Reservoir Characterization & EOR Optimization

Course Description

The Reservoir Characterization & EOR Optimization course builds your competence, confidence, and credibility through a strong theoretical framework review as well as examples, exercises, and case studies discussions designed to consolidate and reinforce learning and identify solutions to specific challenges associated with reservoir characterization and oil recovery optimization processes.

It is well known that a large amount of oil is still underground after primary recovery and implementation of waterflooding operations. Petroleum companies are looking for techniques to improve volumetric sweep efficiency, minimize the effect of reservoir heterogeneities and adverse mobility ratio to increase the final recovery factor, and maximize project economics. EOR screening, data gathering, reservoir characterization, and simulation of EOR processes are paramount to generating reliable oil production forecasts.

The EOR methods can grouped into four main categories: chemical, miscible, thermal, and others. This course will provide detailed explanations of the drive mechanisms of each EOR method as well as critical success factors to maximize oil recovery. This Reservoir Characterization & EOR Optimization training covers the main aspects of polymers, surfactants, and low-salinity waterflooding characterization and simulation which includes pilot project design, geological reservoir modeling, and reservoir and practical reservoir simulation considerations required for EOR optimization.

The expected recovery factor, EOR process maturity, project economics, as well as pros and cons for each EOR method will be discussed during the training. This course covers conventional reservoirs.

Finally, a risk and uncertainty analysis will be discussed to properly support the EOR process implementation.

The course will be supplemented by practical examples, case studies analyses, group exercises, and interactive group discussions designed to consolidate and reinforce learning and identify and offer solutions to specific problems associated with waterflooding and EOR of oil fields.

Who Should Attend?

This course is designed for professionals with a background in Engineering (Petroleum, production, or Chemical), geologists, team leaders, facilities engineers concerned with

waterflooding and EOR processes, and other professionals who are responsible for maintaining or increasing oil production.

1. Attendants should be familiar with Waterflooding processes

2. Preferably, attendants should have some basic knowledge of reservoir characterization, modeling, and simulation.

What are the Goals?

By the end of this Reservoir Simulation of Enhanced Oil Recovery Processes training course, participants will:

- Understand the importance of reservoir characterization and geologic features on the EOR project success.
- Apply the screening criteria guidelines for selecting the candidate's reservoir for EOR projects
- Understand the drive mechanisms related to chemical, miscible, and thermal EOR methods
- Learn how the vertical, areal, and volumetric sweep efficiency can be estimated and how they can be optimized to maximize oil recovery
- Learn key concepts of EOR pilot design based on best practices and lessons learned
- Learn reservoir simulation best practices to ensure EOR implementation success

What You Will Gain:

1. Understand the screening criteria for gas, thermal, and chemical EOR methods
2. Understand the importance of reservoir characterization and geologic features on the EOR project success
3. Understand the drive mechanisms related to chemical, miscible, and thermal EOR methods
4. Learn how the vertical, areal, and volumetric sweep efficiency are estimated and how they can be optimized to improve oil recovery
5. Learn key concepts of EOR pilot design based on best practices and lessons learned.
6. Understand the importance of reservoir monitoring in the EOR optimization process
7. Learn the main aspects of Reservoir simulation of main EOR Processes (polymers, surfactants, and low salinity waterflooding)
8. Identify major risks in EOR implementation and plans for mitigation
9. Learn best practices and lessons learned from case studies

Training Methodology

The training course will combine lectures (30%) with workshop/work presentations (30%), interactive practical exercises and case studies (20%), supported by video material, software and general discussions (20%)

Course Content

Reservoir Characterization and Simulation

- Reservoir characterization
  - Data collection and validation
  - Reservoir fluids, Rock mineralogy, Wettability
  - Relative permeability, Rock types
  - Reservoir heterogeneity and its impact on oil recovery
  - Well testing
  - Core permeability versus well-testing permeability analysis
- Reservoir Simulation definition and applications
  - Reservoir Simulation workflows
  - Reservoir simulation models
  - Governing equations
- Introduction of EOR Methods
    - History of EOR Methods

- IOR/EOR definitions according to SPE
- Maturity of EOR Processes
- EOR processes description

- EOR screening criteria

Introduction to Reservoir Modeling

- Geological model construction
- Principles of Geostatistics:

Facies, property modeling, and distribution

- Model upscaling (geological grid vs Simulation grid)
- Grid Size (based on the considered EOR process), Grid geometry
- Grid Orientation
- Computing limitations

Waterflooding Process Overview, Data Preparation for Reservoir Simulation, EOR pilot design and monitoring

- Data file structure (eclipse .data)
- Well Data (VLP curve generation, perforation, events)
- PVT Data (EoS)
- Properties (KR, Pc)
- Waterflooding Process Overview. Injection Patterns, Mobility ratio, areal, vertical, and volumetric sweep efficiencies
- EOR pilot project design considerations
- Pilot monitoring and surveillance
  - 4-D seismic analysis & Fluid distribution/mapping
  - Tracers
  - CRR
  - Geochemistry

Enhanced EOR simulation optimization. Practical exercises, and case studies discussion

- Waterflooding (base case)
- Design and simulation considerations
- Polymer injection
- Surfactant injection
- Low Salinity Waterflooding
- Enhanced EOR simulation optimization
- Uncertainty and risk analysis for EOR processes