Haward Technology Middle East

COURSE OVERVIEW PE0349
Advance HYSYS Process Modeling
(E-Learning Module)

Course Title
Advance HYSYS Process Modeling
(E-Learning Module)

Course Reference
PE0349

Course Format & Compatibility
SCORM 1.2. Compatible with IE11, MS-Edge, Google Chrome, Windows, Linux, Unix, Android, IOS, iPadOS, macOS, iPhone, iPad & HarmonyOS (Huawei)

Course Duration
30 online contact hours
(3.0 CEUs/30 PDHs)

Course Description

This E-Learning course is designed to provide participants with a detailed and up-to-date overview of advanced HYSYS process modeling. It covers the setting up of dynamic simulation and the advantages of simulation; the good flowsheeting practice and the important features of Aspen plus; the graphic flowsheet operations and automatic naming of streams and blocks; the user interface, data browser, basic input, status indicators and cumene production conditions; setting up specifications form, run types and units; the stream report options; the pure component databanks, starting the run and unit operation models; and the mixers/splitters, separators, heat exchangers, columns, reactors, pressure changers, manipulators, solids and user models.

Further, the course will also discuss the feed convention, methanol-water radfrac column, plot wizard demonstration and reactor models; the property methods and physical properties; the pure component parameters, binary parameters, property sets and properties included in prop-sets; the stream results options, Aspen properties, accessing variables and variable categories; the steps for using sensitivity analysis, design specifications, using calculator blocks, copy and paste and creating active links; and saving and running files with active links, working with the heater model and the heater input specifications.

During this course, participants will learn the heat curves, pressure changers, pump performance, compressor performance, work streams, convergence blocks and convergence block types; the flowsheet sequence, file formats in Aspen plus and file type characteristics; storing a simulation; creating a personal template; maintaining your computer and hard disk; customizing the look of your flowsheet and process flow diagram; adding annotation and global data, using pfd mode, estimating physical properties and using property estimation; the characteristics of an electrolyte system; the various types of components, limitations of electrolytes, solid properties and unit operation models; the specialized initialization methods, engineering design, process modeling using HYSYS, flash calculation and heat exchanger calculations; and the column specifications, pipe segment, pipe flow correlations, heat transfer models and recycle location.

Course Objectives

After completing the course, the employee will:-

- Apply and gain a comprehensive knowledge on advanced HYSYS process modeling

- Set up dynamic simulation and discuss the advantages of simulation

- Carryout good flowsheeting practice and identify the important features of Aspen plus

- Apply graphic flowsheet operations and automatic naming of streams and blocks

- Determine the user interface, data browser, basic input, status indicators and cumene production conditions

- Setup specifications form, run types and units as well as review stream report options

- Discuss pure component databanks, start the run, review results and illustrate unit operation models

- Identify mixers/splitters, separators, heat exchangers, columns, reactors, pressure changers, manipulators, solids and user models

- Illustrate feed convention, methanol-water radfrac column, plot wizard demonstration and reactor models

- Employ property methods and establish physical properties

- Recognize pure component parameters, binary parameters, property sets and properties included in prop-sets

- Identify stream results options, Aspen properties, accessing variables and variable categories

- Carryout steps for using sensitivity analysis, design specifications, using calculator blocks, copy and paste and creating active links

- Save and run files with active links, work with the heater model and discuss heater input specifications

- Determine heat curves, pressure changers, pump performance, compressor performance, work streams, convergence blocks and convergence block types

- Identify flowsheet sequence, file formats in Aspen plus and file type characteristics

- Store a simulation, create a personal template, maintain your computer and hard disk and customize the look of your flowsheet and process flow diagram

- Add annotation and global data, use pfd mode, estimate physical properties and use property estimation

- Describe the characteristics of an electrolyte system and identify the various types of components, limitations of electrolytes, solid properties and unit operation models

- Illustrate specialized initialization methods, engineering design, process modeling using HYSYS, flash calculation and heat exchanger calculations

- Describe column specifications, pipe segment, pipe flow correlations, heat transfer models and recycle location

Who Should Attend

This course provides an advanced overview of HYSYS process modeling for process engineers doing process design and optimization projects and studies, plant engineers checking plant performance under different operating conditions and R&D engineers and researchers using Aspen HYSYS for process synthesis.

Training Methodology

This Trainee-centered course includes the following training methodologies:-

- Talking presentation Slides (ppt with audio)
- Simulation & Animation
- Exercises
- Videos
- Case Studies
- Gamification (learning through games)
- Quizzes, Pre-test & Post-test

Every section/module of the course ends up with a Quiz which must be passed by the trainee in order to move to the next section/module. A Post-test at the end of the course must be passed in order to get the online accredited certificate.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations:-

- USA International Association for Continuing Education and Training (IACET)

Haward Technology is an Authorized Training Provider by the International Association for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 1-2013 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 1-2013 Standard**.

Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Association for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

- British Accreditation Council (BAC)

Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

Course Fee

As per proposal

Course Contents

- Set up Dynamic Simulation
- Advantages of Simulation
- General Simulation Problem
- Approaches to Flowsheet Simulation
- Good Flowsheeting Practice
- Important Features of Aspen Plus
- The User Interface
- Cumene Flowsheet Definition
- Using the Mouse
- Graphic Flowsheet Operations
- Automatic Naming of Streams and Blocks
- Benzene Flowsheet Definition Workshop
- Basic Input
- The User Interface
- The Data Browser
- Help
- Functionality of Forms
- Basic Input
- Status Indicators
- Cumene Production Conditions
- Setup
- Setup Specifications Form
- Stream Report Options
- Setup Run Types
- Setup Units
- Components
- Components Specifications Form
- Entering Components
- Find

- Pure Component Databanks

- Properties

- Streams

- Streams Input Form

- Blocks

- Block ForM

- Starting the Run

- Control Panel

- Reviewing Results

- Benzene Flowsheet Conditions Workshop

- Unit Operation Models

- Unit Operation Model Types

- Mixers/Splitters

- Separators

- Heat Exchangers

- Columns – Shortcut

- Columns – Rigorous

- Reactors

- Pressure Changers

- Manipulators

- Solids

- User Models

- Course Recap

- RadFrac

- RadFrac: Rigorous Multistage Separation

- RadFrac Flowsheet Connectivity

- RadFrac Setup Configuration Sheet

- RadFrac Setup Streams Sheet

- Feed Convention

- RadFrac Setup Pressure Sheet

- Methanol-Water RadFrac Column

- RadFrac Options

- Plot Wizard

- Plot Wizard Demonstration

- RadFrac DesignSpecs and Vary

- RadFrac Convergence Problems

- RadFrac Workshop

- Reactor Models

- Reactor Overview

- Balanced Based Reactors

- Equilibrium Based Reactors

- Kinetic Reactors

- Using a Reaction ID

- Power-law Rate Expression

- Heats of Reaction

- Reactor Workshop

- Physical Properties

- Case Study - Acetone Recovery

- How to Establish Physical Properties

- Property Methods

- Physical Property Models

- Ideal vs. Non-Ideal Behavior

- Comparison of EOS and Activity Models

- Common Property Methods

- Choosing a Property Method – Review

- Choosing a Property Method – Example

- How to Establish Physical Properties

- Pure Component Parameters

- Binary Parameters

- Displaying Property Parameters

- Reporting Parameters

- Reporting Physical Property Parameters

- How to Establish Physical Properties

- Property Analysis

- Property Analysis - Common Plots

- How to Establish Physical Properties

- Establishing Physical Properties – Review

- Property Sets

- Properties included in Prop-Sets

- Specifying Property Sets

- Predefined Property Sets

- Stream Results Options

- Definition of Terms

- Aspen Properties

- Physical Properties Workshop

- Accessing Variables

- Why Access Variables?

- Accessing Variables

- Variable Categories

- Variable Definition Dialog Box

- Notes

- Sensitivity Analysis

- Sensitivity Analysis Example

- Sensitivity Analysis Results

- Uses of Sensitivity Analysis

- Steps for Using Sensitivity Analysis

- Plotting

- Notes

- Sensitivity Analysis Workshop

- Cyclohexane Production Workshop

- Design Specifications

- Design Specification Example

- Steps for Using Design Specifications

- Notes
- Design Specification Workshop
- Cyclohexane Production Workshop
- Calculator Blocks
- Calculator Block Example
- Excel
- Steps for Using Calculator Blocks
- Uses of Calculator Blocks
- Increasing Diagnostics
- Excel
- Excel Aspen Plus Toolbar
- Course Recap
- Windows Interoperability
- Windows Interoperability – Examples
- Benefits of Windows Interoperability
- Steps for Using Copy and Paste
- OLE - Object Linking and Embedding
- Embedding Objects in the Flowsheet
- Copy and Paste Workshop 1
- Copy and Paste Workshop 2
- Creating Active Links
- Steps for Creating Active Links
- Paste Link Demonstration
- Paste Link Workshop
- Saving Files with Active Links
- Running Files with Active Links
- Heat Exchangers
- Heat Exchanger Blocks
- Working with the Heater Model
- Heater Input Specifications
- Heat Streams

- Working with the Heat X Model

- HeatX versus Heater

- Two Heaters versus One HeatX

- Working with Hetran and Aerotran

- Working with HTRI-IST

- Heat Curves

- Heat Curves Tabular Results

- Heat Curve Plot

- HeatX Workshop

- Pressure Changers

- Pressure Changer Blocks

- Working with the Pump Model

- Pump Performance Curves

- Working with the Compr Model

- Working with the MCompr Model

- Compressor Performance Curves

- Work Streams

- Working with the Valve Model

- Working with the Pipe Model

- Pressure Changers Workshop

- Flowsheet Convergence

- Convergence Blocks

- Convergence Block Types

- Flowsheet Sequence

- Tear Streams

- Reconciling Streams

- Convergence Workshop

- Full-Scale Plant Modeling Workshop

- General Guidelines

- Full-Scale Plant Modeling Workshop

- Part 1: Front-End Section

- Part 1: Front-End Section Check

- Part 2: Heat Recovery Section

- Part 2: Heat Recovery Section Check

- Part 3: Methanol Synthesis Section

- Part 3: Methanol Synthesis Section Check

- Part 4: Distillation Section

- Part 4: Distillation Section Check

- Part 5: Furnace Section

- Full-Scale Plant Modeling Workshop

- General Guidelines

- Full-Scale Plant Modeling Workshop

- Part 1: Front-End Section

- Part 1: Front-End Section Check

- Part 2: Heat Recovery Section

- Part 2: Heat Recovery Section Check

- Part 3: Methanol Synthesis Section

- Part 3: Methanol Synthesis Section Check

- Part 4: Distillation Section

- Part 4: Distillation Section Check

- Part 5: Furnace Section

- Maintaining Aspen Plus Simulations

- File Formats in Aspen Plus

- File Type Characteristics

- How to Store a Simulation

- Template Files

- How to Create a Personal Template

- Maintaining Your Computer

- Maintaining Your Hard Disk

- Customizing the Look of Your Flowsheet

- Customizing the Process Flow Diagram

- Viewing

- Adding Annotation

- Example of a Stream Table

- Adding Global Data

- Using PFD Mode

- Examples of When to Use PFD Mode

- Annotation Workshop

- Estimation of Physical Properties

- What is Property Estimation?

- Using Property Estimation

- Estimation Methods and Requirements

- Steps for Using Property Estimation

- Defining Molecular Structure

- Steps for Defining General Structure

- Example of Defining Molecular Structure

- Atom Types

- Bond Types

- Steps for Using Property Estimation

- Example of Entering Additional Data

- Activating Property Estimation

- Property Estimation Notes

- Property Estimation Workshop

- Electrolytes

- Electrolytes Examples

- Characteristics of an Electrolyte System

- Types of Components

- Apparent and True Components

- Apparent and True Components Example

- Electrolyte Wizard

- Simplifying the Chemistry

- Limitations of Electrolytes

- Electrolyte Demonstration

- Steps for Using Electrolytes
- Electrolyte Workshop
- Sour Water Stripper Workshop
- Solids Handling
- Classes of Components
- Specifying Component Type
- Conventional Components
- Conventional Inert Solids (CI Solids)
- Nonconventional Solids (NC Solids)
- Component Attributes
- Component Attribute Descriptions
- Solid Properties
- Solids Properties - Conventional Solids
- Solids Properties - Nonconventional Solids
- Solids Properties - Special Models for Coal
- Built-in Material Stream Classes
- Unit Operation Models
- Solids Workshop 1
- Solids Workshop 2
- Optimization
- Optimization Example
- Steps for Using Optimization
- Notes
- Optimization Workshop
- RadFrac Convergence
- RadFrac Convergence Methods
- RadFrac Convergence Algorithms
- Standard Algorithm
- Sum-Rates Algorithm
- Nonideal Algorithm
- Newton Algorithm

- Vapor-Liquid-Liquid Calculations
- Convergence Method Selection
- RadFrac Initialization Method
- Specialized Initialization Methods
- Estimates
- Composition Estimates
- RadFrac Convergence Workshop
- Vinyl Chloride Monomer (VCM) Workshop
- Process Modeling using HYSYS Part 1
- Why Use Simulation Models?
- Lifecycle Questions
- Engineering Design
- Deep Water Exploration
- Shell Bonga Subsea Flowline System
- Chevron De-Ethanizer Turbo Expander Plant
- Chevron Funiwa Transient Analysis. – Flow Assurance
- NAOC Ebocha Revamp Project
- Shell Oguta Flow station Debottlenecking
- Process Modeling using HYSYS
- HYSYS Main Characteristics
- HYSYS Steady State Simulation
- How HYSYS is structured
- HYSYS Interface Main Structure
- Simulation Basis Manager
- FPM: Hyprotech Database
- Property Packages in HYSYS
- Selecting Property Package
- HypoComponents
- Flash calculation
- Envelope Utility
- Hydrate Formation Utility

- Property Table Utility
- Module 1 - Getting Started
- C7+, C7 and C8
- Flash Calculations
- Exploring the Simulation
- Property Table Utility
- Module 2 – Propane Refrigeration Loop
- Unit Operations
- Conversion to a Template
- Saving the Simulation as a Template
- HYSYS key design aspect
- Module 2 – Propane Refrigeration Loop
- Workshop
- Propane Refrigeration Loop
- Forward–backward information propagation
- Exploring the Simulation: Exercise 1
- Module 3 – Refrigerated Gas Plant
- Modelling Heat Exchangers
- Shell & Tube heat exchangers
- Heat Exchanger calculations
- Heat Exchanger specifications
- Adding the Balance
- Linking Sub-flowsheets
- Tool: Case Study
- Workshop
- Challenge
- Module 4 – NGL Fractionation Train
- Input Experts
- Background
- Column Specifications
- Column Subflowsheets

- Process Modeling using HYSYS Part 2
- Oil Characterization using C7Plus
- Module 6 – Gas Gathering
- Pipe Segment
- Pipe Flow Correlations
- Pipe Segment: Rating
- Rating Tab
- Heat transfer models
- Pipe Sizing: Heat Transfer Page
- Workshop
- Module 7 – Two Stage Compression
- Recycle – Logical operation
- Recycle
- Recycle Parameters
- Recycle location
- Workshop
- Flowsheet 1
- Flowsheet 2
- Flowsheet 3
- Flowsheet 4
- Challenge
- Module 8 – Acid Gas Sweetening with DEA
- Amines Prop. Package
- Suggested values
- Damping Factor
- Set operation
- Spreadsheet
- Workshop
- Regenerator Operation
- Challenge
- Module 9 – Natural Gas Dehydration with TEG

- TEG Prop. Package
- Workshop
- Challenge
- Module 10 – Reporting in HYSYS