



COURSE OVERVIEW ME0743 Heat Exchanger Overhaul & Testing Techniques

Course Title

Heat Exchanger Overhaul & Testing Techniques

Course Date/Venue

October 06-10, 2024/Boardroom, Warwick Doha Hotel, Doha Qatar

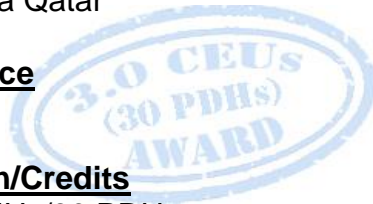
Course Reference

ME0743

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 heat exchanger overhaul and testing techniques. It covers the heat exchanger inspection and testing as well as inspector's qualifications and roles of code authorized inspectors and non-code inspectors; the inspection tools and instruments, inspection reports and data collection and inspection records as a maintenance tool; the maintenance inspection and testing; the safety precautions when inspecting shutdown exchangers; planning for maintenance inspections, inspecting before maintenance and inspecting during performance of maintenance work; inspecting on completion of maintenance; recording and documenting maintenance work; and assessing and inspecting mothballed and used exchangers.

During this interactive course, participants will learn the non-destructive testing (NDT) of heat exchanger and interpreting test and examination results; the heat exchanger inspection codes covering jurisdictional requirements and guide to the national board inspection code (NBIC); troubleshooting, repair and cleaning heat exchanger in a professional manner; record keeping and preparing repairs and alterations; the overhauling, plugging, ferruling and sleeving; and the shell-side repairs and alterations including retubing and rebundling.



Course Objectives

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

- Apply systematic techniques on heat exchanger overhaul and testing techniques
- Carryout heat exchanger inspection and testing as well as discuss inspector's qualifications and roles of code authorized inspectors and non-code inspectors
- Recognize inspection tools and instruments, inspection reports and data collection and inspection records as a maintenance tool
- Employ maintenance inspection and testing of heat exchangers including safety precautions when inspecting shutdown exchangers
- Plan for maintenance inspections, inspect before maintenance and inspect during performance of maintenance work
- Inspect on completion of maintenance, record and document maintenance work as well as assess and inspect mothballed and used exchangers
- Review non-destructive testing (NDT) of heat exchanger, interpret test and examination results
- Discuss heat exchanger inspection codes covering jurisdictional requirements and guide to the national board inspection code (NBIC)
- Troubleshoot, repair and clean heat exchanger in a professional manner
- Apply record keeping and prepare repairs and alterations
- Illustrate heat exchanger overhaul as well as plugging, ferruling and sleeving
- Employ shell-side repairs and alterations including retubing and rebundling

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 a wide understanding and deeper appreciation of heat exchanger overhaul and testing techniques for plant and maintenance engineers, supervisors and other technical staff.

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 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: -

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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.

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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.

Course Fee

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.

Accommodation

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





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 Mechanical Engineer** with over **25 years** of extensive experience within the **Oil & Gas, Refinery, Petrochemical & Power** industries. His expertise widely covers in the areas of **Reciprocating & Centrifugal Compressors, Centrifugal Gas Compressors, Centrifugal Compressor Operation, Screw Compressor, Compressor Control & Protection, Pressure Safety Relief Valve Repair & Recalibration, Pressure Vessels Fabrication, PSV/PRV Troubleshooting, PRV Testing & Repair, PSV Inspection, Process Control Valves, Valve Testing & Inspection,**

Valve Sealing, Valve Calibration, Control Valves & Actuators, Pump Technology, Pump Selection & Installation, Centrifugal Pumps Troubleshooting, Pumps Design, Selection & Operation, Boiler Inspection & Maintenance, Boiler instrumentation & Controls, Boiler Start-up & Shutdown, Boiler Operation & Steam System Management, Boiler Water Chemistry & Treatment, Boiler Efficiency & Waste Heat Recovery, Boiler Inspection & Testing, Boiler Troubleshooting & Safety, Boiler Emissions & Pollution Control, Diesel Engine, Engine Cycles, Vehicle & Equipment Inspection, Crankshafts & Maintenance, Engines/Drivers, Motor Failure Analysis & Testing, Motor Predictive Maintenance, Engine Construction & Maintenance, Gas & Steam Turbine Operation & Maintenance, Gas Turbine Technology, Tank Design & Engineering, Tanks & Tank Farms, Vacuum Tanks, CAESAR II, Pipe Stress Analysis, Piping Stress Analysis, Piping Dynamic, Static & Other Special Analysis, Process/Static Equipment Mechanical Design, Piping Mechanical Design & Specification, Pipe Cuttings, Mechanical Pipe Fittings, Parker Compression Fittings, Pipes & Fittings, Flange Joint Assembly, Adhesive Bond Lamination, Butt Jointing, Joint & Spool Production, Isometric Drawings, Flange Assembly Method, Fabrication & Jointing, Jointing & Spool Fabrication, Flange Bolt Tightening Sequence, Hydro Testing, HVAC & Refrigeration Systems, Direct Digital Control (DCC), Vapor Recovery Engineering, Cooling Water & Compressed Air Systems, Fan Coolers, Chiller & Chiller Plant Design, Heat Recovery Steam Generating (HRSG), Heat Exchangers, Shell & Tube Heat Exchanger Maintenance & Troubleshooting, Combustion Analysis & Tuning Procedures, Combustion Techniques, Water Treatment Technology, Plant Upset & Abnormalities, Impulse Tube Installation & Inspection, Root Cause Failure Analysis & Reliability, Lubrication System Troubleshooting & Maintenance, Fired Equipment Maintenance, Layout of Piping Systems & Process Equipment, Process Heaters, Glass Reinforced Epoxy (GRE), Glass Reinforced Pipes (GRP), Glass Reinforced Vent (GRV), Bearings & Lubrication, Machinery Vibration & Condition Monitoring, Advanced Machinery Dynamics and Machinery Troubleshooting.

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 is a **Registered SAQA Qualification (NQF Level 4) in Chemical Operations, a Certified Multi-Skilled in Instrumentation and Mechanical Engineering, 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.



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: Sunday, 06th of October 2024

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 – 0930	Introduction to Heat Exchanger Inspection & Testing Inspector’s Qualifications • Roles of Code Authorized Inspectors & Non-Code Inspectors • Inspection Tools & Instruments • Inspection Reports & Data Collection • Inspection Records as a Maintenance Tool
0930 – 0945	Break
0945 – 1100	Maintenance Inspection & Testing of Heat Exchangers Safety Precautions when Inspecting Shutdown Exchangers • Planning for Maintenance Inspections • Inspection before Maintenance • Inspection during Performance of Maintenance Work
1100 – 1215	Maintenance Inspection & Testing of Heat Exchangers (cont’d) Inspection on Completion of Maintenance • Recording & Documenting Maintenance Work • Assessing & Inspecting Mothballed & Used Exchangers
1215 – 1230	Break
1230 – 1420	Non-Destructive Testing (NDT) of Heat Exchangers Guidelines to ASME Code, Section V, “Nondestructive Examination” • Visual Inspection (VT) • Radiographic Examination (RT) • Ultrasonic Examination (UT)
1420 – 1430	Recap
1430	Lunch & End of Day One

Day 2: Monday, 07th of October 2024

0730 – 0930	Non-Destructive Testing (NDT) of Heat Exchangers (cont’d) Liquid Penetrant Examination (PT) • Magnetic Particle Examination (MT) • Eddy-Current Examination (ET)
0930 – 0945	Break
0945 – 1100	Non-Destructive Testing (NDT) of Heat Exchangers (cont’d) Leak Testing • Pressure Testing • Destructive Sampling & Trepanning
1100 – 1215	Non-Destructive Testing (NDT) of Heat Exchangers (cont’d) Interpreting Test & Examination Results • Records of Inspections & Tests • Precautions for Hydrostatic & Pneumatic Testing
1215 – 1230	Break
1230 – 1420	Heat Exchanger Inspection Codes Jurisdictional Requirements • Guide to the National Board Inspection Code (NBIC) • The API Inspection Code (API 510) • How the National Board & API Codes Apply the ASME Code Rules
1420 – 1430	Recap
1430	Lunch & End of Day Two





Day 3: Tuesday, 08th of October 2024

0730 – 0930	Heat Exchanger Troubleshooting & Repair Fouling in Heat Exchangers • Corrosion & Erosion in Heat Exchangers • Heat Exchanger Inspection Methods • Operation & Troubleshooting • Performance Monitoring & Testing
0930 – 0945	Break
0945 – 1100	Heat Exchanger Troubleshooting & Repair (cont'd) Flow-Induced Vibration, Mechanisms, Vibration Prediction & Damage Numbers • Cleaning Strategies & Methods: S&THE, PHE, ACHE • Heat Exchanger Repairs • Removal & Replacement of Heat Exchangers • Cost-Effective Maintenance & Repair of Heat Exchangers
1100 – 1215	Cleaning of Heat Exchanger Off versus On-Line Mechanical Cleaning • Hydraulic Cleaning & Water Jetting • Chemical Cleaning • Deciding on Contract Cleaning Organization or Plant Maintenance Force
1215 – 1230	Break
1230 – 1420	Record Keeping: Preparing for Repairs & Alterations Organizing Inspection & Maintenance Records • Deciding Whether to Use In-Plant Maintenance Force or to Contract a Repair or Alteration Organization • Materials Documentation • Documentation of Procedures • Scheduling
1420 – 1430	Recap
1430	Lunch & End of Day Three

Day 4: Wednesday, 09th of October 2024

0730 – 0930	Heat Exchanger Overhaul Opening & Closing Quick-Opening & Nonbolted Closures • Repairing Corroded or Damaged Gasket Surfaces • Field Remachining Warped Flanges
0930 – 0945	Break
0945 – 1100	Heat Exchanger Overhaul (cont'd) Correcting Excessive Deflection in Flat Covers • Strategies for Dealing with Chronically Leaking Gasketed Flanged Closures • Opening & Resealing Diaphragm Closures
1100 – 1215	Heat Exchanger Overhaul (cont'd) How to Correct Pass-Partition Bending • Removing & Replacing Feedwater Heater Pass-Partition Covers • Restoring Damaged Feedwater Heater Pass Partitions
1215 – 1230	Break
1230 – 1420	Heat Exchanger Overhaul (cont'd) Replacing Channels & Covers • Repairing Eroded & Wormholed Tubesheets
1420 – 1430	Recap
1430	Lunch & End of Day Four



Day 5: Thursday, 10th of October 2024

0730 – 0930	Plugging, Ferruling & Sleeving Failures in Tubes & Tube-to-Tubesheet Joints • Locating Tube Failure Positions • Finding Tube-to-Tubesheet Joint Leaks • Plugging Heat Exchanger Tubes • Ferrules & Sleeves • Heat & Erosion Shields
0930 – 0945	Break
0945 – 1100	Shell-Side Repairs & Alterations Shell-Side Failures & Their Causes • Procedures & Practices for Repairing Heat Exchangers • Procedures & Practices for Altering Heat Exchangers • Shell-Side Replacement
1100 – 1215	Retubing & Rebundling General Considerations • General Retubing Techniques & Procedures • Parts Replacements, Repairs, Reassembly & Testing • In-Place Retubing
1215 – 1230	Break
1230 – 1345	Retubing & Rebundling (cont'd) Shop Retubing • Retubing Closed Feedwater Heaters • A Typical Repair of a Three Zone Closed Feedwater Heater • Rebundling
1345 – 1400	Course Conclusion
1400 – 1415	POST-TEST
1415 – 1430	Presentation of Course Certificates
1430	Lunch & 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”.

Tubes Per Pass			
Pass #	Tube Count	Mean Tube Count	% Deviation from Mean
1	200	200	+0.00%

Heat Exchanger Tube Layout Simulator

Course Coordinator

Jaryl Castillo, Tel: +974 4423 1327, Email: jaryl@haward.org

