
PVT Analysis Course: Fluid Sampling, Lab Tests and Equation of State Models

28 June – 2 July 2027
Cape town





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Programme Summary

PVT analysis is the subject of this one-week training course for reservoir, production and asset leaders, ending in a fluid data dossier for one field. Development plans, reserves figures and facility sizing all rest on fluid properties, yet laboratory reports are often accepted without checks on sampling quality or internal consistency. The programme moves from phase behaviour to sampling, laboratory tests, validation and fluid models, applied to a field the participant selects. Mars Training Centre UK delivers this programme on PVT analysis to mixed-organisation cohorts.

The Business Case

Fluid properties sit under volumes in place, well rates and surface facility design. A weak sample or an unchecked laboratory report passes quietly into simulation models and then into investment decisions. Leaders who question how a sample was taken and whether the data agree protect every forecast, reserves figure and facility design built on them.

- Reserves Uncertainty: Falls as fluid data are screened before they enter volumetric and material balance calculations.
- Rework in Reservoir Studies: Falls as models are tuned once against validated data.
- Facility Design Risk: Falls as gas, oil and water volumes at surface are predicted from tested fluid behaviour.

Principles and Evidence Base

- API RP 44 Sampling Practice: Frames the choice between bottomhole and separator sampling and the checks on sample quality made in Session 2.
- Standing Correlation: Gives the empirical benchmark against which laboratory black oil results are compared in Session 3.
- Peng-Robinson Equation of State: Supplies the cubic model that participants tune against laboratory data in Session 4.
- Soave-Redlich-Kwong Equation of State: Provides the second cubic model used to compare fits and predictions in Session 4.



Intended Participants

- Reservoir engineers who build the fluid models that feed simulation and reserves estimates.
- Production and facilities engineers who rely on predicted gas, oil and water volumes at surface.
- Petrophysicists and geoscientists who work with fluid contacts and saturations.
- Asset managers who approve development plans resting on fluid data.
- Technical reviewers who sign off laboratory reports and sampling programmes.

Typical functions include upstream operators, national oil companies and service companies.

Learning Outcomes

1. Participants will be able to classify a reservoir fluid from field and laboratory indicators.
2. Participants will be able to evaluate a sampling programme and its samples.
3. Participants will be able to interpret constant composition expansion, differential liberation and separator test results.
4. Participants will be able to diagnose inconsistencies in a laboratory report using validation checks.
5. Participants will be able to construct a tuned equation of state model from validated data.
6. Participants will be able to justify the fluid properties passed to simulation and production forecasts.

Programme Structure

Day 1: PVT Analysis and Reservoir Fluid Phase Behaviour

How does a reservoir fluid change phase as pressure and temperature fall?

- Phase Envelope Reading
- Black Oil and Volatile Oil Identification
- Gas Condensate and Wet Gas Identification
- Formation Volume Factor and Solution Gas Ratio
- Fluid Classification Screening Sheet

Day 2: Sampling and Sample Quality

Is the sample on the bench representative of the fluid in the reservoir?

- Bottomhole Sampling Design
- Separator Sampling and Recombination
- Sample Validity Checks
- Contamination and Flow Conditioning Review
- Sampling Programme Decision Log



Day 3: Laboratory Tests and Correlations

What does each laboratory test measure, and what can it be compared with?

- Constant Composition Expansion
- Differential Liberation
- Separator Tests
- Constant Volume Depletion
- Correlation Benchmarking

Day 4: Validation and Equation of State Models

Do the data agree with each other, and can a model reproduce them?

- Material Balance Consistency Check
- Y-Function and Hoffman Plot Screening
- Component Lumping and Characterisation
- Regression Tuning of a Cubic Equation of State
- Fit and Prediction Comparison

Day 5: Fluid Dossier for One Field

Do the sampling, test, validation and model results support one set of fluid properties?

- Applying the Session 1 Classification Screening Sheet
- Reviewing the Session 2 Sampling Programme Decision Log
- Re-running the Session 4 Validation Checks
- Selecting the Tuned Model for Simulation
- Completing the Fluid Data Dossier

Methodology

The programme uses a data workshop method built on laboratory report extracts from a shared field case covering an oil and a gas condensate reservoir. Participants screen and tune the data in each session and repeat the steps on a field of their own, with written facilitator feedback on each artefact.

- Suggested activity: Judging two separator samples against validity checks and choosing one for analysis.
- Suggested activity: Plotting a Y-function and Hoffman plot to locate a faulty test point.
- Suggested activity: Tuning an equation of state to saturation pressure and liquid dropout data.



Capstone Output

Each participant completes a fluid data dossier for one field. It holds a fluid classification, a sampling assessment, a validated set of laboratory results, a tuned equation of state with its limits and a short note on fluid properties for simulation. It is used at work to brief study teams and challenge laboratory reports.

Frequently Asked Questions

Is PVT analysis training suitable for managers who are not reservoir engineers?

Yes. PVT analysis is taught through cases and plots, assuming familiarity with field data and basic petroleum terms but no equation of state programming.

Which standards and models does PVT analysis training rest on?

PVT analysis training rests on API RP 44 for sampling, the Standing correlation for benchmarking, and the Peng-Robinson and Soave-Redlich-Kwong equations of state for modelling.

How is the dossier from PVT analysis training used at work?

You use the fluid data dossier to brief study teams, challenge laboratory reports and pass agreed fluid properties into simulation and forecasts for one field.

How does PVT analysis differ from reservoir simulation training?

PVT analysis centres on obtaining, checking and modelling fluid data, while reservoir simulation training centres on grids, histories and forecasts that use them.