

# Introduction to Emulsions

## Basic Course for Engineers and Managers

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This course is an introduction to the fundamentals of emulsion generation and characterization with a focus on how chemical EOR flood components can alter produced fluids. CEOR produced fluid emulsions can be very different from normal oilfield emulsions that result during secondary recovery efforts. This course also introduces participants to emulsion stability theory as well as the techniques and technology for emulsion breaking. The course can be customized and tailored to the requirements of the client.

## Target Audience

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This course will benefit individuals requiring a basic understanding of emulsion generation, emulsion stability, and emulsion breaking. The course is especially important for individuals who are involved with a chemical EOR project due to the enhanced risk of generating stable produced fluid emulsions. Participants may include engineers or managers who need an introduction to the potential produced fluid issues and mitigation strategies associated with CEOR field projects. The course is also designed for engineers that require an overview of produced emulsion testing protocols or that want to understand emulsion testing by service companies. Completion of the Enhanced Oil Recovery Fundamentals and CEOR Principles training courses are recommended prior to taking this course.

## Skills Learned in Course

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Participants in the course will learn to:

- Classify the type of emulsions and processes by which the emulsions break-down
- Appreciate the differences between the types of emulsifiers
- Identify the key properties of the emulsifier that affect the emulsion
- Recognize conditions that may generate emulsions or affect emulsion stability
- Characterize emulsions and emulsion stability
- Understand emulsion breaking fundamentals and experiments
- Appreciate emulsion breaking technologies and techniques
- Evaluate emulsion and chemical demulsifier study results
- Prepare for potential produced fluid emulsions issues

## Course Description

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Chemical EOR has received increasing attention as an EOR recovery technique that is robust, cost-effective and efficient in producing incremental oil from certain reservoirs. A successful chemical EOR project requires an engineer that is aware of the potential for produced fluids to generate stable emulsions. Familiarity with this topic is important as a CEOR project progresses so that mitigation strategies can be identified and realized to minimize down time and production expenses. Participants in this course will start by reviewing emulsion fundamentals and generation. The effects of different types of emulsifiers and their properties on the resultant emulsion will be examined. Participants will learn about the processes by which emulsions break-down, the properties that affect emulsion stability, and demulsification techniques and technology. Experiments to characterize produced emulsions, examine emulsion stability, and screen chemical demulsifiers are explained. Participants may observe emulsion generation and bottle testing in the laboratory, although this training course will mainly occur in the classroom.

This course can be partially customized to the client's specific needs. Participants may also request more in-depth training on specific topics, however longer or shorter training courses may be necessary. The experience level of the participants may also have an effect on the course content and duration. This course must be scheduled well in advance.

## Course Content

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- Emulsion fundamentals
  - Types/classes
- Emulsion generation
- Types and properties of emulsifiers
  - Surfactants
  - Particles
  - Other emulsifiers
- Emulsion stability fundamentals
  - Destabilizing processes of emulsions
  - Properties affecting stability
  - Effects of ASP components on stability
  - Key parameters, conditions, etc. affecting stability
- Characterizing emulsions and emulsion stability
  - Methods of characterization
  - Bottle-testing

- Breaking produced fluid emulsions
  - Purpose
  - Techniques and technology for separating emulsions
  - Strategies for different kinds of emulsions
- Demulsification for ASP or SP projects
  - Purpose of demulsifiers
  - Composition of demulsifiers
  - Chemistry of demulsifier molecules
  - Screening procedures for chemical demulsifiers
- Examples
  - Overview of mitigation strategy project
- Simulation of produced fluids
- Laboratory testing
- Field testing
- Mitigation
- Optimization
- Discussion