



MUE188

Heat Exchangers Maintenance & Troubleshooting

Course Introduction:

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. Thermal design is not discussed except where it affects the structure. The TEMA system which is, internationally used explained for describing size and type. TEMA nomenclature and terminology are illustrated. The ASME code and TEMA standards are observed. Design point setting which affects the structure of the operating deviations, transients and upsets are examined. An overview of tube vibration includes descriptions and illustrations of damage caused by tube vibration, vibration forcing mechanisms and information required for vibration analysis

Course Objectives:

Upon successful completion of this course, the delegates will be able to:

- ✓ Understand the nomenclature and terminology used for shell and tube heat exchangers
- ✓ Learn how the tube side and shell side of tubular heat exchangers are constructed
- ✓ Learn how heat exchangers are structured and assembled, manufactured, preparation for installation and joined to tube sheets
- ✓ Learn how to write and interpret specifications, some of the exchanger codes and standards, inspections, maintenance, repair and inspection techniques
- ✓ Determine the failure causes

Who Should Attend?

This course is aimed at personnel, who are involved with procurement, construction, installation, inspection and troubleshooting, also with maintenance, repair, mechanics, operation and life expectancy of shell and tube heat Exchangers. The course will also be of special value to individuals who specify or buy heat exchangers or who are in charge of evaluating the condition of existing equipment.

Course Outline:

Day 1:

- Shell and tube Heat exchanger I: introduction, nomenclature and parts, classification of heat exchangers, principal types of shell and tube constructions, types of tubes.
- Uses of multi-pass units, Baffles, Tube sheet, Tie-Rods, spacers, seal strips, Nozzles Flanges & Expansion joints
- Packing Glands & Gaskets, Vents & drain connections, & lifting Lugs, Insulation, Heat exchanger specification sheet.

- Shell and Tube heat exchangers II: Flow through shell & Tubes, overall heat transfer coefficient, log mean Temperature difference and correction Factor

Day 2:

- Worked example on the application of a log mean temperature difference, average & pipe wall temperatures, allocation of fluids to shell side & tube side. Main Features of shell-side design methods.
- Uses of liquid-liquid, liquid-gas & gas-gas Exchangers, coolers & cooling water, closed feed water heaters, Double Pipe Heat exchangers
- Shell-and-Tube heat exchangers III: Introduction, condensers, Reboilers and Evaporators.
- Excess surface heat exchangers: Introduction, Extended (finned) surface, heat exchangers, Turbulators & static mixers, air-fin coolers, enhanced surfaces, compact heat exchangers.

Day 3:

- CODES & Standards: Introduction, Codes, TEMA, API & ASME standards
- Mechanical design & failure analysis.
- Material Selection, Fabrication & Welding: Introduction, Material Selection, Fabrication & welding according to ASME standard.
- Plate & Spiral Plate Heat Exchangers: Introduction, Plate Heat Exchangers, Spiral Plate Heat Exchangers.

Day 4:

- Design Considerations.
- Heat exchangers dynamics & optimization
- Introduction, Heat exchanger dynamics, Heat exchanger optimization & hydraulic tests.
- Corrosion, Erosion, Fouling & Water Treatment: Introduction, corrosion, erosion, fouling & water treatment.
- Applications of Heat Exchangers: Power plant, distillation & oilfield industry.

Day 5:

- Flow-Induced Vibrations: Introduction, Definitions of interest, factors causing vibrations, effects of shell-side flow, damaging effects of vibrations & vibration prevention
- Installation, inspection, operation, testing, maintenance & repair: Introduction, general, installation, operation, maintenance & repair
- Case study
- Ending the course ceremony, certificates & evaluation of the course

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

Course Fees:

To be advised as per the course location. This rate includes participant's manual, and-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee/Tea
08:20 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:30	Recess (Coffee/Tea/Snacks)
13:30 - 15:00	Last Session