



Waterflood and Enhanced Oil Recovery (EOR)

Course Objective:

This course provides a complete review of the waterflood scheme being the most proven, lowest cost, and applicable to various types of reservoirs. The various steps of waterflood implementation including cursory screening of candidate fields, scheme planning, design, and the estimation of the expected recovery using the most common methods in the industry.

Additional improvements in oil recovery using the most common secondary and tertiary methods are also discussed. Method mechanism, limitations, expected performance, and estimation of the expected recovery, are discussed. Design procedures and laboratory tests required are reviewed for the various EOR schemes including the application of CO₂, miscible gas, steam, and chemical floods. Interesting class examples using actual field data will be presented. A detailed course hand-out which is an excellent reference, will be provided.

Who Should Attend:

This course is aimed at reservoir, petroleum and exploitation engineers/technologists, and geologists who are involved in the area of EOR schemes.

Course Instructor:

Mr. Saad Ibrahim, P. Eng, president of Petro Management Group Ltd. with 30 years of diversified experience in the oil and gas industry (Please see his professional profile).

Course Agenda:

- **Petroleum Geology:**
 - ▶ Main elements of petroleum reservoirs: hydrocarbon migration & traps
 - ▶ Depositional environment and impact on reservoir quality
 - ▶ Reservoir facies and heterogeneity

- **Rock Properties:**
 - ▶ Porosity types, permeability: relative, absolute, effective
 - ▶ Rock wettability and capillary pressure

- **Fluid Properties:**
 - ▶ Hydrocarbon classifications
 - ▶ Fluid behaviors; oil and gas physical properties (class problem)
 - ▶ Fluid sampling and PVT analysis

- **Reservoir Drive Mechanisms:**
 - ▶ Primary, secondary, and tertiary recovery schemes
 - ▶ Performance characteristics of different reservoir drive mechanisms

- **Reserves Determination:**
 - ▶ Volumetric, material balance, and probabilistic methods (class problem)
 - ▶ Decline analysis
 - ▶ Empirical method (Russian method !)

- **Waterflood Schemes:**
 - ▶ Review and screening of EOR schemes
 - ▶ Waterflood displacement mechanism (fractional flow, Buckley Leverett)
Scheme planning and design
 - ▶ Factors that impact oil recovery
 - ▶ Prediction of recovery efficiency using Dykstra and Parsons, Stiles method and other empirical techniques

- **EOR schemes:**
 - ▶ Scheme screening and limitations
 - ▶ Laboratory tests to define key parameters to optimize scheme design
 - ▶ Physical properties of injected fluids
 - ▶ Expected incremental oil recovery
 - ▶ Scheme planning and design
 - ▶ Performance monitoring

- **CO₂ flooding**
- **Gas miscible flooding**
- **Chemical flooding**
- **Steam flooding**
- **In-situ combustion**