CAPILLARITY IN ROCKS RSE025

COURSE OVERVIEW

The course provides detailed knowledge of how capillarity affects hydrocarbon distribution in a reservoir rock, and how the magnitude of capillary forces can be used to deduce valuable information about rock properties including pore throat sizes, pore network geometry, porosity, and permeability. Several in-class exercises reinforce the course learning and provide students with experience using capillary pressure data for reservoir characterization. Exercises will be worked on the computer using spreadsheet software.

COURSE OBJECTIVES

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

- Understand capillarity's impact on hydrocarbon distribution in reservoir rocks.
- Learn capillary pressure measurement methods and their application.
- Analyze and interpret capillary pressure data using various techniques.
- Estimate rock properties (pore throat sizes, porosity, permeability) from capillary pressure data.
- Convert mercury/air capillary pressure curves to hydrocarbon/water curves.
- Determine saturation-height distribution in different pore system rocks.
- Estimate irreducible water saturation and transition zone length.
- Predict downdip water level and assess clay-bound water.
- Compare capillary pressure data with NMR data.
- Evaluate maximum hydrocarbon column sustainment in sealing layers.
- Apply capillary pressure data in reservoir characterization.
- Extract rock properties from capillary pressure measurements.
- Upscale and represent multiple capillary curves.
- Understand surface phenomena, wettability, and interphase tension.
- Analyze competition between capillary and gravity forces.
- Interpret imbibition cap curves and assess pore system types.
- Evaluate seal capacity for hydrocarbon containment.

WHO SHOULD ATTEND

Geo-scientists, Petrophysicists, reservoir engineers, and research and development staff who want to gain fundamental and intermediate insight into the capillary properties and hydrocarbon distribution in reservoir rocks.

COURSE DURATION

5 Working Days

COURSE OUTLINES

Day 1

- Pre course evaluation.
- Select the appropriate capillary pressure measurement method for a set of desired results.
- Closure correct a set of mercury/air capillary pressure data.
- Fit and analyze capillary pressure data using Thomeer, Leverett-J, and Brooks-Corey methods.
- Determine the representativeness of a set of capillary pressure curves within a zone of interest.
- Estimate permeability from a mercury/air capillary pressure curve.

Day 2

- Calculate pore throat sizes from a capillary pressure curve.
- Create a synthetic capillary pressure curve and estimate the air permeability from a petrographic analysis
- Obtain values for interphase tension
- Convert mercury/air capillary pressure curves to hydrocarbon/water capillary pressure curves
- Determine saturation-height distribution in a single-pore system rock or in a multiple- pore system rock

Day 3

- Determine irreducible water saturation
- Estimate the length of a transition zone
- Predict downdip water level from partial penetration
- Determine clay-bound water using Klein-Hill-Shirley method
- Compare/contrast capillary pressure data with NMR data
- Determine the maximum column of hydrocarbon that a specific sealing layer can sustain without leaking

Day 4

- Capillary pressure applications in reservoir characterization
- Rock properties from mercury/air capillary pressures
- Capillary pressure data representativeness
- Capillary forces in reservoir rocks; their measurement

- Capillary pressure data fitting methods
- Representing / upscaling a large number of capillary curves
- Permeability from capillary pressure curves and petrography
- Saturation-height functions

Day 5

- Surface phenomena, capillarity, wettability, and interphase tension
- Competition between capillary and gravity forces
- Imbibition cap curves
- Interpretation of single and multiple pore system rocks
- Clay-bound water
- Capillary pressure vs. NMR
- Seal capacity
- Post course evaluation.