Best Technology Solutions **BTS**

Modern Reservoir Simulation Overview

Training Program

Introduction:

The course is designed to give an introduction to the fundamental and practical aspects of modern reservoir simulation. Particular emphasis is placed upon the available data and its integration into a data set that reflects a coherent model of the reservoir. These aspects are reinforced with practical examples. The course starts with an overview of the fundamental principles of reservoir simulation and explains various types of simulators including black-oil, compositional, and dual porosity. The role of simulation in managing a reservoir is also highlighted. This overview is followed by a detailed discussion of the required input data for a simulation- including rock properties, rock-fluid interactions, and PVT data. Various options for modeling both vertical and horizontal wells are also presented. This section is followed by a discussion of gridding options and the factors which should be considered when choosing a grid. The impact of both grid size and orientation are shown. The key steps to making a successful history match are then discussed and the main concepts illustrated by hands-on exercises. The final section of the course explores the concept of upscaling and the impact it has on full-field modeling.

Who Should Attend?

Geologists, Petrophysicists, reservoir engineers, production engineers who are interested in obtaining an overview of simulation technology and how simulation fits into the reservoir development and optimization process

Course Objectives:

By the end of this course delegates will be able to:

- Have an understanding of the elements of a reservoir simulation model
- Understand how models are built
- Gain an appreciation for the fundamental concepts of reservoir simulation
- Gain a view on the tools used in the industry

Course Outline:

- Introduction
- Simulator Types
- Basic Principles
- Review of Mathematics
- Formulation of Equations
- Mass Balance Equation
- Darcyâ€™s Law
- Simulator Flow Equations
- Role of Simulation
- Modeling Fundamentals
- Rock Properties
- Rock-Fluid Properties
- PVT
- The Material Balance Equation and its Deficiencies
- Types of Reservoir Simulators
- Data Requirements
- Simulation Steps
- Selection of Model and Data Preparation
- Flow Equations
- Formulation and Derivation of Reservoir Simulation Equations
- Setting Up the Finite-Difference Model
- Solution Methods
- Horizontal Wells (SPE Comparative Study)
- Water Flooding Scenario
- Gas Injection Scenario (SPE Comparative Study)
- Miscible Displacement by CO2 injection (SPE Comparative Study)
- Transmissibilities and Treatment of Faults
- History Matching
- Equations of State and Compositional Modeling
- Well Models
- Discretization

- Formulation Options
- Water Influx
- Water drive classification
- Aquifer classification
- Water-drive diagnosis
- Key aquifer properties
- Black-oil reservoirs
- Material balance and recovery strategies
- Importance of compaction in oil reservoirs
- Estimating oil well rates
- Solution-gas-drive reservoir performance
- Gas-cap-drive reservoir performance
- Water-drive reservoir performance
- Analyzing performance using material balance
- Volatile-oil and gas-condensate reservoirs
- Estimating well rates
- Volatile-oil reservoir performance
- Gas-condensate reservoir performance
- Gas cycling
- Dewpoint cycling
- Analyzing performance using material balance