

N003: Geological Interpretation of Well Logs

Instructor(s): Jenny Garnham / Martin Kennedy

Format and Duration

Classroom - 5 Days

Virtual - 10 Sessions

Summary

Business Impact: The ultimate objectives of this course are to be able to use sets of well logs to establish robust **correlation schemes**, **guide well placement** and **derive property inputs** for geological modelling. These skills will enable participants to reduce risk, understand uncertainty, improve success rates, and reduce costs throughout the E&P life cycle.

This course is an introduction to the principles and applications of conventional well logs. It shows how combinations of logs can be used to interpret mineralogy, lithology, facies, depositional environments and key sequence stratigraphic markers such as flooding surfaces. Sessions start by considering the individual measurements but as the course progresses there is an increasing emphasis on combinations of measurements and the trends with depth. The climax of the course is an exercise to produce a robust correlation scheme using data from three wells. The correlation scheme is then used to choose the location for a fourth well designed to intersect the best developed reservoir.

Participants will receive a digital copy of the text book “Geological Interpretation of Well Logs” by Malcolm Rider and Martin Kennedy.

Learning Outcomes

Participants will learn how to:

1. Differentiate the functions, physical principles, and limitations of logging tools used in a standard logging suite and their applications for geological interpretation.
2. Understand the differences between logs acquired using wireline conveyance and logs acquired whilst drilling.
3. Use well logs to determine lithologies, interpret facies, and identify stratigraphic and structural features.
4. Interpret well logs and cores, integrated with other available data, to produce a coherent geological evaluation.
5. Correlate between wells using well logs, incorporating other available down-hole data.
6. Analyse the interpretation patterns of dipmeter and imaging tools to indicate structural and stratigraphic features.
7. Determine shale volume, porosity, and water saturation from well logs.

Training Method

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

Who Should Attend

This course best suits those beginning to acquaint themselves with logs or those who do not use logs all the time and need a refresher. The course is aimed primarily at inexperienced Geoscientists, but is also

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good for Technologists, Reservoir and Petroleum Engineers and new-hire Petrophysicists.

Prerequisites and Linking Courses

While there are no formal prerequisites for the class, it is advantageous to have a basic knowledge of geology and petroleum systems.

Course Content

In this class, each individual logging tool is described in terms of basic functions, physical principles and geological interpretation. Log data is then used as a complementary set for lithology interpretation, facies recognition, log sequence analysis and correlation.

The following timetable is intended as a guide only and may vary depending on the instructor and experience of the class.

Session 01:

- Introduction
- Impact of Logging
- Environment and Deployment
- Depth Shifting Exercise
- Log Summary Exercise

Session 02:

- Gamma and Spectral Gamma Ray Theory and Usage
- Understanding Caliper
- Worksession: Caliper and Gamma Ray
- Worksession: Spectral Gamma Ray

Session 03:

- Resistivity Logs
- SP Logs
- Worksession: Resistivity Profiles

Session 04:

- Traditional Sonic Logging
- Well Tying and Modern Sonic Logs
- Worksession: Sonic Conversion

Session 05:

- Density Logs

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- Worksession: Shale Density
- Neutron Logs
- Density Neutron Combination

Session 06:

- Integrating Lithology
- Worksession: Lithology Log
- Introduction to NMR

Session 07:

- Dipmeter
- Image Logs
- Worksession: Image logs

Session 08:

- Core Photo and Logs
- Facies and Sequences from Logs
- Worksession: Sequence Analysis

Session 09:

- Stratigraphy and Correlation with Logs
- Worksession: Correlation of 3 Wells

Session 10:

- Basic Rock Property Evaluation
- Worksession: Basic Petrophysical Workflow