

# Wireline and Logging-While-Drilling (LWD)

## INTRODUCTION

- The certification of acquired data is a very critical aspect of wireline and Logging-while-Drilling (LWD) logging and is performed through the observation of key quality indicators. The main objective of this training course is to make you aware of these quality indicators as well as the different techniques to solve commonly found issues at the wellsite.
- This training course will explore the tools response explained from their physical principles as well as their relationship with the rock and fluid properties, most common open hole logging technologies will be covered explaining their main applications and limitations. Basic petrophysical interpretation will be discussed with numerous examples and exercises in order to complement your knowledge to be able to perform a proper log QA/QC analysis.

This training course will feature:

- Explanation of petrophysical concepts and techniques
- Discussions on tools physical principles, applications, and QA/QC
- Tool limitations on different borehole environments
- Metrology concepts and applications on wireline and LWD logs
- Multiple log quality control exercises

## OBJECTIVES

By the end of this training course, participants will be able to:

- Understand the physical principles of wireline and Logging-while-Drilling (LWD) logging tools
- Apply quality control techniques to validate logging data
- Know the main applications and limitations of the different tool readings
- Perform a complete log quality control in a set of logs
- Perform a basic log interpretation

## **ORGANISATIONAL IMPACT**

The organization will benefit because:

- Having their personnel trained on log interpretation will help reduce human mistakes and improve efficiency
- Their personnel will be able to better assess data quality and integrity
- Their personnel motivation will increase as they understand better some critical data needed for their daily job

## **PERSONAL IMPACT**

Attendees will gain by participation in this training seminar as a result of:

- Obtaining a full understanding of logging tools principles and applications
- Learning the principles and key indicators for log quality assurance and quality control
- Learning basic and advanced methods and techniques for log interpretation

## **WHO SHOULD ATTEND?**

This training course on Wireline and Logging-While-Drilling (LWD) Log Quality Control and Its Impact on Interpretation is suitable to a wide range of professionals but will greatly benefit:

- Engineers in exploration and production departments
- Geologists, geophysicist and petrophysicist
- Petroleum, reservoir, and drilling engineers
- In general, all other oil & gas industry professionals who are involved in logging data QA/QC and validation

## **Course Outline**

Basic Logging Concepts and Principles of Metrology

- Basic Well Logging Concepts
- Auxiliary Measurements, QA/QC and common issues
- Principles of Metrology - The Real Environment
- Log Quality Control Basic Principles
- Basic Measurements: Gamma Ray and Spontaneous Potential
- QA/QC Indicators and Examples

## Conductivity and Nuclear Logging Tools

- Conductivity Tools, Uses and Limitations
- LWD Resistivity Determination Tools
- Log Quality Control and Common Issues
- RT and Invasion Profile Determination
- Formation Density Tools, Calibrations, Applications and QA/QC
- Neutron Tools Principles, Calibrations, Applications and QA/QC
- LWD Porosity Determination Tools
- Nuclear Tools Limitations and Environmental Corrections

## Acoustic and Geological Logging Tools

- Basic Sonic Tools, Borehole Compensation
- Dipole Sonic Tools, Applications
- Mechanical Properties Determination and Uses
- Sonic Limitations, QA/QC and common issues in the Borehole
- LWD Acoustic Tools
- Cement Evaluation Logs: CBL-VDL. Interpretation and QA/QC
- Ultrasonic Cement Evaluation Tools
- Dipmeter Interpretation Principles
- Geological Image (resistivity and ultrasonic) Logging Tools
- Principles, Interpretation and Log Quality Control Indicators
- Structural and Stratigraphic Interpretation Principles
- Facies Analysis for Reservoir Characterization with Image Logs

## Advanced Logging Tools and Formation Testers

- Nuclear Magnetic Resonance, Applications, Limitations and QA/QC
- Relaxation Mechanisms and their association with Fluid and Rock Properties
- Porosity, Irreducible Water Saturation and Permeability Determination
- Advanced Fluid Determination Methods: 3D Map T1-T2-Diffusion
- Dielectric Tools Principles and Applications
- Saturation Determination Parameters,  $m$ ,  $n$  and CEC
- Geochemical Logging Tools, Uses, Limitations and QA/QC
- Reservoir Pressure Determination Tools
- Pre-test Interpretation, common issues and QA/QC
- Pressure Gradient Interpretation and Examples
- Fluid Sampling, Optical and Composition Fluid Analyzers
- Advanced Probes for Special Well and Reservoir Conditions
- Permeability Determination

## Well Seismic and Basic Petrophysics

- Checkshot, VSP, Offset and Multi-Offset VSP, Walkaway
- Different Source Types, Air-guns and Vibroseis Trucks
- Physical Principles, Interpretation and Log Quality Control Indicators
- Formation Evaluation Principles
- $R_w$  Determination Methods
- Crossplots Utilization, Hingle and Pickett Plots
- Graphical Interpretation Techniques for Porosity and Lithology
- Saturation Determination Equations and Techniques
- Complete Formation Evaluation for Simple Lithology