Advanced Distillation Techniques Training Course

Professional Development Training Course Outline

Category	General Training	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Distillation remains one of the most critical and energy-intensive separation technologies in modern process industries. As industries embrace Industry 4.0, digital transformation, energy optimization, process intensification, sustainability, carbon reduction, and advanced process control, the need for highly efficient distillation systems has become increasingly important. Advanced distillation techniques enable organizations to maximize product recovery, improve product purity, reduce operating costs, enhance energy efficiency, and achieve operational excellence while meeting stringent environmental and safety requirements.

Advanced Distillation Techniques Training Course provides participants with in-depth knowledge of modern distillation technologies, column design principles, troubleshooting methodologies, process optimization strategies, simulation tools, and emerging innovations. Through practical case studies, industrial applications, and real-world operational scenarios, participants will develop the competencies required to analyze, optimize, and troubleshoot complex distillation systems across refinery, petrochemical, gas processing, and specialty chemical facilities.

Programme Curriculum

Advanced Distillation Techniques Training Course

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Course Objectives

1. Understand advanced distillation fundamentals and separation technologies.
2. Optimize energy-efficient distillation operations.
3. Apply advanced process control (APC) techniques in distillation systems.
4. Improve column performance and operational reliability.
5. Evaluate mass transfer and vapor-liquid equilibrium (VLE) behavior.
6. Analyze tray, packing, and internals efficiency.
7. Utilize process simulation and digital twin technologies.
8. Conduct advanced troubleshooting and root cause analysis.
9. Enhance product quality optimization strategies.
10. Implement process intensification methodologies.
11. Optimize vacuum, extractive, and azeotropic distillation systems.
12. Improve sustainability and carbon footprint reduction initiatives.
13. Develop predictive maintenance and asset integrity programs.

Target Audience

1. Process Engineers
2. Chemical Engineers
3. Production Engineers
4. Operations Supervisors
5. Refinery Engineers
6. Petrochemical Plant Personnel
7. Process Control Engineers
8. Technical Managers and Plant Managers

Course Modules

Module 1: Fundamentals of Advanced Distillation

- Principles of separation processes
- Distillation thermodynamics
- Vapor-liquid equilibrium fundamentals
- Relative volatility concepts
- Industrial distillation applications
- **Case Study:** Performance assessment of a crude distillation unit.

Module 2: Distillation Column Design Principles

- Column configuration selection

- Design methodologies
- Hydraulic considerations
- Design constraints
- Capacity optimization
- **Case Study:** Design optimization of a petrochemical fractionator.

Module 3: Vapor-Liquid Equilibrium Analysis

- Phase equilibrium fundamentals
- VLE modeling techniques
- Activity coefficient methods
- Equation of state applications
- Multicomponent systems
- **Case Study:** VLE prediction for hydrocarbon separation systems.

Module 4: Tray Distillation Technology

- Tray types and selection
- Tray efficiency evaluation
- Hydraulic performance analysis
- Tray damage mechanisms
- Capacity enhancement techniques
- **Case Study:** Troubleshooting tray flooding problems.

Module 5: Packed Column Technologies

- Structured packing applications
- Random packing performance
- Pressure drop optimization
- Mass transfer enhancement
- Capacity improvement methods
- **Case Study:** Structured packing retrofit project.

Module 6: Energy Optimization in Distillation

- Heat integration techniques
- Energy conservation methods
- Utility optimization
- Reboiler efficiency enhancement
- Energy auditing procedures
- **Case Study:** Reducing steam consumption in refinery distillation units.

Module 7: Advanced Process Control for Distillation

- APC fundamentals
- Model predictive control
- Inferential measurements
- Online optimization systems
- Real-time process monitoring
- **Case Study:** APC implementation in a refinery fractionator.

Module 8: Vacuum Distillation Systems

- Vacuum distillation principles
- Vacuum system design
- Ejector and vacuum pump technologies
- Product quality control
- Operational optimization
- **Case Study:** Vacuum tower throughput improvement.

Module 9: Extractive and Azeotropic Distillation

- Separation challenges
- Solvent selection criteria
- Extractive distillation design
- Azeotropic distillation applications
- Process economics
- **Case Study:** Ethanol dehydration optimization project.

Module 10: Distillation Troubleshooting and Debottlenecking

- Performance monitoring
- Root cause analysis
- Flooding diagnosis
- Weeping and entrainment issues
- Debottlenecking methodologies
- **Case Study:** Increasing column throughput by 20%.

Module 11: Distillation Simulation and Digital Technologies

- Process simulation software
- Dynamic modeling techniques
- Digital twins
- Data analytics applications
- AI-assisted optimization
- **Case Study:** Simulation-driven distillation optimization.

Module 12: Product Quality Optimization

- Product specification management
- Online analyzers
- Quality control strategies
- Yield maximization
- Process variability reduction
- **Case Study:** Product purity enhancement initiative.

Module 13: Reliability and Asset Integrity

- Equipment reliability principles
- Corrosion monitoring
- Mechanical integrity management
- Inspection planning
- Predictive maintenance
- **Case Study:** Reliability improvement of distillation assets.

Module 14: Sustainable and Green Distillation Technologies

- Carbon reduction initiatives
- Energy-efficient technologies
- Process intensification
- Waste minimization
- Environmental compliance
- **Case Study:** Sustainability improvements in chemical processing plants.

Module 15: Emerging Innovations in Distillation

- Dividing-wall columns
- Reactive distillation
- Hybrid separation technologies
- Smart manufacturing integration
- Future industry trends
- **Case Study:** Economic evaluation of dividing-wall column implementation.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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