

ENGINEERING DESIGN SEMINAR

Honeywell
UOP

 Course Dates: **2 June – 31 July**

 Location: **Rosemont Area, Illinois**

Course Overview

This intensive 39-day program gives participants the opportunity to learn the fundamentals of refining process design. Each topic is presented in the context of the design of a refinery process unit or the selection of a specific type of refinery equipment. Seminar sessions are led by UOP process design and equipment design specialists who demonstrate how to apply engineering principles to solve design problems.

Course Benefits

Course participants will be able to:

- Understand the practical applications of basic design engineering principles
- Develop steady-state simulations of process flowsheets, including design guidelines, generation of heat/mass balances, and process optimization
- Systematically assess hydraulic circuits
- Understand key criteria for designing vessels, heat exchangers, rotating equipment, piping, relief valves, fractionating columns, and fired heaters
- Explain how to process stream properties affect process equipment metallurgy
- Understand the content and applications of process flow diagrams (PFDs) and piping and instrument diagrams (P&IDs)



Topics

- | Compressors
- | Carbon Capture
- | Energy systems
- | Environmental Issues
- | Fired Heaters
- | Fractionation
- | Gravity separation
- | Heat exchangers
- | Instrumentation
- | Line sizing and hydraulics
- | Metallurgy, Corrosion and Fouling
- | Operational Safety
- | Pinch technology
- | Process unit design
- | Pressure vessel and flange ratings
- | Process and project engineering
- | Process fluid properties
- | Pumps
- | Refinery business economics
- | Relief valves
- | Simulation tools for process design
- | Steam turbines
- | Tray sizing
- | Vacuum Unit
- | Utilities and offsites

**Request a
quote for
available
training options.**

Option 1: Program as listed

Option 2: Customize your training to include:

- Case Studies
- Mentorship
- Operator Training simulators (as applicable)
- On-site walk through
- Web-Based training



Contact Your Service Manager/Account Manager.



Ensure your team stays ahead!

¹Note: Limited to UOP license holders



Course Outline

Compressors - 1.5 days

- Reciprocating Compressor Theory
- Valves
- Reciprocating Compressor Control
- Reciprocating Compressor Parts
- Purchasing Reciprocating Compressors
- Centrifugal Compressor Control
- Antisurge
- Seals and Bearings
- Dry Gas Seals
- Purchasing Centrifugal Compressors
- Oil Consoles
- Centrifugal Parts
- Axial Compressors
- Screw Compressors
- Case Studies (7 case studies)

Crude Distillation Unit Design - 1.0 days

- Crude Assays
- Design Basis
- Feed System Options – Decisions
- Crude Tower Options – Decisions
- Crude Preheat Train and Crude Heater

Energy and Steam Systems - 1.0 days

- Steam properties
- Steam systems
- Energy Integration
- Cogeneration
- Energy efficiency checklists
- Steam traps
- CO2 emissions reductions

Environmental Issues - 0.5 days

- Environmental Issues Related to Refining
- Effluents and Pollution Control
- Monitoring and Reporting Effluents
- Pollution Prevention and Sustainability
- References for Environmental Information

Fired Heaters - 2.0 days

- Fired Heaters Overview
- Radiant Section
- Bridgwall Temperature Evaluation
- Convection Section
- Flame Temperature
- Efficiency
- Pilot and Standard Burners
- Low Nox and Ultra Low Nox Burners
- Latest Generation Burners
- Low Nox Staged Air Burners
- Design Procedures
- Instrumentation
- Skin Thermocouples
- New Heater Specifications
- Air Preheater Specifications
- Reliability
- Field Evaluation
- Troubleshooting Combustion Problems
- Troubleshooting Hydrotreating Heaters
- Heater Tube Ceramic Coating
- Troubleshooting Oil Firing

Fractionation - 3.0 days

- Equilibrium and Relative Volatility
- Heat and Material Balance
- McCabe Thiele
- Shortcut Methods
- Rigorous Computer Methods and Models
- Design Basis
- Design Optimization
- Internals, Peripherals, and Controls
- Tray Efficiency
- Software Guidelines

Gravity Separation - 1.0 days

- Concepts and Principles of Gravity Separation
- Separation Principles in Refining Applications
- Common Internals in Gravity Separation
- Mist Elimination Methods
- Examples and Problems

Heat Exchangers - 3.0 days

- Heat Transfer Objectives and Concepts
- Shell and Tube Exchangers
- Special Heat Exchanger Types
- Phase Changes
- Geometric Influences
- Design Practices
- Troubleshooting Problems
- Maintenance
- Cost Estimating
- Vendors
- Air Cooled Exchanger Overview
- Air Cooled Mechanical Considerations
- Air Cooled Geometric Effects
- Air Cooled Design Procedures
- Air Cooled Winterization
- Air Cooled Troubleshooting
- Alternate Heat Exchanger Technologies
- Crude Unit Heat Exchangers
- Vacuum Unit Heat Exchangers
- NHT-Platforming Heat Exchangers
- Hydroprocessing Heat Exchangers
- Exchanger Evaluation Using HTRI (at UOP facility) – 1 day

Instrumentation - 1.5 days

- Instrumentation Terminology
- P&ID Representation
- Feedback Control Loop
- Individual Components of a Feedback Loop
- DCS System Requirements
- Process Control Applications

Advanced Process Control - 0.5 days (only at UOP location)

- Overview
- Troubleshooting Basic Regulatory Control
- Advanced Regulatory Control
- Multivariable Predictive Control



Course Outline

Line Sizing and Hydraulics - 1.0 days

- Line Sizing – Liquid, Vapor, Two Phase Flow
- Line Sizing – Line Service Types and UOP Guidelines
- Hydraulics Definition and Usage
- Piping Equivalent Length
- Equipment Elevations
- Pump NPSH Calculations
- Thermosiphon Reboiler Hydraulics
- Typical Equipment Pressure Drops
- Hydraulic Circuit Problem and Evaluation

Metallurgy, Corrosion and Fouling - 2.0 days

- Properties and Classes of Metals
- Ferritic Metallurgy
- Non-Ferritic Metallurgy
- Corrosion Fundamentals
- Low-Temperature Corrosion
- High-Temperature Corrosion
- Corrosion Monitoring and Testing
- Fouling and Prevention
- Metallurgy Specification

Operational Safety - 1.0 days

- Operational Hazards
- Technology and Safety Information
- Engineering Design Reviews
- Process Hazard Analyses
- Procedures
- Mechanical Integrity
- Training
- Modifications
- Pre-Startup Safety Reviews
- Decommissioning / Recommissioning
- Process Incident Investigations

Pinch Technology - 1.0 days

- Composite Curves
- Grand Composite Curves
- Network Design
- Pinch Tools
- Data Extraction
- Process Modifications

Process Unit Design - NHT - P&ID Check - 2.0 days

- NHT Process Unit
- Process Unit Design Considerations
- P&ID Symbols
- P&ID Check Exercise

Pressure Vessel and Flange Ratings - 1.5 days

- Process Engineer Responsibilities
- Pressure Vessel Geometry and Heads
- Codes and Standards
- Evaluation Methods
- Fabrication
- Testing
- Revamps
- Stress Analysis and Code Rules

Process and Project Engineering - 1.0 days

- Project Definition and Design Basis
 - PFD, Heat and Material Balance, Major Equipment Sizing
 - Line Sizing and Hydraulics, Equipment Specifications, P&IDs
- Process Fluid Properties - 2.0 days
- Overview of Thermophysical Properties Used in Process Simulation
 - Overview of Thermodynamic Models Used in Common Process Simulation
 - Properties from Thermodynamic Models
 - Equilibrium Calculations in Process Simulation
 - Guidelines for Selecting the Appropriate Property Package

Pumps - 1.0 days

- Pump Curves
- Pump Seals
- Reliability
- Power Requirements
- Hydraulics
- Bearings
- Double Suction, High-Speed Pumps, Proportioning Pumps
- Troubleshooting
- Purchasing Pumps

Refinery Business Economics - 2.0 days

- Refinery Business Environment
- Crude Oil Evaluations and Refinery Margins
- Margin Exercise
- What is a LP
- Refinery Configurations
- Product Blending
- Blending Exercise
- Economics of a New Refinery Project
- Process Unit Economics and Exercise
- Project Planning
- Investment Analysis
- Benchmarking

Relief Valves and Pressure Relief Systems - 1.5 days

- Pressure Relief Basics
- Pressure Relief System Design Process
- Process Model for Relief Conditions
- Feed Surge Drum Calculation
- Fractionator Calculation
- Selecting and Sizing a Relief Device

Simulation tools for Process Design - 2.0 days

- Unisim Design Overview
- Unisim Basic Commands
- Define Components
- Building Unisim Flowsheets
- Unisim Logical Operations
- Workshops
- NHT Process Design
- NHT Process Variables
- NHT Process Design, Sizing, Optimization
- Workshops

Steam Turbines - 0.5 days

- Design Decisions
- Plant Applications
- Prime Mover Selections – Alternatives
- Theory
- Problem
- Hardware
- Controls



Course Outline

Tray Sizing - 1.0 days

- Function and Operation of Trays and Packing
- Internals Types and Uses
- Design Limits and Considerations
- Key Tray Dimensions
- Hand Calculation Work Process
- Use and Exercise with KG-Tower

Vacuum Unit Design - 1.0 days

- Vacuum Unit Purpose
- Design Basis
- Design Options
- Transfer Line
- Vacuum Heater
- Column Internals
- Vacuum System
- Column Bottoms Section

Utilities and Offsites - 2.5 days

- Overview
- Utility Design Fundamentals
- Water Treatment
- Fuel Oil – Fuel Gas Systems
- Cooling Water Systems
- Plant – Instrument Air Systems
- Nitrogen Systems
- Chemical Handling Systems
- Tankage
- Transfer and Delivery Systems
- Refinery Products Blending-Scheduling
- Flare Systems
- Firefighting
- Conclusion



Quotes from 2023 and 2024 Seminar Participants:

- Seminar was life changing
- Got a lot of knowledge about the “big” picture of a refinery
- Very impactful for future expansion and optimizing existing process
- Opened up my horizon towards changing Refinery Business
- Hands-on experience significantly improved my practical skills