

Expert Interpretation of Well Logs

Comprehending Log Analysis & Evaluation

Introduction

Well logs offer a detailed record of the geological strata that a borehole has penetrated. These records include important and priceless information that is gathered at different points in a well's lifespan and is essential for figuring out the petrophysical properties that determine the reservoir's economic value. As a result, the techniques used to evaluate and comprehend well logs are essential for determining possible locations for hydrocarbon extraction.

The whole gamut of well logging is carefully covered in this Advanced Well Log Interpretation training course, from the basic concepts and instruments needed for well log interpretation to the sophisticated methods needed to analyse complicated geological formations. The course swiftly moves from covering the fundamentals of well logging and petrophysical characteristics to in-depth discussions of electrical, acoustic, and nuclear loggings, providing profound insights into each method's unique applications and challenges.

Next, participants will delve into the cutting-edge fields of Production Logging (PL), Nuclear Magnetic Resonance (NMR), and Logging-While-Drilling (LWD). These fields are essential for optimising drilling operations and evaluating formations in real-time. The curriculum culminates in advanced themes and integrated data interpretation methodologies, enhanced by interpretation case studies. These subjects include log applications in difficult carbonate reservoirs, shale oil/gas formations, and shaly sands. This thorough approach guarantees that participants have the information and abilities necessary to meet the difficulties of interpreting contemporary well logs, making it a vital training programme for professionals hoping to succeed in the rapidly changing fields of oil and gas production and exploration.

The following will be covered in this Course N Carry Expert Interpretation of Well Logs course:

- Essentials of Interpreting Well Logs
- Nuclear, sonic, and electrical loggings
- Logging-While-Drilling (LWD), Production Logging (PL), and Nuclear Magnetic Resonance (NMR)
- Coordinated Analysis of Well Logging Information
- Advanced Topics and Measurements, Intricate Geological Applications

- Case Studies for Interpretation

Objectives

Participants in this Expert Interpretation of Well Logs training course will be capable of the following by the end:

- Gain a thorough understanding of both the basic and advanced methods for interpreting well logs.
- Utilise a variety of logging technologies to identify and assess petrophysical characteristics and formation assessment.
- Utilise integrated interpretation techniques to provide accurate assessments of complicated geological formations.
- Employ cutting-edge techniques and measurements to provide a thorough evaluation of the reservoir.
- In complicated settings like carbonate reservoirs, shale oil/gas formations, and shale sands, analyse and interpret log data.
- Learn how to make better drilling and production optimisation decisions by using case studies and real-time log analysis.

Training Methodology

The training material for this course will be provided on carefully designed slides with relevant animations. A detailed handbook with all slides will be provided to each participant either in printed or electronic PDF version. In order to evaluate students' comprehension of the material, our teaching style also includes pre- and post-course evaluation examinations.

Organizational impacts

The following will help the organisation:

Increases the workforce's technical competence in reservoir analysis and well log interpretation.

Improves the ability to make accurate decisions in the areas of reservoir characterisation and formation appraisal.

Increases operational effectiveness by utilising sophisticated logging technologies and interpretation strategies.

Encourages the use of best practices in data analysis and well tracking, as well as innovation.

Increases competitive advantage via streamlining the procedures of resource extraction and identification.

Personal Impact

Participating in this training programme will benefit attendees because:

- Gaining a comprehensive understanding of the interpretation of well logs and how to use them for reservoir assessment.
- Improving knowledge of how to use different logging tools and methods for precise formation analysis.
- Gaining proficiency in integrating intricate log data to provide thorough geological and reservoir insights.
- Gaining knowledge of how to use cutting-edge log interpretation techniques to solve problems in carbonate, shale sands, and shale oil/gas reservoirs.
- Enhancing practical abilities through case studies, simulations, and examination of actual logging situations.

Who should attend?

A wide range of professions can profit from this Course N Carry Expert Interpretation of Well Logs training course, however the following are the main advantages:

- Engineers specialising in exploration
- Engineers in Production
- Geophysicists, petroleum scientists, and geologists
- Engineers for drilling, reservoirs, and petroleum
- All other professions in the oil and gas business who work with data logging, interpretation, and validation in general

Course Outline

Day 1

- Essentials of Interpreting Well Logs
- The History and Evolution of Well Logging
- Evaluation of the Formation and Petrophysical Properties
- Overview of Frequently Used Well Logging Equipment
 - Tools for Open-Hole Logging
 - Tools for Cased-Hole Logging
- Fundamental Connections in Well Log Interpretation

- Essential Data for Log Interpretation

Day 2

Nuclear, sonic, and electrical loggings

- **Electrical Recording**
- Unplanned Potential Recording
- Logs of Resistivity
- Diameter Recording
- **Logging Sonic**
- Sonic Record
- Logging of Acoustic Wave Amplitude
- USI Logs: Ultrasonic Imagers
- UBI, or UltraSonic Borehole Imager
- Borehole Imaging Circumferential Log (CBIL)
- **Nuclear Record-Keeping**
- Logs of Gamma Rays
- Interaction of Neutron and Formation
- Definitions of Logging with Neutrons
- Nuclear Record-Keeping
- Time Logs for Thermal Neutron Decay
- Oxygen/Carbon (C/O) Log

Day 3

Logging-While-Drilling (LWD), Production Logging (PL), and Nuclear Magnetic Resonance (NMR)

- **Magnetic Resonance in Nuclear Environment**
- Nuclear Magnetic Resonance (NMR) Principles
- A Synopsis of the History of the LWD NMR
- Nuclear Magnetic Resonance Tool
- Nuclear Magnetic Resonance Applications
- **Production Logging (PI)**
- Logging of Spinner Flowmeters
- Logs for Fluid-Identification
- Logging of Radioactive Tracers
- Pulsed Neutron Detectors for Flow Analysis
- Tester of Repeated Formation
- **Drilling While Logging (LWD)**
- LWD Instruments
- Measurements of Resistivity During Drilling
- Measurements of Density During Drilling
- Radioactive Measurements During Drilling

- Sound Assessments During Diving
- Directional steering

Day 4

Coordinated Analysis of Well Logging Information

- Classification of Reservoirs
- Formation Assessment
- Lithology Determination Method: M-N PLOT
- Umaa Mid-Plot
- Crosslets of resistivity vs porosity (Pickett Map)
- Determining Porosity in Complicated Situations
- Techniques for Determining Fluid Type Using Resistivity Ratio
- Permeability Estimation
- Examination of Structure
- Integrated Multi-well Interpretation

Day 5

Complex Geological Applications, Advanced Measurements and Topics, and Interpretation Case Studies

- Utilising Formation Testers for Pressure Measurements, Fluid Sampling, and Analysis
- **Understanding Logs in Complicated Carbonate Reservoirs**
- Problems with macro, meso, and microporosity, as well as determining porosity in various lithologies
- Calculating RW, saturations, and permeability in carbonates that are tight or cracked
- **Analysis of Logs in Shaly Sands**
- Identification and characteristics of clay
- Vsh decision-making
- Saturation estimation using several resistivity models and techniques, excess conductivity and clay double layer
- Applications of Logs in Oil and Gas Shale Formations
- **Identification of the source rock, kerogen, TOC, and estimated adsorbed gas**
- Sonic and imaging logs are used to determine brittleness and choose areas for fracking design.
- Case Studies for Interpretation