

COURSE OVERVIEW RE0126
Maintenance of Process Plant Equipment

Course Title

Maintenance of Process Plant Equipment

Course Date/Venue

Session 1: July 07-11, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Session 2: December 14-18, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

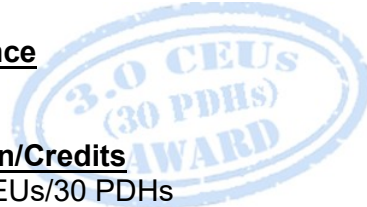


Course Reference

RE0126

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 process equipment maintenance and troubleshooting. It covers the process equipment, centrifugal pumps, positive displacement and vacuum pumps; the fans and blowers including its types and configurations, performance and system effects, performance correction, capacity control options, operation and troubleshooting; and the electric motors, gears and transmission equipment, and lubrication systems.



During this interactive course, participants will learn the maintenance planning approaches, regimes inspections and analytical on-line condition monitoring; the possible causes of vibration; the monitoring and diagnostic systems including pressure measurement, temperature measurement and vibration measurement; and troubleshooting as an extension of failure analysis.

Course Objectives

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

- Apply and gain an in-depth knowledge on process equipment maintenance and troubleshooting
- Identify process equipment, centrifugal pumps, positive displacement and vacuum pumps
- Recognize fans and blowers including its types and configurations, performance and system effects, performance correction, capacity control options, operation and troubleshooting
- Discuss electric motors, gears and transmission equipment, and lubrication systems
- Select maintenance planning approaches, inspect regimes and apply analytical on-line condition monitoring
- Identify the possible causes of vibration as well as recognize monitoring and diagnostic systems including pressure measurement, temperature measurement and vibration measurement
- Apply troubleshooting as an extension of failure analysis

Exclusive Smart Training Kit - H-STK®



Participants of this course will receive the exclusive “Howard 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 process equipment maintenance and troubleshooting for technical support, maintenance, operating and managerial personnel in process plants, refineries, air liquefaction, natural gas separation, geothermal mining, power generation and design contracting.

Course Fee

US\$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Howard 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 Certificate(s)

- (1) Internationally recognized Competency Certificates and Plastic Wallet Cards will be issued to participants who completed a minimum of 80% of the total tuition hours and successfully passed the exam at the end of the course. Certificates are valid for 5 years.

Recertification is FOC for a Lifetime.

Sample of Certificates

The following are sample of the certificates that will be awarded to course participants:





- (2) Official Transcript of Records will be provided to the successful delegates with the equivalent number of ANSI/IACET accredited Continuing Education Units (CEUs) earned during the course.

* Haward Technology * CEUs * Haward Technology * CEUs * Haward Technology * CEUs * Haward Technology *



Haward Technology Middle East

Continuing Professional Development (HTME-CPD)

CEUs

CEU Official Transcript of Records

TOR Issuance Date: 14-Nov-21
HTME No. 8667-2014-9020-2555
Participant Name: Abdulsatar Al Otaibi

Program Ref.	Program Title	Program Date	No. of Contact Hours	CEU's
RE0126-3D-IH	Process Equipment Maintenance & Troubleshooting	12 Nov-14 Nov, 2021	19.5	1.95

Total No. of CEU's Earned as of TOR Issuance Date **1.95**

TRUE COPY



Jaryl Castillo
Academic Director

Haward Technology has been approved as an Authorized Provider by the International Association for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this approval, 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 their Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for 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 is accredited by



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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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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.

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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.



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.





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	PRE-TEST
0830 – 0930	Introduction to Process Equipment Process Overview • Plant Types • Plant Layout • Process Equipment • Piping System • Control & Instrumentation • Safety
0930 – 0945	Break
0945 – 1130	Centrifugal Pumps Configurations & Styles • Application Ranges & Constraints • Construction Features and Options
1130 - 1230	Centrifugal Pumps (cont'd) Pump Auxiliaries • Wear Components • □ Canned Motor and Magnetic Drive Pumps
1230 - 1245	Break
1245 - 1420	Centrifugal Pumps (cont'd) High Speed/Low Flow Pumps • Servicing & Condition Monitoring • Operation • Control • Troubleshooting
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

0730 - 0930	Positive Displacement & Vacuum Pumps Reciprocating Steam & Power Pumps • Diaphragm Pumps • Plunger Pumps • Gear Screw & Progressive Cavity Pumps • Peristaltic Pumps
0930 – 0945	Break
0945 – 1030	Positive Displacement & Vacuum Pumps (cont'd) Conventional & Special Vacuum Pumps • Liquid Jet & Liquid Ring Pumps • Combination & Staged Vacuum Pumps • Operation • Control • Troubleshooting
1030 -1230	Fans & Blowers Types & Configurations • Performance & System Effects • Performance Correction • Capacity Control Options • Operation • Troubleshooting
1230 - 1245	Break
1245 - 1420	Electric Motors Design • Controls • Wiring Systems • Standard Motors • Special Designs • Major Components • The Motor as Part of a System • Adjustable Frequency Motors • Operation • Control • Troubleshooting
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

0730 - 0930	Gears & Transmission Equipment <i>Types of Gears • Applications Constraints • Maintenance • Troubleshooting</i>
0930 - 0945	Break
0945 - 1130	Lubrication Systems <i>Bearings & Seal Types • Lube Oil Selection • Medium Viscosity Turbine Oils (ISO Grade 68)</i>
1130 - 1230	Lubrication Systems (cont'd) <i>Inhibited Lubricants • Oil Cleaning & Conditioning</i>
1230 - 1245	Break
1245 - 1420	Maintenance Planning <i>Selecting Maintenance Approaches • Inspection Regimes • Analytical On-Line Condition Monitoring</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	Lunch & End of Day Three

Day 4

0730 - 0930	Video Presentation <i>Borescope Inspection of LM2500</i>
0930 - 0945	Break
0945 - 1130	Vibration - Possible Causes <i>Turbine Misalignment • Unbalanced Turbine • Rubbing Parts</i>
1130 - 1230	Vibration - Possible Causes (cont'd) <i>Lubrication Problems • Cracked or Worn Parts</i>
1230 - 1245	Break
1245 - 1420	Monitoring & Diagnostic Systems <i>Pressure Measurement • Temperature Measurement • Vibration Measurement</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	Lunch & End of Day Four

Day 5

0730 - 0930	Vibrations <i>Aerodynamic Flow-Induced Vibrations • Interpretation of Collected Data • Establishing Safe Operating Limits for Turbo Machinery</i>
0930 - 0945	Break
0945 - 1030	Troubleshooting as an Extension of Failure Analysis <i>Causes of Machine Failures • The "7-Cause Category Approach" to Root Cause Failure Analysis • Techniques</i>
1030 - 1230	Troubleshooting as an Extension of Failure Analysis (cont'd) <i>The Matrix Approach • The Cause and Effect Principle • Bearings • Journal and Tilt-Pad Thrust Bearings</i>
1130 - 1145	Break
1145 - 1215	Troubleshooting as an Extension of Failure Analysis (cont'd) <i>Patterns of Load Paths and their Meaning in Bearing Damage • Noise Signature Recordings • Action Planning and Decision-Making</i>

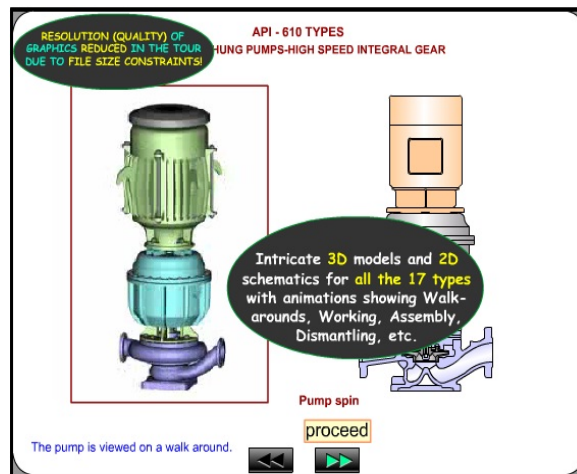




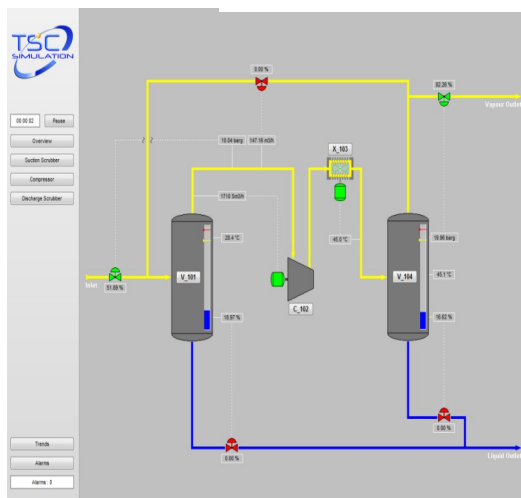
1215 - 1300	Video Presentation Mechanical Troubleshooting of Auxiliary Steam Turbine (Cleaning Turbine Parts, Adjusting Nozzle Clearance)
1300 - 1315	Course Conclusion Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course
1315 - 1415	COMPETENCY EXAM
1415 - 1430	Presentation of Course Certificates
1430	Lunch & End of Course

Simulator (Hands-on Practical Sessions)

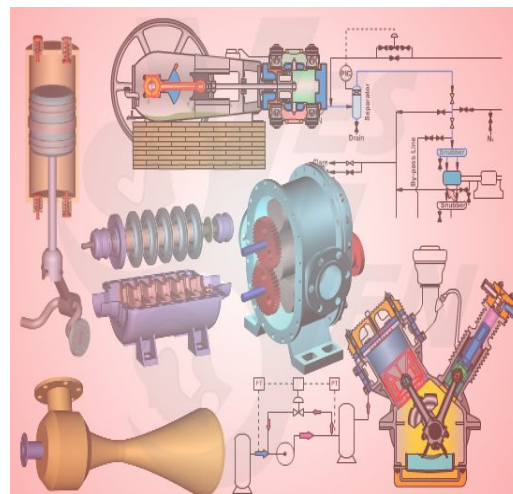
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the simulators “Centrifugal Pumps and Troubleshooting Guide 3.0”, “SIM 3300 Centrifugal Compressor”, “CBT on Compressors”, and “iLearnVibration Simulator”



Centrifugal Pumps and Troubleshooting Guide 3.0



SIM 3300 Centrifugal Compressor Simulator



CBT on Compressors



iLearnVibration Simulator

Course Coordinator

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