PetroSkills

Waterflooding A to Z - WF - eLearning course

COURSE

About the Course

Waterflooding has long been proven as the simplest and the lowest cost approach to maintaining production and increasing oil recovery from an oil reservoir. However, these benefits may fall far short of the expectations unless the time-tested concepts and practices are clearly understood and judiciously implemented. These concepts and practices aim at process optimization – reducing production cost while minimizing waste and maximizing oil recovery and income.

This course is light on theory but heavy on proven and successful practices. Published case histories of projects around the world are reviewed to provide an understanding of divergent points-of-view, what works where, what fails when, and why.

This training covers all elements of a waterflood project from A to Z – from source water selection to produced water disposal and everything in between. Participants are grouped into small multidisciplinary teams. All classroom discussions and problem-solving sessions are handled in an asset management team format. Simulation studies are done in class to evaluate basic waterflooding physics as well as to optimize the development of a hypothetical field.

This program is comprised of the following skill modules in PetroSkills PetroAcademy®. Each module ranges from 4-8 hours of self-paced or virtual instructor-led activities.

See demo online learning module

Target Audience

Reservoir, production, facilities, and operations engineers who are involved with some aspects of a new or existing waterflood project; geoscientists and professionals who want to get a better feel for the entire process of planning, development, management, and recovery optimization of a waterflood project.

You Will Learn

Waterflood Overview

In this skill module, we start at the very beginning, describing what waterflooding is, how it works, and the differences between various kinds of waterfloods.

You will learn how to:

- Define waterflooding
- Describe how it works
- Explain why waterflooding is applied to some reservoirs
- Explain the differences between patterns
- Describe other ways of typing waterfloods
- Describe how to measure the success of a waterflood

Waterflood Reservoir Property Effects

In this skill module, we demonstrate how rock and fluid properties affect the performance of a waterflood using analytical and numerical models. We then explain our observations by describing the physics of water displacing oil in the reservoir.

You will learn how to:

- Identify the effects of rock properties on waterflood performance
- Identify the effects of fluid properties on waterflood performance
- Quantify the effects of relative permeability and wettability on waterflood performance
- Quantify the effects of capillary pressure on waterflood performance
- Discuss the effects of pattern size and shape on waterflood performance

Waterflood Reservoir Heterogeneity Effects

In this skill module, we use models to demonstrate how heterogeneity and anisotropy complicate our understanding of how water displaces oil in the reservoir.

You will learn how to:

- Explain why shale continuity is critical to predicting waterflood performance
- Describe how dipping reservoirs behave differently under waterflooding
- Describe how reservoir anisotropy controls waterflood performance
- Explain why reservoir continuity is critical to predicting waterflood performance
- Describe how natural and hydraulic fractures affect waterflood performance
- Explain how reservoir heterogeneity can be measured and compared

Waterflood Forecasting Overview

This skill module is a survey of the most popular methods used to forecast waterfloods. We discuss strengths and weaknesses and expose assumptions on which each technique is built.

You will learn how to:

- Describe multiple statistical methods of predicting waterflood performance
- Describe multiple analytical methods of predicting waterflood performance

- Describe multiple numerical methods of predicting waterflood performance
- Compare the strengths and weaknesses of these prediction methods

Waterflood Analytical Forecasting

This skill module is a deep dive into a selection of the most popular analytical waterflood models. We provide step-by-step instructions on how to build each one and discuss the mathematics necessary to actually make them work in the 21st century.

You will learn how to:

- Predict waterflood performance using the Buckley-Leverett Method
- Predict waterflood performance using the Craig-Geffen-Morse Method
- Predict waterflood performance using the Stiles Method

Waterflood Surveillance

In this skill module, we assemble and describe a diversified collection of surveillance techniques that have been proven effective for managing waterfloods all over the world.

You will learn how to:

- Describe multiple ways to monitor the performance of an injection well
- Describe multiple ways to monitor the performance of a producing well
- Describe multiple ways to monitor the performance of a pattern
- Describe multiple ways to measure the connectivity between injectors and producers

Producing vs. Injecting Wells

In this skill module, we construct single-well models of both injectors and producers, describe their applications to waterflooding, and discuss their limitations.

You will learn how to:

- Estimate the performance of an injection well using analytical methods
- Estimate the performance of an injection well using numerical methods
- Explain the advantages of modeling producing wells together with injection wells
- Compare injection above and below the oil-water contact
- Compare injection above and below bubble point
- Compare injection through vertical and horizontal wells
- Compare injection through hydraulically fractured wells
- Discuss the merits of partial perforation vs. full perforation
- Explore perforation strategy differences between injection and producing wells
- Compare and contrast multiple methods of water shut-off in both injection and producing wells

- Compare and contrast multiple artificial lift methods for producing high water-cut wells
- Discuss the advantages and disadvantages of hydraulically fracturing injection and/or producing wells
- Discuss the advantages and disadvantages of gravel-packing injection and/or producing wells
- Calculate the optimal ratio of producing to injecting wells for a waterflood
- Discuss the merits of dry tree vs. subsea wells for a waterflood

Waterflood Water Sources

In this skill module, we compare water sources, describe how injection water interacts physically and chemically with our reservoir, wells and surface facilities, and discuss how we can change the properties of our injection water on the surface.

You will learn how to:

- Identify sources of water for a waterflood
- Identify which properties of the water matter
- Identify which properties of the water source matter
- Describe how impurities can be removed from injection water
- Describe what kinds of materials are added to injection water

Waterflood Optimization

In this skill module, we survey the kinds of opportunities available to optimize a waterflood and discuss ways to efficiently implement changes.

You will learn how to:

- Explain how to search for optimization opportunities by:
- Measuring deviations from expectations
- Revisiting design assumptions
- Deploying new technology intelligently
- Moving from secondary to tertiary

Waterflood Planning

This skill module covers waterflood design. We compare traditional and agile approaches to design and discusses data requirements and exit strategies.

You will learn how to:

- List the kind of data needed to plan a waterflood
- Explain how to measure the importance of missing data
- Describe how to pay for the collection of important data
- List the choices that need to be considered in creating a robust waterflood design

- Explain why an exit strategy is important
- Describe how to create a waterflood design document that will remain relevant over the life of the flood

Course Content

BLENDED LEARNING WORKSHOP STRUCTURE

This program is comprised of the following activities:

ILT = Virtual Instructor-led Training

OL = Online Learning Activity/Reading

Unit	Activity	Hours (Est.)	Subject
Unit 1	**ILT**	1.0	Orientation Webcast (pre-recorded)
	OL	5.0	Waterflood Overview
Unit 2	**ILT**	1.0	Waterflood Reservoir Property Effects Fundamentals - Session 1
	OL	3.5	Waterflood Reservoir Property Effects Fundamentals
	ILT	1.0	Waterflood Reservoir Property Effects Fundamentals - Session 2
Unit 3	**ILT**	1.0	Waterflood Reservoir Heterogeneity Effects Fundamentals - Session 1
	OL	3.0	Waterflood Reservoir Heterogeneity Effects Fundamentals
	ILT	1.0	Waterflood Reservoir Heterogeneity Effects Fundamentals - Session 2

Unit 4	**OL**	2.0	Waterflood Forecasting Overview
Unit 5	**ILT**	1.0	Waterflood Analytical Forecasting Fundamentals - Session 1
	OL	2.0	Waterflood Analytical Forecasting Fundamentals
	ILT	1.0	Waterflood Analytical Forecasting Fundamentals - Session 2
Unit 6	**OL**	3.5	Waterflood Surveillance
Unit 7	**ILT**	1.0	Producing vs. Injecting Wells Fundamentals - Session 1
	OL	4.5	Producing vs. Injecting Wells Fundamentals
	ILT	1.0	Producing vs. Injecting Wells Fundamentals - Session 2
Unit 8	**OL**	2.5	Waterflood Water Sources
	OL	2.0	Waterflood Optimization
Unit 9	**OL**	3.0	Waterflood Planning

Product Details

Categories: Upstream

Disciplines: Reservoir Engineering

Levels: Foundation

Product Type: Course

Formats Available: On-Demand Virtual

Instructors: PetroSkills Specialist Richard Henry

On-Demand Format

| Course | On-Demand (Available Immediately) $4,090.00
