

# SIMULATION OF NATURALLY FRACTURED RESERVOIRS

**RSE038**

## COURSE OVERVIEW

This course covers geologic and engineering concepts, methodology, and technology used to characterize, evaluate, and manage naturally-fractured reservoirs. Applications and limitations of geologic and engineering procedures and tools are discussed. Field examples and case studies demonstrate the importance of integrated geologic and engineering studies in developing effective, economical reservoir management strategies for different types of reservoirs.

## COURSE OBJECTIVES

By the end of this course, participant will be able to:

- Detect and predict natural fractures using cores and well logs.
- Analyze fractured rock properties impacting reservoir performance.
- Design and interpret pressure transient tests in fractured reservoirs.
- Evaluate reservoir performance and apply numerical simulation models.
- Apply geomechanics and fluid-flow behavior to reservoir management.
- Evaluate the impact of natural fractures on hydraulic fracture stimulation.
- Characterize and classify natural fractures and fracture systems.
- Understand the influence of stratigraphy and structure on fracture development.
- Assess effects of fractures on reservoir permeability and drainage.
- Apply reservoir engineering principles to numerical modeling.
- Analyze results for single-well, pattern, and full-field models.
- Prepare data and resolve numerical issues in simulation studies.
- Perform history matching and predict future reservoir performance.
- Understand displacement mechanisms and analyze grid refinement.
- Conduct routine and special core analysis for model parameters.

## WHO SHOULD ATTEND

Engineers and geoscientists interested in a multi-disciplinary approach to evaluating and predicting the overall effect of natural fractures on subsurface fluid-flow and subsequent reservoir performance.

## COURSE DURATION

5 Working Days

## COURSE OUTLINES

### Day 1

- Pre course evaluation
- Detect and predict subsurface natural fracture occurrence and intensity from cores and well logs
- Determine fractured rock properties affecting reservoir performance
- Design and analyze pressure transient tests in naturally-fractured reservoirs
- Evaluate reservoir performance in naturally-fractured reservoirs
- Develop and apply numerical simulation models to fluid-flow in naturally-fractured reservoirs

### Day 2

- Apply coupled geomechanics/fluid-flow behavior to reservoir management strategies in naturally fractured reservoirs
- Evaluate the impact of natural fractures on hydraulic fracture stimulation
- Characterization of natural fractures and fracture systems
- Influence of mechanical stratigraphy and structure on fracture development

### Day 3

- Detection and prediction of subsurface natural-fracture occurrence and intensity from cores and well logs
- Fractured rock properties affecting reservoir performance
- Classification of naturally-fractured reservoirs with reservoir examples and potential production problems
- Naturally-fractured reservoirs: fluid-flow, well performance and well testing, reservoir performance, numerical simulation
- Geomechanics/fluid-flow
- Behavior and stimulation of naturally-fractured reservoirs
- Effects of natural fractures on reservoir permeability, anisotropy, drainage area, and waterflood sweep efficiency

### Day 4

- Apply the principles of reservoir engineering to numerical modeling
- Set up, run, and analyze the results for single-well, pattern, and full-field models
- Prepare fluid and rock property data in the manner required for simulation studies
- Identify and eliminate causes of numerical problems
- Perform a history match
- Use the matched model to predict future performance under a variety of assumptions

## Day 5

- Buckley Leverett displacement
- One dimensional water oil displacement
- Model components, types, and modern gridding methods
- Two dimensional displacement
- Grid orientation and refinement
- Routine and special core analysis
- Single phase up-scaling of geo-cellular model parameters
- Post course evaluation

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