

COURSE OVERVIEW ME0010
Mechanical Pumps and Rotating Equipment

Course Title

Mechanical Pumps and Rotating Equipment

Course Date/Venue

June 29–July 03, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference

ME0010

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 Mechanical Pumps and Rotating Equipment. It covers the mechanical pumps, rotating equipment basics and types of pumps and their applications; the hydraulics and fluid dynamics in pumps, materials of construction and safety in pump operations; designing and operating centrifugal pumps and the common operational issues; the types and mechanisms of positive displacement pumps including bearings and lubrication systems; the pump efficiency and performance monitoring; and the mechanical seals and packing including piping and system integration.

During this interactive course, participants will learn the routine maintenance practices, vibration analysis, condition monitoring and troubleshooting common pump issues; the alignment and balancing, failure analysis of pumps, overhauling procedures and testing after rebuilding; the lifecycle management of rotating equipment and energy efficiency and optimization; the advanced diagnostic techniques covering thermography, ultrasonic testing and oil analysis; the asset management systems, environmental considerations and high-pressure pump systems; the cryogenic pumps, magnetic drive pumps and pumps in corrosive environments; the need for upgrades and retrofitting older systems for improved performance; and the ASME and ISO standards and regulatory requirements for pump systems.

Course Objectives

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

- Apply and gain an in-depth knowledge on mechanical pumps and rotating equipment
- Discuss mechanical pumps, rotating equipment basics and types of pumps and their applications
- Recognize hydraulics and fluid dynamics in pumps, materials of construction and safety in pump operations
- Design and operate centrifugal pumps and identify the common operational issues
- Recognize the types and mechanisms of positive displacement pumps including bearings and lubrication systems
- Illustrate pump efficiency and performance monitoring and discuss mechanical seals and packing including piping and system integration
- Employ routine maintenance practices, vibration analysis, condition monitoring and troubleshooting common pump issues
- Carryout alignment and balancing, failure analysis of pumps, overhaul procedures and testing after rebuilding
- Explain the lifecycle management of rotating equipment and apply energy efficiency and optimization
- Employ advanced diagnostic techniques covering thermography, ultrasonic testing and oil analysis
- Recognize asset management systems, environmental considerations and high-pressure pump systems
- Describe cryogenic pumps, magnetic drive pumps and pumps in corrosive environments
- Identify the need for upgrades and retrofit older systems for improved performance
- Discuss of ASME and ISO standards and regulatory requirements for pump systems

Who Should Attend

This course provides an overview of all significant aspects and considerations of mechanical pumps and rotating equipment for mechanical engineers, maintenance technicians, reliability engineers, plant operators, project engineers/managers, supervisors and team leaders, professionals in oil & gas, power plants, or manufacturing and other technical staff.

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**.

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. Andrew Ladwig is a **Senior Process & 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 **Valve Selection & Maintenance, Ammonia Manufacturing & Process Troubleshooting, Distillation Towers, Crude Oil Distillation, Fundamentals of Distillation** for Engineers, **Distillation Operation and Troubleshooting, Advanced Distillation Troubleshooting, Distillation Technology, Vacuum Distillation, Ammonia Storage & Loading Systems, Ammonia Plant Operation, Troubleshooting & Optimization, Ammonia Recovery, Ammonia Plant Safety, Hazard of Ammonia Handling, Storage & Shipping, Operational Excellence in Ammonia Plants, Fertilizer Storage Management (Ammonia & Urea), Fertilizer Manufacturing Process Technology, Sulphur Recovery, Phenol Recovery & Extraction, Wax Sweating & Blending, Petrochemical & Fertilizer Plants, Nitrogen Fertilizer Production, Petroleum Industry Process Engineering, Refining Process & Petroleum Products, Refinery Planning & Economics, Safe Refinery Operations, Hydrotreating & Hydro-processing, Separators in Oil & Gas Industry, Gas Testing & Energy Isolations, Gas Liquor Separation, Industrial Liquid Mixing, Wax Bleachers, Extractors, Fractionation, Operation & Control of Distillation, Process of Crude ATM & Vacuum Distillation Unit, Water Purification, Water Transport & Distribution, Steam & Electricity, Flame Arrestors, Coal Processing, Environmental Emission Control, R&D of Wax Blending, Wax Molding/Slabbing, Industrial Drying, Principles, Selection & Design, Certified Process Plant Operations, Control & Troubleshooting, Operator Responsibilities, Storage Tanks Operations & Measurements, Process Plant Troubleshooting & Engineering Problem Solving, Process Plant Performance, Efficiency & Optimization, Continuous Improvement & Benchmarking, Process Troubleshooting Techniques, Oil & Gas Operation/Introduction to Surface Facilities, Pressure Vessel Operation, Process Equipment Performance & Troubleshooting, Plant Startup & Shutdown, Startup & Shutdown the Plant While Handling Abnormal Conditions, Flare & Relief System, Process Gas Plant Start-up, Commissioning & Problem Solving, Process Liquid and Process Handling & Measuring Equipment. Further, he is also well-versed in **Compressors & Turbines Operation, Maintenance & Troubleshooting, Heat Exchanger Overhaul & Testing Techniques, Balancing of Rotating Machinery (BRM), Pipe Stress Analysis, Valves & Actuators Technology, Inspect & Maintain Safeguarding Vent & Relief System, Certified Inspectors for Vehicle & Equipment, Optimizing Equipment Maintenance & Replacement Decisions, Certified Maintenance Planner (CMP), Root Cause Analysis (RCA), Production Optimization, Permit to Work (PTW), Project Engineering, Data Analysis, Process Hazard Analysis (PHA), HAZOP Study, Sampling & Analysis, Training Analysis, Job Analysis Techniques, Storage & Handling of Toxic Chemicals & Hazardous Materials, Hazardous Material Classification & Storage/Disposal, Dangerous Goods, Environmental Management System (EMS), Supply Chain, Purchasing, Procurement, Logistics Management & Transport & Warehousing & Inventory, Risk Monitoring Authorized Gas Tester (AGT), Confined Space Entry (CSE), Personal Protective Equipment (PPE), Fire & Gas, First Aid and Occupational Health & Safety.****

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 has a **Bachelor's degree in Chemical Engineering** and a **Diploma in Mechanical Engineering**. Further, he is 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.

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.

Accommodation

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

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.

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, 29th of June 2025

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 – 0930	Introduction to Mechanical Pumps Overview of Pump Types and Classifications • Applications in Industrial Systems • Components and Basic Working Principles • Energy Conversion in Pumps.
0930 – 0945	Break
0945 – 1030	Rotating Equipment Basics Definition and Examples of Rotating Equipment • Role in Industrial Processes • Comparison of Static and Rotating Equipment • Key Performance Indicators (KPIs) for Rotating Equipment
1030 – 1130	Types of Pumps & Their Applications Centrifugal Pumps: Design and Use • Positive Displacement Pumps: Types and Functions • Specialty Pumps (Submersible, Diaphragm, etc.) • Selection Criteria for Various Industrial Applications
1130 – 1215	Hydraulics & Fluid Dynamics in Pumps Basic Principles of Fluid Dynamics • Relationship Between Flow, Pressure and Velocity • Hydraulic Losses and Their Impact on Efficiency • Net Positive Suction Head (NPSH) Concepts
1215 – 1230	Break

1230 – 1330	Materials of Construction <i>Common Materials Used in Pumps and Rotating Equipment • Factors Influencing Material Selection • Corrosion Resistance and Wear Considerations • Standards for Material Compliance</i>
1330 – 1420	Safety in Pump Operations <i>Identifying Potential Hazards • Safety Protocols and PPE Requirements • Safe Startup and Shutdown Procedures • Emergency Handling of Pump Failures</i>
1420 – 1430	Recap <i>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</i>
1430	<i>Lunch & End of Day One</i>

Day 2: Monday, 30th of June 2025

0730 – 0830	Centrifugal Pumps: Design & Operation <i>Components: Impellers, Casings, Shafts and Seals • Operational Principles: Energy Transfer in Centrifugal Pumps • Curve Analysis: Flow Versus Head • Common Operational Issues</i>
0830 – 0930	Positive Displacement Pumps: Types & Mechanisms <i>Reciprocating Pumps: Piston and Plunger Types • Rotary Pumps: Gear, Vane, and Screw Designs • Operational Advantages and Limitations • Maintenance Considerations</i>
0930 – 0945	<i>Break</i>
0945 – 1100	Bearings & Lubrication Systems <i>Types of Bearings Used in Rotating Equipment • Importance of Lubrication • Lubricant Selection and Application • Monitoring Bearing Condition</i>
1100 – 1215	Pump Efficiency & Performance Monitoring <i>Key Performance Indicators for Pump Efficiency • Methods for Performance Testing • Identifying Efficiency Losses • Impact of Cavitation on Performance</i>
1215 – 1230	<i>Break</i>
1230 – 1330	Mechanical Seals & Packing <i>Types of Mechanical Seals • Principles of Seal Operation • Maintenance and Troubleshooting of Seals • Alternative Sealing Technologies</i>
1330 – 1420	Piping & System Integration <i>Designing Piping Systems for Pumps • Effects of Piping Layout on Performance • Integration of Pumps into Larger Systems • Expansion Joints and Vibration Dampers</i>
1420 – 1430	Recap <i>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</i>
1430	<i>Lunch & End of Day Two</i>



Day 3: Tuesday, 01st of July 2025

0730 – 0830	Routine Maintenance Practices Importance of Preventive Maintenance • Daily, Weekly and Monthly Maintenance Checklists • Recordkeeping and Documentation • Maintenance Scheduling Techniques
0830 – 0930	Vibration Analysis & Condition Monitoring Basics of Vibration Analysis • Identifying Imbalance and Misalignment • Tools for Condition Monitoring • Using Vibration Data for Predictive Maintenance
0930 – 0945	Break
0945 – 1100	Troubleshooting Common Pump Issues Diagnosing Cavitation and its Causes • Addressing Flow and Pressure Irregularities • Dealing with Excessive Vibration and Noise • Identifying Causes of Overheating
1100 – 1215	Alignment & Balancing Methods for Shaft Alignment • Tools and Techniques for Precision Alignment • Rotor Balancing Procedures • Importance of Alignment for Longevity
1215 – 1230	Break
1230 – 1330	Failure Analysis of Pumps Understanding Common Modes of Failure • Root Cause Analysis Techniques • Case Studies on Pump Failures • Preventive Measures to Avoid Failures
1330 – 1420	Pump Rebuild & Overhauling Step-by-Step Overhaul Procedures • Inspection of Components During Rebuilding • Replacement Versus Repair Decisions • Testing after Rebuilding
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Three

Day 4: Wednesday, 02nd of July 2025

0730 – 0830	Lifecycle Management of Rotating Equipment Stages of Equipment Lifecycle • Planning for Replacement and Upgrades • Impact of Operational Conditions on Lifecycle • Total Cost of Ownership Considerations
0830 – 0930	Energy Efficiency & Optimization Identifying Energy-Saving Opportunities • Upgrades to Improve Efficiency • Variable Frequency Drives (VFDs) and Their Role • Monitoring and Reporting Energy Usage
0930 – 0945	Break
0945 – 1100	Advanced Diagnostic Techniques Thermography for Pump Condition Monitoring • Ultrasonic Testing for Early Fault Detection • Oil Analysis for Wear and Tear Prediction • Integrated Diagnostic Systems
1100 – 1215	Asset Management Systems Digital Tools for Asset Tracking • Maintenance Management Software • Integration with Enterprise Systems • Data Analysis for Decision-Making
1215 – 1230	Break



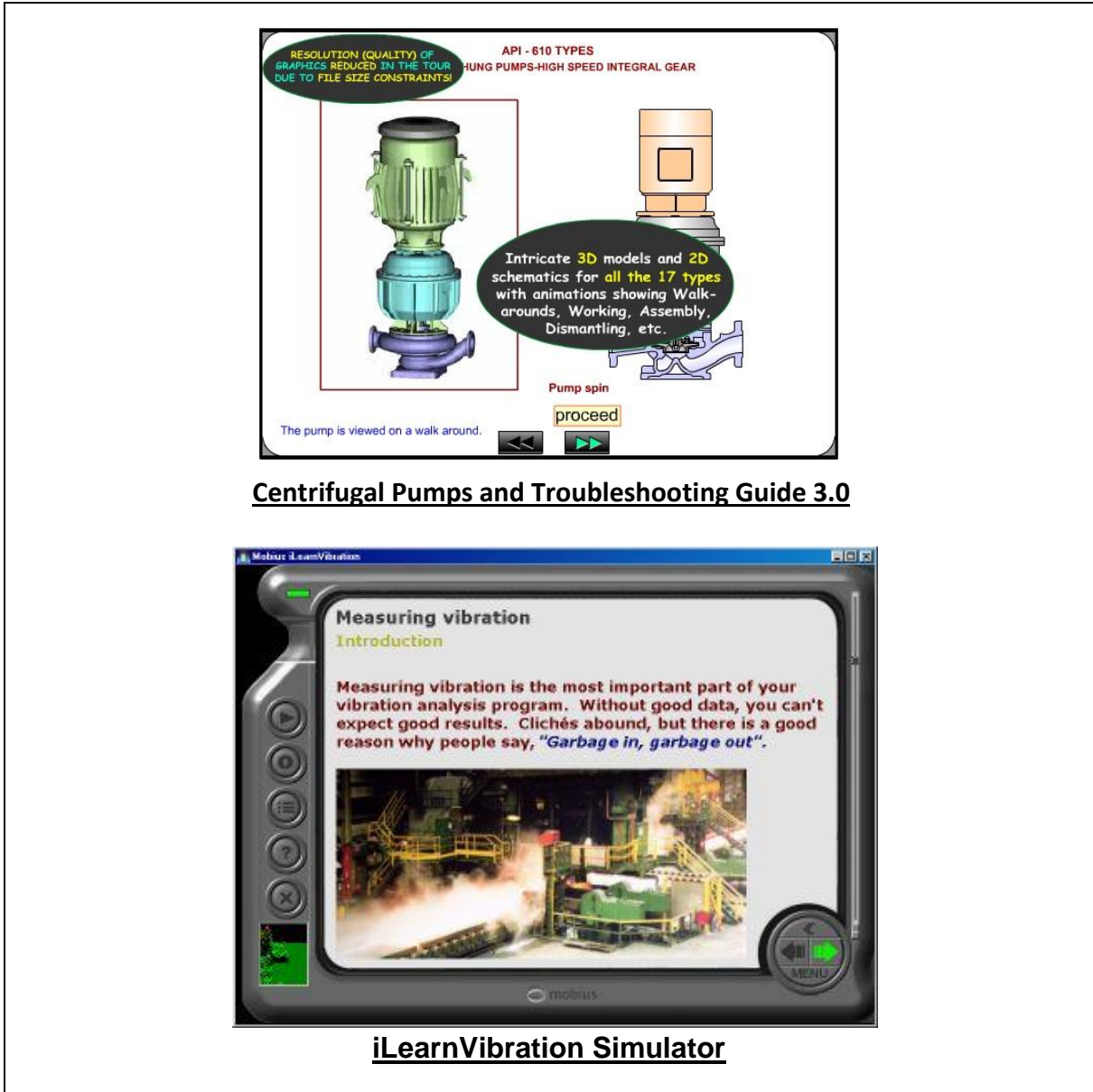
1230 – 1330	Environmental Considerations <i>Managing Leaks and Emissions • Adhering to Environmental Regulations • Sustainable Practices in Pump Operation • Recycling and Disposal of Old Equipment</i>
1330 – 1420	Workshop on Advanced Techniques <i>Hands-on Alignment Exercise • Vibration Analysis Simulation • Demonstration of Diagnostic Tools • Group Problem-Solving for Troubleshooting Scenarios</i>
1420 – 1430	Recap <i>Using this Course Overview, the Instructor(s) will Brief Participants about the were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow</i>
1430	<i>Lunch & End of Day Four</i>

Day 5: Thursday, 03rd of July 2025

0730 – 0830	High-Pressure Pump Systems <i>Design Considerations for High-Pressure Applications • Material and Seal Selection • Special Operational Challenges • Case Studies of High-Pressure System Failures</i>
0830 – 0930	Specialty Pumps & Applications <i>Cryogenic Pumps for Low-Temperature Fluids • Magnetic Drive Pumps for Hazardous Materials • Pumps in Corrosive Environments • Selection and Design Considerations</i>
0930 – 0945	<i>Break</i>
0945 – 1100	Pump System Upgrades & Retrofits <i>Identifying the Need for Upgrades • Retrofitting Older Systems for Improved Performance • Balancing Cost Versus Benefit • Examples of Successful Upgrades</i>
1100 – 1215	Industry Standards & Compliance <i>Overview of ASME and ISO Standards • Regulatory Requirements for Pump Systems • Audits and Certifications • Ensuring Compliance During Operations</i>
1215 – 1230	<i>Break</i>
1230 – 1300	Case Studies & Best Practices <i>Real-World Examples of Pump System Issues • Analysis of Successful Troubleshooting Cases • Lessons Learned from Failures • Best Practices in Operation and Maintenance</i>
1345 – 1400	Course Conclusion <i>Using this Course Overview, the Instructor(s) will Brief Participants about Topics that were Covered During the Course</i>
1315 – 1415	POST-TEST
1415 – 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch & End of Course</i>

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” “iLearnVibration Simulator”.



Course Coordinator

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org