

Operation of a Binary Distillation Column - Level 1

Practical Simulator Training (CORYS IndissPlus simulator)

4 days

PSE/ICD-E

Overview

LEVEL

Proficiency

PURPOSE

This course provides a comprehensive and working knowledge of distillation columns operating conditions and parameters through a hands-on experience.

LEARNING OBJECTIVES

Upon completion of the course, the participants will be able to:
grasp the meaning of the operating conditions of a continuous distillation column with two compounds in the feed,
learn how to operate a binary column with a simple control scheme,
achieve proper settings to keep products on spec.

WAYS AND MEANS

Use of a virtual column modeled on RSI IndissPlus dynamic simulator.

Each handling includes the definition of setting objectives, implementation with observation of the response of the system, shared analysis of the results and practical conclusions regarding the operation.

LEARNING ASSESSMENT

Quiz.

PREREQUISITES

No prerequisites for this course.

Agenda

BASICS OF DISTILLATION

0.75 d

Volatility of pure compounds: boiling point, vapor pressure.
Properties of simple hydrocarbon mixtures.
Sensible and latent heat: definitions, differences in magnitude and their association with changes of physical state, i.e., vaporization and condensation.
Behavior of mixtures in distillation: dew and bubble points, incomplete condensation and vaporization, liquid-vapor separation and distribution of lights and heavy compounds.
Relation between temperature, pressure and the composition of the products.

ANALYSIS OF OPERATING PARAMETERS USING THE VIRTUAL COLUMN

0.75 d

Familiarization with simulator controllers, face plates, trends and control loops.
Study of the circuits, instrumentation and control loops around the column.
Principles of a distillation column: liquid and vapor traffic, role of the condenser and reboilers, trays and packing.
Analysis of the operating conditions: significance of measured values and calculated variables.

Mass balance, representation of the separation, pressure profiles, composition profiles, temperature profiles, illustrating the link between these profiles and the operating parameters.

STUDY THE OPERATING PARAMETERS OF THE DISTILLATION COLUMN

2.5 d

Operating parameters of the column and analysis of their influences:

Reflux flow rate modifications: action, consequences on mass balance, purities, and internal profiles.

Flow rate of hot oil at the reboiler: modifications of the duty and consequences on the operating parameters.

Changes in feed characteristics: temperature, flow rate and composition.

Overhead pressure control, different control schemes, pressure modification and consequences.

Each case is studied using the following pedagogical approach:

Make a change to the column via controllers set point.

Analyze how column performance is affected in response to the change.

Compare the new steady state to the base case influence on cut point and fractionation capability.

Identify the consequences of the changes on associated equipment.

SIMULATOR TRAINING

Exercises are conducted in small groups of 2 to 3 participants, each group operating its own virtual column.

Each exercise includes: definition of the target exercise objective; adequate time to run the virtual columns; open analysis of the results, shared with all participants; and practical conclusions related to the operation of the columns.

Attendees are invited to bring descriptions of their specific column diagrams. Conclusions drawn from the exercises on the simulator can be transposed to other actual schemes.