Introduction to Reservoir Simulation Theory & Application

Available to EGI Corporate Associate Members

Overview

Conventional analytical and semi-analytical methods used to describe, evaluate, and predict the production behavior of simple wells give us great insight into the physics of hydrocarbon production. However, as we move towards heterogeneous and highly complex systems such as horizontal wells in shales, naturally fractured formations, multilayered target zones, multiwell projects, etc., we face increasing challenges in the number of analytical tools available to us. Production decisions become even more critical during industry downturns, creating enormous pressure on engineers and geologists to correctly evaluate existing and new projects. Reservoir simulation technologies have profoundly changed the game for reservoir engineers by adding a whole new evaluation tool capable of handling almost any problem.

Significant differences in important prediction and evaluation results are observed when simulations are not performed efficiently. In this short course, we introduce clients who are new or familiar to reservoir simulation to important aspects such as the theory and the fundamentals necessary to make educated decisions. Indeed, reservoir simulation is only as good as the available data as well as the analysis and insight that the simulation user brings. Upon completion of the course, participants will add value to their companies by performing adequate and rigorous simulation studies as well as being able to troubleshoot common simulation issues.

Introduction

- Background and importance of reservoir simulation
- Analytical and semi-analytical methods versus numerical methods
- Assessment of simulation results
Theory Fundamentals & Simulation Development

- Reservoir engineering topics (PVT, relative permeability, Darcy’s law, etc.)
- Derivation of governing equations
- Assumptions and simple exercises
- Simulation framework
- Equation development and discretization
- Solution methods
- Well models

Commercial Simulation Application

- Introduction to commercial simulators: CMG and Eclipse
- Essential engineering and geologic data before running simulations
- Input data format
- Simple examples (Vertical wells, waterflooding, etc.)
- Analysis of simulation output (fluid rates, pressure distributions, etc.)
- Troubleshooting: Typical problems, convergence issues, errors, warnings, modification of simulation controls, etc.
- Complex examples (Hydraulically fractured horizontal wells, multi-well projects, compositional simulation, etc.)