it can be incorporated in well reviews. Improved understanding of the services available and their applications can lead to greater efficiency in data acquisition campaigns and ultimately maintaining or improving production.

Day 1

Introduction

- Review of Basic Fluid Properties – the fundamental principles that govern the properties of hydrocarbon liquids and gases will be reviewed in the context of relating downhole measurements to surface data
- Deployment Methodologies and Depth – a review of the types of deployment methods with associated advantages and disadvantages. The importance of depth control and correlation with existing logs will also be discussed

Formation Evaluation Through Casing

- Openhole Measurements Applicable to Cased Hole – those openhole tools which are applicable to cased hole logging will be discussed along with any special considerations or processing required
- Pulsed Neutron Measurements and Theory – historical and modern logging tools will be described, their capabilities and disadvantages discussed along with the theory behind their measurements
- Pulsed Neutron Applications – various applications of pulsed neutron logging will be reviewed including; time-lapse monitoring, log-inject-log, oxygen activation and CO2 saturation monitoring

Cement Bond Logging

- Common Problems – examples of common problems with casing-cement and cement-formation bonds and how these can be detected
- Overview of CBL Logging Tools and Measurement Theory - historical and modern logging tools will be described, their capabilities and disadvantages discussed along with the theory behind their measurements

Day 2

Perforation

- Production Optimisation – discussion of Skin Effects, their impact on well productivity, and how we can select perforating guns to minimise ‘Skin’
- Perforating Gun Design and Selection – the design and specification of perforating guns and charges will be reviewed, along with the application of some of the newer, more specialised perforating systems such as Dynamic Underbalance, Reactive Liner and Fracturing while Perforating

Casing Integrity
• Types of Casing Damage/Deformities – a summary of the types of damage or deformities that are typically encountered along with appropriate detection methods
• Corrosion Logging Tools – current logging tools available for corrosion monitoring will be discussed along with a brief review of historical tools and data quality
• Multi-Finger Caliper Tools – review of the use of multi finger caliper tools to detect casing pitting/holes, scaling and casing deformities

Production Logging

• Basic Measurements and Logging Tools – a review of the standard production logging services including: gamma ray, CCL, temperature, pressure, fluid density, fluid capacitance and flow meters and the basic interpretation of their data
• Classic Production Problems – a summary of several production problems that production logging can be used to identify
• Single Phase Flow – properties of single phase flow regimes and their impact on production logging tools
• Multi-Phase Flow – types of multiphase flow, how this impacts production logging tools and how we can determine the relative holdups and flow rates
• Horizontal Wells – the impact of well deviation on standard production logging measurements will be discussed. Tools specifically designed for deviated and horizontal wells will be reviewed, their capabilities and disadvantages discussed along with the theory behind their measurements
• Permanent Monitoring Systems – a brief discussion on some common types of permanent production monitoring such as DTS and DAS and how this compares to wireline production logging data