
Distillation Unit Performance Management Training Course for Plant Leaders

17 – 21 January 2027
Manama





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Programme Summary

Distillation unit performance management for plant leaders is a one-week training course for refinery and petrochemical leaders at managerial level, culminating in a column performance improvement plan for a distillation unit at their own site. Distillation columns set the throughput, product quality and much of the energy bill of most process plants, yet many run well inside or dangerously close to their hydraulic limits without leaders knowing which. The approach links separation principles, tray and packing hydraulics, control and energy to diagnostic surveys and revamp choices. Mars Training Centre UK delivers this programme in distillation unit performance management.

The Business Case

A column that floods, weeps or foams loses product quality and capacity, and a poorly tuned control scheme wastes steam and cooling every hour. Leaders who read column behaviour correctly, commission the right surveys and challenge control and energy settings recover margin from existing equipment and plan turnarounds with confidence.

- Unit Throughput and Product Specification: Improve as operating windows are set against known flooding and weeping limits.
- Energy Intensity: Falls as reflux, reboiler duty and pressure are optimised against product targets.
- Turnaround and Revamp Value: Rises as tray, packing and internal decisions rest on gamma scans and pressure surveys.

Principles and Evidence Base

- Vapour-Liquid Equilibrium and the McCabe-Thiele Diagram: Explain the trade-off between stages and reflux examined in Session 1.
- Tray and Packing Hydraulic Limits: Define jet flooding, downcomer flooding, weeping and entrainment boundaries in Session 2.
- Dual-Composition Control and Advanced Process Control: Frame how temperature, pressure and inferential analysers hold product quality in Session 3.
- Heat and Material Balance Reconciliation: Underpins energy assessment and the troubleshooting surveys in Session 4.



Intended Participants

- Leaders accountable for the throughput, yield and energy use of distillation and fractionation units.
- Managers who approve control changes, operating windows and energy targets for columns.
- Heads of process engineering who commission column surveys and revamp studies.
- Technical managers who prepare turnaround scopes for column internals.

The programme serves crude and vacuum units in refining, petrochemical and chemical plants, gas processing fractionation trains and solvent recovery systems.

Learning Outcomes

1. Participants will be able to evaluate column performance against separation targets using reflux, stage and efficiency data.
2. Participants will be able to diagnose flooding, weeping, foaming and entrainment from operating symptoms and survey results.
3. Participants will be able to assess column control schemes and the case for advanced process control.
4. Participants will be able to prioritise energy savings across reboilers, condensers and operating pressure.
5. Participants will be able to justify tray, packing and internals decisions for turnarounds and revamps.
6. Participants will be able to construct a column performance improvement plan for their unit.

Programme Structure

Day 1: Distillation Unit Performance Fundamentals

What determines how well a column separates and how much it can process?

- Vapour-Liquid Equilibrium and Relative Volatility
- McCabe-Thiele Diagram, Minimum Reflux and Stages
- Tray Efficiency and Packing Height Equivalents
- Column Performance Indicators and Targets
- Distillation Unit Performance Baseline Review

Day 2: Column Hydraulics and Operating Limits

Where are the hydraulic boundaries, and how close is the column to them?

- Trays Versus Structured and Random Packing
- Jet Flooding and Downcomer Flooding
- Weeping, Entrainment and Turndown Limits
- Foaming Causes and Antifoam Practice
- Operating Window Charts



Day 3: Column Control and Advanced Process Control

How do control schemes hold product quality while respecting limits?

- Pressure, Level and Temperature Control Loops
- Dual-Composition Control Strategies
- Inferential Analysers and Online Quality Measurement
- Advanced Process Control Benefits and Sustainment
- Common Distillation Control Mistakes

Day 4: Energy, Diagnostic Surveys and Revamp Decisions

How are energy losses and internal damage found, and when is a revamp justified?

- Reboiler and Condenser Constraints
- Reflux and Pressure Optimisation for Energy
- Gamma Scan and Pressure Drop Survey Interpretation
- Temperature Profile and Heat and Material Balance Checks
- Turnaround Inspection and Revamp Options

Day 5: Applying the Column Performance Improvement Plan

How are separation, hydraulics, control and energy combined into one unit plan?

- Baseline Assessment of a Participant Column
- Hydraulic and Control Improvement Options
- Energy Saving Priorities
- Peer Challenge of Revamp Cases
- Column Performance Improvement Plan Presentation

Methodology

The programme relies on case analysis supported by data exercises. Participants interpret operating data, gamma scans and pressure surveys from crude, gas processing and petrochemical columns, test operating and control changes against hydraulic limits and compare revamp options on cost and capacity.

- Suggested activity: Placing a column's operating points on a flooding and weeping chart.
- Suggested activity: Interpreting a gamma scan to locate damaged trays.
- Suggested activity: Ranking reflux, pressure and heat recovery options by energy saving.



Capstone Output

Each participant completes a column performance improvement plan for a distillation unit at their site. It sets out the performance baseline, hydraulic limits, control and energy actions, survey requirements and any turnaround or revamp case, ready to present to plant leadership.

Frequently Asked Questions

Is distillation unit performance management suitable for managers who are not process engineers?

Yes. It suits operations managers, superintendents and technical leaders who make decisions on column operation and investment. It assumes plant experience but no specialist distillation design training.

Which models underpin distillation unit performance management?

It draws on vapour-liquid equilibrium and the McCabe-Thiele diagram, tray and packing hydraulic limits, dual-composition and advanced process control, and heat and material balance reconciliation.

How is the column performance improvement plan used at work?

You take back a plan plant leadership can approve, with operating window changes, control and energy actions, survey needs and turnaround scope for your column.

How does distillation unit performance management differ from distillation design programmes?

It focuses on running, diagnosing and improving existing columns and on investment decisions, rather than sizing new columns from first principles.