MERCURY

Process Simulation and Flowsheet Modeling Training Course with Petro-SIM

29 November – 3 December 2026
Online



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Ref: 45_1082643 **Date:** 29 November – 3 December 2026 **Location:** Online **Fees:** 2900 Euro

The Process Simulation and Flowsheet Modeling Training Course with Petro-SIM is a one-week course for refinery process engineers, chemical modeling specialists, facilities designers, and digital twin system integrators. Working with crude assays, kinetic reactor loops, and historian interfaces, you construct a complete Petro-SIM Flowsheet Modeling and Digital Twin Dossier. Mercury Training Center delivers this course to help you deploy rigorous process simulations across complex production facilities.

About This Course

Unconverged flowsheets, inaccurate crude characterization, and misaligned plant balances compromise refinery yield planning and unit debottlenecking studies. To follow this course, you must already build basic heat and material balances, specify fluid physical properties, and navigate piping schematics. Through hands-on simulation modules and data reconciliation workflows, you practice solving steady-state models and integrating live plant data.

Who It Is For

- Professionals responsible for building and troubleshooting steady-state process simulation flowsheets
- Professionals responsible for monitoring refining conversion units and evaluating reaction kinetics
- Professionals responsible for reconciling operating balances and updating LP planning vectors
- Professionals responsible for linking plant historians to real-time engineering simulation models

This course is not for field operators seeking entry-level control room board navigation, who are better served by introductory plant operations training, nor is it for corporate financial analysts needing high-level product pricing projections, who would benefit more from fundamental energy economics courses.

Competencies You Will Build

- Fluid Assay Characterization: Characterizing crude fractions and defining rigorous thermodynamic property packages for complex hydrocarbon systems.
- Kinetic Reactor Modeling: Embedding rigorous kinetic reaction mechanisms into conversion unit flowsheets to evaluate conversion yields.
- Plant Data Reconciliation: Balancing mass and energy flowsheets against operating historian data to resolve measurement deviations.
- Linear Programming Updating: Generating validated sub-model yield representations for downstream refinery planning and economic scheduling.
- Digital Twin Integration: Connecting simulation flowsheets to operational plant historians through automated bidirectional synchronization protocols.

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What You Will Be Able to Do

By the end of the course you will be able to:

- From laboratory distillation data, characterize crude cut assays and select appropriate thermodynamic equations of state.
- Given operational stream conditions, build and converge multiphase separation and fractionation flowsheets in Petro-SIM.
- Using reaction kinetic data, tune conversion reactor unit operations for catalytic cracking and hydroprocessing units.
- From process historian readings, execute data reconciliation to close plantwide mass and energy imbalances.
- Given reconciled simulation results, extract validated yield vectors for refinery linear programming planning models.
- Using the Petro-SIM Integrator, configure bidirectional tag mapping to link simulation flowsheets with plant historian systems.

Course Content

Day 1: Fluid Characterization and Flowsheet Thermodynamics

- Petroleum Assay Characterization and Pseudocomponent Generation for Crude Blends
- Thermodynamic Property Package Selection for Multiphase Hydrocarbon Systems
- Stream Property Tables and Phase Envelope Generation for High-Pressure Separators
- Physical Property Estimation Methods for Petrochemical Solvents and Light Ends
- Mass Balance Initialization and Convergence Diagnostics for Primary Flash Vessels

Day 2: Rigorous Fractionation and Heat Integration

- Atmospheric Crude Distillation Column Configuration and Column Specification Setup
- Side-Stripper and Pumparound Circuit Modeling for Heavy Oil Fractionators
- Heat Exchanger Network Integration and Rating Models for Pre-Heat Trains
- Hydraulic Tray Sizing and Rating Profiles for Absorption and Stripping Columns
- Flowsheet Recycle Loop Convergence Algorithms and Acceleration Parameters

Day 3: Kinetic Reactor Integration and Utility Systems

- Profimatics Reactor Interface Setup for Fluid Catalytic Cracking Units
- Kinetic Reaction Modeling and Yield Tuning for Distillate Hydrotreaters
- Steam and Utility Balance Modeling for Process Plant Utility Networks
- Environmental Emission Estimation for Combustion Units and Flue Gas Streams
- CAPE-OPEN Standard Interface Implementation for Custom Unit Operations

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Day 4: Data Reconciliation and Digital Twin Integration

- Process Data Reconciliation Workflows for Plantwide Mass and Energy Closure
- Measurement Error Detection and Gross Error Identification on Field Flowmeters
- Linear Programming Sub-Model Vector Generation for Refinery Planning Systems
- Petro-SIM Integrator Configuration for Bidirectional Historian Synchronization
- Real-Time Digital Twin Flowsheet Deployment Using PI Asset Framework Tag Mapping

Day 5: Flowsheet Execution and Dossier Compilation

- Exercise on Heavy Crude Fractionation Column Convergence and Tray Rating
- Exercise on Kinetic Reactor Calibration and Linear Programming Yield Generation
- Exercise on Data Reconciliation and Historian Tag Synchronization Protocols
- Exercise on Utility Emissions Tracking and Process Debottlenecking Analysis
- Final Compilation and Verification of the Petro-SIM Flowsheet Modeling and Digital Twin Dossier

Case Studies and Exercises

These suggested activities provide practical application of flowsheet modeling methods across different operating environments:

- Case study: A refinery crude distillation unit where you characterize heavy sour crude feeds, configure atmospheric tower pumparounds, and resolve tower convergence failures.
- Case study: A petrochemical aromatics plant where you model extraction columns, integrate heat recovery exchanger trains, and reconcile material balances against laboratory analyses.
- Exercise: A distillate hydrocracker where you tune kinetic reaction parameters, balance hydrogen consumption, and export yield coefficients to the site planning model.
- Exercise: A coastal gas processing terminal where you configure the simulation integrator, connect historian asset tags, and monitor real-time separation efficiency.

What You Take Back

The Petro-SIM Flowsheet Modeling and Digital Twin Dossier provides proven simulation templates, reconciliation workbooks, and integration maps to support process engineering tasks immediately during your first month back at work. You will use it to troubleshoot operating columns, tune conversion units, and maintain live digital models.

- Validated flowsheet starter templates with preconfigured thermodynamic property packages
- Data reconciliation workbooks for plantwide mass and energy balance closure
- Refinery planning export routines for linear programming vector updates
- Historian integration mapping sheets for automated bidirectional tag connectivity

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Quick Answers FAQ

What background is required before attending the Process Simulation and Flowsheet Modeling Training Course with Petro-SIM?

You need working knowledge of chemical or petroleum engineering fundamentals, including mass and energy balances, fluid thermodynamics, and piping schematics. Practical experience with operating units or process design calculations helps you complete the flowsheet building exercises.

How does this course differ from general process simulation training?

General process simulation training covers basic flash drums, simple single-component property sets, and generic flowsheeting. This course focuses on rigorous hydrocarbon characterization, specialized kinetic reactor modeling, data reconciliation against plant measurements, and real-time digital twin synchronization with plant historians.

Why is real-time historian integration critical in Petro-SIM flowsheet modeling?

Historian integration bridges the gap between theoretical process models and operating plant reality. Bidirectional data synchronization allows engineers to track real-time unit performance, detect equipment fouling, reconcile measurement errors, and provide validated operating data for planning and optimization decisions.

What tangible materials do participants retain from the Petro-SIM flowsheet training?

Participants retain the completed Petro-SIM Flowsheet Modeling and Digital Twin Dossier. This package includes verified flowsheet templates, crude assay characterization files, data reconciliation spreadsheets, linear programming export tables, and historian integration configuration guides for direct deployment in operating facilities.

For Your Manager

This course equips your engineer to build, calibrate, and maintain steady-state models that optimize unit performance and debottleneck plant operations. Returning with the Petro-SIM Flowsheet Modeling and Digital Twin Dossier, they can immediately reconcile operating balances, update linear programming planning vectors, and synchronize simulation flowsheets with plant historians to support reliable operational decision-making across your facility.