

## MICP and Deterministic Rock Typing

### Course general description:

This is an applied course on how to use capillary pressure data to help the user understand what is controlling the fluid distribution, the importance of pore geometry and why water saturation is not an accident. Case studies and workshops on bi-modal carbonates are used to show the challenges associated with interpreting fluid distributions. To understand many carbonates it is necessary to examine capillary pressure, HPMI, lab NMR, thin-sections and SEM images. Both clastics and carbonate examples and core-log integration workshops are used to show how simple saturation height models can be applied in fields to study many parameters as fluid contacts, hydro-carbon column height and help you determine the dominant hydrocarbon-water contact.

A large number of workshops are used in this course so the participants can gain a hands-on experience for interpreting capillary pressure data.

### Course audience:

This course is designed to for:

- Geologists
- Geophysicists
- Reservoir engineers
- Managers who are involved in or will be involved in petroleum sector

### Course objectives:

By the end of the course, the participants will know more knowledge and get training on:

1. Pore Geometry and Wettability
2. Drainage and Imbibition Capillary Pressure Data
3. Fluid contacts and Free Water Level
4. Measurement Methods and Options
5. Converting from Lab Conditions to Height
6. Introduction to Petrophysical Rock Types
7. Saturation Height Models to Predict Saturation Distribution

### Course duration:

5 days

### Course location:

Dubai

### Course contents:

#### **Day-1: Module 1: Basic Pore Geometry**

On the first day participants will learn the importance of capillary pressure and its practical applications. Pore geometry will be discussed using petrographic thin-sections and SEM methods. Wettability will be introduced and the day will end with a practical pore geometry workshop.

- Course Expectations and Participants Complete a Pre-Course Technical Assessment.
- Discussion on Why Capillary Pressure Is Important.
- Pore Geometry and Wettability.
- Using Petrographic Thin-Sections to Explore Pore-Geometry.

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- Using Scanning Electron Microscopic Images to Explore Pore-Geometry.
- Using Lab Methods to Explore Pore Geometry.
- Workshop on Basic Pore Geometry.

**Day-2: Module 2: Lab Methods to Determine Capillary Pressure**

Module 2 will focus on the drainage and imbibition processes associated with establishing fluid saturations. Practical applications of determining the free water level (FWL) and immiscible fluid-contacts will be discussed and demonstrated by using workshops and example. Common laboratory methods will also be addressed.

- Introduction to Drainage and Imbibition.
- Applications of Drainage Capillary Pressure Analysis (Contacts and FWL).
- Applications of Imbibition Capillary Pressure Analysis (Production Trends and Residual Saturation).
- Workshop on Lab Methods to Determine Capillary Pressure.

**Day-3: Module 3: Determining Pore Throat Radius from Lab Data**

Module 3 will cover more specific information concerning lab methods and data acquisition. Common lab data analysis will focus on lab-based pore throat radius and techniques to predict pore throat radius from porosity and permeability. Participants will complete a detailed workshop using these techniques.

- Porous Plate Method.
- Centrifuge Method.
- Dynamic Method.
- High Pressure Mercury Injection
- Applications
- Workshop on Determining Pore Throat Radius from Lab Data.

**Day-4: Module 4: What is rock typing?**

Module 4 will cover show how to convert lab measured capillary pressure data to reservoir conditions to determine height above free water, seal capacity and initial water saturation. Petrophysical rock types will be determined from high pressure mercury injection porosimetry data using semi-log, Cartesian and incremental saturation intrusion plots combined with several other quality control data analysis graphs. Participants will complete a detailed workshop using these techniques.

- Converting from lab data to height above free water
- Excursuses
- Common Applications (Thomeer and Leverett J)
- Excursuses
- Introduction to Petrophysical Rock Types
- Excursuses
- Workshop on rock typing.

**Day-5: Module 5: Rock typing and Saturation-height Model**

Module 5 will cover show how to create a customized saturation height capillary model based on petrophysical rock types. The SHM can be based on Leverett, Gunter/Smart or a Modified Thomeer method.

- Applied Saturation Height Model Using Petrophysical Rock Types.
- Well log Analysis and Reservoir Evaluation Workshop.
- Workshop on rock typing and saturation model.
- Post Course Technical Assessment.
- Course Wrap-Up.

**Methodology:**

- 50% lectures & concepts
- 10% Videos
- 20% Case studies
- 10% Exercises
- 10% Discussions

**Course code: (TEXP006)**