COURSE OVERVIEW ME0062-3D
Heat Exchanger Design, Operation, Performance, Inspection, Maintenance & Repair

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

Course Date/Venue
September 20-22, 2020/Boardroom 3, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference
ME0062-3D

1.8 CEUs (18 PDHs) AWARD

Course Duration/Credits
Three days/1.8 CEUs/18 PDHs

H-STK© INCLUDED

Course Description

This hands-on, 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, sample video clips of the instructor's actual lectures & practical sessions during the course 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 skills 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.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations:-

- USA International Association for Continuing Education and Training (IACET)

  Haward Technology is an Authorized Training Provider by the International Association 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 1-2013 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 1-2013 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 Association 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 **1.8 CEUs** (Continuing Education Units) or **18 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.

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. Dimitry Rovas, CEng, MSc, PMI-PMP, is a **Senior Mechanical Engineer** with extensive industrial experience in **Oil**, **Gas**, **Power** and **Utilities** industries. His expertise includes **Pump** Technology, **Pump** Selection & Installation, **Centrifugal Pumps & Troubleshooting**, **Reciprocating & Centrifugal Compressors**, **Compressor** Control & Protection, **Gas & Steam Turbines**, **Turbine** Operations, **Gas Turbine** Technology, **Valves**, **Bearings & Lubrication**, Advanced **Machinery Dynamics**, **Rubber Compounding**, **Elastomers**, **Thermoplastic**, **Industrial Rubber Products**, **Rubber** Manufacturing Systems, **Heat Transfer**, **Vulcanization Methods**, **Process Plant Shutdown & Turnaround**, **Maintenance Optimization & Best Practices**, **Maintenance Auditing & Benchmarking**, **Reliability** Management, **Rotating Equipment**, **Energy Conservation**, **Energy Loss Management** in Electricity Distribution Systems, **Energy Saving**, **Thermal Power Plant** Management, **Thermal Power Plant** Operation & Maintenance, **Heat Transfer**, **Machine Design**, **Fluid Mechanics**, **Heating & Cooling Systems**, **Heat Insulation Systems**, **Heat Exchanger & Cooling Towers**, **Mechanical Erection**, **Heavy Rotating Equipment**, Material Unloading & Storage, Commissioning & Start-Up. Further, he is also well-versed in MS project & AutoCAD, EPC Power Plant, Power Generation, Combined Cycle Powerplant, Leadership & Mentoring, Project Management, Strategic Planning/Analysis, Construction Management, Team Formation, Relationship Building, Communication, Reporting and Six Sigma. He is currently the **Project Manager** wherein he is managing, directing and controlling all activities and functions associated with the domestic heating/cooling facilities projects.

During his life career, Mr. Rovas has gained his practical and field experience through his various significant positions and dedication as the **EPC Project Manager**, **Field Engineer**, **Preventive Maintenance Engineer**, **Researcher**, **Instructor/Trainer**, **Telecom Consultant** and **Consultant** from various companies such as the Podaras Engineering Studies, Metka and Diadikasia, S.A., **Hellenic Petroleum Oil Refinery** and COSMOTE.

Mr. Rovas is a **Chartered Engineer** of the **Technical Chamber** of **Greece**. Further, he has **Master** degrees in **Mechanical Engineering** and **Energy Production & Management** from the **National Technical University of Athens**. Moreover, he is a **Certified Instructor/Trainer**, a **Certified Project Management Professional** (**PMP**) and a **Certified Six Sigma Black Belt**. He is an active member of Project Management Institute (**PMI**), Technical Chamber of Greece and Body of Certified Energy Auditors and has further delivered numerous trainings, seminars, courses, workshops and conferences internationally.

Training Methodology

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Workshops & Work Presentations
20% Case Studies & Practical Exercises
30% Videos, Software & Simulator

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

Course Fee

US$ 3,750 per Delegate + **5% VAT**. 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 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, 20th of September 2019

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0900	***Introduction and Definition of Heat Transfer Coefficients*** *Conduction • Convection • Overall Heat Transfer • Logarithmic Temperature Differences • Correction Factors • Fouling • Effectiveness*
0900 – 0930	***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*
0930 – 0945	*Break*
0945 – 1030	***Worked Examples*** *Calculation of Overall Heat Transfer Coefficient for a Heat Exchanger • Effect of Fouling on the Overall Heat Transfer Coefficient • Introduction to Condensation of Steam in a Condenser*
1030 – 1130	***Industrial Features and Additional Information*** *Industrial Distribution of Different Types • Condensation, Evaporation, Heat Recovery, Heat Rejection • Power Cycles, Distillation, Recuperators, Regenerators*
1130 – 1215	***Heat Exchanger Analysis in Detail*** *Logarithmic Mean Temperature Difference Method • Effectiveness- NTU Method*
1215 – 1230	*Break*

1230 – 1330	***Counter Flow, Cross Flow & Multipass Heat Exchangers*** *Application of Correction Factors • Worked Example*
1330 – 1420	***Heat Exchanger Energy Balance*** *Pre-heat Calculations • Energy Moduling*
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, 21st of September 2020

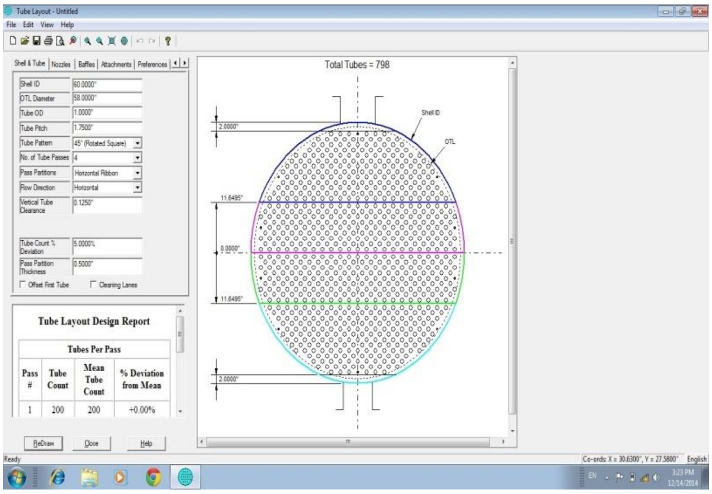
0730 – 0830	***Counter Flow Heat Exchanger*** *Worked Example for Double-Pipe Arrangement*
0830 – 0930	***Heat Exchanger Selection for a Given Process*** *Course and Fine Filters • General Points on Material Selection and Pressures • Thermal Effectiveness • Advantages and Disadvantages of Double-Pipe Arrangements and Scope of Application • Common Materials Used • Shell and Tube Heat Exchangers*
0930 – 0945	*Break*
0945 – 1030	***Heat Exchanger Selection for a Given Process (cont'd)*** *Plate and Frame Heat Exchangers • Advantages and Disadvantages of these Types and Scopes of Application • Air-Cooled Heat Exchangers • Plate-fin heat Exchangers • Printed Circuit Heat Exchangers • Advantages and Disadvantages of these Types and Scopes of Application*
1030 – 1030	***Heat Exchanger Costing*** *Scoping • Quick-sizing • Correction Factors • Estimation of the Overall Heat Transfer Coefficient • Estimating Cost • ESDU Data • Logarithmic Interpolation • Worked Example*
1030 – 1130	***Multipass Heat Exchanger*** *Worked Examples in Determining Heat Transfer Rate With and Without Effects of Fouling*
1130 – 1215	***Problem Session*** *Numerical Exercise on Multipass Heat Exchangers*
1215 – 1230	*Break*
1230 – 1300	***Cooling of an Automotive/Industrial Compact Radiator*** *Determination of Overall Heat Transfer Coefficient*
1300 – 1330	***Effectiveness/NTU Method for Heat Exchanger Analysis*** *Heat Transfer Effectiveness, Capacity Ratios • Worked Examples*
1330 – 1420	***Upper Limit of Heat Transfer in a Heat Exchanger*** *Counter Flow Heat Exchanger • Effectiveness as a Function of NTU • Worked Examples*
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 Two*

Day 3: **Tuesday, 22nd of September 2020**

0730 – 0830	***Shell and Tube Heat Exchangers*** *Heat Exchanger Inspection • Scope • Construction • TEMA Standards and Terminologies • Fluid Allocation • Design Problems, Design Enhancement • Examples*
0830 – 0930	***Heat Exchanger Maintenance*** *Planning • Precautions Required • Plugging • Ferruling • Sleeving • Shell Side Repairs • Retubing*
0930 – 0945	*Break*
0945 – 1030	***Fouling Control of Heat Exchanger***
1030 – 1130	***Heat Exchanger Inspection Techniques*** *Visual, NDT • Common Failures • Inspection Tools • Inspection Codes*
1130 – 1200	***Design of Shell and Tube Heat Exchangers*** *Achievement of Duty Required • Developing Design Envelope • Choosing the Best Design • Pressure Drop and Tube Vibration Issues*
1200 – 1230	***Worked Example on a Multipass Heat Exchanger*** *Determination of Heat Transfer and Outlet Stream Temperatures*
1230 – 1245	*Break*
1245 – 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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