# 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**
November 17-21, 2024/Plaza 1, Elite Byblos Hotel Al Barsha, 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.***

This course is designed to cover the selection, operation, maintenance, inspection and troubleshooting of the various types of rotating equipment 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 "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, 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.

## 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 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 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. Roshdi Alkam** is a **Senior Mechanical Engineer** with over **35 years** of extensive experience within the **Oil & Gas**, **Petrochemical** and **Refining Industries**. His specialization widely covers in the areas of **Diesel Engine** Maintenance, **Centrifugal & Reciprocating Compressors**, **Pump Technology**, **Lubrication & Bearing** Maintenance, **Valve** Troubleshooting, **Mechanical & Dry Gas Seals**, **Gas & Steam Turbine**, **Boiler** Operation, **Mechanical Governors**, **Burners**, **Storage Tanks** Maintenance, **Pressure Vessel & Reactors**, **Heat Exchangers**, **Cooling Towers & Heaters**, **Steam Traps** Operation, **Flanges & Blinding**, **Piping System & Online Leak Sealing**, **Mechanical & Rotor Alignment & Balancing**, **Pump** Technology, **Pump** Selection & Installation, **Centrifugal Pumps & Troubleshooting**, **Compressor** Control & Protection, **Turbine** Operations, **Valves**, **Bearings & Lubrication**, Advanced **Machinery Dynamics**, **Heat Transfer**, **Process Plant Shutdown & Turnaround**, **Maintenance Optimization & Best Practices**, **Maintenance Auditing & Benchmarking**, **Reliability** Management and **Rotating Equipment**. Further, he is also well-versed in **Machinery Root Cause Failure Analysis** (**RCFA**), **Condition Based Monitoring**, **Piping System**, **Process Equipment**, **Mechanical Integrity**, **Maintenance Management**, **Reliability Management**, **Reliability Centred Maintenance** (**RCM**), Total Plant Maintenance (**TPM**), Reliability-Availability-Maintainability (**RAM**), **Engineering Drawings** and **P&ID** Reading, Interpretation & Developing.

Throughout Mr. Roshdi's professional career, he has handled key positions as the **Technical Instructor** for **Mechanical Trade**, **Maintenance Manager** and **Mechanical Engineer** for international companies and organizations such as United Nations Relief and Works Agency (**UNRWA**), The United Nations Educational, Scientific and Cultural Organization (**UNESCO**) and Azmi Sabri Contracting Company just to name a few. Further he has been the **Certified Process Operator Program** (**CPO**) **(Accredited by City & Guilds**) **Instructor** contracted by **KNPC** for the year 2014-2015 in delivering **Certified Program for Kuwaiti Contractor Employee**.

Mr. Roshdi has a **Bachelor's** degree and **Diploma** in **Mechanical Engineering** from the **University of Annaba**. He is also an active member of the **Jordan Engineers Association**, **JICA Alumni Association**, **GIZ Forum** (**Germany**) and the **UNESCO-UNEVOC e-Forum**. Further, he is a **Certified Instructor/Trainer** and has delivered numerous training, courses, seminars, workshops and conferences in his field of expertise.

## 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 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, 17th of November 2024***

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|---|---|
| *0730 – 0800* | *Registration & Coffee* |
| *0800 – 0815* | *Welcome & Introduction* |
| *0815 – 0830* | ***PRE-TEST*** |
| *0830 – 0930* | ***Electric Motors***<br>*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 and Transmission Equipment***<br>*Types of Gears • Applications Constraints • Maintenance* |
| *1100 – 1230* | ***Gas Turbines and Engines***<br>*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 and Expanders***<br>*Impulse Turbines • Reaction Turbines • Application Ranges • Turbine Configurations • Applications Constraints • Maintenance* |
| *1420 – 1430* | ***Recap*** |
| *1430* | *Lunch & End of Day One* |

***Day 2:*** ***Monday, 18th of November 2024***

| | |
|---|---|
| *0730 – 0930* | ***Steam Turbines and Expanders (cont'd)***<br>*Turbo-expander Construction Features • Applications • Operation* |
| *0930 – 0945* | *Break* |
| *0945 – 1100* | ***Centrifugal Pumps***<br>*Configurations and Styles • Application Ranges and Constraints • Construction Features and Options • Pump Auxiliaries • Wear Components* |
| *1100 – 1230* | ***Centrifugal Pumps (cont'd)***<br>*Canned Motor and Magnetic Drive Pumps • High Speed/Low Flow Pumps • Servicing and Condition Monitoring* |
| *1230 – 1245* | *Break* |

| | |
|---|---|
| *1245 – 1420* | ***Positive Displacement and Vacuum Pumps***<br>*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, 19th of November 2024***

| | |
|---|---|
| *0730 – 0930* | ***Positive Displacement and Vacuum Pumps (cont'd)***<br>*Conventional and Special Vacuum Pumps • Liquid Jet and Liquid Ring Pumps • Combination and Staged Vacuum Pumps* |
| *0930 – 0945* | *Break* |
| *0945 – 1100* | ***Turbo-compressors***<br>*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)***<br>*Condition Monitoring • Application Criteria • Performance Capabilities and Limitations • Maintenance* |
| *1230 – 1245* | *Break* |
| *1245 – 1420* | ***Fans and Blowers***<br>*Types and Configurations • Performance and System Effects* |
| *1420 – 1430* | ***Recap***<br>*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, 20th of November 2024***

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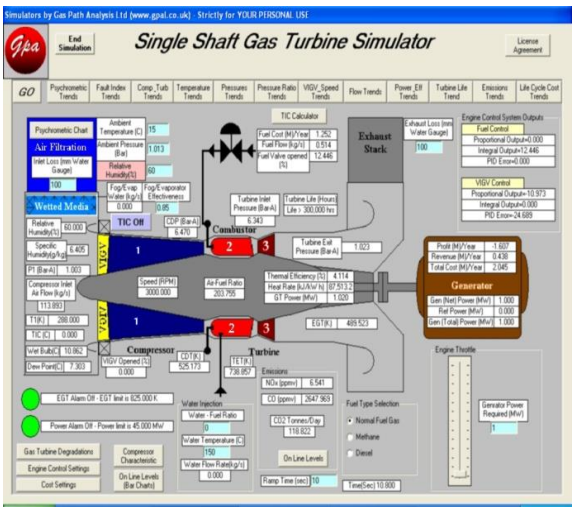
|---|---|
| *0730 – 0930* | ***Fans and Blowers (cont'd)***<br>*Performance Correction • Capacity Control Options* |
| *0930 – 0945* | *Break* |
| *0945 – 1100* | ***Displacement Compressors***<br>*Classification • Reciprocating Compressors vs. Rotary Screw Compressors* |
| *1100 – 1230* | ***Displacement Compressors (cont'd)***<br>*Application Ranges and Limitations • Compression Processes* |
| *1230 – 1245* | *Break* |
| *1245 – 1420* | ***Displacement Compressors (cont'd)***<br>*Construction Features and Components • Capacity Control* |
| *1420 – 1430* | ***Recap***<br>*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* |

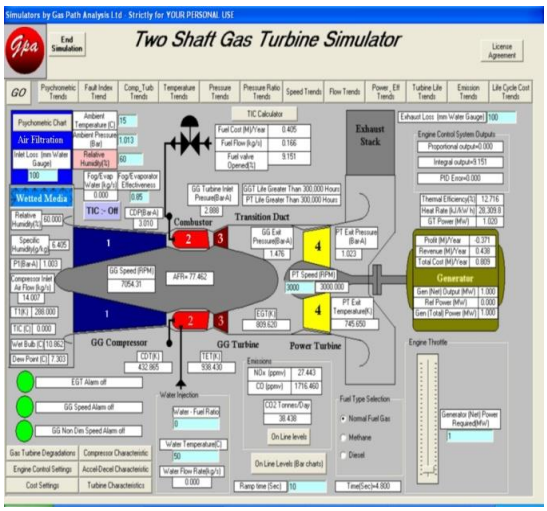
| Day 5: | Thursday, 21st of November 2024 |
|---|---|
| 0730 – 0930 | ***Theory & Shortcut Calculation Methods for Fluid Machinery***<br>*Pumps ● Turbines* |
| 0930 – 0945 | *Break* |
| 0945 – 1100 | ***Theory & Shortcut Calculation Methods for Fluid Machinery (cont'd)***<br>*Compressors* |
| 1100 – 1230 | ***Machinery Reliability and Availability Calculations***<br>*Reliability Indices* |
| 1230 – 1245 | *Break* |
| 1245 – 1345 | ***Machinery Reliability and Availability Calculations (cont'd)***<br>*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)

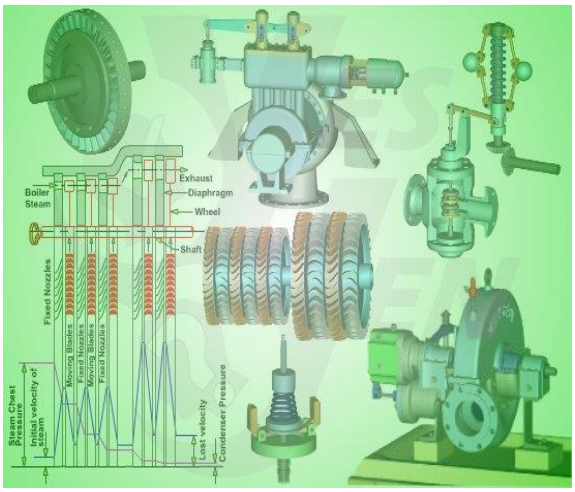
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art "Single Shaft Gas Turbine Simulator" and "Two Shaft Gas Turbine Simulator", "Steam Turbine & Governing System", "Centrifugal Pumps and Troubleshooting Guide 3.0", "SIM 3300 Centrifugal Compressor Simulator" and "CBT on Compressors" Simulators.



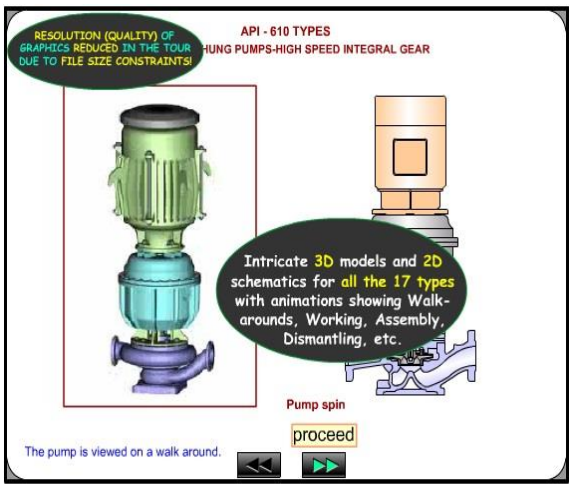

**Single Shaft Gas Turbine Simulator**



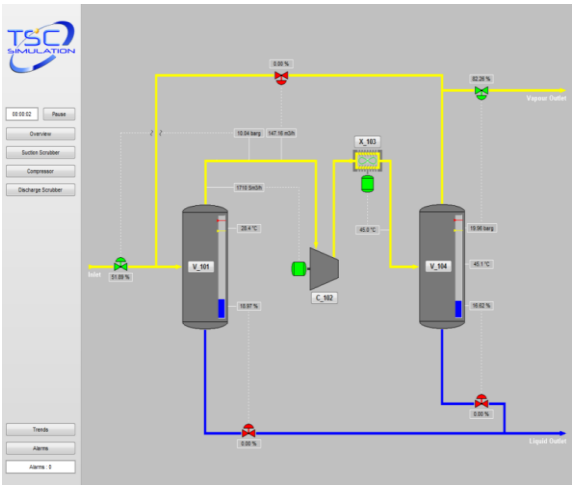

**Two Shaft Gas Turbine Simulator**



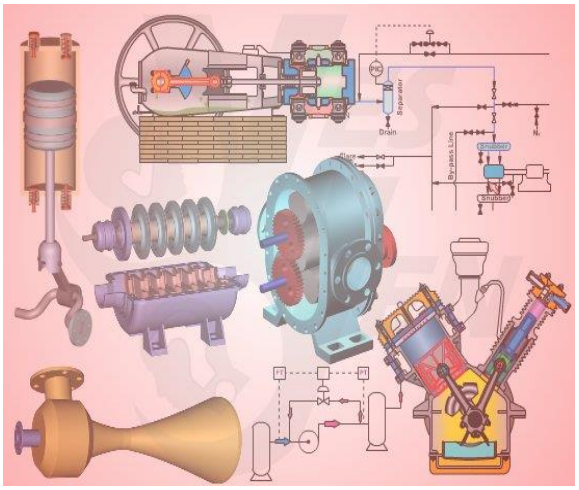

**Steam Turbine & Governing System**




**Centrifugal Pumps and Troubleshooting Guide 3.0**



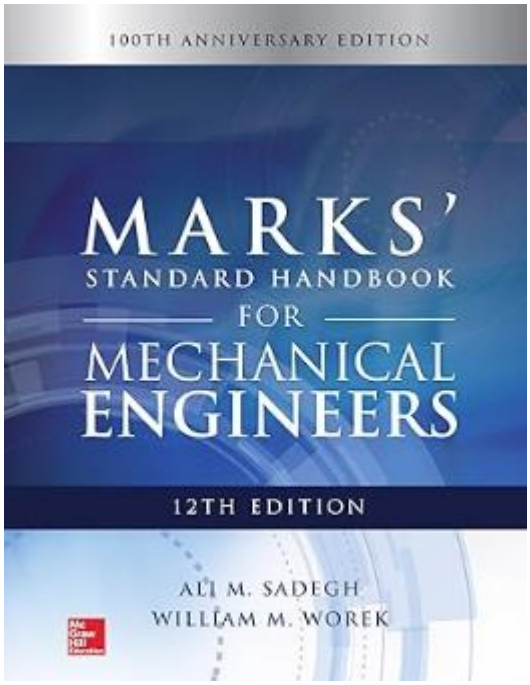
**SIM 3300 Centrifugal Compressor Simulator**



**CBT on Compressors**

## Book(s)

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




**Title** : Marks' Standard Handbook For Mechanical Enginerrs
**ISBN** : 1259588505
**Author** : Ali Sadegh, William Worek
**Publisher** :

## Course Coordinator

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