CONCEPT

PVT Analysis and Reservoir Fluid Characterisation: Equation of State Modelling

11 – 15 October 2027
London - Central London four-star



PVT Analysis and Reservoir Fluid Characterisation: Equation of State Modelling

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Introduction:

PVT analysis errors travel quietly into every reservoir decision: an unrepresentative sample, an unchecked laboratory report or a poorly tuned equation of state skews in-place volumes, condensate yield, well deliverability and facility design. This Core Concept course takes reservoir, petroleum and production engineers from sampling and sample validation through laboratory test interpretation, plus-fraction characterisation and cubic equation of state regression, to black-oil and compositional tables ready for simulation. Participants finish with a Fluid Characterisation Study and a tuned EOS model for a case field.

Course Objectives:

- Classify a reservoir fluid from its composition, gas-oil ratio and phase diagram and select a sampling method that captures it representatively
- Validate bottomhole and surface samples and laboratory reports with consistency checks before the data enter engineering work
- Interpret expansion, depletion, liberation and separator test results and convert them into formation volume factors and gas-oil ratios at field separator conditions
- Characterise the heptanes-plus fraction by splitting and lumping and assign critical properties to pseudo-components
- Regress a cubic equation of state against laboratory data and export black-oil or compositional tables for reservoir simulation
- Assemble a Fluid Characterisation Study that documents data selection, model tuning and limits of use for a case field

Target Audience:

- Reservoir engineers who select fluid properties for volumetrics, material balance and simulation models
- Petroleum engineers who plan sampling campaigns and commission PVT laboratory programmes
- Production engineers who use fluid models for well performance, separator settings and flow assurance screening
- Simulation engineers who build and maintain PVT input tables and compositional fluid models
- Fluid and laboratory data specialists who review PVT reports before release to project teams

Course Outline:

Day 1: Reservoir Fluid Types, Phase Diagrams and Sampling Strategy

- Pressure-Temperature Diagrams: Cricondenbar, Cricondentherm and Critical Point Location
- Fluid Typing by Initial Producing Gas-Oil Ratio, Stock-Tank Gravity and Heptanes-Plus Content
- Bottomhole Sampling with Single-Phase Samplers and Wireline Formation Testers
- Surface Recombination Sampling: Separator Stabilisation and Gas-Oil Ratio Measurement
- Sample Validation: Opening Pressure, Bubble Point at Ambient Temperature and Contamination Checks

Day 2: PVT Laboratory Programme and Report Validation

- Constant Composition Expansion: Relative Volume, Y-Function and Saturation Pressure Picking
- Constant Volume Depletion for Gas Condensates: Liquid Dropout and Produced Gas Composition
- Differential Liberation: Residual Oil, Liberated Gas Gravity and Oil Density Profiles
- Multistage Separator Tests and Optimum Separator Pressure Selection
- Laboratory Report Quality Control: Material Balance Check, Hoffman Plot and Equilibrium Ratio Trends

Day 3: Black-Oil Properties, Correlations and Compositional Analysis

- Converting Differential Liberation Data to Separator Conditions for Bo and Rs
- Published Black-Oil Correlations: Selection, Validation and Local Calibration
- Dead and Live Oil Viscosity Measurement and Correlation Checks
- Gas Chromatography Compositional Analysis to Single Carbon Numbers
- Heptanes-Plus Characterisation: Molar Distribution Splitting, Lumping and Critical Property Assignment

Day 4: Cubic Equations of State, Regression and Near-Critical Fluids

- Peng-Robinson and Soave-Redlich-Kwong Equations: Parameters, Mixing Rules and Volume Shift
- Binary Interaction Coefficients and Their Effect on Saturation Pressure Prediction
- EOS Regression Strategy: Parameter Selection, Weighting and Overfitting Diagnostics
- Retrograde Condensation, Condensate Banking and Volatile Oil Shrinkage Modelling
- Compositional Grading with Depth and Near-Critical Fluid Behaviour

Day 5: Case Field Fluid Characterisation Study and EOS Model Build

- Case Field Data Pack Screening: Sample Selection and Rejected Data Log
- Case EOS Tuning Exercise Against Expansion, Depletion and Separator Results
- Simulation Table Export: Black-Oil Tables, Pseudo-Component Sets and Model Checks
- Fluid Model Uses in Material Balance Inputs and Wax, Asphaltene and Hydrate Screening Overview
- Fluid Characterisation Study Presentation with Peer Technical Challenge

Skills You Will Gain:

- Reservoir Fluid Sampling Design
- PVT Report Quality Control
- Laboratory Test Interpretation
- Plus-Fraction Characterisation
- Equation of State Regression
- Gas Condensate Behaviour Analysis
- Simulation PVT Table Preparation
- Fluid Model Documentation

Why Attend This Course:

- Return with a Fluid Characterisation Study and tuned EOS model for a case field, with documented data choices and limits of use
- Reject unrepresentative samples and inconsistent laboratory data before they reach reserves, well or facility calculations
- Explain to asset teams how condensate dropout, volatile oil shrinkage and fluid grading change forecasts and separator settings
- Compare fluid modelling practice with engineers from operators, service laboratories and consultancies across gas, oil and condensate fields

Conclusion:

Reliable fluid models start with representative samples and end with tables that simulators and engineers can trust. The course moves from fluid typing, phase diagrams and sampling, through laboratory test interpretation and report quality control, to black-oil correlations, heptanes-plus characterisation and cubic equation of state regression for condensates and volatile oils. The final day applies these methods to a case field and produces a Fluid Characterisation Study and EOS model with simulation tables ready for the next reservoir or production study.