Geoscience for Petroleum Engineering

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Introduction:

This 5-day course focuses on introducing the non-geoscientist to some of the important concepts of geoscience relevant to anyone working in or seeking to work in the industry.

Course Requirement:

Science or Engineering background.

Who should attend?

Non-geoscientists (engineers, drillers and other technical personnel) who need to work with geoscience concepts concerning the subsurface.

Learning objectives of Geoscience for Petroleum Engineering include:

1. understand the geological environment responsible for hydrocarbon formation, migration and storage
2. identify the main characteristics of hydrocarbon-bearing formations
3. estimate the volume of such reservoirs

Course Outline:

Day 1. Geological concepts

- Introduction to Earth materials, processes, basins and petroleum system: Review of the nature and composition of the Earth; Plate tectonics and sedimentary basins; Principles of stratigraphy; Rock types and their identification.
- Transport, deposition and deformation processes: Reservoir Seal, Source rock and migration path, Trap, Timing; Understand how depositional process affect texture of sedimentary rocks and the relation with petro physical properties; common depositional structures and their origin; well (log and core) observations and their relation to a 3-D depositional model; general differences between carbonate and clastic depositional process and environments?

Day 2. Reservoir architecture

- Reservoir heterogeneity, architecture, faults seals: Identify the main types of structural features; Identify the characteristics of a structural trap; Main types of faults, and tectonic setting; Fold geometries; Fractures and other localized deformation and the effect on fluid flow characteristics; Fracture patterns associated with folding; Structural features shown in core and on dipmeter/image logs/cross sections and maps; Fault compartmentalization.

Day 3. Geophysics

- Geophysics: Review the basic geophysical concepts as used in the petroleum industry; Applications of seismic data in reservoir description, main geophysical methods; Wave propagation – P and S waves, alteration at interfaces (reflection/refraction); Seismic method (data gathering and interpretation); Use and limits of seismic in reservoir description.

Day 4. Subsurface interpretation

- Mapping: Spatial data contouring using manual and mechanical methods; Advantages and disadvantages of computer and manual mapping techniques; Characteristics of computer gridding and manipulation; Identification of "good" and "poor" maps from the type and density of the input data.
- Correlation: Importance in reservoir development; Definition of a subsurface framework to understand geological relationships between wells; Identification of correlation markers and flow units; Principles of flow unit correlation; Role of different data (e.g. seismic, log, biostratigraphic) and models (sequence stratigraphy) on flow unit correlation; Common misinterpretations in flow unit correlation.

Day 5. What size hydrocarbon accumulation?

- Geostatistics, Property evaluation and Volumetric: Porosity/permeability variations; Relationships between petro physical properties and geology; Construction of measures of spatial correlation (variorums); Definition of gross/net sand and gross/net pay; Methods to determine gross rock volume; Reserve parameter distributions; Calculation of volumetric reserves by deterministic and stochastic methods?