



N644: Geology for Non-Geologists (4 Day)

Instructor(s): Paul Pause

4 Days

Competence Level:
Foundation



Classroom Course

Summary

This popular four-day course will provide non-geologists with a practical understanding of the principles used by petroleum geologists in the search for oil and gas. The sessions will include both the scientific background and the practical applications of geology. The tools, techniques, and vocabulary of the petroleum geologist will be emphasized throughout the course.

Learning Outcomes

Participants will learn to:

- Understand how the nature of geology itself affects the way geologists approach problem solving.
- Describe the paradigm of plate tectonics and how modern exploration uses the concepts of the plate tectonic model in the search for oil and gas.
- Communicate more effectively in geoscience meetings through an understanding of the terms, tools, and techniques used in the exploration and development of hydrocarbons.
- Tell the difference between rock types and know why some are, or are not, suitable reservoirs for oil and gas
- Define the concept of the petroleum system and how it aids in the interpretation and evaluation of hydrocarbon generation, maturation, migration, and accumulation.
- Understand the information illustrated through the construction and interpretation of cross sections and maps.
- Describe the importance and use of analogs in interpreting subsurface data.
- Distinguish the difference between stratigraphic and structural traps for oil and gas and how to recognize them from cross sections and maps.
- Know how to recognize different depositional environments using facies maps, isopachs, and fence diagrams.
- Describe the importance of environments of deposition in predicting the distribution, location, and geometry of reservoir rocks.
- Describe the difference between porosity and permeability and discuss the importance of each in conventional and unconventional reservoirs.
- Describe the characteristics of shales and the geologic parameters that control "sweet spots" in shale plays
- Understand the basics of well-log analysis and formation evaluation, including basic tool types, their measurements, and interpretation of lithology, porosity, and water saturation
- Calculate oil-in-place (OIP) reserves using log-derived data.
- Appreciate the importance of sample examination and the recognition and interpretation of oil shows at the wellsite.
- Understand the basic principles of seismic prospecting and know the difference between 2D, 3D, and 4D seismic.

Duration and Training Method

Four classroom days providing 3.2 CEU (Continuing Education Credits) or 32 PDH (Professional Development Hours)



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Who Should Attend

The course is designed for anyone in the oil and gas industry who does not have a geological background. Previous attendees include petroleum engineers, geophysicists, geotechs, finance and personnel officers, managers, administrative assistants, and accounting, IT, land, and public/investor relations personnel.

Course Content

Course Agenda

Day One

1. Introduction; the practice and profession of petroleum geology
2. Physical and historical geology; methodology – the principal of uniformity
3. Earth's structure; the Big Picture – How the Earth works
 - a. Plate tectonics
 - b. Basin formation and importance to oil and gas
4. Rocks and minerals
 - a. Rock identification and classification: source rocks, reservoir rocks, and seals
 - b. Primary and secondary porosity
 - c. Permeability
5. Sedimentology
 - a. Depositional environments and their significance to reservoir rock properties
6. EXERCISE: rock and mineral identification
7. Origin, nature, and occurrence of petroleum
8. The Total Petroleum System concept
 - a. Primary and secondary migration of hydrocarbons
 - b. Conventional and unconventional resources – shale gas, oil shale, oil sands, gas hydrates

Day Two

1. Stratigraphy
 - a. Utility of fossils in oil and gas
 - b. Stratigraphic correlation
2. Geological time and dating events
 - a. Radiometric age dating
3. The geological time scale
4. Transgressions and regressions
 - a. Facies and prediction of reservoir trends
5. EXERCISES: working with cross sections and relative dating of events, creating and interpreting fence diagrams, facies mapping
6. Structural geology; determining the attitude of beds – strike and dip
 - a. Brittle vs. ductile deformation – folds, faults and fractures
7. Block diagrams: formation and description of petroleum traps

Day Three

1. History of petroleum exploration
2. Surface and subsurface mapping methods



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- a. Field work
3. Structural and stratigraphic cross-sections
4. Contouring
 - a. Structure maps
 - b. Isopach maps
5. Exploration methods - generating and evaluating prospects
6. EXERCISES: Geological map interpretation and constructing cross-sections, correlating cross-sections, structure contour mapping

Day Four

1. Introduction to wireline well logging
 - a. Picking tops
 - b. Calculating subsea values for structure mapping
 - c. Formation evaluation
 - d. Logging methods
 - e. Interpreting gamma ray
 - f. SP
 - g. Sonic
 - h. Neutron-density and PE curves
 - i. Image tools
 - j. Logging while drilling – geosteering
2. Calculating reserves – oil in place (OIP)
3. Geophysical methods
 - a. Seismic data acquisition, processing, and interpretation
 - b. Direct hydrocarbon indicators (DHI)
 - c. 2D, 3D, and 4D seismic
 - d. Multi-azimuth, VSP, and Microseismic applications
4. Geochemical methods
 - a. Microseeps
 - b. Surface soil sampling
5. Well-site geology
 - a. Sample examination
 - b. Oil and gas shows
 - c. Mud logs
 - d. Formation evaluation
6. Drill Stem tests
7. Sources of data
 - a. Scout tickets
 - b. Land/lease/license maps
 - c. Oil and gas field publications
 - d. Geological reports
8. EXERCISES: Log interpretation – picking tops, determining lithology, calculating porosity, water saturation, and calculating reserves