Enhanced Oil Recovery Processes: Chemical, Miscible, and Thermal

This course presents a comprehensive summary of miscible, polymer, and thermal enhanced oil recovery processes. The topics that are also covered include fractional flow theory, Cyclic Steam Stimulation (CSS), Steam Assisted Gravity Drainage (SAGD), and some other EOR methods (including the newly introduced hybrid processes).

For each technique theoretical and practical aspects will be discussed in detail along with case studies and field examples.

Sub-Discipline	Enhanced Recovery
Discipline	Reservoir Engineering
Modality	Classroom
Course Level	Foundation
Course duration	5 Days

Course Objective

This course presents a comprehensive summary of chemical, miscible, and thermal enhanced oil recovery processes. The topics that are also covered include fractional flow theory, Cyclic Steam Stimulation (CSS), Steam Assisted Gravity Drainage (SAGD), and some other EOR methods (including the newly introduced hybrid processes).

For each technique theoretical and practical aspects will be discussed in detail along with case studies and field examples.

Audience

Reservoir engineers, production engineers, and geoscientists interested in EOR projects.

Prerequisite

A basic knowledge of reservoir engineering.

Activities

Day 1

Enhanced Oil Recovery Fundamentals

- Overview
- Different EOR processes
- Fundamental science and engineering behind EOR applications
-

The day will begin with a quick overview of material of this five day course. Participants will learn about the different Enhanced Oil Recovery (EOR) processes, the concepts, limitations, and challenges of these processes. Fundamental science and engineering behind EOR applications will also be covered.

Day 2

Phase Behavior Fundamentals

- Fluid sampling, testing, and characterization
- Phase behavior fundamentals
- EOR simulation process and workflow
- Examples and problems

On day two of the course participants will discuss fluid sampling, testing, and characterization involved in enhanced oil recovery processes. Fundamentals of phase behavior will also be reviewed. The day will end with an EOR simulation process and workflow, along with examples and problems to help the participants use the knowledge obtained throughout the day.

Day 3

Fractional Flow Theory

  Laboratory displacement tests
  Relative permeability curve trends
- Polymer flooding and patterns
- Alkaline and surfactant flooding
- Examples and problems

Participants will learn about fractional flow theory and its use in oil recovery estimations. Laboratory displacement tests and relative permeability curve trends for different fluid systems in different reservoir conditions will also be covered. Other concepts that will be covered are polymer flooding and patterns, along with alkaline and surfactant flooding. The day will end with example problems on topics discussed throughout the day.

Day 4

Minimum Miscibility Pressure

- Minimum Miscibility Pressure (MMP) measurements and correlations
- Mechanisms of miscible displacement
- Use of ternary diagrams
- CO2 flooding properties and design
- CO2 field case study

On day four the focus will be mainly on Minimum Miscibility Pressure (MMP). The participants will learn the mechanisms of miscible displacement, about MMP measurements and correlations. Participants will also apply ternary diagrams to describe first contact miscibility, vaporizing gas drive, and condensing gas drive. The end of the day will include discussion of CO2 flooding: properties, design, and a field case-study.

Day 5

Thermal Recovery Processes

- Cyclic Steam Stimulation (CSS)
- Steam Flood and Steam Assisted Gravity Drainage (SAGD)
- SAGD alternatives
- Fire Flood and In-Situ Combustion
- Newly developed recovery processes

The last day of the course will focus on thermal recovery processes, such as Cyclic Steam Stimulation (CCS), Steam Flood and Steam Assisted Gravity Drainage (SAGD). SAGD alternatives and Fire Flood / In-Situ Combustion will also be covered. The day will end with a discussion of newly developed recovery processes including Toe to Heel Air Injection (THAI), THAI with Catalyst (CAPRI), and steam/solvent based hybrid processes.