Haward Technology Middle East

COURSE OVERVIEW ME0062

Heat Exchanger Design, Operation, Performance, Inspection, Maintenance & Repair

Course Title

Heat Exchanger Design, Operation, Performance, Inspection, Maintenance & Repair

Course Date/Venue

December 14-18, 2025/Slaysel 02 Meeting Room, Movenpick Hotel & Resort Al Bida'a Kuwait

Course Reference

ME0062

3.0 CEUs (30 PDHs) AWARD

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.

The design, performance and operation of modern heat exchangers require an understanding of the principles of heat transfer and fluid flow, coupled with access to numerically based techniques and supporting data.

This course will review heat transfer fundamentals as applied to tubular and plate devices. Included will be sessions on the practical aspects of shell and tube heat exchanger design with ASME and TEMA codes.

Upon completion of this course, delegates will gain an understanding of the basic principles of heat transfer and fluid flow and their application to the design, operation and maintenance of shell and tube heat exchangers as well as compact and air-cooled heat exchangers.

Participants will gain an understanding of TEMA and ASME codes and learn how to numerically analyze the different heat exchanger configurations. Attention will be paid to the recognition and solving of a wide variety of industrial problems, taking existing case studies.

The course will also address the ways in which systematic techniques of inspection and maintenance (including Fouling Control) can alleviate major problem areas. Further, the course will explain the Energy Balance in Heat Exchangers and discuss the new technologies of Heat Transfer and heat exchanger within the industry.

There will be troubleshooting workshops devoted to the discussion of regularly occurring heat exchanger problems, performance assessment and methods to improve the overall thermal efficiencies of these devices.

The course will also cover current methods of inspection and maintenance.

Course Objectives

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

- Design, operate, inspect, maintain and repair heat exchangers and analyse their performance in a professional manner
- Employ the concepts of heat transfer coefficients and determine their overall effect on heat exchanger fouling
- Differentiate between the various types of heat exchangers and learn more of their industrial features and other relevant information
- Discuss the industrial features and other information that explain distributed types in relation to power cycles, distillation, recuperators and regenerators
- Carryout heat exchanger analysis for counter flow, cross flow and multipass heat exchangers and to apply the well-known correction factors
- Conduct a heat energy balance for different types of counter flow heat exchangers
- Practice the process of heat exchanger selection for a given application and its costing in line with the advantages and disadvantages of its types and scopes of its applications
- Determine the cooling performance of a range of heat exchangers, including an automotive/industrial compact radiator
- Establish insights on the effectiveness/NTU method for heat exchanger analysis in terms of capacity ratios
- Interpret TEMA standards and terminologies for present-day shell and tube heat exchangers
- Enhance comprehension of the practices and principles of heat exchanger maintenance and inspection techniques with its common inspection tools and codes

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 wider and deeper appreciation of heat exchanger design, performance, inspection, maintenance and operation in the oil, chemical and other process industries. Project engineers, process engineers, plant and maintenance engineers and supervisors will gain an excellent numerical problem-solving skill in the practical approach of the course. The course is also useful to those generally knowledgeable on the subject, but who may require a refresher or update. No prior knowledge of heat transfer is required. Participants will be taken through an intensive primer of heat transfer principles as they apply to shell and tube heat exchangers.

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: -

- 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.

- 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.

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. Karl Thanasis, PEng, MSc, MBA, BSc, is **Senior Mechanical & Maintenance Engineer** with over **45 years** of extensive industrial experience within the **Power & Water Utilities** and other **Energy Sectors**. His wide expertise includes **District Cooling Plant**, **District Cooling Plant Operations**, **HVAC** Basics, **HVAC&R**, **KOTZA**, **Refrigeration**, **Modern HVAC & Refrigeration Systems Design, Utilization, Operation & Effective Maintenance, Control Valve & Actuators**, **Fire Safe Valves**, **Piping & Pipeline**, Maintenance, Repair, **Shutdown**, **Turnaround & Outages**, **Maintenance & Reliability** Management, **Mechanical Maintenance** Planning, Scheduling & Work Control, Advanced Techniques in **Maintenance** Management, **Predictive & Preventive** Maintenance, **Maintenance & Operation Cost Reduction** Techniques, Reliability Centered Maintenance (**RCM**), **Machinery Failure** Analysis, **Rotating Equipment Reliability** Optimization & Continuous Improvement, **Material Cataloguing**, **Mechanical & Rotating Equipment** Troubleshooting & Maintenance, **Root Cause Analysis & Reliability** Improvement, **Condition** Monitoring, **Root Cause Failure Analysis** (RCFA), **Steam Generation**, **Steam Turbines**, **Power Generator Plants**, **Gas Turbines**, **Combined Cycle Plants**, **Boilers**, **Process Fired Heaters**, Air Preheaters, Induced Draft Fans, All Heaters Piping Work, Refractory Casting, Heater Fabrication, Thermal & Fired Heater Design, **Heat Exchangers**, Heat Transfer, Coolers, **Power Plant** Performance, Efficiency & Optimization, **Storage Tank** Design & Fabrication, **Thermal Power Plant** Management, **Boiler & Steam** System Management, **Pump** Operation & Maintenance, **Chiller & Chiller Plant** Design & Installation, **Pressure Vessel**, **Safety Relief Valve** Sizing & Selection, **Valve** Disassembling & Repair, Pressure Relief Devices (**PSV**), **Hydraulic & Pneumatic** Maintenance, Advanced **Valve** Technology, **Pressure Vessel** Design & Fabrication, **Pumps**, Turbo-Generator, Turbine **Shaft Alignment**, **Lubrication**, Mechanical **Seals**, Packing, **Blowers**, **Bearing** Installation, **Couplings**, **Clutches** and **Gears**. Further, he is also versed in **Wastewater Treatment** Technology, **Networking** System, **Water Network Design**, Industrial **Water Treatment** in Refineries & Petrochemical Plants, **Piping** System, Water Movement, Water Filtering, Mud Pumping, **Sludge Treatment** and **Drying**, **Aerobic Process** of **Water Treatment** that includes **Aeration**, **Sedimentation** and **Chlorination Tanks**. His strong background also includes **Design** and **Sizing** of all **Waste Water Treatment Plant Associated Equipment** such as **Sludge Pumps**, **Filters**, **Metering Pumps**, **Aerators** and **Sludge Decanters**.

Mr. Thanasis has acquired his thorough and practical experience as the **Project Manager**, **Plant Manager**, **Area Manager - Equipment Construction**, **Construction Superintendent**, **Project Engineer** and **Design Engineer**. His duties covered **Plant Preliminary Design**, **Plant Operation**, **Write-up** of **Capital Proposal**, **Investment Approval**, **Bid Evaluation**, **Technical Contract Write-up**, **Construction** and **Sub-contractor Follow up**, **Lab Analysis**, **Sludge Drying** and **Management** of **Sludge Odor** and **Removal**. He has worked in various companies worldwide in the **USA**, **Germany**, **England** and **Greece**.

Mr. Thanasis is a **Registered Professional Engineer** in the **USA** and **Greece** and has a **Master's** and **Bachelor's** degree in **Mechanical Engineering** with **Honours** from the **Purdue University** and **SIU** in **USA** respectively as well as an **MBA** from the **University of Phoenix** in **USA**. Further, he is a **Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management** (**ILM**) a **Certified Instructor/Trainer** and has delivered numerous trainings, courses, seminars, workshops and conferences worldwide.

Course Fee

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

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 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, 14th of December 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction & Definition of Heat Transfer Coefficients*** *Conduction • Convection • Overall Heat Transfer • Logarithmic Temperature Differences • Correction Factors • Fouling • Effectiveness*
0930 – 0945	*Break*
0945 – 1100	***Types of Heat Exchangers*** *Double-Pipe • Parallel-Flow and Counter-Flow • Compact • Shell and Tube • Plate and Frame • Regenerative • Condensers • Boilers • Space Radiators • Addition of Fins*
1100 – 1215	***Worked Examples*** *Calculation of Overall Heat Transfer Coefficient for a Heat Exchanger • Effect of Fouling on the Overall Heat Transfer Coefficient*
1215 – 1230	*Break*
1230 – 1330	***Worked Examples*** *Introduction to Condensation of Steam in a Condenser*
1330 – 1420	***Industrial Features & Additional Information*** *Industrial Distribution of Different Types • Condensation, Evaporation, Heat Recovery, Heat Rejection • Power Cycles, Distillation, Recuperators, Regenerators*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2: **Monday, 15th of December 2025**

0730 – 0830	***Heat Exchanger Analysis in Detail*** *Logarithmic Mean Temperature Difference Method • Effectiveness- NTU Method*
0830 – 0930	***Counter Flow, Cross Flow & Multipass Heat Exchangers*** *Application of Correction Factors • Worked Example*
0930 – 0945	*Break*
0945 – 1100	***Heat Exchanger Energy Balance*** *Pre-heat Calculations • Energy Moduling*
1100 – 1215	***Counter Flow Heat Exchanger*** *Worked Example for Double-Pipe Arrangement*
1215 – 1230	*Break*
1230 – 1330	***Heat Exchanger Selection for a Given Process*** *Course & Fine Filters • General Points on Material Selection & Pressures • Thermal Effectiveness • Advantages & Disadvantages of Double-Pipe Arrangements & Scope of Application*
1330 – 1420	***Heat Exchanger Selection for a Given Process (cont'd)*** *Common Materials Used • Shell & Tube Heat Exchangers • Plate & Frame Heat Exchangers • Advantages & Disadvantages of these Types & Scopes of Application*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3: **Tuesday, 16th of December 2025**

0730 – 0930	***Heat Exchanger Selection for a Given Process (cont'd)*** *Air-Cooled Heat Exchangers • Plate-fin heat Exchangers • Printed Circuit Heat Exchangers • Advantages and Disadvantages of these Types and Scopes of Application*
0930 – 0945	*Break*
0945 – 1115	***Heat Exchanger Costing*** *Scoping • Quick-sizing • Correction Factors • Estimation of the Overall Heat Transfer Coefficient • Estimating Cost • ESDU Data • Logarithmic Interpolation • Worked Example*
1115 – 1215	***Multipass Heat Exchanger*** *Worked Examples in Determining Heat Transfer Rate with and Without Effects of Fouling*
1215 – 1230	*Break*
1230 – 1330	***Problem Session*** *Numerical Exercise on Multipass Heat Exchangers*
1330 – 1420	***Cooling of an Automotive/Industrial Compact Radiator*** *Determination of Overall Heat Transfer Coefficient*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4: **Wednesday, 17th of December 2025**

0730 – 0830	***Effectiveness/NTU Method for Heat Exchanger Analysis*** *Heat Transfer Effectiveness, Capacity Ratios • Worked Examples*
0830 – 0930	***Upper Limit of Heat Transfer in a Heat Exchanger*** *Counter Flow Heat Exchanger • Effectiveness as a Function of NTU • Worked Examples*

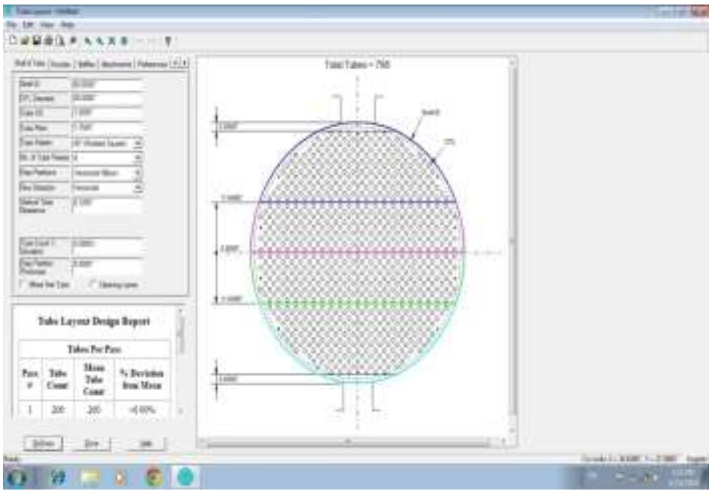
0930 – 0945	Break
0945 – 1215	***Shell & Tube Heat Exchangers*** *Heat Exchanger Inspection • Scope • Construction • TEMA Standards & Terminologies • Fluid Allocation • Design Problems, Design Enhancement • Examples*
1215 – 1230	Break
1230 – 1330	***Heat Exchanger Maintenance*** *Planning • Precautions Required • Plugging • Ferruling • Sleeving • Shell Side Repairs • Retubing*
1330 – 1420	***Fouling Control of Heat Exchanger***
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5: Thursday, 18th of December 2025

0730 – 0930	***Heat Exchanger Inspection Techniques*** *Visual, NDT • Common Failures • Inspection Tools • Inspection Codes*
0930 – 0945	*Break*
0945 – 1100	***Design of Shell and Tube Heat Exchangers*** *Achievement of Duty Required • Developing Design Envelope • Choosing the Best Design • Pressure Drop and Tube Vibration Issues*
1100 – 1215	***Worked Example on a Multipass Heat Exchanger*** *Determination of Heat Transfer and Outlet Stream Temperatures*
1215 – 1230	*Break*
1230 – 1330	***New Technology in Heat Exchanger***
1330 – 1345	***Final Discussions***
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
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".



Heat Exchanger Tube Layout Simulator

Course Coordinator

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