MAWA EVENTS

Address: No. 857, Block A2. Leisure Commerce Square - No 9., 46150 Petaling Jaya, Selangor, Malaysia

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HEAT EXCHANGER - PRACTICAL - COMPREHENSIVE UNDERSTANDING ON SHELL & TUBE HEAT EXCHANGER TYPES

"Maximize Operational Efficiency, Troubleshooting, and Lifecycle Performance of Shell & Tube Heat Exchangers"

Schedule

Date	Venue	Fees (Face-to-Face)
02 – 06 Feb 2026	Dubai, UAE	USD 3495 per delegate

Introduction

Shell and tube heat exchangers are the workhorses of industrial heat transfer, essential in refining, petrochemicals, power, and process industries. Despite their widespread use, these units often suffer from fouling, leakage, inefficient operation, and early failure due to poor design understanding and suboptimal maintenance.

This 5-day practical course offers a deep dive into shell and tube heat exchanger construction, performance, troubleshooting, and design principles. Through interactive exercises and real plant case studies, participants will gain hands-on knowledge to manage heat exchangers from selection to lifecycle reliability.

Objectives

By the end of this course, participants will be able to:

- Understand the design and operational principles of shell and tube heat exchangers
- Select and size heat exchangers based on process requirements
- Diagnose common operational issues such as fouling, tube leaks, and poor heat transfer
- Apply TEMA standards and understand key construction configurations
- Perform thermal and hydraulic calculations
- Improve maintenance planning, cleaning, and inspection techniques

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Why Attend

- Build strong fundamentals in heat exchanger types and performance
- Learn how to optimize thermal efficiency and reliability
- Identify and solve recurring failure modes
- Apply international design and inspection standards (TEMA & ASME)
- Use hands-on tools and field-based troubleshooting methods

Target Audience

This program is designed for:

- Mechanical and process engineers
- Plant and maintenance engineers
- Project and design engineers
- Reliability and integrity engineers
- Technicians involved in exchanger inspection and servicing

Individual Benefits

Key competencies that will be developed include:

- Shell and tube design interpretation and thermal analysis
- Fault diagnosis and root cause identification
- Maintenance and inspection readiness
- Application of best practices for performance optimization
- Cross-functional understanding of process and mechanical considerations

Organizational Benefits

Upon completing the training course, participants will demonstrate:

- Increased exchanger efficiency and heat transfer reliability
- Reduced fouling, failures, and unscheduled shutdowns
- More effective inspection, cleaning, and performance tracking
- Standardized decision-making based on TEMA and API recommendations
- Lower maintenance costs and higher asset utilization

Instructional Methodology

The course follows a blended learning approach combining theory with practice:

- Strategy Briefings – Design types, standards, operating principles, and thermal theory
- Case Studies – Failure analysis and best practice application from refineries and process plants
- Workshops – Sizing, selection, fouling diagnosis, and inspection readiness
- Peer Exchange – Experience sharing on common issues and lifecycle improvement
- Tools – Design charts, cleaning checklists, inspection protocols, and troubleshooting templates

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Course Outline

DETAILED 5-DAY COURSE OUTLINE

Training Hours: 7:30 AM – 3:30 PM Daily Format: 3–4 Learning Modules | Coffee breaks: 09:30 & 11:15 | Lunch Buffet: 01:00 – 02:00

Day 1: Fundamentals of Heat Transfer and Exchanger Design

- Module 1: Heat Transfer Basics (07:30 – 09:30) • Modes of heat transfer: conduction, convection, radiation • Role of LMTD, U-value, and heat duty • Process and utility integration
- Module 2: Shell & Tube Exchanger Components (09:45 – 11:15) • Shell types, baffles, tube bundles, heads, and nozzles • Flow arrangements: counterflow, crossflow, parallel flow • Material selection and corrosion considerations
- Module 3: Introduction to TEMA Standards (11:30 – 01:00) • TEMA classifications: B, C, and R • Naming conventions and common configurations • Key design criteria and tolerances
- Module 4: Workshop – TEMA Exchanger Identification (02:00 – 03:30) • Interactive exercise on identifying configurations • Mapping names to diagrams

Day 2: Thermal and Hydraulic Design Principles

- Module 1: Thermal Design Considerations (07:30 – 09:30) • Calculating heat duty and temperature profiles • Sizing tubes and surface area requirements • LMTD and correction factors
- Module 2: Pressure Drop and Flow Distribution (09:45 – 11:15) • Calculating shell-side and tube-side pressure drops • Baffle spacing and shell velocity control • Fluid distribution problems and design implications
- Module 3: Tube Layout and Bundle Design (11:30 – 01:00) • Tube pitch, layout types, and bundle arrangements • Expansion joints and support systems
- Module 4: Workshop – Thermal Performance Exercise (02:00 – 03:30) • Participants solve a sizing and performance case study

Day 3: Fouling, Failure Mechanisms, and Performance Degradation

- Module 1: Fouling Types and Causes (07:30 – 09:30) • Scaling, particulate, biological, and chemical fouling • Impact on performance and pressure drop • Indicators and detection methods
- Module 2: Mechanical Failures and Root Causes (09:45 – 11:15) • Tube leaks, gasket failures, erosion/corrosion • Vibration-induced damage and flow-induced wear • Fatigue and thermal cycling issues
- Module 3: Inspection Techniques (11:30 – 01:00) • Visual inspection, eddy current, hydrotest, IR thermography • Inspection frequencies and record-keeping
- Module 4: Workshop – Troubleshooting Simulation (02:00 – 03:30) • Group exercise: analyzing a fouling and performance case

Day 4: Operation, Maintenance, and Cleaning

- Module 1: Operational Best Practices (07:30 – 09:30) • Startup, shutdown, and normal operating procedures • Monitoring parameters and early warning signs
- Module 2: Cleaning Techniques and Tools (09:45 – 11:15) • Chemical cleaning, hydroblasting, mechanical pigging • Selecting appropriate cleaning methods
- Module 3: Planning for Turnaround and Maintenance (11:30 – 01:00) • Maintenance schedules and spare parts planning • Common challenges in shutdown inspection
- Module 4: Workshop – Cleaning Method Selection (02:00 – 03:30) • Compare cost, effectiveness, and safety of cleaning options

Day 5: Performance Monitoring, Optimization & Lifecycle Management

- Module 1: Heat Exchanger Monitoring Tools (07:30 – 09:30) • Using sensors, SCADA, and data logs for performance checks • Alarm setting for temperature and pressure variations
- Module 2: Retubing, Replacement, and Upgrades (09:45 – 11:15) • When to refurbish vs. replace • Evaluating thermal upgrades or retrofits

- Module 3: Lifecycle and Reliability Analysis (11:30 – 01:00) • Tracking failure rates, repair frequency, and OPEX impacts • Reliability modeling and MTBF/MTTR calculations
- Module 4: Final Case Study and Course Wrap-up (02:00 – 03:30) • Participants present a lifecycle improvement plan • Final Q/A and learning consolidation

Certification

Participants will receive a Certificate of Completion in Shell & Tube Heat Exchangers, confirming their comprehensive knowledge of heat exchanger design, operation, troubleshooting, and maintenance aligned with industrial standards.

Why Choose MAWA Events

- **Global Expertise:** More than 17 years of experience in professional training and consulting.
- **Industry-Leading Faculty:** Courses delivered by seasoned professionals with hands-on experience.
- **Practical Insights:** Learn to turn theory into actionable strategies for real-world business impact.
- **Client-Focused Solutions:** Customized programs designed to achieve your organisation’s unique goals.

In-House / Customized Training Interested in running this course for your team? Please contact us:	TEL: **+601116373203**	EMAIL: **info@mawaevents.net**