

RESERVES ESTIMATION

RSE002

COURSE OVERVIEW

This course will cover wide range of knowledge in Petroleum Resources Definitions and Classification following the SPE Petroleum Resources Management System (SPE-PRMS), and addressing Risk Analysis in estimating hydrocarbon volumes highlighting tools and techniques used discussing the basics of Monte Carlo Analysis using software application.

The course will illustrate theoretical and practical classroom sessions providing presentations of Petroleum Resource Definitions, Reserves Classification and Portfolio Management. The participants will then have practical sessions using the Petroleum Resource Management System (PRMS) to classify and categorize reserves within a field blocks. This will include an introduction to SPE-PRMS, Principles and Definitions, Project-based Resources Evaluation, Resources Classification and Categorization Guidelines, Resources Evaluation & Reporting Guidelines, Estimating Recoverable Quantities and Resources Aggregation rules. Examples of other systems will be touched such as SEC, NPDS & UNFC systems.

The course will also address basic techniques of Risk Assessment in volumes estimations linking between "geology" and "business" reviewing the four elements of Chance of Success (CoS); Reservoir, Seal, Trap and Charge. Different Risk Analysis and Risking tools will be discussed and explained during the training such as Risk Trees, Risk Matrix, Expectation Curve, Italian Flag... etc. By the end of this part, participants will know how to build the Risk Tree / Probability Tree to risk the estimates volumes and/or prize. In addition to that, Monte Carlo simulation will be elaborated as an efficient tool in managing uncertainty in volumes estimation with practical examples.

COURSE OBJECTIVES

By the end of this course, participant will be able to:

- Gain a comprehensive understanding of Petroleum Resources Definitions and Classification based on the SPE Petroleum Resources Management System (SPE-PRMS).
- Learn the principles and definitions of the SPE-PRMS and how it works.
- Understand the importance of defining and classifying petroleum resources for technical and business needs.
- Familiarize yourself with the historical overview and evolution of resource classification systems.
- Learn about project-based resources evaluation and the classification framework.
- Understand the different reserve categories and guidelines, including Proved, Probable, and Possible reserves.
- Gain practical skills in estimating recoverable quantities using analytical procedures and uncertainty management techniques.

- Learn the methods and guidelines for aggregating petroleum quantities.
- Explore risk assessment tools and techniques, including Risk Matrix, Italian Flag, and Chance Factor assessment.
- Understand the concept of benchmarking in risk assessment.
- Acquire knowledge and practical experience in using Monte Carlo simulation for evaluating resources, risk assessment, and aggregation.

WHO SHOULD ATTEND

- Reservoir Engineers
- Geoscientists
- Development Geologist
- Geophysicists
- Field Engineers
- Production Managers
- Field Managers
- Oil Field Technical Staff
- Production Technologists
- All individuals involved in the area of reservoir engineering, welltest operations, exploration stage, development stage and production optimization.

COURSE DURATION

5 Working Days

COURSE OUTLINES

DAY (1)

Resource Definitions & Classification – SPE-PRMS Overview

In this part, SPE-Petroleum Resource Management System will be over-viewed. This includes an introduction to SPE-PRMS, Fundamental Definitions and Historical Overview. Participant will gain knowledge about Resources Classification Framework and Project-based Resources Evaluation.

The following are the main topics will be covered in this section:

- Introduction to Portfolio Management
- Why to define and classify petroleum resource?
 - Technical Needs
 - Business Needs
- Fundamental Definitions
 - Petroleum Resources

- Resources Assessment
- Resources Evaluation
- Commercial Viability vs. Economic Efficiency
- History
 - Evolution of API
 - Contribution of SPE, WPC, AAPG, SPEE, SEG and SEC
 - SPE-PRMS Overview
 - How it works?
 - SPE-PRMS goals
 - Basis of SPE-PRMS
 - Principles of SPE-PRMS
- Principles and Definitions
 - Resources Classification Framework
 - Definition of "Petroleum"
 - Total PIIP
 - Discovered PIIP, Undiscovered PIIP and Production
 - Reserves
 - Contingent Resources
 - Unrecoverable Resources
 - Technology criteria
 - Chevron Classes of CR
 - Prospective Resources
 - Project-based Resources Evaluation
 - Data Sources
 - Reservoir element
 - Project/Development element
 - Property/Concession element
- Resources Classification & Categorization
 - Resources Classification
 - Discovery Status
 - Commerciality
 - Project Status; Chance of Commerciality
 - Recoverable Resources Classes & Sub-classes
 - Play, Lead & Prospect
 - Development not viable, On-hold & Pending cases
 - Reserves: Justified for Development vs. Approved for Development

DAY (2)

Resource Definitions & Classification – Reserves Categories & Evaluation

In this part, Petroleum Resources Classification and Categorization will be furtherly addressed by defining the term of "Project", elaborating more about Reserve Classes and Categories including technical notes on incremental projects (e.g. Workover and EOR) and their resources definition. Resources Evaluation and Reporting Guidelines will also be overviewed. By the end of this day, Participants will be able to define Proved Areas, Classify and categorize reserves.

The following are the main topics will be covered in this section:

- Resources Classification & Categorization (cont'd)
 - Projects
 - Examples of Projects
 - Dynamic Feature of Projects
 - Reserve Status
 - Proved Developed Producing Reserve (PDP)
 - Proved Developed Non-Producing (PDNP)
 - Proved Undeveloped (PUD)
 - Economic Status
 - Marginal CR
 - Sub-Marginal CR
 - Reserves Category Definitions & Guidelines
 - Proved Reserve Guidelines
 - What is Proved Area?
 - Undeveloped Locations
 - Proved Developed
 - Proved Undeveloped
 - Probable Reserve
 - Possible Reserve
 - Example
 - Resources Categorization
 - Range of Uncertainty
 - Category Definitions and Guidelines
 - Incremental Approach
 - Cumulative Approach
 - Exercises
 - Incremental Projects

- Workovers, Treatments and Equipment Change
- Infill Drilling
- EOR
- Short Note in PRMS of Unconventional Resources
- Resources Evaluation & Reporting Guidelines
 - Commercial Evaluation
 - Cash-flow based Resources Evaluation
 - Economic Criteria
 - Commercial Risk
 - Production Measurement
 - Reference Point
 - Lease Fuel
 - Natural Gas (Wet or Dry)
 - Associated Non-HC
 - Natural Gas Re-injection
 - Underground Natural Gas Storage

DAY (3)

Resource Definitions & Classification – Estimating Recoverable Quantities & Aggregation, and Risk Tree.

In this part, Different methods used in estimating recoverable quantities will be demonstrated. Both deterministic and probabilistic methods will be explained stating recommendations on the usage of each one. Aggregating different petroleum resources will be addressed in this section within the context of Portfolio Management.

The following are the main topics will be covered in this section:

- Estimating Recoverable Quantities
 - Analytical Procedures
 - Analogy method
 - Volumetric calculations
 - Material Balance
 - Production Performance Analysis
 - Uncertainty Management
 - Deterministic and Probabilistic methods
 - Comparison

- Calculating PIIP
 - o Deterministic (Scenario) method
 - o Deterministic (Incremental) method
 - o Probabilistic method
 - o Multi-scenario method
- Strength & Weaknesses of Deterministic vs. Probabilistic methods
- VOI
- Guidelines in selecting Probability Distribution Function
- Examples (Use Monte Carlo)
- Petroleum quantities Upgrading with Time/Development
- Guidelines while Resources Assessment
- Aggregation (How to add petroleum quantities to each other?)
 - Methods
 - Levels of Aggregation
 - Portfolio Effect
 - Dependencies Effect
- Examples of Other Systems
 - Securities and Exchange Committee (SEC)
 - SPE-PRMS vs. SEC
 - UNFC System
 - Petronas System
 - Norwegian Petroleum Directorate System (NPDS)
 - Nigerian National Standard (NNS)

DAY (4)

Risk Assessment and Benchmarking

In this part, Risk Assessment will be illustrated starting with describing essential ingredients reaching to Uncertainty management concept. Different Risk Assessment tools will be described and detailed with special focus on Risk Matrix and other Risking tools.

The following topics will be covered in this section:

- Introduction
- Essential Ingredients – Geology
 - Reservoir
 - Seal
 - Trap
 - Charge



- Objective of Risk & Volume (R&V) Assessment
- Basic Volume Equation
- Expectation Curve
- Risk vs. Uncertainty
- Risk Matrix – Confidence/Knowledge vs. Likelihood
- Italian Flag
- Assessing Chance Factor
- What is "Technical Success"?
- Low POS! – Should we go for it?
- Low POS Differentiation
- Recommendations
- Judgement under Uncertainty
- Benchmarking

DAY (5)

Using Monte Carlo Simulation in Evaluating Resources, Risk Assessment and Aggregation

In this part, Monte Carlo simulation will be demonstrated using software application. Many examples will be exercised starting from simple risking of volumetric calculations, estimating oil rates, reaching to aggregating different petroleum resources together.

The following topics will be covered in this section:

- What is Monte Carlo simulation?
- Using Monte Carlo in Risking Oil Rate for New Wells
- Using Monte Carlo in Estimating Volumetric Calculation
- Using Monte Carlo in Aggregating/Summation of Different Resources
- Other Applications for Monte Carlo

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