COURSE OVERVIEW ME0098
Pump Technology

Course Title
Pump Technology

Course Date/Venue
January 25-29, 2026/The Victoria Meeting Room, The H Dubai Hotel, Sheikh Zayed Rd - Trade Centre, Dubai, UAE

Course Reference
ME0098

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

Course Description

This practical and highly-interactive course includes various practical sessions and exercises. Practical sessions will be organized during the course using our state-of-the-art simulators and our cutting-edge Virtual Reality (VR) and Augmented Reality (AR) technologies to provide participants with a highly immersive and interactive learning experience.

This course is designed to provide delegates with a detailed and up-to-date overview on Pump Technology It covers the reliability data sources, factors affecting equipment reliability, reliability engineering philosophy and reliability basic terms; the maintenance philosophy, equipment failure patterns and failure causes and turbomachinery; the basic concepts of fluid flow and fundamental laws related to fluid energy; the classifications of pumps and centrifugal pumps operation, construction and functional description; the centrifugal pumps components, codes and standards and pumps cavitation; the shaft sealing systems for centrifugal and rotary pumps and mechanical seals classification by arrangement; and the mechanical seals materials.

During this interactive course, participants will learn the pumps failure mechanisms, centrifugal pumps selection criteria and performance of centrifugal pumps; the pumps components materials of construction, coating technology for pump components, bearings types and theory of operation and rolling elements bearings; the hydrodynamic bearings (oil film bearings), gear couplings, diaphragm couplings, disc coupling and lubrication system; the FAT, shipping, storage, installation, commissioning, operation and control of centrifugal pumps; the common operational issues that affect pumps reliability, pumps protection systems, pumps failure modes and troubleshooting; the mechanical seal failure modes and troubleshooting; the pumps maintenance, overhauling and inspection and predictive maintenance (PDM); and the vibration monitoring and analysis.

Course Objectives

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

- Apply and gain an in-depth knowledge on the pump technology
- Discuss reliability data sources, factors affecting equipment reliability, reliability engineering philosophy and reliability basic terms
- Explain maintenance philosophy, equipment failure patterns and failure causes and turbomachinery
- Discuss the basic concepts of fluid flow and fundamental laws related to fluid energy as well as classifications of pumps and centrifugal pumps operation, construction and functional description
- Identify centrifugal pumps components, codes and standards and pumps cavitation
- Recognize shaft sealing systems for centrifugal and rotary pumps, mechanical seals classification by arrangement and mechanical seals materials
- Discuss pumps failure mechanisms, centrifugal pumps selection criteria and performance of centrifugal pumps
- Identify pumps components materials of construction, coating technology for pump components, bearings types and theory of operation and rolling elements bearings
- Describe hydrodynamic bearings (oil film bearings), gear couplings, diaphragm couplings, disc coupling and lubrication system
- Carryout FAT, shipping, storage, installation, commissioning, operation and control of centrifugal pumps
- Recognize common operational issues that affect pumps reliability, pumps protection systems, pumps failure modes and troubleshooting and mechanical seal failure modes and troubleshooting
- Apply pumps maintenance, overhauling and inspection, predictive maintenance (PDM) and vibration monitoring and analysis

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 pump technology for plant and maintenance engineers, process engineers, maintenance personnel, supervisors and reliability specialists working in refineries and petrol filling stations. The course is also highly valuable to senior maintenance technical staff who are involved with pumps, their operation and their maintenance.

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

Haward's 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**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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.

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
10% Practical Workshops & Work Presentations
10% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos
30% VR/AR Hands-on Practical Application

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

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. Adel Abdallah is a **Senior Process & Mechanical Engineer** with over **20 years** of extensive experience within the **Petrochemical**, **Refinery** and **Oil & Gas** industries. His expertise covers **Centrifugal Pump** Maintenance, Repair & Troubleshooting, **Positive Displacement & Centrifugal Pumps**, **Pump** Selection, Installation, Performance & Control, **Pumps & Valves** Maintenance, **Valves**, **Safety Relief Valves, Strainers & Steam Traps**, **Fundamentals of Process Operations**, **Crude Oil & Refinery Products**, **Sampling & Feed/Product Quality**, **Process Troubleshooting & Problem Solving**, **Hydro-Treating Technology**, **Catalysts**, **Distillation Column**, **Process Heaters/Furnaces**, **Reboilers**, **Condensers**, **Piping System** and **P&ID**. He is also well-versed in **Turbines**, **Fans**, **Blowers**, **Electric Motors**, **Gears & Transmission Equipment**, **Heat Exchangers**, **Valves**, **Packing & Mechanical Seal**, **Bearing**, **Couplings**, **Alignment**, **Water & Wastewater Treatment**, **Steam Boiler**, **Air Compressors** and ISO system.

During Mr. Abdallah's career life, he has handled challenging positions wherein he has acquired his wide technical and practical experience in the field of process & chemical industry such as the **Technical Instructor/Consultant**, **Senior Chemical Engineer**, **Chemical Engineer**, **Process Engineer**, **Technical Engineer** and **Production Supervisor** for various companies such as the **Jordan Petroleum Refinery**, **Jordanian Tunisian Chemicals Co.**, Al-Mas Resin Factory, **Tabuk Chemical Fertilizer Factory**, **UIP-FCEC JV Design and Build Company**, **Degussa MBT** and **National Chlorine Company** in the Middle East.

Mr. Abdallah has a **Bachelor's** degree in **Chemical Engineering** from the **University of Jordan**. Further, he is a **Certified Instructor/Trainer** and delivered various trainings internally in his previous companies.

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.

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 workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: ***Sunday, 25th of January 2026***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0900	***Introduction to Reliability & Maintenance*** *Understanding Reliability • Reliability Data Sources • Factors Affecting Equipment Reliability • Reliability Philosophy • Reliability Engineering Philosophy • Reliability Basic Terms*
0900 – 0930	***Maintenance Philosophy*** *Understanding Maintenance • Maintenance Policies • Maintenance Policies - Comparisons*
0930 – 0945	*Break*
0945 – 1030	***Equipment Failure Patterns & Failure Causes*** *Equipment Failure Patterns • How Failures Appear? • Causes of Machinery Failures*
1030 – 1100	***Turbomachinery*** *What is Meant by "Turbomachinery"? • Classification of "Turbomachines"*
1100 – 1130	***Basic Concepts of Fluid Flow & Fundamental Laws Related to Fluid Energy*** *Compressible & Incompressible Fluids • Volumetric Flow Rate "Q" • Mass Flow Rate "m˙" • Energy • Energy of Fluid Flow • Bernoulli's Equation (Conservation of Energy)*
1130 – 1215	***Introduction to Pumps***
1215 – 1230	*Break*
1230 – 1330	***Classifications of Pumps***
1330 – 1420	***Centrifugal Pumps Theory of Operation, Construction & Functional Description*** *Centrifugal Pumps – Theory of Operation • Centrifugal Pumps Construction • Centrifugal Pumps – Casing • Centrifugal Pumps – Shaft*
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, 26th of January 2026***

0730 – 0815	***Centrifugal Pumps Components – Impeller*** *Centrifugal Pumps – Hydraulic Loads • Centrifugal Pumps – Impeller • Centrifugal Pumps Construction • Centrifugal Pumps – Internal Seals • Centrifugal Pumps – Advantages • Centrifugal Pumps – Disadvantages • Centrifugal Pumps – Applications*
0815 – 0900	***Centrifugal Pumps Codes & Standards***
0900 – 0930	***Pumps Cavitation*** *Cavitation – Introduction • Types of Cavitation • Suction Cavitation • Discharge/Suction Recirculation • Internal Recirculation • Air Entrainment*
0930 – 0945	*Break*
0945 – 1030	***Shaft Sealing Systems for Centrifugal & Rotary Pumps*** *Pumps Shaft Sealing Devices • Gland Packing*

1030 – 1130	***Mechanical Seal*** *Mechanical Seal – Main Components • How a Mechanical Seal Works? • Mechanical Seal – Balancing Ratios • Mechanical Seal – Split Design*
1130 – 1230	***Mechanical Seals Classification by Arrangement*** *Mechanical Seal Configurations • API Standards*
1215 – 1230	*Break*
1230 – 1330	***Mechanical Seals Materials***
1330 – 1420	***Pumps Failure Mechanisms*** *Overload • Fatigue • Thermal Mechanical Fatigue (TMF) • Surface Fatigue (Spalling or Flaking) • Thermal Shock • Corrosion • Pitting Corrosion • Standby Corrosion • Abrasive Wear • Erosion • Erosion Corrosion • Cavitation Erosion • Cavitation Corrosion • Corrosion Fatigue (CF)*
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, 27th of January 2026***

0730 – 0815	***Centrifugal Pumps Selection Criteria*** *Key Design Parameters of Pumps • Basic Pumps Selection Criteria • Series Pumps Performance Curves • Parallel Pumps Performance Curves*
0815 – 0900	***Performance of Centrifugal Pumps*** *Best Efficiency Point (BEP) • Preferred Operating Region (POR) • Minimum Continuous Stable Flow (MCSF) • Effect of Impeller Trim on the Pump BEP • Static Losses • Friction (Dynamic) Losses*
0900 – 0930	***Pumps Components Materials of Construction*** *Impellers • Casings • Shafts • Wear Rings*
0930 – 0945	*Break*
0945 – 1030	***Coating Technology for Pump Components***
1030 – 1130	***Bearings Types & Theory of Operation*** *Bearings – Introduction • Bearings – Functions • Bearings – Classifications*
1130 – 1230	***Rolling Elements Bearings*** *Rolling Element Bearings – Types • Rolling Element Bearings – Lubrication • Rolling Element Bearings – Loads • Rolling Element Bearings – Rating Life • Rolling Element Bearings – Advantages • Rolling Element Bearings – Disadvantages*
1215 – 1230	*Break*
1230 – 1330	***Hydrodynamic Bearings*** *Hydrodynamic Bearings – Working Principle • Hydrodynamic Bearings – Advantages • Hydrodynamic Bearings – Disadvantages*
1330 – 1420	***Hydrodynamic Bearings (Oil Film Bearings)*** *Cylindrical Journal (Radial) Bearings • Elliptical Journal (Radial) Bearings • Tilting-Pad Journal (Radial) Bearings • Thrust (Axial) Bearings • Tapered-Land Thrust (Axial) Bearings • Tilting Pad Thrust (Axial) Bearings • Hydrodynamic Bearings – Material*
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, 28th of January 2026

0730 – 0815	***Couplings*** *Couplings – Function • Couplings – Main Components • Types of Couplings • Jaw (Spider) Coupling • Tire Coupling • Grid Coupling*
0815 – 0900	***Gear Couplings*** *Gear Couplings – Features • Gear Couplings – Disadvantages*
0900 – 0930	***Diaphragm Couplings*** *Diaphragm Coupling – Features • Diaphragm Coupling – Advantages*
0930 – 0945	*Break*
0945 – 1030	***Disc Coupling***
1030 – 1130	***Lubrication System*** *Lubrication System Function • Lube Oil System Basic Components • Lube Oil Systems Standards*
1130 – 1230	***Centrifugal Pumps, FAT, Shipping, Storage, Installation & Commissioning*** *Pumps – Factory Acceptance Tests (FAT) • Pumps – Acceptance Tests • Pumps – Shipping • Pumps – Lifting & Moving • Pumps – Storage • Pumps – Installation & Commissioning • Pumps – Foundation • Pumps – Alignment • Pumps Installation – Piping Configuration • Pumps – Piping Configuration • Pumps – Pipe Stress/Strain • Pumps – Piping Configuration • Pumps – Commissioning*
1215 – 1230	*Break*
1230 – 1330	***Centrifugal Pumps Operation & Control*** *Centrifugal Pumps – Startup Procedure • Multiple Pumps Operation • Centrifugal Pumps – Run Strategy • Centrifugal Pumps – Run (Changeover) Strategy • Methods of Varying Pumps Performance • Adjusting Pumps Performance*
1330 – 1420	***Common Operational Issues that Affect Pumps Reliability*** *Main Operation Issues that Affect Pumps Reliability • Operating Pump with Suction Cavitation • Pump Recirculation • Air Binding • Pump Operation Away from BEP • Pump Reverse Rotation • Lack of Fluid (Operating the Pump Dry) • Closed Head Operation • Wrong Fluid Type for the Pump • Pump Cycling • Pipe Strain*
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*

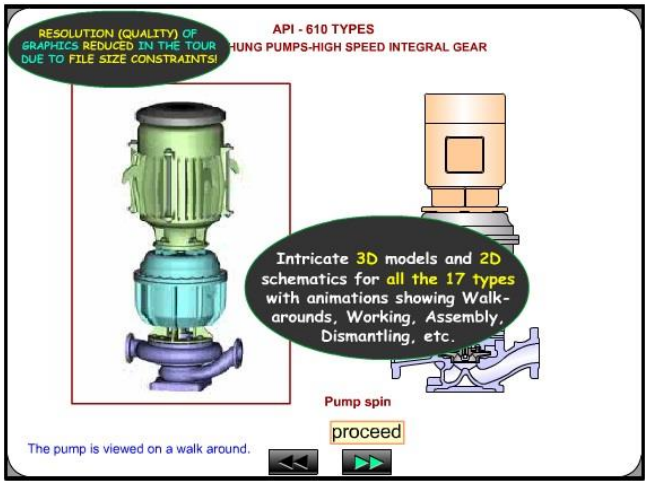
Day 5: Tuesday, 29th of January 2026

0730 – 0830	***Pumps Protection Systems*** *Centrifugal Pumps – Protection Devices*
0830 – 0930	***Pumps Failure Modes & Troubleshooting*** *What is Troubleshooting? • Machinery Troubleshooting – Process • Centrifugal Pumps – FMs & Troubleshooting*
0930 – 0945	*Break*
0945 – 1030	***Mechanical Seal Failure Modes & Troubleshooting*** *Mechanical Seals Failure Causes • Mechanical Seals – FMs & Troubleshooting*
1030 – 1100	***Pumps Maintenance, Overhauling & Inspection*** *Understanding Maintenance • Pumps Maintenance & Inspection*

1100 – 1145	***Pump Maintenance & Inspection*** *Mechanical seals • Mechanical Seals – Installation • Mechanical Seal Installation – Process • Pump Overhaul • Replace Stuffing Box Packing • Replace Stuffing Box Packing – Tools • Replace Stuffing Box Packing – Steps • Pump Disassembly • Pump Pre-Disassembly Checks • Check Shaft End Play (Axial Movement) • Check Radial Movement of Shaft (Lift Check) • Check Shaft Run-out (Bent Shaft) • Couplings Inspection & Maintenance • Check Bearing Clearance*
1145 – 1230	***Predictive Maintenance (PDM)*** *ISO Definition*
1230 – 1245	*Break*
1245 – 1345	***Vibration Monitoring & Analysis*** *What is Vibration? • What Causes Vibration? • Effect of Vibration on Machinery • Machine Vibration Monitoring – Principle • Characteristics of Vibration • How Vibration Signal is Characterized? • Vibration Monitoring • Vibration Sensor Location & Arrangement • Representation of Vibration Data • Types of Data Collection • Which Machines Need to be Monitored? • Vibration Monitoring and Analysis*
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 our state-of-the-art simulator "Centrifugal Pumps and Troubleshooting Guide 3.0" and VR/AR Applications.



Centrifugal Pumps and Troubleshooting Guide 3.0

Virtual Reality (VR) and Augmented Reality (AR) Practical Sessions

Practical sessions will be organized during the course using cutting-edge Virtual Reality (VR) and Augmented Reality (AR) technologies to provide participants with a highly immersive and interactive learning experience. Through VR headsets and AR-enabled devices, delegates will be able to simulate real-world scenarios in a safe and controlled virtual environment, allowing them to practice the theories and techniques learned in class. Participants will engage in realistic, hands-on exercises such as operating equipment, performing inspections, troubleshooting systems and responding to simulated incidents that closely replicate actual field conditions. This advanced training approach enhances understanding, improves decision-making skills and builds confidence by bridging the gap between theoretical knowledge and real-world application.

Course Coordinator

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