



COURSE OVERVIEW ME0447

Rotating Equipment: Pumps, Turbines & Compressors Technology: Design, Selection, Operation, Control, Inspection, Maintenance & Troubleshooting

Course Title

Rotating Equipment: Pumps, Turbines & Compressors Technology: Design, Selection, Operation, Control, Inspection, Maintenance & Troubleshooting

Course Date/Venue

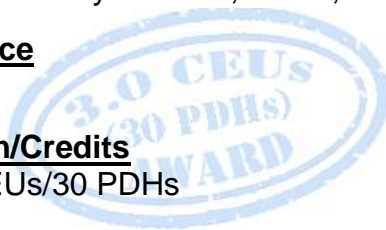
February 11-15, 2024/The Paragon Meeting Room, The H Hotel, Sheikh Zayed Road, Dubai, UAE

Course Reference

ME0447

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.

The course is designed to cover the machinery application. This includes the selection, operation, maintenance, inspection and troubleshooting of the various types of machinery such as compressors, pumps, motors, turbines, turbo-expanders, gears and transmission equipment. The course will feature a unique blend of practical application experience and basic analysis methods. Its aim is to convey a thorough understanding of machinery operating principles, equipment and specific operations.



The course will cover the principal machines represented at a large number of plants. There will be a thorough examination of basic operating concepts, application ranges, selection criteria, maintenance, inspection and vulnerabilities of certain types of equipment. The course will also review the short-cut selection and sizing methods for fluid machinery.



Upon the successful completion of this course, participants will have gained an understanding of the 12 principal types of machinery used in industry. They will understand the differences between electric motors, design peculiarities, advantages and disadvantages of different types of gears, operating principles of gas turbines and reciprocating gas engines.





The course will convey an understanding of impulse vs. reaction turbines, insights into application ranges, limitations, maintenance and operability constraints for different kinds of pumps, compressors and dynamic gas machinery such as turbo-machinery as opposed to displacement machinery.

The course includes an e-book entitled “*Machinery’s Handbook Pocket Companion*”, published by Industrial Press, which will be given to the participants to help them appreciate the principles presented in the course.

Course Objectives

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

- Select, operate, maintain, inspect and troubleshoot the major types of rotating equipment such as pumps, compressors, motors, turbines, etc
- Discuss electric motors, gears, transmission equipment, steam turbines and expanders
- Select and use centrifugal pumps, positive displacement and vacuum pumps, turbo-compressors, fans, blowers and displacement compressors
- Implement the shortcut calculation methods for fluid machinery
- Discuss machinery reliability and availability calculations

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, sample video clips of the instructor’s actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.

Who Should Attend

This course covers systematic techniques and methodologies on the selection, operation, maintenance, inspection and troubleshooting of rotating equipment for mechanical engineers, rotating equipment engineers, supervisors and other technical staff. Further, the course is suitable to all other engineering disciplines who are dealing with rotating equipment such as process engineers, chemical engineers, electrical engineers, plant engineers, project engineers and instrumentation engineers.

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:-

- 
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.

- 
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\$ 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 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 Maintenance & Reliability 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 Modern Maintenance & Reliability Management, Maintenance Errors, Maintenance Audit & Site Inspection, 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), 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, 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's** and **Bachelor's** 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: Sunday, 11th of February 2024

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 – 0930	Electric Motors Design • Controls • Wiring Systems • Standard Motors • Special Designs • Major Components • The Motor as Part of a System • Adjustable Frequency Motors
0930 – 0945	Break
0945 – 1100	Gears & Transmission Equipment Types of Gears • Applications Constraints • Maintenance
1100 – 1230	Gas Turbines & Engines Simple Cycle • Heat Recovery Cycles • Type Selection • Maintenance • Two and Four Cycle Gas Engines • Gas Engine Compressor Auxiliary Systems
1230 – 1245	Break
1245 – 1420	Steam Turbines & Expanders Impulse Turbines • Reaction Turbines • Application Ranges • Turbine Configurations • Applications Constraints • Maintenance
1420 – 1430	Recap
1430	Lunch & End of Day One

Day 2: Monday, 12th of February 2024

0730 – 0930	Steam Turbines & Expanders (cont'd) Turbo-expander Construction Features • Applications • Operation
0930 – 0945	Break
0945 – 1100	Centrifugal Pumps Configurations and Styles • Application Ranges and Constraints • Construction Features and Options • Pump Auxiliaries • Wear Components
1100 – 1230	Centrifugal Pumps (cont'd) Canned Motor and Magnetic Drive Pumps • High Speed/Low Flow Pumps • Servicing and Condition Monitoring
1230 – 1245	Break
1245 – 1420	Positive Displacement & Vacuum Pumps Reciprocating Steam and Power Pumps • Diaphragm Pumps • Plunger Pumps • Gear Screw and Progressive Cavity Pumps • Peristaltic Pumps
1420 – 1430	Recap
1430	Lunch & End of Day Two

Day 3: Tuesday, 13th of February 2024

0730 – 0930	Positive Displacement & Vacuum Pumps (cont'd) Conventional and Special Vacuum Pumps • Liquid Jet and Liquid Ring Pumps • Combination and Staged Vacuum Pumps
0930 – 0945	Break
0945 – 1100	Turbo-compressors Types, Styles and Configurations of Centrifugal and Axial Compressors • Construction Features • Mode of Operation • Compressor Auxiliaries and Support Systems



1100 – 1230	Turbo-compressors (cont'd) Condition Monitoring • Application Criteria • Performance Capabilities and Limitations • Maintenance
1230 – 1245	Break
1245 – 1420	Fans & Blowers Types and Configurations • Performance and System Effects
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, 14th of February 2024

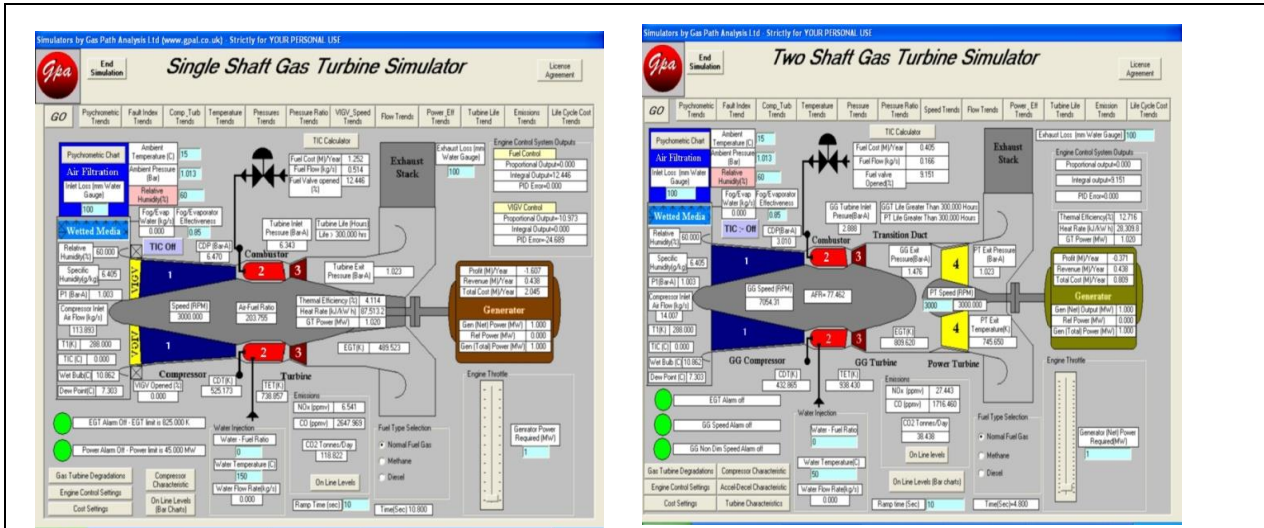
0730 – 0930	Fans & Blowers (cont'd) Performance Correction • Capacity Control Options
0930 – 0945	Break
0945 – 1100	Displacement Compressors Classification • Reciprocating Compressors vs. Rotary Screw Compressors
1100 – 1230	Displacement Compressors (cont'd) Application Ranges and Limitations • Compression Processes
1230 – 1245	Break
1245 – 1420	Displacement Compressors (cont'd) Construction Features and Components • Capacity Control
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: Thursday, 15th of February 2024

0730 – 0930	Theory & Shortcut Calculation Methods for Fluid Machinery Pumps
0930 – 0945	Break
0945 – 1100	Theory & Shortcut Calculation Methods for Fluid Machinery (cont'd) Turbines
1100 – 1230	Theory & Shortcut Calculation Methods for Fluid Machinery (cont'd) Compressors
1230 – 1245	Break
1245 – 1345	Machinery Reliability & Availability Calculations Reliability Indices • Machinery Systems Reliability Calculations
1345 – 1400	Course Conclusion
1400 – 1415	POST-TEST
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course

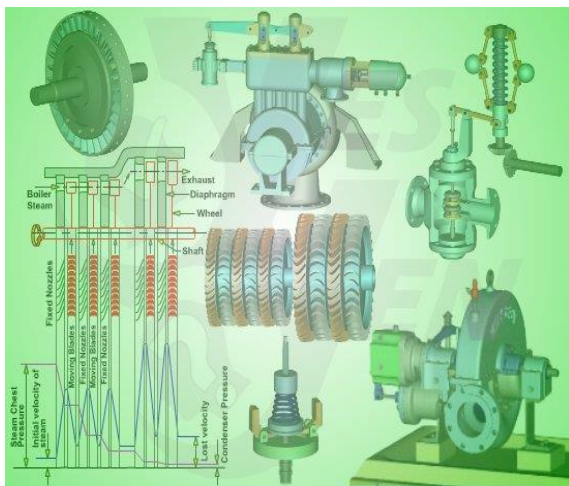
Simulator (Hands-on Practical Sessions)

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 “Single Shaft Gas Turbine Simulator” and “Two Shaft Gas Turbine Simulator”, “Steam Turbine & Governing System”, “Centrifugal Pumps and Troubleshooting Guide 3.0”, “SIM 3300 Centrifugal Compressor Simulator” & “CBT on Compressors” Simulators.

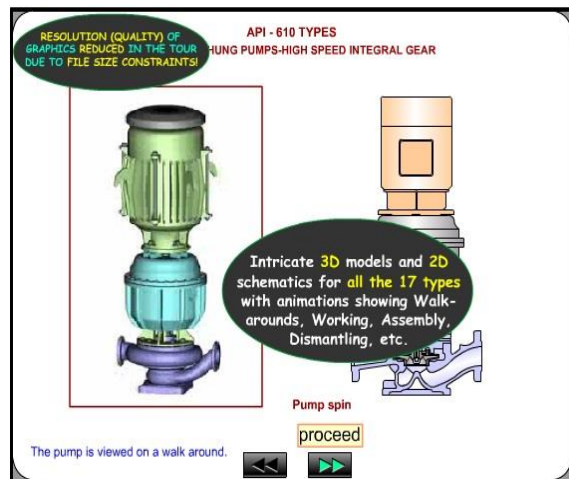


Single Shaft Gas Turbine Simulator

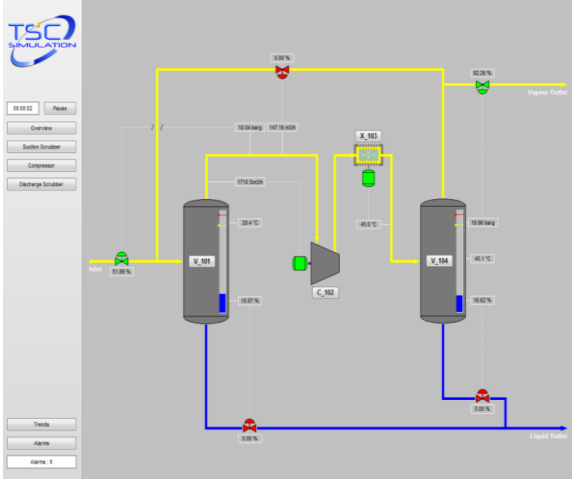
Two Shaft Gas Turbine Simulator



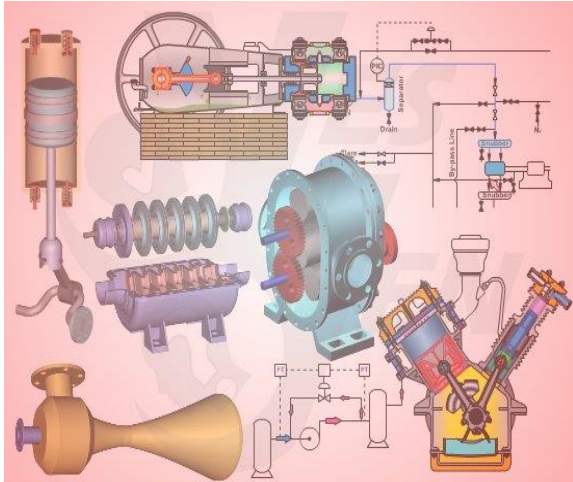
Steam Turbine & Governing System



Centrifugal Pumps and Troubleshooting Guide 3.0



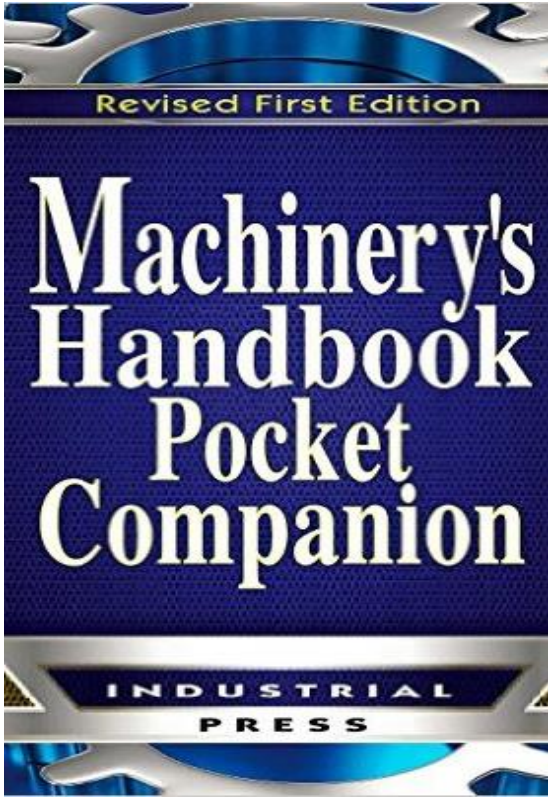
SIM 3300 Centrifugal Compressor Simulator



CBT on Compressors

Book(s)

As part of the course kit, the following e-book will be given to all participants:



Title : Machinery's Handbook Pocket Companion

ISBN : 9780831130954

Author : Christopher McCauley

Publisher : Industrial Press

Course Coordinator

Kamel Ghanem, Tel: +971 2 30 91 714, Email: kamel@haward.org