

ANALYSIS AND MODELING OF PETROLEUM SYSTEMS

General:

Discipline: Petroleum Systems

Level: Basic

Duration: 5 days

Instructor: Jorge Rodriguez

Purpose:

Petroleum Systems Analysis and Modeling is an essential tool in the evaluation of conventional and unconventional exploration and reservoir development projects. The course describes the fundamentals of source rock formation processes, generation, migration, accumulation and alteration of hydrocarbons in a sedimentary basin; and the geological and thermodynamic processes that govern them. It also includes practical demonstrations of Petroleum Systems Modeling with Kinex/Genesis/Trinity software and basic geochemical interpretation of source rocks and fluids.

Designed for:

It is intended for geologists, geophysicists and petrophysicists working on the evaluation of a basin, play, prospect or field who want to expand their knowledge in the analysis and modeling of Petroleum Systems:

You Will learn how to do:

- Modeling of maturity, generation time and estimation of hydrocarbon volumes expelled, retained and accumulated in conventional and unconventional deposits.
- Geochemical characterization of the distribution and quality of source rocks and the origin of the oils and gases generated in a basin.
- Modeling the migration and charge of the fields and their impact on the prediction of the phase and properties of fluids in the reservoir.
- Modeling of pressures and hydrodynamic processes and how they affect migration, charge and seal efficiency.
- Modeling of the thermal and compaction processes and their impact on the prediction of reservoir quality.
- Geochemical characterization and alteration of fluids in the reservoir and their application in studies of compartmentalization and production speeding.

Course Content:

Introduction to the Analysis and Modeling of Petroleum Systems: Elements and processes of Petroleum Systems: trap, seal, reservoir, source rock, overburden, generation, migration, accumulation and preservation in space and time. Examples of conventional and unconventional Petroleum Systems in different tectonic environments. Examples of

applications, added value in E&P projects, applications in risk and uncertainty assessment, necessary data, workflows, best practices and key decision-making products.

Modeling of Petroleum Systems. Main processes of formation and thermal evolution of sedimentary basins. Modeling of subsidence and heat flow. Thermal effects of lithology, paleobathymetry, sedimentation rate, erosion and compaction. Effects on the maturation of source rocks, timing of expulsion of hydrocarbons. Calibration of thermal history and petrophysical properties. Examples of 1D modeling with Genesis software. Reconstruction of oil and gas migration. Prediction of the occurrence and phase of accumulations through space and time. Hydrodynamics and pressure calibration. Evaluation of seal effectiveness and prediction of the hydrocarbon column. 3D modeling techniques and examples with Trinity software.

Characterization of source rocks. Source rock deposit environments. Organofacies and kinetics. Process of organic matter transformation into oil and gas. Sampling techniques, laboratory analysis, geochemical characterization and estimation of volumes of gas and oil generated, expelled and retained in the source rock. Data required for maturity calibration. Demonstrations with Kinex software.

Geochemistry of oils and gases. Sampling, analysis and interpretation of geochemical data. Correlation techniques and interpretation of the origin of hydrocarbons. Alteration processes in the reservoir. Distribution of fluid properties in the reservoir. Geochemistry applied to the compartmentalization of reservoirs and production allocation.

Software used for demonstrations in the course:

- Kinex, Genesis, Trinity

