Best Technology Solutions **BTS**

Introductory Geo Scientist Processes & Techniques for Reservoir Engineering Training Program

Introduction:

The course examines the standard reservoir engineering processes and techniques, particularly their interface with geoscience activities. It follows, and illustrates with examples, the use of subsurface data and the techniques employed during the construction of a reservoir model. The course covers three related main themes - building a static reservoir model; developing a dynamic reservoir numerical simulation model; reservoir management during the producing life of a field. The material covered in this course is built around the process of the construction of a reservoir model. The process is in three parts; building a static reservoir model, developing a dynamic model and reservoir management during the producing life of a field.

The static reservoir model refers to the description of the reservoir in terms of reservoir and fluid distribution, volumetric and reservoir zonation to identify the main potential flow units.
The dynamic model builds on the static model to include the consideration of fluid flow in the reservoir, near the wellbore and through the production tubing to the wellhead. The dynamic model is often constructed using a numerical reservoir simulator, but there are analytical techniques which can be used to predict fluid flow in the reservoir. Reservoir management is a key activity for a producing field, performed with the general objective of maximizing economic recovery. Monitoring is performed by measuring production and pressures in the reservoir and the results drive the forward activity program and production forecasts.

Who Should Attend?

Geologists, Geophysicists, Reservoir Engineers, Production Engineers, Petrophysicists, Petroleum Engineers, Drilling Engineers, Field Development Engineers, Managers, Asset Managers, Oil & Gas Engineers, Reservoir Operators, Surveillance Engineers, Technicians, Engineering Trainees, Technical Managers, Technical Assistants, Technicians, Chemists, Physicists, Technical Supervisors, Service Company Personnel responsible for improving the performance of petroleum reservoirs, geoscientists and professionals from other disciplines who interface with reservoir engineers in their regular work, or who wish to obtain a broad grounding in reservoir engineering techniques. It is appropriate for reservoir or production geoscientists at an introductory level and for exploration geoscientists at an intermediate or advanced level

Course Objectives:

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

- Operate more effectively, and work more collaboratively, with their reservoir engineering colleagues
- Interpret original fluid contacts, through analysis of logs and pressure vs. depth profiles, prior to production start-up; understand saturation vs. height relationships and estimate original hydrocarbon in place volumes, for both oil and gas reservoirs
- Employ fluid sampling techniques
- Differentiate the physical and chemical properties of hydrocarbons and their description through phase diagrams
- Examine the uses and importance of well tests, and appraise how analysis is conducted.
- Examine the controls on fluid flow in the reservoir, the balance of viscous, capillary and gravity forces and the impact of reservoir drive mechanisms including depletion, water and gas drive
- Analyze production performance in the wellbore, and debate artificial lift techniques
- Compare production enhancement through stimulation, horizontal wells and completion techniques
- Examine the processes and interfaces of building both static and dynamic reservoir models
- Show awareness of the principles, objectives, demands and uses of reservoir numerical simulation techniques and its validation
- Analyze the importance of continued reservoir management for forecasting future production profiles and maximizing economic hydrocarbon recovery from a producing field over the complete life cycle
- Compare the enhanced recovery techniques: steam and fire flooding; miscible and immiscible gas displacement

Course Outline:

Controls on Fluid Flow in the Reservoir

- Rock permeability, and relationship with porosity
- Reservoir zonation

Defining Fluid Contacts and Estimating Volumetrics

- Basic reservoir volumetrics
- Defining fluid contacts; RFT pressure measurements and pressure vs. depth relationships
- Capillary pressures and saturation-height relationships

Reservoir Fluid Properties

- Fluid sampling
- Analysis of fluid samples
- Chemical properties of hydrocarbons
- Physical properties of hydrocarbons
- Phase diagrams
- Making use of the PVT report

Well Test Analysis

- Uses of well testing
- Planning a well test
- Well testing operations
- Well test analysis – determining KH, skin, PI, boundary effects
- Analysis principles
- Analysis techniques – semi-log and log-log analysis
- The components of total skin
- Special test types

Material Balance and Fluid Displacement

- Drive mechanisms; depletion, gas cap drive, water drive
- Material balance for oil reservoirs
- Material balance for gas reservoirs
- Fluid displacement on a macroscopic scale; sweep efficiency
- Fluid displacement on a microscopic scale; relative permeability
- Estimating recovery factors
- Diffuse and segregated flow regimes
- Buckley-Leverett displacement theory

Dynamic Well Performance

- The inflow performance relationship
- Tubing performance curves
- Artificial lift
- Coning and cusping
- Well completions
- Horizontal wells
- Well stimulation; fracturing and acidulation

Reservoir Simulation

- Gridding
- Simulation principles
- Input, output and visualization

Reservoir Monitoring

- Overview of reservoir management
- Monitoring tools: pressure, PLT, TDT, production and injection data
- Well interventions and workover

Production Forecasting

- Field analogues
- Decline curve analysis
- Analytical models
- Reservoir simulation and history matching
- Probabilistic production forecasting

Enhanced Oil Recovery Techniques

- Defining the target oil
- EOR techniques
- Steam and fire flooding
- Miscible gas displacement
- Immiscible gas displacement
- Novel techniques