

DISTILLATION CONTROL



Course Overview

Course number: 4720

Course length: 4-5 days

NOTE: *SESP Training Match and MPA discounting are not available for this course.*

Need to improve the performance of a distillation or fractionation operation?

The control requirements in distillation and fractionation operations are steadily becoming more demanding. In two-product towers, the norm in the past was to control the composition of only one product stream (single-ended composition control). Today, the norm is to control the composition of both product streams (double-ended composition control), which immediately raises the issue of interaction within the control configuration. The distillation and fractionation systems are also becoming more complex, including columns in series (often with heat integration), sidestreams, side heaters/coolers, reactions occurring within columns, etc.

The issues that must be addressed in such applications are many and varied. This course encompasses the following:

- Economic issues in the operation of distillation columns and the role of control
- Characteristics of towers, both tray towers and packed towers
- Single-ended composition control using either reflux/boilup (energy) or product draw (material)
- Measurement issues, especially use of temperature in lieu of composition analysis
- Various condenser configurations and the control of tower pressure (or vacuum)
- Various reboiler configurations, including the issue of condensate return
- Applications of feedforward control in columns
- Double-ended composition control
- Complex towers (towers in series, heat integrated towers, towers with sidestreams, etc.)

Course Benefits

Better product quality and/or more efficient operation of a distillation column.

In the control of industrial distillation or fractionation operations, the primary objective is to control the product composition(s) within tight tolerances. The obvious benefit is to enhance product quality, but an additional economic benefit is that the operating targets can be set very close to their limiting values so that the unit is operated most efficiently with regard to one of the following:

- Increased throughput
- Improved recovery of the valuable product
- Lower energy utilization
- Maximum allowable amount of a low value impurity in a high value product stream

This course covers the range of topics that must be addressed in order to achieve a high degree of automation of industrial distillation or fractionation operations.

Course Delivery Options

- In-Center Instructor-Led Training
- On-Site Instructor-Led Training

Who Should Take This Course?

Anyone involved in the control of distillation or fractionation operations.

This course addresses distillation from an operations perspective as opposed to column design. That is, this course assumes that the column exists and is operating in a known service (although not necessarily the service for which the tower was designed).

Prerequisite/Skill Requirements

Prerequisite Course(s)

- Loop tuning and troubleshooting - 4700 (or its equivalent)

Required Skills and/or Experience

- None

Prerequisite/Skill Requirements Continued

Desirable Skills and/or Experience

- Familiarization with own plant's separation operations

Course Topics

You will learn how to....

- **Economics of distillation control.** How improved control provides the ability to operate towers closer to limiting conditions, resulting economic benefits, such as improved recovery or lower energy utilization.
- **Characteristics of towers.** Relationship of separation to energy and product draws; separation models; dynamic characteristics of both tray and packed towers.
- **Single-ended composition control.** Configurations for controlling the composition of only one product stream (overheads or bottoms, but not both); direct material balance configurations (controlling composition with the respective product draw); indirect material balance configurations (controlling the composition with reflux or boilup); issues pertaining to direct material balance control.
- **Condenser configurations.** Options for controlling pressure; condenser configurations, including water-cooled, air-cooled, hot-gas bypass, flooded condensers, etc; partial condensers; vacuum towers; atmospheric towers.
- **Reboiler configurations.** Kettle reboilers; thermosiphons; condensate return issues; hot-oil systems; use of economizers and/or feed preheaters.
- **Temperature.** Pros and cons of temperature measurement; pros and cons of composition analyzers; pressure compensated temperature measurements; differential temperature control.
- **Use of feedforward control.** Configurations that utilize feedforward concepts to enhance the control of columns; internal reflux control; steam-to-feed ratios; feedforward of feed composition; issues raised by towers in series; heat-integrated towers.
- **Double-ended composition control.** Interaction associated with double-ended composition control; methods for quantifying the degree of interaction; potential configurations for double-ended composition control.
- **Complex tower configurations.** Towers with side-streams; control of internal flows below a liquid draw and above a vapor draw; role of model predictive controllers in complex towers.

Column simulations are used throughout the presentations to illustrate the various points. The presentations are accompanied by practice sessions where the attendees use the simulations to examine the various issues pertaining to control of distillation columns.

Additional Training

To increase your knowledge and skills, there are additional courses available from Automation College.

For more information and registration, visit www.automationcollege.com.