



**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**

October 28-November 01, 2024/Gallery 2 Meeting Room, London Marriott Hotel Kensington, London, United Kingdom

**Course Reference**

ME0447

**Course Duration/Credits**

Five days/3.0 CEUs/30 PDHs



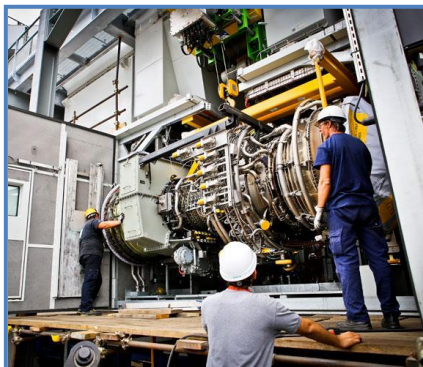
**Course Description**



***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

### **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.

### **Accommodation**

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

### **Course Fee**

**US\$ 8,800** per Delegate + **VAT**. This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

### **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 **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:



**Dr. Jalal Fairo, PhD, MBM, BSc**, is a **Senior Maintenance Engineer** with over **25 years** of international experience within the **Offshore & Onshore, Oil & Gas, Refinery, Petrochemical and Utilities** industries. His wide expertise covers **Pumps & Compressors**, Overhauling, **Pump Maintenance, Pumps & Valves**, Repair & Maintenance, Bearings & Seals, Centrifugal & Reciprocating **Compressors, Tubular & Pipe Handling, Tubular Strength, Casing & Tubing Design, Production/Injection Loads** for Casing Strings & Tubing, **Drilling Loads, Drilling & Production Thermal Loads, Well Architecture, Wellhead Integrity, Well Integrity & Artificial Lift, Well Integrity Management, Well Completion & Workover, Applied Drilling Practices, Horizontal Drilling, Petroleum Production, Coiled Tubing Technology, Corrosion Control, Slickline, Wireline & Coil Tubing, Pipeline Pigging, Corrosion Monitoring, Design, Specification, Construction, Inspection and Maintenance of Process Equipment, Process Plant Start-up & Commissioning, Process Plant Optimization Technology, Process Plant Performance & Efficiency, Process Plant Troubleshooting & Engineering Problem Solving, Process Safety Engineering, Process Engineering Calculations, Distillation Technology, Applied Natural Gas Processing & Dehydration, Process Plant Performance & Efficiency, LPG & Petrochemical Plants Process Technology, Conditioning Monitoring, Oil & Gas Processing and Gas Field Operations**. Further, his expertise includes **Piping Systems & Pipelines, Boilers, Rotating & Static Equipment** such as **turbines, pump, valve, compressor, blower, fan, pipe, pressure vessels and heat exchanger**, Compliance with **OSHA & ANSI/ASME Safety Requirements, Hazardous Materials Management (HAZMAT), Process Hazard Analysis (PHA), HAZOP, HAZIN, What-If and FMEA**. He is currently the **Certified Professional Trainer/Coach** and a **Certified Instructor/Consultant** of various engineering services providers to the international clients as he offers his expertise in many areas of the **drilling & petroleum discipline** and is well **recognized & respected** for his process and procedural expertise as well as ongoing participation, interest and experience in continuing to promote technology to producers around the world.

Dr. Jalal handled major managerial and technical responsibilities in many **international companies**. He has worked as the **Manager of Instrumentation & Control Department, the Production Manager, the Operation Manager** and he has further worked as a **Petroleum Engineer, Process Engineer, a Project Engineer, Senior Instrumentation & Control Engineer, Quality Manager, Project Manager, Member of the Parliament (MP)** and finally a **Senior Consultant** wherein he is responsible in different facets of **Petroleum & Process Engineering** from managing **asset integrity, well integrity process, pre-commissioning/commissioning and start up** onshore & offshore process facilities. Dr Jalal was the **Chairman** of the **International Parliamentary Union (IPU), Geneva and Switzerland** for more than 3 years.

Dr. Jalal has a **PhD in Management, a Master's degree in Business Management and Bachelor's degree in Petroleum Engineering** from the **University of Texas, USA**. Further, he has a **Higher Diploma in Training the Trainer/Professional Trainer** from the **Emerald College, UK**, a **Postgraduate Diploma in QAS Leadership** from the **British Standards Institute, UK** and a **Certified Professional Trainer** from the **International Academy for Training & Consultancy, UK**. Moreover, he is a **Certified Instructor/Trainer, a Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management (ILM)** and has delivered numerous trainings, courses, seminars, workshops and conferences internationally.





**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: Monday, 28<sup>th</sup> of October 2024**

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	<b>PRE-TEST</b>
0830 – 0930	<b>Electric Motors</b> 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	<b>Gears &amp; Transmission Equipment</b> Types of Gears • Applications Constraints • Maintenance
1100 – 1230	<b>Gas Turbines &amp; Engines</b> Simple Cycle • Heat Recovery Cycles • Type Selection • Maintenance • Two and Four Cycle Gas Engines • Gas Engine Compressor Auxiliary Systems
1230 – 1245	Break
1245 – 1420	<b>Steam Turbines &amp; Expanders</b> Impulse Turbines • Reaction Turbines • Application Ranges • Turbine Configurations • Applications Constraints • Maintenance
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day One

**Day 2: Tuesday, 29<sup>th</sup> of October 2024**

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

**Day 3: Wednesday, 30<sup>th</sup> of October 2024**

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





1100 – 1230	<b>Turbo-compressors (cont'd)</b> Condition Monitoring • Application Criteria • Performance Capabilities and Limitations • Maintenance
1230 – 1245	Break
1245 – 1420	<b>Fans &amp; Blowers</b> Types and Configurations • Performance and System Effects
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: Thursday, 31<sup>st</sup> of October 2024**

0730 – 0930	<b>Fans &amp; Blowers (cont'd)</b> Performance Correction • Capacity Control Options
0930 – 0945	Break
0945 – 1100	<b>Displacement Compressors</b> Classification • Reciprocating Compressors vs. Rotary Screw Compressors
1100 – 1230	<b>Displacement Compressors (cont'd)</b> Application Ranges and Limitations • Compression Processes
1230 – 1245	Break
1245 – 1420	<b>Displacement Compressors (cont'd)</b> Construction Features and Components • Capacity Control
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 Four

**Day 5: Friday, 01<sup>st</sup> of November 2024**

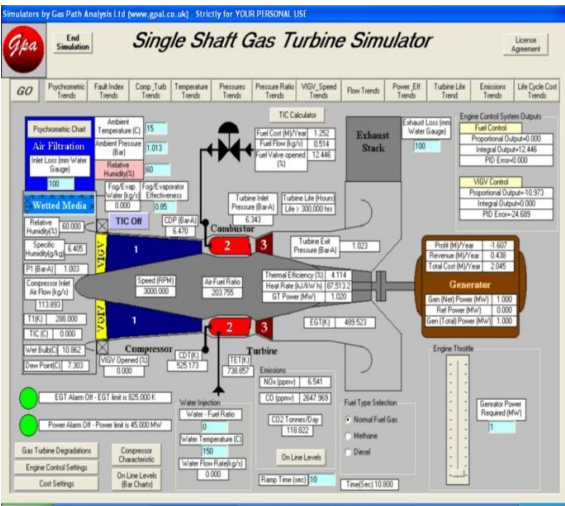
0730 – 0930	<b>Theory &amp; Shortcut Calculation Methods for Fluid Machinery</b> Pumps • Turbines
0930 – 0945	Break
0945 – 1100	<b>Theory &amp; Shortcut Calculation Methods for Fluid Machinery (cont'd)</b> Compressors
1100 – 1230	<b>Machinery Reliability &amp; Availability Calculations</b> Reliability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



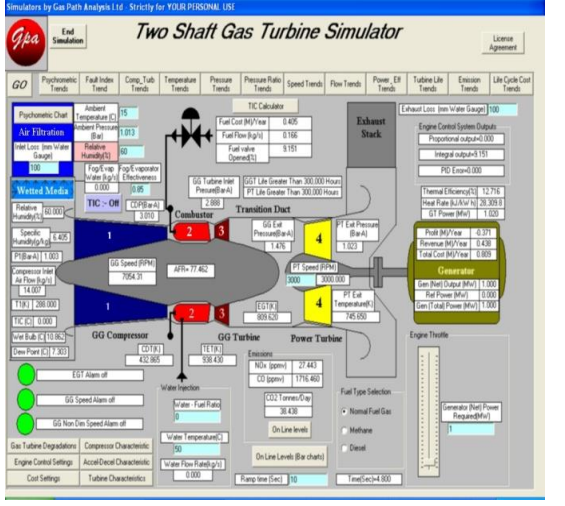


### Simulator (Hands-on Practical Sessions)

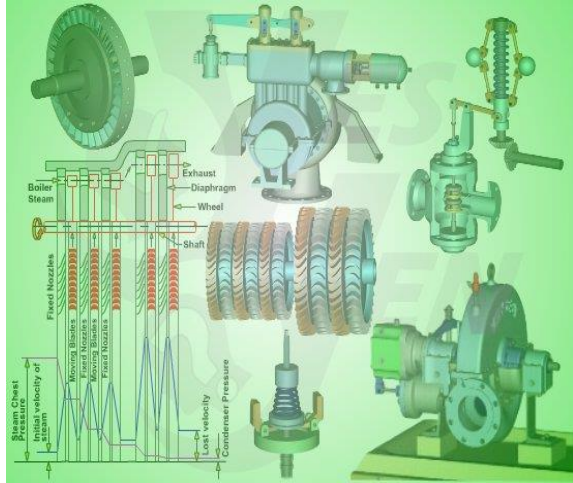
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art “Single Shaft Gas Turbine Simulator” and “Two Shaft Gas Turbine Simulator”, “Steam Turbine & Governing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



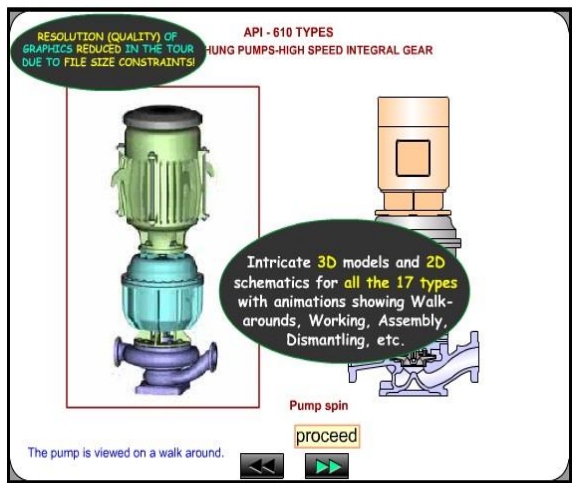
**Single Shaft Gas Turbine Simulator**



**Two Shaft Gas Turbine Simulator**

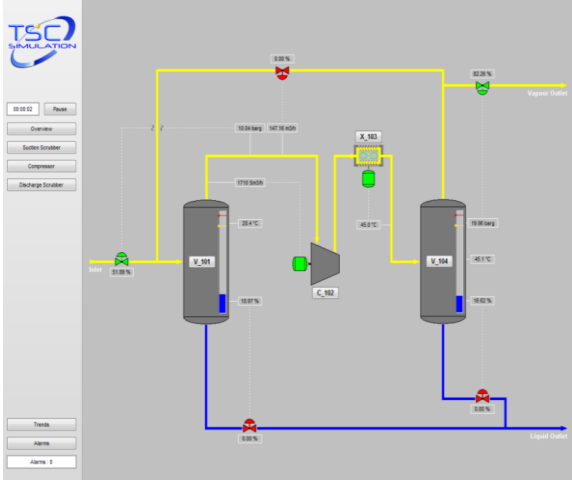


**Steam Turbine & Governing System**

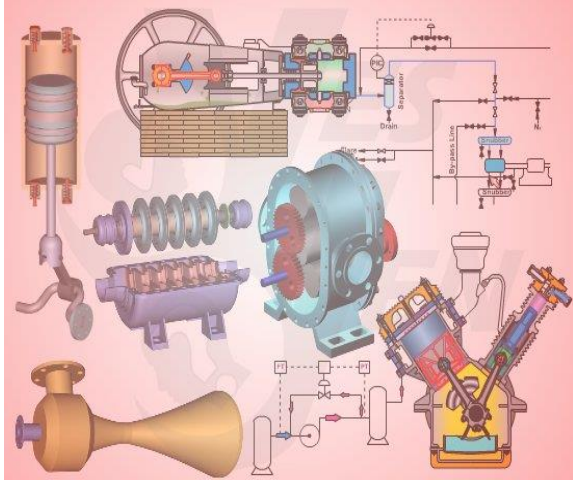


**Centrifugal Pumps and Troubleshooting Guide 3.0**





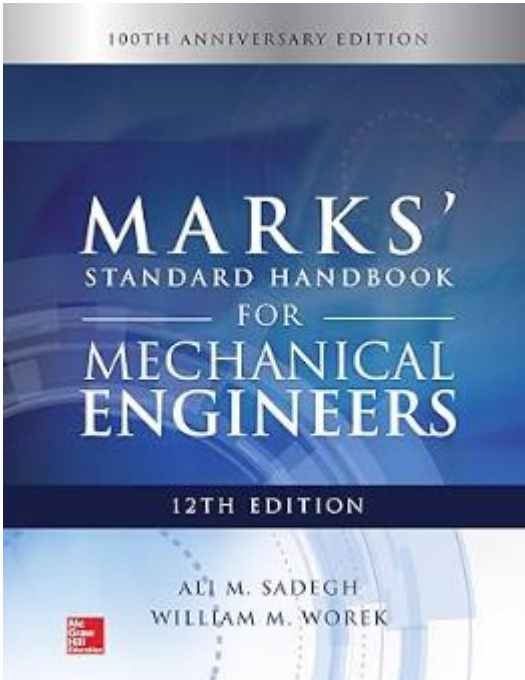
**SIM 3300 Centrifugal Compressor Simulator**



**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 Engineers

**ISBN** : 1259588505

**Author** : Ali Sadegh, William Worek

**Publisher** :

**Course Coordinator**

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