Advanced Distillation Operation, Control, and Troubleshooting Training Course for Olefins Personnel

Introduction

The success of every company depends on each employee's understanding of the business's key components. Employee training and development will unlock the companies' profitability and reliability. When people, processes and technology work together as a team developing practical solutions, companies can maximize profitability and assets in a sustainable manner.

It is strategically important that your operations group understands the fundamentals of process tank design, operations and troubleshooting concepts. This is the difference between being in the best quartile of operational ability and being in the last quartile. There is vast difference in the operational ability of operating companies and most benchmarking studies have confirmed this gap in operational abilities.

Whether you have a team of new or seasoned employees, an introduction or review of these concepts is greatly beneficial in closing the gap if you are not in the best quartile or maintaining a leadership position. Most studies show that a continuous reinforcement of best practices in operational principles is the most effective way to obtain the desired results. Training and learning should be an ongoing continuous lifelong goal.

Distillation is the most common separation technique and is energy intensive. Distillation can consume more than 50% of a process plant’s operating energy cost. A way to improve an existing plant’s operating cost or to reduce a new distillation system’s operating cost is to improve the efficiency and operations by correct equipment selection, maintenance, process optimization and control.

Course Objective

This course will guide the participates to develop key concepts and techniques to design, operate, maintain and troubleshoot a distillation system. These key concepts can be utilized to make design, maintenance and operating decisions. Training and development is an investment in future success - give yourself and your employees the keys to success.

Product recoveries, purities and energy utilization can be improved in most distillation systems. This cannot be achieved without first an understanding of distillation principles and design. These principles need to be understood in advance of designing, operating, maintaining and trouble shooting a distillation column for the operator, maintenance, designer, or problem solving to be effective.

The goal of the course would be to refresh the knowledge of those who have a basic understanding of distillation and process simulation software techniques and to build a foundation to those who are new to the distillation.

Course Duration and Delivery

Typical course duration is 3 to 5 days based on the background of the participates. One of our Senior Technical Professional with over 25 years of experience would lead the class. Instruction can be in house or in an online webinar.

This course is an advanced course for these topics – for a more introductory course consider attending our introduction course.

Course Syllabus

Typical Course Outline

A. Introduction to the Chemical Processing Industry

B. Safety for the Chemical Processing Industry

C. Introduction to the Ethylene Plant Flow Sheet

- Furnace Section
- Quench Section
- Compressor Section
- Cold Section
- Hot Section
- Hydrotreating / BTX Extraction

D Introduction to Distillation

1. General Column Design

- The components of a distillation system, more than just a tower – it is a system of different components
- History of distillation
- Different types of distillation columns
- Differences among batch, flash, and multistage distillation process
- Relative advantages of tray and packed columns
- Steps in the process design

E. Column Design

1. Tray Column Design

- The major design differences between tray types

    1. Baffle Trays
    2. Bubble Cap Trays
    3. Sieve Deck Trays
    4. Valve Trays
    5. Downcommer Types
    6. Feed Nozzles

- The operational limits for trays – operating window

- Process Design

    1. Tray Efficiency
    2. Tray Capacities
    3. Collector Trays

- Mechanical Design

    1. Metallurgy Selection
    2. Mechanical Strength
    3. Collector Tray Design

2. Packed Column Design

- The different types of packing and their characteristics

    1. Grids
    2. Random Packing
    3. Structured Packing

- The best type of packing for a given system

- Process Design

    1. Packing Efficiency
    2. Packing Capacities
    3. Distributor Design

- Mechanical Design

    1. Metallurgy Selection
    2. Mechanical Strength
    3. Distributor Tray Design

F. Olefins Distillation

- Quench Oil Tower
    - General PFD
    - KLM Only Recommends trays for Quench Oil Towers
    - Typical Fouling Issues
    - Design for Reliability
    - Case Study
- Quench Water Tower
    - General PFD for Naphtha Feed
    - General PFD for Gas Feeds
    - KLM Recommends CMR Random Packing for Quench Water Towers
    - Typical Fouling Issues
    - Design for Reliability
    - Case Study
- Caustic Tower
    - General PFD
    - Typical Fouling Issues
    - Design for Reliability
    - Bimetallic Corrosion Issues
    - Case Study

- DeMethanizer Tower
  - General PFD for Low Pressure Tower
  - General PFD for High Pressure Tower
  - Typical Fouling Issues
  - Low Temperature Embrittlement Issues
  - Design for Reliability
  - Case Study
- DeEthanizer Tower
  - General PFD
  - Typical Fouling Issues
  - Low Temperature Embrittlement Issues
  - Design for Reliability
  - Greatly Improving DeEthanizer Tower Energy
  - Case Study
- Ethylene Splitter Tower
  - General PFD
  - Design for Reliability
  - Operating for Maximum Recovery
  - Case Study
- DePropanizer Tower
  - General PFD
  - Typical Fouling Issues
  - Design for Reliability
  - Case Study
- Propylene Splitter Tower
  - General PFD for High Pressure
  - General PFD for Heat Pump
  - Design for Reliability
  - Propylene Tower Condenser Issues
  - Operating for Maximum Recovery
  - Case Study

- DeButanizer Tower Design
  - General PFD
  - Design for Reliability
  - Typical Fouling Issues
  - Case Study

G. Design Guidelines

- Designing for Fouling Service
- Designing Quench Towers
- Designing BTX Extraction Towers

H. Troubleshooting

- Introduction

1. Evaluate operation of a packed column
2. Evaluate operation of a tray column
3. Use tools to diagnosis problems

I. Trouble Shooting Case Studies

- Distillation

1. Typical Problems
2. Flooding and Its Detection
3. Pressure Surveys
4. Saltation
5. Entrapment
6. Damaged Equipment
7. Entrainment and Product Quality
8. Intermittent Draws

- Heat Exchangers

1. Preheat and Fouling
2. Leaks
3. Flooded Exchangers and Tubesheet Failures
4. Hot Vapor Bypass and Sealing
5. Vapor Blanketing
6. Heat Integration and Startup
7. Heat Flux Limits
8. Thermosyphon Reboilers

J. Process Control

1. Distillation Column Control

- Functions of Process Control
- Characteristics of a Continuous Process

2. Typical controlled and manipulated process variables

- Level
- Pressure
- Composition
- Temperature
- Flow

3. Controller Performance Criteria

- Final Control Elements
- Control Algorithms

4. Feed Forward Control of an Ideal Process

- Feedback and Feed forward Control Loops

K. Reboiler and Condenser

- Review Heat Exchange Design Fundamentals
- Reboiler Design, Operation and Maintenance
- Condenser Design Operation and Maintenance

L. Demister Pad

- Demister Pad Design Review
- Demister Pad Mechanical Review

M. Designing Columns for improved operation and maintenance

- Maintenance Intervals
- Designing for Fouling Service

N. Installation

- Common column installation mistakes
- List tasks to insure a proper installation
- Revamp Installation Case Study

O Inspection

- New tower inspection guidelines
- Turn Around inspection guidelines

P Tower Scanning

- Tower Scanning Overview
- Tower Scanning Case Study

Q Commissioning

1. Tower Pre Commissioning Guidelines

2. Tower Start Up Guidelines
   - Common start up problems and understand how to correct them

3. Tower Shut Down Guidelines

R. Turn Around Planning

1. Estimating Replacement Parts Needed
2. Estimating Inspection
3. Project Management

What You Can Expect To Gain;

- The operation, maintenance, control and trouble shooting of a distillation columns and it's associated equipment,
- An overview of distillation, practical solutions as well as theory
- Valuable Distillation concepts
- An understating of essential distillation concepts,
- Valuable practical insights for trouble free design and field proven techniques for commissioning, start up and shutdown of distillation operation.
- The fundamental knowledge of distillation control.
- Mechanical design of tower internals
- To tailor your approach to specific design, analysis and trouble shooting problems.

Who Should Attend

- People who are making day to day decisions regarding operation, design, maintenance, and economics of process industry plants.

    1. 1st Line Operations personnel,
    2. Operation Supervisors,
    3. 1st Line Maintenance personnel,
    4. Maintenance Supervisors,
    5. Senior Plant Supervisors,
    6. Operations Engineers
    7. Process Support Engineers,
    8. Design Engineers,
    9. Cost Engineers
    10. Environmental Professionals
    11. Chemist
    12. Sales and Marketing Specialist

- A supervisor or engineer who must troubleshoot and solve distillation problems in a plant. Technical Engineers, Operating Engineers, Process Support Personnel, and Managers

- Plant Operation Support Engineers checking plant performance under different operating conditions, and who are involved in design of new facilities or revamps of existing facilities.

- Ideal for veterans and those with only a few years of experience who want to review or broaden their understanding of process safety.

- This is an opportunity for new plant personnel and for those who are experienced to meet and discuss current problems and learn how to enhance their operations.

- Other professionals who desire a better understanding of the subject matter.