

**Training Title**

**HEAT EXCHANGERS OPERATION, SELECTION, TROUBLESHOOTING AND MAINTENANCE**

**Training Duration**

**5 days**

**Training Venue and Dates**

REF ME077	Heat Exchangers Operation, Selection, Troubleshooting and Maintenance	5	26 - 30 May 2025	\$6,500	Vienna, Austria
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Will be held in any of the 4 or 5-star hotels. The exact venue will be informed upon finalization.

**Training Fees**

**\$6,500 per participant for Public Training includes Materials/Handouts, tea/coffee breaks, refreshments & Lunch**

**Training Certificate**

**Define Management Consultancy & Training Certificate of course completion will be issued to all attendees.**

**TRAINING OVERVIEW**

**TRAINING DESCRIPTION**

A heat exchanger is an important and expensive item of equipment that is used almost in every industry (oil and petrochemical, sugar, food, pharmaceutical and power industry). A better understanding of the basic principles of heat transfer and fluid flow and their application to the design and operation of heat exchangers that you gain from this course will enable you to improve their efficiency and extend your life. You understand how to use the applicable API, TEMA and ASME recommended practices, standards and codes for heat exchangers. This will enable you to communicate with the designers, manufacturers and bidders of heat exchangers. You will understand how to avoid fouling, corrosion and failure and leak problems by your design. You will also be able to survey and troubleshoot heat exchangers and assist in performing inspection, cleaning, and maintenance. You will be exposed to recent developments and future trends in heat exchangers.

**TRAINING OBJECTIVES**

- To learn the classification, (API, TEMA) and selection procedure for heat exchangers.
- To review the thermal and mechanical design of heat exchangers.
- To learn the installation, operation and maintenance procedure for heat exchanger.

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- To acquire information that will enable decisions to be made on the repair and refurbishment of aging equipment as well as repair vs. replacement options.
- To learn techniques of failure elimination and appropriate maintenance and troubleshooting procedures.
- To delineate/determine the factors that lead to overall economically advantageous decisions.

### WHO SHOULD ATTEND?

- Project engineers, process engineers and plant engineers in the oil, chemical, sugar, power, and other industries require a wider and deeper appreciation of heat exchangers design, performance and operation. The detailed review of thermal and mechanical design is particularly useful to plant and maintenance engineers as well as to those generally knowledgeable in the subject, but who require a refresher or update.
- Codes and standards are useful for project engineers to help them communicate with manufacturers, designers and bidders of heat exchangers. Troubleshooting procedures are important for process engineers.

### TRAINING METHODOLOGY:

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions and motivate everybody to find the right answers. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on a daily basis to examine the effectiveness of delivering the course.

Very useful Course Materials will be given.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Group Work & Practical Exercises
- 20% Videos & General Discussions

### DAILY OUTLINE

Following topics will be covered in 5 days.

#### Day 1

- ✓ HEAT EXCHANGERS CLASSIFICATION APPLICATION, CODE AND STANDARDS
- ✓ Classification according to construction (tubular, plate, finned, enhanced)
- ✓ Classification according to service (cooler, heater, condenser, re boiler, etc.)

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- ✓ Construction, applications, range and limitations and sizes
- ✓ Code and standards (TEMA, API)
- ✓ TEMA nomenclature: rear end head types, shell types, front end type
- ✓ TEMA standards: shell size, tube size, baffle, selection of materials, component design, nozzle loadings, supports, lifting features, high pressure, low temperature, specials designs.

#### DAY II

- ✓ HEAT TRANSFER FUNDAMENTALS AND THERMAL DESIGN
- ✓ Heat transfer mechanisms: conduction and convection as related to heat exchangers.
- ✓ Temperature difference in heat exchanger
- ✓ Overall heat transfer coefficient
- ✓ Heat transfer coefficient and pressure drop for single phase and multiphase.
- ✓ (Evaporation and condensation)
- ✓ Resistance to fouling.

#### DAY III

- ✓ MECHANICAL DESIGN OF H.E
- ✓ Mechanical design: shells, channels and heads, tube sheets, bundles, tubes-tube sheet attachment
- ✓ Design strategy, design algorithm
- ✓ Heat exchanger:
  - Selection procedure
  - Specification sheet
  - Bid evaluation.

#### DAY IV

- ✓ Storage, Installation, Operation, Maintenance
- ✓ Storage
- ✓ Installation procedure
- ✓ Operation
- ✓ startup
- ✓ shutdown
- ✓ Maintenance
- ✓ Cleaning
- ✓ Repair
  - Plug
  - Sleeving
  - Expansion
- ✓ Replacement
  - Re tubing

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- Re bundling.
- Replacement (new unit)

#### DAY V

- ✓ Troubleshooting
- ✓ Heat exchangers' problem
  - Fouling: causes, mechanisms, design considerations and exchanger selection, remedies, cleaning
  - Leakage: Location (tube sheet, tube failure), causes (differential thermal expansion, flow-induced vibration),
  - Corrosion: Type, causes, material of construction, fabrication
  - Vibration: causes (velocity), design procedure to avoid vibration including baffle selection, rod baffles, impingement baffles
- ✓ Past incidents failure.

Examples of common problems encountered in heat exchangers (low rate, un-controlled outlet temperature, failure of tubes near the inlet nozzles)

#### NOTE:

**Pre & Post Tests will be conducted.**

**Case Studies, Group Exercises, Group Discussions, Last Day Review & Assessments will be carried out.**

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