

DISTILLATION MASTERCLASS - DISTILLATION & FRACTIONATION PROCESS (DISTILLATION COLUMN, DISTILLATION TOWER, BUBBLE CAP TRAYS, ETC.)

“Optimizing Separation Performance through Process Understanding and Equipment”

Schedule

Date	Venue	Fees (Face-to-Face)
02 - 06 Mar 2026	Dubai, UAE	USD 3495 per delegate

Introduction

Distillation is one of the most widely used and energy-intensive separation processes in chemical, petrochemical, and refining industries. Whether processing crude oil, producing solvents, or purifying chemicals, distillation requires deep technical understanding of both process dynamics and mechanical equipment.

This 5-day Distillation Masterclass equips process engineers, operators, and technical professionals with essential knowledge and skills to design, operate, and troubleshoot distillation and fractionation systems. Through interactive sessions and practical examples, participants will explore column internals, vapor-liquid equilibrium, tray types, control systems, and efficiency optimization techniques.

Objectives

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

- Understand the principles of distillation, fractionation, and vapor-liquid equilibrium
- Describe the function and operation of columns, towers, trays, and packing
- Evaluate design and performance parameters for industrial distillation systems
- Troubleshoot common operational problems such as flooding, weeping, and fouling
- Apply strategies to improve column efficiency, control, and energy usage

Why Attend

- To strengthen technical competence in core separation processes
- To increase operational efficiency and reduce energy losses in distillation units
- To gain hands-on understanding of column internals and control elements
- To proactively address distillation issues using root cause analysis techniques
- To improve communication between process, mechanical, and operations teams

Target Audience

This program is designed for:

- Process, chemical, and operations engineers
- Plant supervisors and control room operators
- Maintenance and mechanical engineers involved in column internals
- Project and design engineers working on separation systems
- Technical staff in refining, petrochemical, gas processing, and specialty chemical plants

Individual Benefits

Key competencies that will be developed include:

- Distillation system analysis and operation
- Troubleshooting of common process problems
- Understanding of tray design, packing, and hydraulic behavior
- Knowledge of control systems and optimization strategies
- Practical application of VLE, reflux ratio, and energy balance concepts

Organizational Benefits

Upon completing the training course, participants will demonstrate:

- Improved performance and reliability of distillation and fractionation systems
- Lower operational costs through better energy management
- Reduction in downtime due to proactive troubleshooting skills
- Increased safety and compliance through better control of distillation variables
- Enhanced cross-functional collaboration and system understanding

Instructional Methodology

The course follows a blended learning approach combining theory with practice:

- Strategy Briefings - Process theory, equipment internals, and control fundamentals
- Case Studies - Real-world examples of distillation problems and resolutions
- Workshops - Vapor-liquid equilibrium, tray sizing, and operating condition analysis
- Peer Exchange - Group-based evaluation of column troubleshooting scenarios
- Tools - Diagrams, troubleshooting checklists, calculation templates, and design guides

MAWA EVENTS

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Course Outline

Detailed 5-Day Course Outline

Training Hours: 7:30 AM - 3:30 PM Daily Format: 3-4 Learning Modules | Coffee breaks: 09:30 & 11:15 | Lunch Buffet: 01:00 - 02:00

Day 1: Principles of Distillation and Vapor-Liquid Equilibrium

- Module 1: Introduction to Distillation and Fractionation (07:30 - 09:30) • Fundamentals of vapor-liquid separation • Binary and multi-component distillation • Industrial applications and objectives
- Module 2: Vapor-Liquid Equilibrium (09:45 - 11:15) • Phase diagrams and Raoult's Law • Relative volatility and equilibrium curves • Impact on separation efficiency
- Module 3: Reflux Ratio and Operating Lines (11:30 - 01:00) • Minimum reflux and number of stages • Understanding McCabe-Thiele diagrams • Enriching and stripping section behavior
- Module 4: Workshop - VLE Calculations (02:00 - 03:30) • Hands-on analysis of phase behavior for separation performance

Day 2: Column Equipment and Internals

- Module 1: Column Types and Design Basics (07:30 - 09:30) • Continuous vs. batch distillation • Design considerations for trays and packed columns • Key equipment components: tower shell, reboiler, condenser
- Module 2: Tray Design and Operation (09:45 - 11:15) • Types of trays: bubble cap, sieve, valve trays • Tray spacing, pressure drop, and capacity limits • Flooding, weeping, and entrainment explained
- Module 3: Packing Systems (11:30 - 01:00) • Structured vs. random packing • Design parameters: HETP, pressure drop, surface area • Selection criteria for trays vs. packing
- Module 4: Workshop - Tray vs. Packing Analysis (02:00 - 03:30) • Efficiency comparison and suitability for various services

Day 3: Column Operation, Control, and Energy Management

- Module 1: Reboilers and Condensers (07:30 - 09:30) • Thermal role and configuration types • Heat integration and temperature control • Troubleshooting fouling and scaling
- Module 2: Control Strategies and Instrumentation (09:45 - 11:15) • Control variables: pressure, temperature, level, composition • Feed preheat and column stabilization • Basic DCS/PLC configurations for columns
- Module 3: Energy Efficiency in Distillation (11:30 - 01:00) • Energy intensity of distillation • Optimization: reflux minimization, heat recovery • Use of intermediate reboilers and split-feed strategies
- Module 4: Case Study - Energy Optimization Challenge (02:00 - 03:30) • Group analysis of an energy-inefficient system

Day 4: Troubleshooting and Root Cause Analysis

- Module 1: Operational Challenges and Symptoms (07:30 - 09:30) • Flooding, foaming, and tray damage symptoms • Tower pressure problems and capacity bottlenecks • Instrumentation faults and misreadings
- Module 2: Root Cause Analysis Techniques (09:45 - 11:15) • Structured troubleshooting approach • 5 Whys, Fishbone Diagrams, and fault tree analysis • Case examples of persistent distillation issues
- Module 3: Turnaround and Maintenance Considerations (11:30 - 01:00) • Inspection of internals and repair practices • Turnaround planning checklist • Safety considerations during shutdown/startup
- Module 4: Troubleshooting Simulation Workshop (02:00 - 03:30) • Group activity: identify root causes from operating data

Day 5: Advanced Applications and Review

- Module 1: Multi-Component and Azeotropic Distillation (07:30 - 09:30) • Handling non-ideal mixtures and azeotropes • Extractive and pressure-swing distillation basics • Ternary diagrams and entrainer selection
- Module 2: Column Design and Simulation Tools (09:45 - 11:15) • Introduction to Aspen HYSYS or equivalent software • Simulation of tray/packed column configurations • Feed sensitivity and scenario testing
- Module 3: Final Review and Knowledge Integration (11:30 - 01:00) • Recap of core concepts and key takeaways • Troubleshooting checklist for field use
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Module 4: Final Exercise and Certification (02:00 – 03:30) • Group presentations on simulated column case • Certification distribution and feedback

Certification

Participants will receive a Certificate of Completion in Distillation & Fractionation Process Mastery, confirming their ability to operate, troubleshoot, and optimize industrial distillation systems for reliability, safety, and efficiency.

Why Choose MAWA Events

- **Global Expertise:** More than 17 years of experience in professional training and consulting.
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