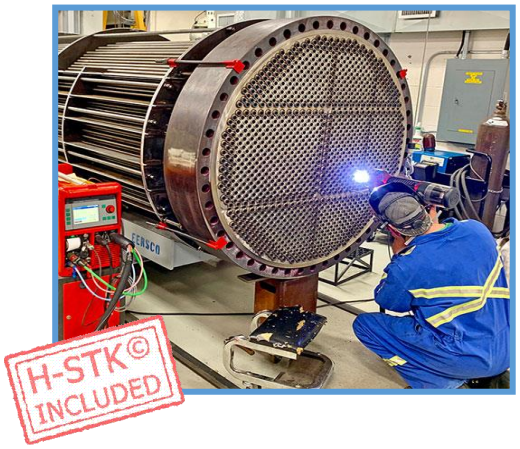
COURSE OVERVIEW ME0718
TEMA Shell & Tube Heat Exchanger
Design Installation, Testing, Maintenance & Repair

Course Title
TEMA Shell & Tube Heat Exchanger: Design Installation, Testing, Maintenance & Repair

Course Date/Venue
Please see page 3

Course Reference
ME0718

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs



Course Description

This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

This course is designed to provide participants with a detailed and up-to-date overview of TEMA Shell & Tube Heat Exchanger. It covers the basic principles and functions of shell and tube heat exchanger; the TEMA (tubular exchanger manufacturers association) classifications and the application of different TEMA types in industry; the heat exchanger components, heat transfer principles flow arrangements and safety and operational considerations; the installation procedures, inspection techniques, pressure testing procedures and safety precautions; the common defects of corrosion, erosion, fouling, and scaling; and the crack detection, documentation and reporting of defects.

Further, the course will also discuss the maintenance schedule, predictive maintenance tools and technologies and cost-benefit analysis of preventive maintenance; the mechanical cleaning techniques and chemical cleaning processes; the tube cleaning tools and equipment; and maintaining tube bundle through proper removal and reinstallation procedures, inspection and repair of tube bundles and techniques for extending tube life.

During this interactive course, participants will learn the shell maintenance, internal and external cleaning, inspection and repair of shell components; the strategies for shell life extension and the causes and effects of fouling; the preventive measures and treatment options; monitoring fouling and maintaining efficiency; troubleshooting common issues, tube plugging and replacement, shell repairs, weld procedures, gasket replacement and flange maintenance; the heat exchanger performance, temperature and flow data; the detection of leaks, repairing leaks in tubes and shell and preventing future leaks; the emergency repairs, best practices in heat exchanger maintenance and continuous improvement strategies; the energy efficiency considerations, emerging technologies in maintenance and sustainability and environmental impact; and the maintenance risks, safety protocols, risk assessment and management tools.

Course Objectives

Upon the successful completion of this course, each participant will be able to: -

- Apply and gain an in-depth knowledge on TEMA shell and tube heat exchanger
- Discuss the basic principles and functions of shell and tube heat exchangers
- Explain TEMA (tubular exchanger manufacturers association) classifications and the application of different TEMA types in industry
- Recognize heat exchanger components, heat transfer principles, flow arrangements and safety and operational considerations
- Apply installation procedures, inspection techniques, pressure testing procedures and safety precautions
- Identify the common defects of corrosion, erosion, fouling, and scaling and apply crack detection, documentation and reporting of defects
- Develop a maintenance schedule and carryout predictive maintenance tools and technologies and cost-benefit analysis of preventive maintenance
- Illustrate mechanical cleaning techniques and chemical cleaning processes as well as identify tube cleaning tools and equipment
- Maintain tube bundle through proper removal and reinstallation procedures, inspection and repair of tube bundles and techniques for extending tube life
- Apply shell maintenance, internal and external cleaning, inspection and repair of shell components and strategies for shell life extension
- Identify the causes and effects of fouling, apply preventive measures and treatment options and implement monitoring fouling and maintaining efficiency
- Document maintenance activities, track maintenance history and trends, utilize maintenance software and tools
- Employ troubleshooting common issues, tube plugging and replacement, shell repairs, weld procedures, gasket replacement and flange maintenance
- Assess heat exchanger performance, analyze temperature and flow data and make adjustments for optimal performance
- Implement methods for detecting leaks, repair leaks in tubes and shell and prevent future leaks
- Apply emergency repairs, best practices in heat exchanger maintenance and continuous improvement strategies

- Discuss energy efficiency considerations, emerging technologies in maintenance and sustainability and environmental impact
- Identify and mitigate maintenance risks and apply safety protocols and training, risk assessment and management tools

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of TEMA shell and tube heat exchanger for boiler control system engineers, maintenance supervisors, instrumentation engineers and technicians, boiler plant commissioning engineers, operation, inspection and repair engineers and technicians, mechanical engineer and technicians and managers, project engineers, process engineers, plant and maintenance engineers and supervisors in the oil, chemical and other process industries who require an advanced knowledge of heat exchanger design, performance, inspection, maintenance and operation.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Date/Venue

Session(s)	Date	Venue
1	August 18-22, 2025	Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
2	September 07-11, 2025	Meeting Plus 9, City Centre Rotana, Doha Qatar
3	November 09-13, 2025	Crowne Meeting Room, Crowne Plaza Al Khobar, an IHG Hotel, Al Khobar, KSA
4	December 07-11, 2025	Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE BoardRoom, Sheraton Dubai Creek Hotel & Towers, Dubai, UAE

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations:-

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

Course Fee

Dubai/Abu Dhabi/Al Khobar	**US$ 5,500** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Doha	**US$ 6,000** per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Mr. Andrew Ladwig is a **Senior Welding, Process & Mechanical Maintenance Engineer** with over **25 years** of extensive experience within the **Oil & Gas**, **Refinery**, **Petrochemical & Power** industries. His expertise widely covers in the areas of **Ammonia Manufacturing & Process Troubleshooting**, **Distillation Towers**, **Crude Oil Distillation**, **Ammonia Storage & Loading** Systems, **Operational Excellence** in **Ammonia Plants**, **Fertilizer Storage** Management (Ammonia & Urea), **Fertilizer Manufacturing** Process Technology, **Sulphur Recovery**, Phenol Recovery & Extraction, **Refining Process & Petroleum Products**, **Refinery Planning & Economics**, **Hydrotreating & Hydro-processing**, **Separators** in **Oil & Gas** Industry, **Gas Testing & Energy** Isolations, **Industrial Liquid Mixing**, **Extractors**, **Fractionation**, **Water Purification**, **Water Transport** & Distribution, **Environmental Emission Control**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Plant Performance**, **Plant Startup & Shutdown**, **Process Troubleshooting** Techniques and Oil & Gas Operation/Surface Facilities. Further, he is also well-versed in **Rotating Machinery** (**BRM**), **Rotating Equipment** Operation & Troubleshooting, Root Cause Analysis (**RCA**), **Process Plant** Shutdown, Turnaround & Troubleshooting, Planning & Scheduling **Shutdowns & Turnarounds**, Optimizing **Equipment Maintenance** & Replacement Decisions, **Maintenance Planning & Scheduling**, **Material Cataloguing**, Maintenance, Reliability & Asset Management Best Practices, **Storage Tanks Operations** & Measurements, **Tank** Inspection & Maintenance, **Pressure Vessel** Operation, **Flare & Relief** System, **Flaring System** Operation, **PSV** Inspection & Maintenance, **Centrifugal & Reciprocating Compressor**, **Screw Compressor** Troubleshooting, **Heat Exchanger** Overhaul & Testing, **Pipe Stress** Analysis, **Control Valves & Actuators**, **Vent & Relief System**, **Centrifugal & Reciprocating Pump** Installation & Repair, **Heat Exchanger** Troubleshooting & Maintenance, **Steam Trapping & Control**, **Control & ESD** System and Detailed Engineering Drawings, Codes & Standards.

During his career life, Mr. Ladwig has gained his practical experience through his various significant positions and dedication as the **Mechanical Engineer**, **Project Engineer**, **Reliability & Maintenance Engineer**, **Maintenance Support Engineer**, **Process Engineer**, **HSE Supervisor**, **Warehouse Manager**, **Quality Manager**, **Business Analyst**, **Senior Process Controller**, **Process Controller**, **Safety Officer**, **Mechanical Technician**, **Senior Lecturer** and **Senior Consultant/Trainer** for various companies such as the Sasol Ltd., Sasol Wax, Sasol Synfuels, just to name a few.

Mr. Ladwig has a **Bachelor's** degree in **Chemical Engineering** and a **Diploma** in **Mechanical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and has delivered various trainings, workshops, seminars, courses and conferences internationally.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Shell & Tube Heat Exchangers*** *Overview of Heat Exchanger Types • Basic Principles & Functions • Importance in Petrochemical Processes*
0930 – 0945	*Break*
0945 – 1030	***TEMA Standards & Classifications*** *TEMA (Tubular Exchanger Manufacturers Association) Classifications • Understanding TEMA Types (A, B, C, Etc.) • Application of Different TEMA Types in Industry*
1030 – 1130	***Heat Exchanger Components*** *Shell, Tube Bundle, Baffles, & Supports • Material Selection for Components • Design Considerations*
1130 – 1215	***Heat Transfer Principles*** *Conduction, Convection, & Radiation • Heat Transfer Coefficients & Their Significance • Calculations for Heat Exchange Efficiency*
1215 – 1230	*Break*
1230 – 1330	***Flow Arrangements*** *Parallel Flow, Counterflow, & Crossflow • Impact on Heat Exchanger Performance • Selection Criteria for Different Flow Arrangements*
1330 – 1400	***Safety & Operational Considerations:*** *Safety Protocols & Best Practices • Common Operational Issues & Troubleshooting • Introduction to Maintenance Strategies*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Installation Procedures*** *Site Preparation & Pre-Installation Checks • Installation Steps & Guidelines • Alignment & Support Requirements*
0830 – 0930	***Inspection Techniques*** *Visual Inspections & Checklists • Non-Destructive Testing Methods (NDT) • Frequency & Scheduling of Inspections*
0930 – 0945	*Break*
0945 – 1100	***Pressure Testing*** *Types of Pressure Tests (Hydrostatic, Pneumatic) • Testing Procedures & Safety Precautions • Interpreting Test Results*
1100 – 1215	***Common Defects & Their Identification*** *Corrosion, Erosion, Fouling, & Scaling • Crack Detection & Material Fatigue • Documentation & Reporting of Defects*

1215 – 1230	Break
1230 – 1300	***Preventive Maintenance Planning*** *Developing a Maintenance Schedule • Predictive Maintenance Tools & Technologies • Cost-Benefit Analysis of Preventive Maintenance*
1300 - 1420	***Case Studies*** *Real-World Examples of Installation & Inspection • Lessons Learned & Best Practices • Group Discussion & Q&A*
1420 – 1430	***Recap***
1430	Lunch & End of Day Two

Day 3

0730 – 0830	***Cleaning Methods*** *Mechanical Cleaning Techniques • Chemical Cleaning Processes • Advantages & Disadvantages of Each Method*
0830 – 0930	***Tube Cleaning Tools & Equipment*** *Types of Tube Cleaners • Safe Handling & Operation • Selection Criteria for Cleaning Tools*
0930 – 0945	Break
0945 – 1100	***Maintenance of Tube Bundle*** *Removal & Reinstallation Procedures • Inspection & Repair of Tube Bundles • Techniques for Extending Tube Life*
1230 – 1300	***Shell Maintenance*** *Internal & External Cleaning • Inspection & Repair of Shell Components • Strategies for Shell Life Extension*
1215 – 1230	Break
1100 – 1215	***Dealing with Fouling*** *Causes & Effects of Fouling • Preventive Measures & Treatment Options • Monitoring Fouling & Maintaining Efficiency*
1215 – 1230	Break
1300 - 1420	***Maintenance Record Keeping*** *Documentation of Maintenance Activities • Tracking Maintenance History & Trends • Utilizing Maintenance Software & Tools*
1420 – 1430	***Recap***
1430	Lunch & End of Day Three

Day 4

0730 – 0830	***Troubleshooting Common Issues*** *Diagnosing Performance Problems • Identifying Root Causes • Step-By-Step Troubleshooting Process*
0830 – 0930	***Repair Techniques*** *Tube Plugging & Replacement • Shell Repairs & Weld Procedures • Gasket Replacement & Flange Maintenance*
0930 – 0945	Break
0945 – 1100	***Thermal Performance Analysis*** *Assessing Heat Exchanger Performance • Analyzing Temperature & Flow Data • Making Adjustments for Optimal Performance*
1100 – 1215	***Leak Detection & Repair*** *Methods for Detecting Leaks • Repairing Leaks in Tubes & Shell • Preventing Future Leaks*

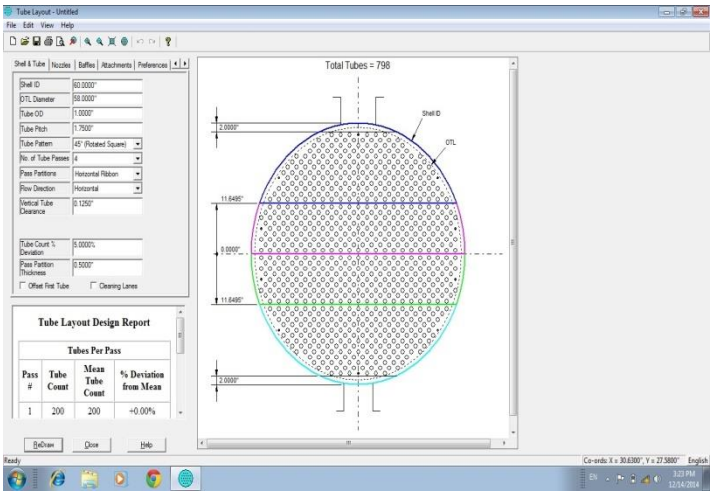
1215 – 1230	*Break*
1230 – 1300	***Emergency Repairs*** *Rapid Response to Critical Failures • Temporary versus. Permanent Repair Solutions • Coordination with Operational Teams*
1300 - 1420	***Case Studies & Problem-Solving*** *Detailed Case Studies of Troubleshooting & Repair • Group Exercises & Simulations • Q&A Session*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 - 0830	***Best Practices in Heat Exchanger Maintenance*** *Industry Standards & Guidelines • Maintenance Planning & Execution • Continuous Improvement Strategies*
0830 - 0930	***Energy Efficiency Considerations*** *Impact of Maintenance on Energy Efficiency • Techniques for Improving Efficiency • Monitoring & Optimizing Performance*
0930 – 0945	*Break*
0945 – 1130	***Emerging Technologies in Maintenance*** *Advances in NDT & Inspection Tools • Innovative Cleaning & Repair Techniques • Automation & Digital Solutions*
1130 – 1230	***Sustainability & Environmental Impact*** *Environmental Considerations in Maintenance • Reducing Emissions & Waste • Sustainable Maintenance Practices*
1230 – 1245	*Break*
1245 – 1345	***Risk Management*** *Identifying & Mitigating Maintenance Risks • Safety Protocols & Training • Risk Assessment & Management Tools*
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Luch & End of Course*

Simulator (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the simulator "Heat Exchanger Tube Layout".



Heat Exchanger Tube Layout Simulator

Course Coordinator

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