

# Chemical Process Modelling and Simulation Training Course

20 – 24 December 2026
Johannesburg

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**Ref:** 1884_240514 **Date:** 20 – 24 December 2026 **Location:** Johannesburg **Fees:** 6000 Euro

## Overview

Chemical Process Modelling and Simulation Training Course is a one-week intermediate programme for chemical and process engineers, operations engineers, analysts, and project personnel who leave with a Process Model Validation Pack. Participants translate process intent and flow diagrams into components, streams, thermodynamic methods, unit-operation models, specifications, recycles, and solved steady-state flowsheets. The course emphasizes assumptions, balance closure, convergence, sensitivity, validation, uncertainty, and traceable communication rather than software-specific certification or detailed equipment design. Agile Leaders Training Center delivers this software-neutral process simulation course.

## Who Should Attend

- Chemical and process engineers who build or review steady-state models
- Operations engineers who use simulation evidence for troubleshooting and studies
- Technical analysts responsible for data, cases, and model documentation
- Project personnel who review process concepts and simulation deliverables
- Graduate engineers seeking structured process-modelling practice

Participants should understand material and energy balances, basic thermodynamics, and common unit operations. The course does not authorize equipment design, relief-system sizing, operating changes, or decisions outside approved engineering governance.

## Departments and Industries

The course supports oil and gas, petrochemicals, chemicals, refining, utilities, water, energy, food processing, and industrial manufacturing.

- Process engineering and technical services
- Operations support and production optimisation
- Projects, design review, and commissioning support
- Research, development, and process improvement
- Energy, sustainability, and performance analysis

## Learning Objectives

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

- Define a model purpose, boundary, assumptions, and required evidence
- Build components, streams, balances, and unit-operation connections
- Select and justify thermodynamic and physical-property methods
- Manage specifications, degrees of freedom, recycles, and convergence
- Run sensitivity cases and interpret model response
- Validate, document, and communicate model uncertainty and limitations

## Course Agenda

### Day 1: Model Purpose, Boundaries, and Balance Basis

- Decision Question and Model-Fidelity Definition
- Process Flow Diagram to Model Boundary Map
- Component, Stream, Phase, and Basis Register
- Material and Energy Balance Closure Worksheet
- Assumption, Data Source, and Limitation Log

### Day 2: Thermodynamics and Stream Definition

- Property Requirement and Phase-Behaviour Map
- Equation-of-State and Activity-Coefficient Method Comparison
- Pure-Component, Interaction, and Pseudo-Component Data Review
- Flash Calculation and Stream-State Interpretation
- Property-Method Selection and Validation Record

### Day 3: Unit Operations and Flowsheet Construction

- Mixer, Splitter, Valve, Pump, and Compressor Model Setup
- Heater, Cooler, and Heat-Exchanger Model Boundaries
- Separator, Reactor, and Column Model Inputs
- Specification, Variable, Constraint, and Degree-of-Freedom Check
- Connected Flowsheet Build and Intermediate Result Review

### Day 4: Recycles, Convergence, and Sensitivity

- Recycle Loop Identification and Tear-Stream Selection
- Initial Estimate and Convergence Control Strategy
- Numerical Failure, Infeasibility, and Warning Diagnosis
- Case Study, Sensitivity Variable, and Response Matrix
- Result Trend, Constraint, and Unexpected-Behaviour Review

## Day 5: Validation, Uncertainty, and Decision Communication

- Plant, Vendor, Literature, and Reference-Case Comparison
- Residual, Bias, Calibration, and Reconciliation Review
- Input Uncertainty and Output Sensitivity Register
- Model Version, Scenario, Assumption, and Audit Trail
- Capstone Exercise: Process Model Validation Pack

## Practical Exercises

Guided exercises develop disciplined model construction and review without depending on one commercial simulator.

- Convert a process flow diagram into model objects and streams
- Close material and energy balances for a defined case
- Compare property methods against stated phase behaviour
- Resolve a recycle convergence problem and run a sensitivity study
- Validate a model and present a bounded engineering recommendation

## FAQs

### Is the course tied to one simulation package?

No. It teaches transferable process-modelling principles and workflow. Demonstrations or exercises may use an available environment, but no software certification is claimed.

### Does the course cover dynamic simulation?

The principal scope is steady-state modelling. Dynamic concepts may be distinguished for context, but building dynamic control models is outside the course outcome.

### Which unit operations are included?

Examples include mixers, splitters, valves, pumps, compressors, heat exchangers, separators, reactors, and columns at an intermediate modelling level.

### How is model quality assessed?

Participants check balance closure, data provenance, thermodynamic suitability, convergence, residuals, trends, sensitivity, uncertainty, assumptions, and limits.

### What will participants take back to work?

A Process Model Validation Pack containing the model basis, property review, flowsheet checks, convergence record, sensitivity matrix, validation evidence, and audit trail.

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## Conclusion

Participants return able to build and review steady-state chemical process models, diagnose simulation behaviour, and communicate conclusions with explicit evidence and boundaries.