MERCURY

Mastering Heat Exchangers: Types, Applications, Design, Operation, and Maintenance

30 May – 3 June 2027
Cairo (Egypt)



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Ref: 6040_294612 **Date:** 30 May – 3 June 2027 **Location:** Cairo (Egypt) **Fees:** 4000 Euro

Introduction

Heat exchangers are vital equipment in numerous industries, central to controlling efficiency and cost-effectiveness in operations. This comprehensive heat exchanger training course will provide a deep dive into the various types of industrial heat exchangers, their functionalities, and applications. An understanding of heat transfer principles and their relevance to heat exchanger design and operation is crucial for improving the operational efficiency and longevity of the equipment.

Participants in the heat exchanger design and maintenance course will be equipped with knowledge of the utilization of pertinent design codes and standards such as API, TEMA, and ASME.

The heat exchanger design and maintenance course covers critical aspects such as material selection, understanding of heat exchanger thermodynamics, heat exchange efficiency, and how these factors impact the cost and effectiveness of heat exchange solutions in industry.

Understand Heat Exchanger Design and Maintenance

Explore the intricacies of heat exchanger design and maintenance in our comprehensive training course. Dive deep into the fundamentals with our expert instructors, covering essential topics such as heat exchange efficiency, understanding various types of industrial heat exchangers, and the application of heat exchangers in industry.

Gain valuable insights into heat transfer applications and the diverse range of heat exchanger designs. From exploring the role of heat exchangers to mastering different types and their applications, this course equips you with the knowledge and skills to optimize heat exchange processes effectively. Whether you're delving into exchanger types or seeking to enhance heat exchange design, our training ensures you're equipped for success in this critical field.

Targeted Groups

- Maintenance Professionals.
- Inspection Personnel.
- Process Supervisors.
- Plant Operators.
- Plant/Technical Managers.

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Course Objectives

At the end of this heat exchanger design and maintenance course, the participants will be able to:

- Highlight the essential role of heat exchangers in optimizing plant operations.
- Offer a thorough understanding of heat transfer and fluid dynamics as they pertain to the thermal design of heat exchangers.
- Understand how to present methodologies for the mechanical design of heat exchangers, adhering to industry codes, standards, and best practices.
- Share insights on cost-effective approaches and best practices to enhance heat exchanger performance.
- Dispense comprehensive knowledge of the hydraulic, thermal, and mechanical aspects of heat exchanger design and operation.
- Teach how to recognize and rectify causes of performance decay and potential failures, ultimately conserving energy and extending service life.

Targeted Competencies

By the end of this heat exchanger design and maintenance course, the target competencies will be able to:

- Develop knowledge of heat exchanger designs and their characteristics.
- Grasp of heat transfer principles and applications.
- Understand familiarity with international codes and standards for fabrication, operation, and maintenance.
- Learn about the ability to troubleshoot operational issues such as fouling.
- Understand inspection skills for corrosion, erosion, and structural integrity.

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Course Content

Unit 1: Types and Application of Heat Exchangers

- Overview and fundamentals.
- Learn about the significance of heat exchange in the petroleum, petrochemical, and process industries.
- Heat transfer fundamentals and heat transfer coefficients.
- Heat exchanger types and applications.
- Shell and tube heat exchangers.
- Compact heat exchangers.
- Plate heat exchangers.
- Print circuit heat exchangers.
- Heat pipes.
- Air-cooled heat exchangers.
- Regenerative heat exchangers.
- The geometry of Shell and Tube Heat Exchangers STHE and double pipes - TEMA nomenclature, front-end head types, shell types, rear-end types, double pipe units, and selection guidelines.

Unit 2: Thermal and Hydraulic Design of Heat Exchangers

- Size and Specifying the heat exchanger.
- Temperature difference In STHE.
- Understand countercurrent, co-current, and cross-current.
- TEMA flow arrangements and comparisons.
- Work example.
- Learn about velocity triangles and performance derivation from first principles.
- Pump performance curves: head-capacity, power, efficiency.
- System curve: static, friction, and pressure head components.
- Learn about fluid flow and pressure drop.
- Shell and tube heat exchangers.
- Plate heat exchangers.
- Types and applications.
- General design considerations.
- Condensers and Reboilers.

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Unit 3: Mechanical Design of Heat Exchangers

- Learn about design and construction codes and best practices.
- ASME BPVC section VIII.
- API 660, 661, and 662.
- TEMA.
- Understand the basic design of heat exchangers - STHE, PHE, ACHE.
- Special design considerations.
- Piping loads on exchanger nozzles.
- Impact of service conditions on material selection.
- Shell and tube heat exchangers.
- Plate heat exchangers.
- Learn about construction materials for heat exchangers.
- Fabrication of heat exchangers.

Unit 4: Operation and Maintenance of Heat Exchangers

- Learn fouling in heat exchangers.
- Understand types and mechanisms and the economic impact on design and operation.
- Fouling mitigation by design.
- Learn fouling mitigation by operation and maintenance.
- Understand corrosion and erosion in heat exchangers.
- Heat exchanger inspection methods.
- Operation and troubleshooting.
- Performance monitoring and testing.
- Flow-induced vibration, mechanisms, vibration prediction, damage numbers, and design procedure to avoid vibration, including baffle selection, rod baffle exchangers, and twisted tube exchangers.
- Learn about cleaning strategies and methods: STHE, PHE, ACHE.
- Heat exchanger repairs.
- Understand Removal and replacement of heat exchangers.
- Learn about Cost-effective maintenance and repair of heat exchangers.

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Unit 5: Performance Enhancement and Optimization of Heat Exchangers

- Heat transfer augmentation techniques.
- Finned tubes.
- Understand in-tube enhancement - The tube inserts and sintered coatings.
- Tube bundle replacement - Alternative enhanced tube bundle designs.
- Rod baffle.
- Heli baffle.
- Twisted tube.
- Pinch technology.
- Heat exchanger train optimization.
- Heat integration basics.