Best Technology Solutions **BTS**

Principles of Reservoir Engineering Training Program

Introduction:

This course offers both the fundamentals of oil and gas reservoir engineering and the practical applications to conventional and unconventional (fractured, tight gas) reservoir problems. Estimation of oil and gas reserves, volumetric and material balance methods, reservoir, well recovery and performance analysis are presented. Well testing methods, behavior of reservoir under primary, secondary and tertiary recovery methods, and different drive mechanisms, are discussed. Field development strategies and planning, including horizontal well and multi-stage fracturing are presented. Displacement of oil by gas and water, principles of reservoir simulation and new technical developments are introduced. The course is intended for petroleum engineers, geologists, geophysicist and others who are interested in understanding the fundamental principles of reservoir engineering and the basic behavior and performance of hydrocarbon reservoirs. The objective of the course is to provide a more comprehensive understanding of the characteristics of oil and gas reservoirs, from fluid and rock characteristics through reservoir definition, delineation, classification, development plan, and production. Data collection, integration and application towards maximizing recovery are emphasized.

Who Should Attend?

Geologists, Geophysicists, Petrophysicists working in exploration and exploitation, engineers anyone who are relatively new to the industry, but who have some background in reservoir geology and the production of hydrocarbons

Course Objectives:

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

- Gain an understanding of the principles and basic practice of reservoir engineering

Course Outline:

- Introduction to reservoir engineering
- Role of reservoir engineer in E&P Interaction with other petroleum engineering disciplines
- Definition of reservoir pressure
- Determination of pressure gradients
- Identification of contacts
- Effect of capillary pressure on contact
- Areal variation in reservoir pressure
- Definitions of reservoir porosity, permeability, capillary pressure
- Review of core analysis methods to determine rock properties
- Effect of stress on properties
- Interaction of rock and fluids - relative permeability effects
- Measurement of relative permeability
- Correlation of permeability measurements - laboratory and welltest
- Effect of vertical variations in permeability on gas/water/oil saturation
- Composition of reservoir fluids
- Molecular basis for variation in hydrocarbon content of a reservoir
- Examination of the fluid physical changes in the reservoir during production
- Variations in number and saturation of each hydrocarbon phase
- Physical and mechanical properties of reservoir hydrocarbons
- Measurement of properties
- Determination of state parameters for each phase
- Introduction to fluid flow in the reservoir
- Estimation of average pressure
- Development of diffusivity equation
- Application of diffusivity equation to steady state, semi-steady state and unsteady state flow
- Applications of line source solution to determine reservoir pressure
- Extension of line source solution to well testing
- Overview of well testing techniques Use of well testing in determining average reservoir pressure, productivity index, permeability

- Use of Horner equation
- Understanding reservoir energy - drive mechanisms: water drive, gas cap drive, solution gas drive, gravity segregation Vapor liquid equilibrium
- Effect of composition on equilibrium
- Variation with temperature
- Application of deviation factor to ideal gas law
- Downhole and surface fluid sampling
- Measurement of PVT parameters
- Presentation of data to produce formation volume factors, gas oil ratios, compressibilities
- Concept of reservoir as a single tank
- Definition of material balance equation for combination drive reservoir
- Limitations on use of material balance equation
- Determination of most effective drive mechanism
- Examination of water influx
- Use of fractional flow equations
- Concept of transient and instantaneous pressure changes at oil water contact; immiscible displacement concepts
- Calculation of recovery from reservoir
- Effect of heterogeneity on recovery processes
- Role of geological characterization in improving reservoir flow models
- Differences in depositional sequences and the effects on fluid distributions
- Calculation of immiscible displacement floods
- Concept of reservoir simulation
- Application of approximate solution to diffusivity equation to overcome restrictions in simple analytical models
- Nature of gridding process
- Assignment of fluid and rock properties within the reservoir