

This course can be adapted to virtual classroom mode

Fundamentals of Reservoir Geology

15 days

RESGEOL-EN-A

Overview

LEVEL

Skilled

PURPOSE

This course provides an in-depth understanding of reservoir geology, covering concepts as well as data reviewing and modeling.

LEARNING OBJECTIVES

Upon completion of the course, participants will be able to:

- discuss main concepts of reservoir geology, especially petrophysical concepts, used in the description of reservoirs and the way the corresponding rock properties are measured from cores,
- access to rock properties from log interpretation and compare to core measurements,
- define petro-facies, electro-facies and rock-types,
- integrate cores, logs and well tests data for reservoir modeling,
- apply the workflow for building a reservoir static model using dedicated software,
- identify and assess the uncertainties within the geomodeling workflow.

WAYS AND MEANS

Interactive lectures, exercises.

Hands-on practice using software dedicated to reservoir modeling (PETREL™ and EasyTrace™).

Software used during workshops: with courtesy of Beicip-Franlab and Schlumberger.

LEARNING ASSESSMENT

Knowledge assessment with multiple choice questions and open explanatory questions.

PREREQUISITES

E&P professionals, with basic knowledge in reservoir characterization.

Agenda

INTRODUCTION TO RESERVOIR CHARACTERIZATION

5 d

Introduction to reservoir characterization:
Reservoir characterization and modeling objectives.
Reservoir characterization and modeling workflows.
Data and related uncertainty.
Data integration.
Reservoir architecture:
Seismic interpretation and pitfalls.
Well log analysis.
Facies analysis.
Rock-typing.
Petrophysics and rock properties.

Reservoir heterogeneities.

PETROPHYSICS - RESERVOIR PROPERTIES FROM CORES & LOGS EVALUATION

5 d

Reservoir properties from conventional and special core analysis:

Coring.

Porosity: definition and measurements (effective and total porosity); pore size distribution by NMR and mercury Injection.

Single-phase permeability: definition and measurements; liquid and gas permeability, Klinkenberg correction; permeability composition.

Capillary pressure: definition and measurements (porous plates and centrifuge/interpretation, local saturation); from lab to reservoir: P_c to determine reservoir initial saturations and transition zones.

Wettability: definition and measurements (Amott index, USBM index); influence of wettability on P_c .

Electric measurements. Formation factor and Resistivity Index (RI).

Multi-phase permeability: Darcy's law for two-phase flows core analysis; relative permeabilities: steady-state, unsteady-state, interpretations, synthesis.

Influence of wettability on the relative permeabilities.

Petrophysical rock-typing. Leverett J functions.

Reservoir properties from log evaluation:

Wireline logging operations and logs.

Open-hole log quick-look interpretation methodology.

Determination of reservoir properties from log interpretation (non-reservoir and reservoir zones, porosity, contacts, Archie's law and saturations).

RESERVOIR MODELING WORKSHOP

5 d

Basic principles: introduction and objectives.

Case study: field presentation and data discussion.

Project definition:

Data QC and summary table.

Interpolation and basic reservoir modeling.

Structural framework:

Structural context.

Time depth conversion.

Surfaces modeling and quality control.

Fault modeling and regions.

Well correlation and stratigraphic data analysis.

Grid building; grid zones and layering; geo-cellular grid validation.

Rock-type and facies modeling:

Basic of geostatistics.

Rock-typing.

Data analysis and facies modeling.

Property modeling:

Petrophysical modeling.

Seismic drivers in reservoir modeling.

Geological model analysis: N-t-G, porosity, permeability and water saturation.

Volumetric, upscaling and uncertainty:

Hydrocarbon volume calculation.

Structure and properties upscaling.

Quantification of uncertainty. Sensitivity analysis and ranking of models.

Inputs for reservoir simulators.

Summary, synthesis and wrap-up.