

COURSE OVERVIEW ME0562

Pump Selection, Installation, Performance & Control

Course Title

Pump Selection, Installation, Performance & Control

Course Reference

ME0562

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs



Course Date/Venue

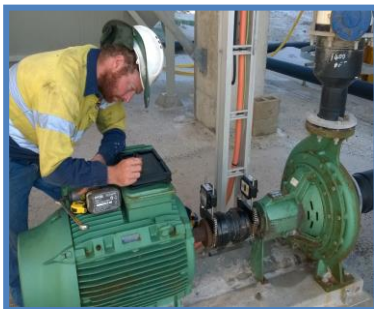
Session(s)	Date	Venue
1	June 23-27, 2024	Oryx Meeting Room, Doubletree By Hilton Doha-Al Sadd, Doha, Qatar
2	October 20-24, 2024	Kizkulesi, Crown Plaza Istanbul Asia Hotels & Convention Center, Istanbul, Turkey
3	December 15-19, 2024	The Kooh Al Noor Meeting Room, The H Dubai Hotel, Sheikh Zayed Rd - Trade Centre, Dubai, UAE

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 simulator.

This course is designed to provide delegates with a detailed and up-to-date overview on the proper selection, installation, performance and control of pumps. It covers pump construction covering centrifugal pump, pump curves, characteristics, most common end-suction and in-line pump types, impeller and casing types, single-stage and multistage pumps, long coupled and close-coupled pumps as well as various types of pumps and mechanical shaft seals including its components, functions and factors affecting the seal performance.



The course will enable the participants to describe motors, liquids and materials and employ proper installation of pumps as well as analyze pump performance, system characteristics and pumps connected in series and parallel. Participants will be able to adjust pump performance and describe speed controlled pump solutions for constant pressure and temperature control, constant differential pressure in a circulating system and flow compensated differential pressure control.



Further, the advantages of speed control and pumps with integral frequency converter as well as its basic function, characteristics, components and special conditions will be discussed and lifecycle costs equation and calculation will be illustrated during the course.

Course Objectives

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

- Apply and gain an in-depth knowledge on the selection, installation, performance and control of various types of industrial pumps
- Recognize pump construction covering centrifugal pump, pump curves, characteristics, most common end-suction and in-line pump types, impeller and casing types, single-stage and multistage pumps as well as long coupled and close-coupled pumps
- Identify the various types of pumps and mechanical shaft seals including its components, functions and factors affecting the seal performance
- Describe motors, liquids and materials as well as employ proper installation of pumps
- Analyze pump performance, system characteristics and pumps connected in series and parallel
- Adjust pump performance and describe speed controlled pump solutions for constant pressure and temperature control, constant differential pressure in a circulating system and flow compensated differential pressure control
- Explain the advantages of speed control and pumps with integral frequency converter
- Enumerate the basic function, characteristics, components and special conditions of frequency converter
- Illustrate life cycle costs equation and calculation

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 covers systematic techniques and methodologies in the selection, installation, performance and control of pumps for plant and maintenance engineers, process engineers, maintenance personnel, supervisors and reliability specialists working in a wide variety of process plant environments, such as petrochemical, plastics, power utilities, oil, gas, water utilities, wastewater etc. The course is also highly valuable to senior maintenance technical staff who are involved with pumps, their operation and their maintenance.

Accommodation

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




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 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. Mohamed Refaat, MSc, BSc, is a **Senior Mechanical & Maintenance Engineer** with almost **30 years** of extensive experience in **Rotating Equipment** and **Machinery** including **Pumps, Compressors, Turbines, Motors, Turbo-expanders, Gears**, etc. His wide experience also covers **Centrifugal Compressor & Steam Turbine, Centrifugal Pump, Pump Technology, Gas Turbine Technology, Heat Exchanger, Turbines & Motors, Variable Speed Drives, Seals, Control Valves, Advanced Valve Technology, Dry Seal, Fired Heaters, Air Coolers, Crude Desalter, Process Vessels & Valves, Industrial Equipment & Rotating Machinery, Mechanical Engineering, Mechanical Equipment & Turbomachinery, Piping, Pipelines, Valves, Lubrication Technology, Vibration Analysis, Power System Hydraulics, Security Detection Systems & Operation, Process Plant Equipment, Troubleshooting Process Operations, Maintenance Management Best Practices, Rotating Equipment Reliability Optimization, Practical Machinery Vibration, Vibration Techniques, Effective Reliability Maintenance, Excellence in Maintenance & Reliability Management, Preventive & Predictive Maintenance, Machinery Failure Analysis (RCFA), Reliability Optimization & Continuous Improvement, Maintenance Planning, Scheduling & Work Control, Maintenance Management Strategy, Mechanical & Rotating Equipment Troubleshooting, Preventive Maintenance, Predictive Maintenance, Reliability Centered Maintenance (RCM), Condition Based Monitoring (CBM), FMEA** and Troubleshooting of machinery and rotating equipment including turbines, bearings, compressors, pumps etc. He is currently the **Mechanical Maintenance Section Head** of the **Arab Petroleum Pipelines Company** where he is in charge of planning, scheduling & managing the execution of preventive & corrective mechanical maintenance activities for all equipment. He is responsible for executing the scheduled inspections & major overhauls for gas turbines, valves & pumps, carrying out off-line vibration monitoring plans, troubleshooting, fault diagnosing & investigating failures of machinery.

During his career life, Mr. Mohamed was able to modify the gas turbines self cleansing system to improve its maintainability and extend the air filters' lifetime. He was responsible for defining & updating the equipment codes and parameters for replacing the old **CMMS** with **MAXIMO**. He also worked as the Operations Supervisor wherein he was closely involved with the operation of the crude oil internal **pipeline** system between the tankers and tank farm, operation & control of the booster pumps for pumping crude oil for main pipelines and the development & implementation of the plans & procedures for draining the main terminal internal lines for maintenance purposes. He also held the position of Measurement Engineer where he was responsible for the crude oil custody transfer, performing loss control analysis and operating the crude oil automatic sampler & related equipment. Prior to that, he was the Design Engineer responsible for the design phase of the Truck Mixer Manufacturing Project of the Mechanical Design Department.

Mr. Refaat has **Master** and **Bachelor** degrees in **Mechanical Engineering** and a General Certificate of Education (**GCE**) from the **University of London, UK**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management (ILM)** and a member of the Engineering Syndicate of Egypt. He has further delivered numerous training, courses, workshops, seminars and conferences worldwide.





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 Fee

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.
Istanbul	US\$ 6,000 per Delegate + VAT . This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Dubai	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.

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	<i>Registration & Coffee</i>
0800 – 0815	<i>Welcome & Introduction</i>
0815 – 0830	PRE-TEST
0830 – 0930	Pump Construction <i>The Centrifugal Pump • Pump Curves • Characteristics of the Centrifugal Pump • Most Common End-Suction & In-Line Pump Types • Impeller Types (Axial Forces)</i>
0930 – 0945	<i>Break</i>
0945 – 1100	Pump Construction (cont'd) <i>Casing Types (Radial Forces) • Single-Stage Pumps • Multistage Pumps • Long-Coupled and Close-Coupled Pumps</i>
1100 – 1215	Types of Pumps <i>Standard Pumps • Split-Case Pumps • Hermetically Sealed Pumps • Sanitary Pumps • Wastewater Pumps • Immersible Pumps • Borehole Pumps • Positive Displacement Pumps</i>
1215 – 1230	<i>Break</i>
1230 – 1420	Mechanical Shaft Seals <i>The Mechanical Shaft Seal's Components & Function • Balanced & Unbalanced Shaft Seals • Types of Mechanical Shaft Seals • Seal Face Material Combinations • Factors Affecting the Seal Performance</i>
1420 – 1430	Recap
1430	<i>Lunch & End of Day One</i>



Day 2

0730 – 0930	Motors Standards • Motor Start-Up • Voltage Supply • Frequency Converter • Motor Protection
0930 – 0945	Break
0945 – 1100	Liquids Viscous Liquids • Non-Newtonian Liquids • The Impact of Viscous Liquids on the Performance of a Centrifugal Pump • Selecting the Right Pump for a Liquid with Antifreeze • Calculation Example • Computer Aided Pump Selection for Dense and Viscous Liquids
1100 – 1215	Materials What is Corrosion? • Types of Corrosion • Material & Metal Alloys • Ceramics • Plastics • Rubber • Coatings
1215 – 1230	Break
1230 – 1420	Pump Installation New Installation • Existing Installation-Replacement • Pipe Flow for Single-Pump Installation • Limitation of Noise & Vibrations • Sound Level (L)
1420 – 1430	Recap
1430	Lunch & End of Day Two

Day 3

0730 – 0930	Pump Performance Hydraulic Terms • Electrical Terms • Liquid Properties
0930 – 0945	Break
0945 – 1030	System Characteristics Single Resistances • Closed and Open Systems
1030 – 1100	Pumps Connected in Series & Parallel Pumps in Parallel • Pumps Connected in Series
1100 – 1215	Adjusting Pump Performance Throttle Control • Bypass Control • Modifying Impeller Diameter • Speed Control • Comparison of Adjustment Methods
1215 – 1230	Break
1230 – 1420	Adjusting Pump Performance (cont'd) Overall Efficiency of the Pump System • Example: Relative Power Consumption when the Flow is Reduced by 20%
1420 – 1430	Recap
1430	Lunch & End of Day Three

Day 4

0730 – 0930	Speed-Controlled Pump Solutions Constant Pressure Control • Constant Temperature Control
0930 – 0945	Break
0945 – 1100	Speed-Controlled Pump Solutions (cont'd) Constant Differential Pressure in a Circulating System • Flow-Compensated Differential Pressure Control
1100 – 1215	Advantages of Speed Control
1215 – 1230	Break
1230 – 1420	Advantages of Pumps with Integral Frequency Converter Performance Curves of Speed-Controlled Pumps • Speed-Controlled Pumps in Different Systems
1420 – 1430	Recap
1430	Lunch & End of Day Four

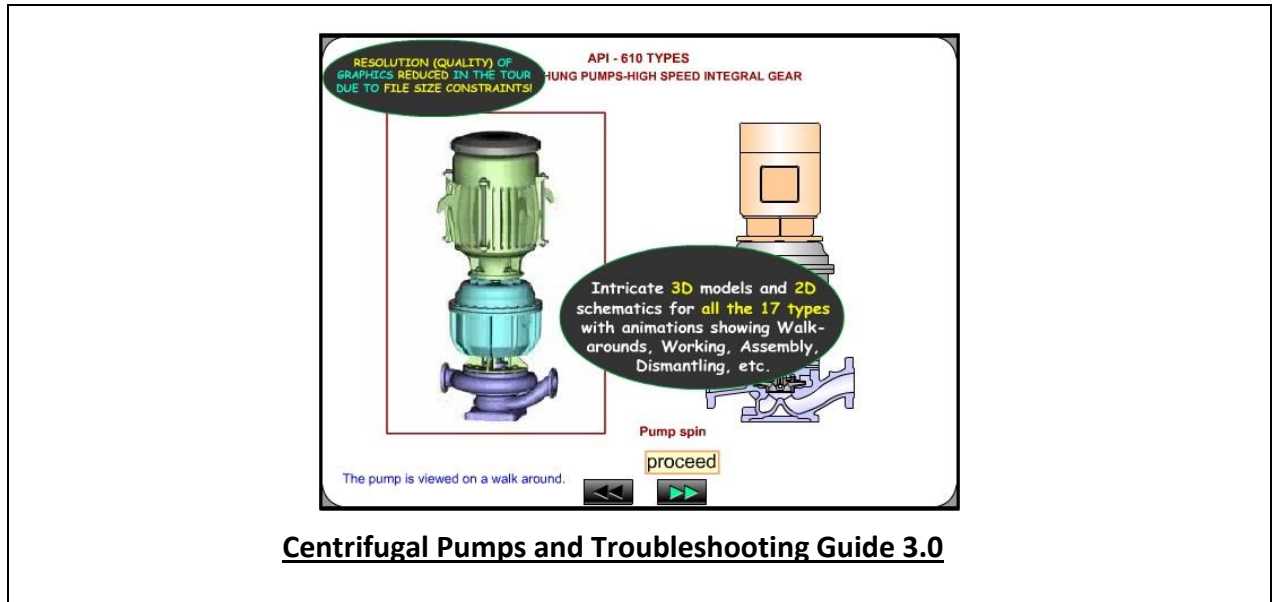


Day 5

0730 – 0930	Frequency Converter Basic Function & Characteristics • Components of the Frequency Converter • Special Conditions Regarding Frequency Converters
0930 – 0945	Break
0945 – 1100	Life Cycle Cost Equation Initial Costs & Purchase Price (Cic) • Installation & Commissioning Costs (Cin) • Energy Costs (Ce) • Operating Costs(Co) • Environmental Costs (Cenv)
1100 – 1215	Life Cycle Cost Equation (cont'd) Maintenance & Repair Costs (Cm) • Downtime Costs, Loss of Production (Cs) • Decommissioning & Disposal Costs (co)
1215 – 1230	Break
1230 – 1345	Life Cycle Costs Calculation-An Example
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 our state-of-the-art simulator “Centrifugal Pumps and Troubleshooting Guide 3.0”.



Course Coordinator

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