

# **Introduction to Process Engineering Simulation Software**

## **Introduction**

The success of every company depends of 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.

There are times when the virtual world of computers needs to be taken to the real world. It should be remembered that machine calculations are for the purpose of improving only the speed of the calculation – the engineer must supply correct input data and correct judgment of results. Without the key concepts of the correct input data and estimates of the results, the two worlds may collide.

## **Course Objective**

This introductory course will guide the participants to develop key concepts and techniques to utilize process engineering simulation software. This course includes discussions about the general approach and the key elements for successful simulations

These key concepts can be utilized to make process engineering simulation software a troubleshooting tool to help solve distillation tower problems. The key concepts taught in this course are independent of the clients chosen software and will apply to all the industry standard simulation packages.

## What You Can Expect To Gain

- An overview of distillation, practical solutions as well as theory
- General simulation & flow sheeting techniques. Learn to build, evaluate and optimize process flow sheets.
- General component, thermodynamic & stream data requirements
- Unit operations: Columns, flashes, mixers, pumps, valves, heat exchangers, compressors, etc.
- How to select the proper input data
- Proper selection of VLE Data
- Workshops based on your plant's towers

## Course Syllabus

This suggested course is a three to five days. The goal of the course would be to refresh the knowledge of those who have a basic understanding of process simulation software techniques and to build a foundation to those who are new to the process simulation software.

### Typical Course Outline

#### A. General Introduction

##### 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

##### 2. Tray Column Design

- The major design differences between tray types

- The operational limits for trays – operating window
- Size a distillation column for a given vapor rate

### 3. Packed Column Design

- The different types of packing and their characteristics
- The best type of packing for a given system
- Size a packed column diameter

### 4. Distillation Column Control

- Typical process variables in a distillation column
- Select appropriate composition and column pressure control schemes
- Process settings during column operation

## B. Thermodynamics and Equilibrium

### 1. Vapor Liquid Equilibrium

- Select the correct vapor-liquid equilibrium equation for your system
- Review vapor pressure and equilibrium diagrams
- Interpret mole fraction equilibrium curves, commonly called y-x diagrams

### 2. Stages & Transfer Units Efficiencies

- Calculate the number of equilibrium stages using short cut methods
- Calculate minimum reflux and stages using graphical & analytical methods
- Determine number of theoretical stages needed in a distillation column

### 3. Stage Efficiency

- Methods for determining efficiency
- Calculate an overall column efficiency for tray columns

## C. Process Simulation Review

### 1. Getting started with simulation software

### 2. General simulation & flow sheeting techniques

### 4. General component, thermodynamic & stream data requirements, enter basic input required for a simulation

4. Unit operations: Columns, flashes, mixers, pumps, valves, heat exchangers, compressors, etc.
- E. Workshops (which are mixed in the lectures)
1. Simulation of DePropanizer
    - Comparison of VLE
    - Choosing distillation device
    - Selection of stage efficiency
  2. Simulation of Crude Tower
    - Comparison of VLE
    - Choosing distillation device
    - Selection of stage efficiency
  3. Simulation of DeEthanizer
    - Comparison of VLE
    - Choosing distillation device
    - Selection of stage efficiency
  4. Simulation of one of your plants towers
    - Comparison of VLE
    - Choosing distillation device
    - Selection of stage efficiency

### **Who Should Attend**

- People who are making day to day decisions regarding operation, design, maintenance, and economics of process industry plants.
- An engineer or chemist who must troubleshoot and solve distillation problems in a plant, an engineering office or laboratory.
- Technical Engineers, Operating Engineers, Process Support Personnel, Chemist, and Managers
- Engineering graduates/technologists who will be using simulation software in their daily work.

- Technical Process engineers doing process design and optimization projects and studies.
- Plant Operation Support Engineers checking plant performance under different operating conditions.
- R&D engineers and researchers using process simulators for process synthesis, upgrade or modifications.
- Ideal for veterans and those with only a few years of experience who want to review or broaden their understanding of process safety.
- Other professionals who desire a better understanding of the subject matter.

### **Prerequisites**

- A background in chemical engineering or industrial chemistry

### **Schedule**

This course can also be customized to your requirements at your site. Please contact us about providing training at your site.