

**COURSE OVERVIEW ME0375-4D**  
**Pump Selection, Installation, Operation, Performance, Control,**  
**Maintenance & Troubleshooting**

**Course Title**

Pump Selection, Installation, Operation, Performance, Control, Maintenance & Troubleshooting

**Course Date/Venue**

Session 1: August 26-29, 2024/Al Aziziya Hall, The Proud Hotel Al Khobar, Al Khobar, KSA

Session 2: November 18-21, 2024/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE



**Course Reference**

ME0375-4D

**Course Duration/Credits**

Four days/2.4 CEUs/24 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 course is designed to provide an in-depth perspective of centrifugal pump technology in terms of selection, operation, performance, control, maintenance and repair. Topics covered include pump types and terminology, packing, mechanical seals and sealing systems, bearings, couplings and other vital components. In addition, various pump types will be examined as to how they perform in their respective operating systems and advantages/disadvantages of various pump types will be discussed. Centrifugal pump operation, troubleshooting and maintenance will be dealt with in depth.



The course will provide participants with a complete and up-to-date knowledge of pumps and their systems. Further, participants will learn more about selection, operation and maintenance strategies which will assist in increasing pump availability and reliability. Upon the completion of this course, participants will be able to troubleshoot all types of pump problems.

### Course Objectives

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

- Apply proper techniques in selection, installation, operation, performance, control, maintenance and troubleshooting of various types of centrifugal pumps used in process industry
- Maintain and troubleshoot all types of pumps including the failure analysis and troubleshooting of packing and mechanical seals
- Properly maintain pump bearings and describe the importance of couplings and alignment
- Implement the maintenance and reliability programs to analyze and minimize pump costs and improve its reliability

### 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 centrifugal pumps for those who are involved in the selection, installation, operation, performance, control, maintenance and troubleshooting of pumps. This includes plant and maintenance engineers, process engineers, maintenance technical staff, production & operation staff and reliability specialists working in a wide variety of process plant environments such as petrochemical, plastics, fertilizers, power utilities, oil, gas and water utilities.

### 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 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 **2.4 CEUs** (Continuing Education Units) or **24 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 Fee

**US\$ 4,500** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

### Course 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 & Water Engineer with over 20 years of extensive experience in Water Distribution Systems & Pumping Stations, bSystem, Water Pumping, Water Pumps & Pumping Systems, Water Network Systems, Water Pipe Installation, Water Pipe Testing, Water Pipe Inspection, Water Pipe Repair, Water Treatment Systems, Water Pipeline Optimization, Water Desalination Plant, Water Pipeline Conveyor, Water Pollution Control, Water Pumping Stations, Water Audit & Leak Detection, Water Fittings Regulations & Standards, Water Pipe Troubleshooting, Potable Water Pipe Inspection, Water Pressure Calculation, Water Network Rehabilitation, Irrigation Network Design, Pumps Installation, Pipe Laying for Water & Sewer Networks, Pipe Installation Supervision, Water Meters & Water Tankers, Water House Connection Installation, Electro-fusion & Butt-fusion, HDPE, Water Tanks Filling Station Operation, Water Pipes Inspection & Repair, Water Treatment Technology, RO Plants, MSF Plants, Industrial Water Treatment, Piping System, Water Filtering, Galvanized Pipes Rehabilitation, Pipe Materials, Valve & Pipe Fittings, Joint Connections and Water Networks.** Further, he is also well-versed in **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 Manager** 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. Refaat 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 **Water Engineer** as well as **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.

### 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**

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	<b>PRE-TEST</b>
0830 – 0930	<b>Pump Types &amp; Terminology</b> Pumps • Pump Terminology • Nomenclature and Definitions • Pump Types
0930 – 0945	Break
0945 – 1100	<b>Centrifugal Pumps</b> Centrifugal Pump Theory • Operating Characteristics • Centrifugal Pump Operation • Cavitations and NPSH • Elements of Minimum Continuous Safe Flow (MCSF) • How to Calculate MCSF • Types of Centrifugal Pumps
1100 – 1200	<b>Centrifugal Pump Specification &amp; Selection</b> Selecting a Pump Vendor • Industry Standards • API vs. ANSI Standards • Driver Size Selection • Variable Speed Drive Selection • Pump Design Audit/Review
1200 – 1215	Break
1215 – 1420	<b>Centrifugal Pump Maintenance &amp; Repair</b> Parts of Centrifugal Pumps • Bearing Basics • Balancing Criteria • Installation and Startup • Troubleshooting Centrifugal Pumps • Inspecting Centrifugal Pump Components for Wear • Centrifugal Pump Overhaul • Case Studies
1420 – 1430	<b>Recap</b> 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**

0730 – 0930	<b>Positive Displacement Pumps</b> Reciprocating Pumps • NPSH Requirement for Reciprocating Pumps • Rotary Pump Theory and Operation • PD Pumps in the Operating System • How to Select Progressing Cavity Pumps
0930 – 0945	Break
0945 – 1100	<b>Special Purpose PD Pumps</b> Fluid Metering System Design and Options • PD Metering Pumps, Plunger Pumps, Diaphragm Pumps, Rotary Metering Pumps • Controlling Pulsation and Surge
1100 – 1200	<b>Selection of PD Pumps</b> Selecting Reciprocating (Power) Pumps • Selecting Rotary Gear Pumps • Selecting Screw Pumps • Handling Abrasives and Corrosives with PD Pumps



1200 - 1215	Break
1215 - 1420	<b>Positive Displacement Pump Operation, Maintenance &amp; Repair</b> Operation • Reciprocating (Power) Pump Liquid End Maintenance • Reciprocating Pump Valve Repair • Power End Maintenance • Stuffing Box Design and Upgrading • Case Studies
1420 - 1430	<b>Recap</b> 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**

0730 - 0930	<b>Packing &amp; Mechanical Seals</b> Compression Packing • Molded (Automatic) Packing • Basic Principles of Mechanical Seals • Face Materials • Secondary Seal Materials • Single Mechanical Seals • Single Mechanical Seal Flushing Plans
0930 - 0945	Break
0945 - 1100	<b>Mechanical Seal Systems</b> Dual Sealing Systems and Flushing Plans • API 682 Reference Guide • Gas Barrier Seal Technology • Tough Applications: Slurries, Pulp and Paper, Abrasives, Crystallizing Fluids, High Temperature Fluids, Autoclaves, Mixers and Reactors • Mechanical Seal Selection Strategies
1100 - 1200	<b>Mechanical Seal Failure Analysis &amp; Troubleshooting</b> Failure Analysis • Mechanical Seal Troubleshooting • Determining Leakage Rates • Ascertaining Seal Stability • Troubleshooting Hydraulic Instability
1200 - 1215	Break
1215 - 1420	<b>Mechanical Seal Maintenance &amp; Repair</b> Bellows Seal Repair • Cartridge Seal Installation and Management • Seal Face Care • Seal Consolidation and Standardization Programs
1420 - 1430	<b>Recap</b> 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**

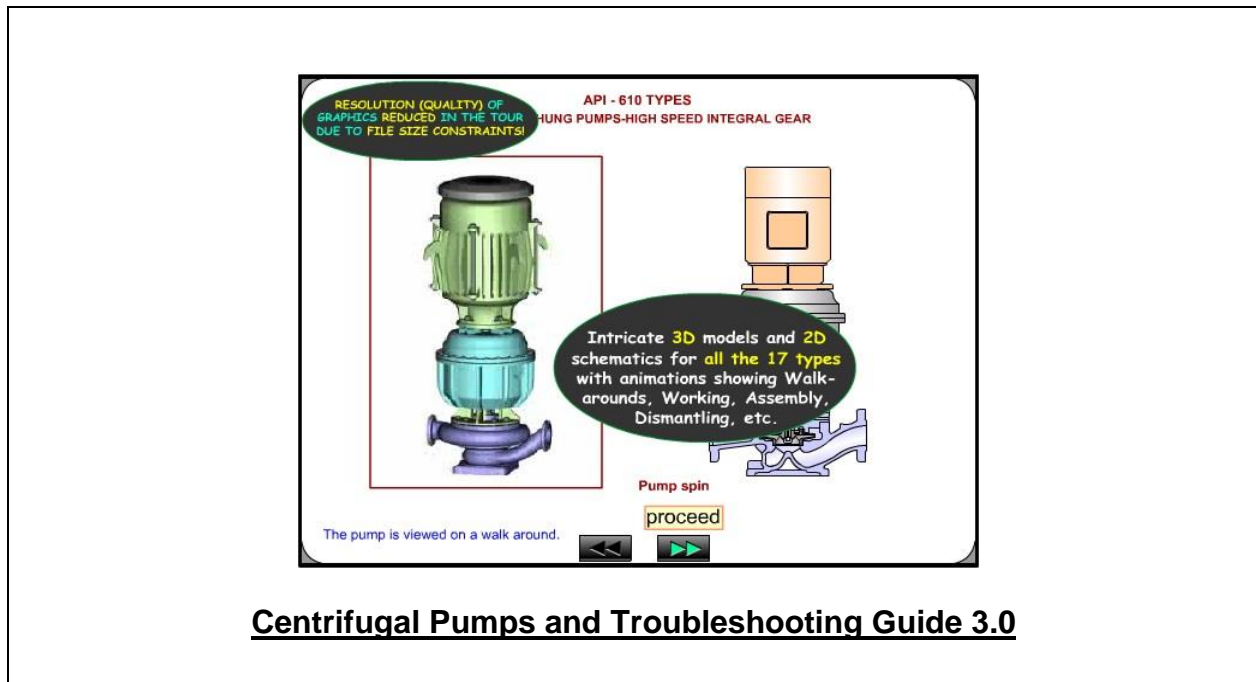
0730 - 0930	<b>Bearing Care &amp; Maintenance</b> Basic Concepts of Bearings • Bearing Classifications • Bearing Care and Maintenance • Lubrication Management
0930 - 0945	Break
0945 - 1100	<b>Couplings &amp; Alignment</b> Purpose of Couplings • Types of Couplings • Alignment Methods • Foundation and Grouting Guidelines • Inlet Piping Configuration and Piping Installation Guidelines
1100 - 1200	<b>Pump Maintenance &amp; Reliability</b> A Systems Approach to Pump Reliability • Predictive/Preventive • Addressing Pump Vibrations - Mechanical & Hydraulic • Fifty Upgrading Opportunities for Centrifugal Pumps



1200 - 1215	Break
1215 - 1345	<b>Reliability Programs</b> <i>Building Availability Data • Availability and Reliability Goals • How to Analyze Pump Costs • How to Initiate a Pump Reliability Improvement Program</i>
1345 - 1400	<b>Course Conclusion</b> <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course</i>
1400 - 1415	<b>POST-TEST</b>
1415 - 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch &amp; 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”.



**Course Coordinator**

Mari Nakintu, Tel: +971 2 30 91 714, Email: [mari1@haward.org](mailto:mari1@haward.org)