Advanced Distillation Control and Troubleshooting Training Course

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4100 € (Per Person)

Ref: #ACE1780_296130

Course Introduction / Overview:

Distillation is the cornerstone of separation technology in the chemical, petrochemical, and oil and gas industries, yet its operational complexity presents significant challenges in control and troubleshooting. This intensive training course is meticulously designed to transform participants into proficient experts capable of optimizing distillation column performance, ensuring operational stability, and systematically resolving complex issues. Drawing upon the foundational principles established by leading authorities like Henry Kister in his seminal work "Distillation Design," this program bridges the gap between theoretical knowledge and practical application. Participants will delve into advanced process control strategies, energy efficiency improvements, and proven troubleshooting methodologies. At BIG BEN Training Center, we provide a comprehensive learning journey that covers everything from vapor-liquid equilibrium fundamentals to the nuances of advanced control systems and root cause analysis. This course equips professionals with the critical skills to enhance product quality, reduce operational costs, and improve plant safety, making them invaluable assets to their organizations in a competitive global market.

Target Audience / This training course is suitable for:

- Process Engineers.
- Chemical Engineers.
- Plant and Unit Operators.
- Control Room Technicians.
- Production Supervisors and Managers.
- Maintenance and Instrumentation Engineers.
- Process Safety Professionals.
- Research and Development Chemists.
- Technical Service Engineers.

Target Sectors and Industries:

- Oil and Gas Refining.
- Petrochemicals and Polymers.
- Specialty and Bulk Chemical Manufacturing.
- Pharmaceutical and Biotechnology Industries.
- Food and Beverage Processing.
- Water Treatment and Environmental Services.
- Governmental agencies and regulatory bodies.

Target Organizations Departments:

- Operations and Production.
- Process Engineering and Design.
- Maintenance and Reliability.
- Instrumentation and Control.
- Health, Safety, and Environment (HSE).
- Quality Assurance and Quality Control (QA/QC).
- Research and Development (R&D).
- Technical Services.

Course Offerings:

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

- Analyze and interpret vapor-liquid equilibrium (VLE) data for different mixtures.
- Identify the function and limitations of various distillation column internals like trays and packing.
- Develop and implement effective basic and advanced process control strategies for distillation columns.
- Execute safe and efficient startup, shutdown, and emergency procedures.
- Diagnose and troubleshoot common distillation operational problems such as flooding, weeping, and foaming.
- Apply systematic root cause analysis techniques to prevent recurrence of operational issues.
- Evaluate and optimize column performance to improve energy efficiency and reduce costs.
- Implement safety protocols and best practices related to distillation operations.

Course Methodology:

The training methodology at BIG BEN Training Center is centered on creating an immersive and practical learning environment that fosters deep understanding and skill retention. This course moves beyond traditional lectures by integrating a dynamic mix of interactive sessions, real-world case studies, and collaborative problem-solving workshops. Participants will engage with complex scenarios drawn from actual industrial incidents, allowing them to apply theoretical concepts to tangible challenges. The facilitator will guide group discussions and brainstorming sessions to explore various troubleshooting and control strategies. Practical exercises and simulation-based activities will be used to reinforce understanding of column dynamics and control loop tuning. This hands-on approach ensures that participants not only learn the principles of advanced distillation but also gain the confidence to apply them effectively in their own operational settings. Continuous feedback and Q&A sessions are embedded throughout the course to address individual queries and ensure all learning objectives are met.

Course Agenda (Course Units):

Unit One: Fundamentals of Distillation Principles

- Introduction to Separation Processes and Distillation.
- Vapor-Liquid Equilibrium (VLE) and Relative Volatility.
- McCabe-Thiele Method for Binary Distillation Analysis.
- Understanding Distillation Column Internals: Trays vs. Packing.
- Key Operating Parameters: Temperature, Pressure, and Reflux.
- Mass and Energy Balances in a Distillation Column.
- Introduction to Column Efficiency and Performance Metrics.

Unit Two: Distillation Column Operation and Monitoring

- Standard Operating Procedures for Startup and Shutdown.
- Monitoring Key Performance Indicators (KPIs) for Optimal Operation.
- Managing Feed Composition and Condition Variations.
- The Role of Reboilers, Condensers, and Auxiliary Equipment.
- Techniques for Sampling and On-stream Analysis.
- Understanding Column Pressure and Temperature Profiles.
- Practical Aspects of Normal and Abnormal Situation Management.

Unit Three: Basic and Advanced Process Control Strategies

- Fundamentals of Process Control Loops in Distillation.
- Tuning and Optimizing Temperature, Pressure, and Level Controllers.
- Implementing Feedforward, Ratio, and Cascade Control Schemes.
- Advanced Regulatory Control (ARC) Strategies.
- Introduction to Model Predictive Control (MPC) for Distillation.
- Control Strategies for Energy Integration and Heat Recovery.
- Managing Constraints and Optimizing for Economic Objectives.

Unit Four: Systematic Troubleshooting of Distillation Columns

- A Framework for Systematic Problem Solving and Diagnosis.
- Troubleshooting Common Hydraulic Issues: Flooding, Weeping, and Foaming.
- Diagnosing Mass Transfer Efficiency Problems.
- Identifying and Resolving Issues with Reboilers and Condensers.
- Using Process Data and Trend Analysis for Root Cause Identification.
- Case Studies on Major Distillation Unit Upsets.
- Human Factors in Troubleshooting and Operational Discipline.

Unit Five: Optimization, Safety, and Modern Technologies

- Techniques for Energy Efficiency Improvement and Pinch Analysis.
- Process Safety Management (PSM) for Distillation Units.
- Hazard Identification and Risk Assessment (HAZOP) for Columns.
- Managing Contamination and Product Quality Issues.
- Introduction to Advanced Separation Technologies (e.g., Dividing Wall Columns).
- The Role of Digitalization and Process Simulation in Optimization.
- Developing a Proactive Maintenance and Reliability Strategy for Distillation Assets.

FAQ:

Qualifications required for registering to this course?

There are no requirements.

How long is each daily session, and what is the total number of training hours for the course?

This training course spans five days, with daily sessions ranging between 4 to 5 hours, including breaks and interactive activities, bringing the total duration to 20 - 25 training hours.

Something to think about:

Considering the high energy consumption of traditional distillation, how might the integration of machine learning and AI-driven predictive controls fundamentally reshape column optimization and safety protocols in the next decade?

What unique qualities does this course offer compared to other courses?

This training course distinguishes itself by providing a holistic and deeply practical perspective on distillation that transcends basic operational theory. While other courses may focus separately on either design, operation, or control, this program integrates all three pillars into a unified framework, mirroring the interconnected nature of real-world plant environments. Its core strength lies in the heavy emphasis on systematic troubleshooting and root cause analysis, equipping participants not just with solutions to common problems but with a robust methodology to diagnose any issue they might encounter. The curriculum delves into advanced process control strategies, including Model Predictive Control (MPC), providing insights that are often reserved for more specialized courses. By analyzing a diverse range of industry case studies, from petrochemicals to pharmaceuticals, the course ensures the learning is relevant and applicable across multiple sectors. It moves beyond textbook examples to tackle the
omplex, non-ideal scenarios that engineers and operators face daily, fostering a level of critical thinking and problem-solving capability that is immediately transferable to the workplace.