



TEMA & HTRI – Heat Exchanger Design & Cost Saving Management

Training Program



Introduction:

This training course is a comprehensive course to the technology of shell and tube heat exchangers as these robust type of heat exchangers are the most commonly used in the process and refinery industries, where they provide flexibility and are easy to maintain.

The course will provide details on the thermal and mechanical design, fabrication, inspection and maintenance in relation with international standards as TEMA, API and ISO. For this heat exchanger type we focus on the mechanical and practical aspects.

Many case studies will be presented to show failures, mismatches. The thermal and mechanical design is conducted using sophisticated computer software and this course is intended to complement thermal design training based on the software. Attendees will be offered problem case studies in order to reach solutions on their own.

To get a full picture of proven (advanced) heat transfer technologies a basic training module for other types of heat exchangers is included. Besides air-cooled we discuss compact heat exchangers in more detail with all their pro's and con's.

Delegates need to bring Calculator and Laptop with Microsoft Excel installed and Microsoft as the operating system

Who Should Attend?

- Mechanical Engineer
- Design Engineer
- Maintenance Engineer
- Instrument Engineer
- Project Engineer
- Process Engineer
- Heat Transfer Engineer
- Plant Engineer
- Operation Engineer

Course Objectives:

- For those engineers, this course will provide a broad understanding of the technology and an excellent base for further learning.
- For those responsible for thermal design, TEMA type selection the training is intended to illustrate the interaction between the thermal and mechanical design, the understanding of which will lead to more reliable design outcomes
- For those coming from an operating environment, the course will lead to a greater knowledge of the maintenance, inspection and repair needs of shell and tube heat exchangers, including information on common causes of failure. Solutions will be offered using latest “state of art” technologies are used to prevent fouling, tube vibration and throughput limitations.

Course Outline:

DAY 1 & 2

Introduction to Shell & Tube Heat Exchangers (day 1,2)

- General description
- Nomenclature
- Key Components

Standards for Shell & Tube Heat Exchangers

- TEMA, API661, ISO16812
- Computer Simulation Software, HTRI, HTFS, B-Jac
- Text Books
- Maintenance Aspects

Shell & Tube Heat Exchangers

- TEMA Type selection & Design Aspects
- Shell type (Floating Head, Fixed Tube Sheet, U-tube)
- Baffle type (conventional, helical, rod, expanded metal)
- Tube type (plain, low-fin, twisted tube and corrugated)
- High Pressure Breech Lock
- Texas Tower, Heli tower
- Fabrication Aspects

Case Studies & HTRI Simulations

DAY 3 & 4

Thermal Aspects (day 3,4)

- Basic Heat Transfer
- Heating/Cooling (viscous fluids, high pressure gas)
- Condensation (reflux, vacuum)

- Boiling (LNG kettles, thermosiphon, falling film)
- Fouling & Mitigation Technologies
- Tube Insert Technologies
- Design Features

Troubleshooting, Case Studies & HTRI Simulations

Tube Vibration

- Basic Principles
- Fluid elastic vibration
- Acoustic vibration

Troubleshooting, Case Studies & HTRI Simulations

DAY 5

Introduction to Air Cooled Heat Exchangers (day 5)

- General Description
- Nomenclature
- Key Components (louvers, fans)
- Forced / Induced Draft
- A-frame

Thermal & Mechanical Aspects

- Type selection
- Fouling behavior/mitigation
- Tube Insert Technologies
- Header types
- High Fin tube types

Case Study & HTRI Simulations

Introduction to Compact Heat Exchangers

- Double Pipe / Multi tube
- Plate & Frame
- Spiral Plate
- Brazed Aluminum

- Printed Circuit
- Spiral Coil (LNG)
- Electrical heater

Case Study

Introduction to Special Type

- Open Rack Vaporizer (LNG)
- Submerged Vaporizer (LNG)
- Water bath Vaporizers

Discussions and Questions

- Total Life Cycle Analysis
- Heat Exchanger Selection Tool