N933: Reservoir Engineering Fundamentals

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Summary

This course is an introduction to Petroleum Engineering, emphasising the physical principles that govern reservoir and well performance. Basic principles and terminology are discussed and applied to: measuring rock and fluid properties; estimating hydrocarbon volumes; analysing production and well test data; assessing static and dynamic reservoir processes; and predicting long term performance.

Learning Outcomes

Participants will learn to:

1. Apply the physical principles underlying oil and gas field behaviour to predict the performance of simple reservoirs.
2. Use subsurface pressure data to assess qualitatively the dynamic performance of hydrocarbon reservoirs.
3. Calculate the "in place" and "recoverable" volumes associated with simple oil and gas fields, and categorise these volumes using industry-standard definitions.
4. Analyse the performance of closed reservoirs undergoing depletion using fluid PVT data.
5. Analyse the performance of 1D, homogeneous reservoirs undergoing waterflood.
6. Examine the principles of well test analysis.
7. Quantify the production rate from under-saturated oil reservoirs taking into account the inflow and outflow performance of a well.
8. Distinguish between the limitations of the techniques described during the course and examine ways in which they may be improved.

Duration and Training Method

This is a five-day course which includes classroom lectures, exercises and class discussions. The exercises involve hand calculations.

Who Should Attend

This course is designed for technical staff wishing to gain an understanding of the physical principles behind oil and gas field production. It would be especially suitable for engineers working in disciplines outside Petroleum Engineering, or as a refresher course for Petroleum Engineers.

Prerequisites and Linking Courses

No prior knowledge of Petroleum Engineering is assumed. The course forms the basis for N936 (Applied Petroleum Engineering). Course N006 covers a similar range of topics but in a more qualitative fashion.

Course Content

Day 1: Introduction

- What do Reservoir Engineers do?
- Terminology
- Basic physical principles
- "My first model"

- Subsurface pressures

Day 2: Hydrocarbon volumes

- Volumetric calculations
- Reserves classification
- Probabilistic and deterministic reserves
- Reserves estimation using decline curves

Day 3: Primary recovery

- Phase behaviour
- The "Black Oil" model
- Fluid properties
- Primary recovery methods
- Oil material balance
- Gas material balance

Day 4: Secondary and tertiary recovery

- Relative permeability
- Capillary pressure
- Secondary recovery methods
- Immiscible displacement
- Tertiary recovery methods

Day 5: Well and reservoir performance

- Introduction to well testing
- Inflow performance
- Outflow performance
- Well performance prediction
- Reservoir performance prediction