



Heat Exchangers, Mechanical Design, Operation, Performance & Specification

Training program



Introduction:

Heat exchangers are important and expensive pieces of equipment that are used in a wide variety of industries. This course will enable you to improve heat exchanger effectiveness and extend the equipment's life span by teaching the basic principles of fluid flow and heat transfer. You will also learn about the design and operation of shell and tube heat exchangers, as well as compact and air-cooled exchangers.

The course will explain how to use the applicable API, TEMA, and ASME codes, standards, and recommended practices. Class discussions will cover fabrication; materials of construction; costs of tubular units, condensers, and re-boilers; the effect and mitigation of fouling; and, causes and preventions of exchanger tube vibration and damage. You will study factors to consider when deciding between repairs and refurbishments of aging equipment, focusing on the most cost-effective options.

This course will prepare you for mechanical systems operation and maintenance of heat transfer equipment. There will be an emphasis on mechanical components design, material selection, specification, and performance evaluation in this course. All types of exchangers are addressed including shell and tube, plate, brazed aluminum, air coolers, and fired heaters. The course concentrates on heat exchanger hardware, performance requirements, inspection, maintenance and repair, and life extension. The material applies to tubular exchangers used in chemical and petrochemical plants, oil refineries, power stations and industrial facilities. Design point setting and effects on the structure of operating deviations, transients and upsets are examined. Differential pressure design, connections of tube sheets to shells and channels and metal temperature differences are discussed.

Who Should Attend?

Mechanical Engineers, Facility Engineers, Plant Engineers, Design Engineers who are involved in the design of heat transfer equipment utilized in petroleum facilities, Project Engineers; Process Engineers, Facilities Engineers; Mechanical Engineers involved in design, operations, troubleshooting, and maintenance, Supervisors, Technicians, and Technologists in oil, chemical, power and other industries, who require a more extensive understanding of heat exchangers, Plant and Maintenance Engineers, as well as to those generally knowledgeable in the subject, will find this course to be a useful refresher

Course Objectives:

At the end of this seminar participants will be able to:

- Learn about designing, specifying and comprehending the basics of fabrication for heat transfer equipment used in the petroleum industry
- Know about identifying and selecting the most appropriate type of heat transfer equipment for the application
- Develop an understanding of the process design calculations for sizing and positioning heat transfer equipment
- Prevent common problems with heat exchangers
- Explain the principles of heat transfer and fluid flow in heat exchangers
- Apply good industry practices and supporting data
- Optimize design, performance, and operation of modern heat exchangers
- Understand the cause, effect, and mitigation of fouling
- Classify various types of heat exchangers, their applications, and recent technological advances
- Develop thermal and mechanical design
- Determine rating considering recommended practices, standards, and codes
- Prevent future problems and damage using vibration forcing mechanisms
- Identify the causes of failure of your heat exchangers
- Reduce expenses using a knowledge of fabrication, construction materials, and costs

Course Outline:

- Types and Application of Heat Exchangers
- Significance of Energy Use and Heat Exchange in the Petroleum, Petrochemical, Process, and Power Plants and Other Facilities
- Thermodynamics and Heat Transfer Fundamentals
- Heat Transfer Principles
- Heat Transfer Coefficients
- Types of Heat Exchangers and Their Application
- Geometry of Shell and Tube Heat Exchangers (STHE) and Double Pipes
- Materials and Material Selection
- Thermal and Hydraulic Design of Heat Exchangers
- Temperature Difference in STHE
- Fluid Flow and Pressure Drop
- Thermal Design and Rating of STHE
- Condensers and Reboilers
- Sizing and Specifying STHE
- Mechanical Design of Heat Exchangers
- Design Parameters, Design Codes, Standards and Recommended Practices
- Basic Design of Heat Exchangers: STHE, PHE, ACHE
- Materials of construction for heat exchangers
- Fabrication of Heat Exchangers
- Operation, Optimization, and Performance Enhancement of Heat Exchangers
- Fouling in Heat Exchangers
- Degradation Mechanisms and Inspection Methods
- Performance Enhancement
- Heat Exchanger Optimization
- Operation and Troubleshooting

- Corrosion and Corrosion Control
- Fluids Behavior
- Design Process and Considerations
- Shell and Tube Exchangers
- Plate Exchangers
- Brazed Aluminum
- Air Coolers
- Fired Heaters
- Interface to Piping Systems
- Control Systems in Heat Transfer Applications
- Operating and Maintenance Considerations