Heat Exchangers: Types, Applications, Design, Operation & Maintenance

Course general description:

This Heat Exchangers training course will present the technical and operational features of Heat Exchangers of various designs (shell-and tube (STHE), air-cooled (ACHE), plate (PHE) that play a vital role in thermal power plants and petrochemical and process industries. It has been realized that Engineers of diverse backgrounds and expertise need to develop a sound understanding of fundamental principles and interrelationship between various parameters that govern the well designed and operated heat exchangers.

This Heat Exchangers training course will familiarize engineers and technicians with various codes and standards and best practices used for design, manufacture, operation and maintenance of heat exchangers. The emphasis in course will be on the best practices for efficient operation, inspection, maintenance and repair of widely used types of heat exchangers: shell and tube, air-cooled, plate compact types. Several workshops will be included with case studies and real examples from engineering practice that will enable the analysis of the root causes as a prerequisite for effective troubleshooting process.

Audience:

This course is designed for:

1. Process & Operations Engineers
2. Maintenance Professionals
3. Inspection Personnel
4. Process Supervisors
5. Plant Operators
6. Plant/Technical Managers

Course objectives:

The course objectives are:

1. Understand essential design guidelines and specifications
2. Analyze heat exchanger thermal and hydraulic operational parameters
3. Determine the correct selection criteria for sizing of heat exchangers
4. Identify the problems in operation that lead to performance deterioration
5. Determine correct troubleshooting techniques

Course duration:

5 days

Course location:

Cairo-Dubai-Istanbul

Course contents:

Day-1

- Pretest
- Types and Applications of Heat Exchangers
  - Heat Exchanger Types and Applications: Choice of Working Fluid
  - Heat Transfer Fundamentals and Heat Transfer Rates

- Heat Exchanger Elements: Tube Bundles, Tube Sheets, Baffles and Nozzles
- TEMA Nomenclature of Shell & Tube Heat Exchangers (STHE)
- Air Cooled Heat Exchangers (ACHE) and Plate Heat Exchangers (PHE)
- Condensers, Evaporators and Reboilers

Day-2

- Thermal and Hydraulic Design of Heat Exchangers
  - Flow vs. Temperature Difference in STHE
  - Thermal Specification of Heat Exchangers: Sizing and Rating
  - Hydraulic Design of STE: Fluid velocity and Pumping Power Calculation
  - Aerodynamic Design of ACHE: Sizing of Fans and Drive
  - Sizing and Specifying of PHE Units: Compabloc Design
  - Workshop: Case Studies, Examples & Solutions

Day-3

- Mechanical Design of Heat Exchangers
  - Mechanical Design of Heat Exchangers
  - Calculation of Basic Elements of STHE
  - Piping Loads on Exchanger Nozzles
  - Material selection and Construction of Heat Exchangers
  - Fabrication Technologies of Heat Exchangers
  - Workshop: Case Studies, Examples & Solutions

Day-4

- Operation and Maintenance of Heat Exchangers
  - Fouling and scaling in tubes and shells: Problem Solutions and Remedies
  - Inspection Techniques of Vital Elements of Heat Exchangers
  - Corrosion & Erosion Reduction Techniques, Fitness for Service Analysis (FFS)
  - Control in Operation: Tube Vibration & Troubleshooting
  - Cleaning, Maintenance and Repair Techniques: Tube Plugging and Re-tubing
  - Workshop: Case Studies, Examples & Solutions

Day-5

- Performance Enhancement and Optimisation of Heat Exchangers
  - Performance Monitoring and Testing
  - Performance Validation
  - Heat Transfer Augmentation Techniques
  - Tubes with external and internal fins
  - Heat Integration Basics: Pinch Technology
  - Workshop: Case Studies, Examples and Solutions
- Posttest

Methodology:

- 50% lectures & concepts
- 10% Videos
- 10% Case studies
- 10% Exercises

- 10% Discussions
- 10% Software (if applicable or examples)

Course code: (TEME037)