



COURSE OVERVIEW ME0015
Centrifugal Compressor & Steam Turbine Design,
Performance, Operation, Maintenance & Troubleshooting

Course Title

Centrifugal Compressor & Steam Turbine Design,
Performance, Operation, Maintenance &
Troubleshooting

Course Date/Venue

December 21-25, 2025/Meeting Plus 6, City Centre
Rotana Doha, Doha, Qatar

Course Reference

ME0015

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.

Centrifugal Compressors and Mechanical Drive Steam Turbines are used extensively in the process industries. There are many types with widely varying configurations and applications. Compressors and steam turbines represent a significant part of the capital and operating costs of most plants, and optimizing their selection is therefore, of major economic importance.

The course deals with design features, efficiencies, operating characteristics, reliability and maintenance implications of centrifugal compressors and their steam turbine drivers.

The course will cover the operating principles of centrifugal compressors and steam turbines, specifications, their design, thermodynamics, effects of efficiency on operating costs, energy usage, and effect on plant costs, materials of construction, selection, troubleshooting and maintenance.

The course will provide the participant with a basic as well as advanced centrifugal compressor and steam turbine technology knowledge inventory required to successfully select, apply, operate, troubleshoot and maintain compression and steam turbine equipment.



Upon completion of this course, participants will have gained a thorough understanding of the various centrifugal compressor and steam turbine configurations available to most industrial users, including mechanical design features, sizing and application criteria, maintainability, reliability, vulnerability and troubleshooting issues. Participants will learn simple techniques and short-cut methods of machinery sizing and selection. This replaces tedious hand or other methods of calculation and will serve as a fast way to arrive at sensitivity or influence of parameter changes on equipment performance.

Participants will be able to determine the most appropriate and efficient matching of steam turbine drivers to compressors. Participants will also acquire knowledge of operating and maintenance issues by getting to know mechanical design, machinery components, connecting piping design as well as proven approaches to monitoring, troubleshooting and maintaining compressor installations.

Course Objectives

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

- Apply a comprehensive knowledge in the mechanical design, performance, operation, maintenance and troubleshooting of centrifugal compressor and steam turbine
- Illustrate the different alignment techniques and support criteria for centrifugal compressor and steam turbines
- Describe parameters of thermodynamics, capacity, power, efficiency, gas properties and intercooling for turbocompressors
- Select centrifugal process compressors by utilizing calculation methods, characteristic curves and stability criteria
- Employ the proper procedure for compressor train inspection, maintenance, overhaul and repair
- Explain in detail the mechanical design, configurations, application ranges and constraints for steam turbines
- Identify the different turbine components which include turbine rotors, balancing, rotor dynamics, casings, bearings, shaft sealing devices and lube oil management
- Perform the selection and sizing of steam turbines for compressor drives and recognize the operation and maintenance of steam turbines
- Emphasize approaches to machinery troubleshooting, cite examples from recent failure incidents attributed to design defects and maintenance deficiencies
- Explain the difference between predictive and preventive maintenance techniques and determine which method to use
- Carryout machinery reliability audits and reviews as well as recognize the importance of reliability enhancement efforts



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 compressor & steam turbine for those directly involved in the design, performance, operation, maintenance and troubleshooting of such equipment. This course is also intended for rotating equipment and machinery engineers, plant and maintenance engineers and other technical staff involved in turbomachinery management, operation and maintenance. Further, it is suitable for operations, process and process unit contact, mechanical and project 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.

Accommodation

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

Course Fee

US\$ 6,000 per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.



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

Haward's certificates are accredited by the following international accreditation organizations:

-  British Accreditation Council (BAC)

Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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.

-  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:



Dr. Tony Dimitry, PhD, MSc, BSc, is a **Senior Mechanical & Maintenance Engineer** with over **30 years** of industrial experience within the **Petroleum, Oil & Gas, Petrochemical, Nuclear & Power** industries. His expertise covers **Gas & Steam Turbine Maintenance, Compressor Inspection, Maintenance, Overhaul & Repair, Pumps & Compressors, Pressure Vessel Design, Fabrication & Testing, Boiler, Pressure Vessel & Piping Systems, External Pressure Design & Considerations, ASME**

Boiler & Pressure Vessels Code, Pipe Stress Analysis, Pipeline System Design, Construction, Maintenance and Repair, Facilities & Pipeline Integrity Assessment, Pipeline Welding Practices, Revising Piping Layouts & Isometrics, P&ID Reading & Interpretation, Glass Reinforced Epoxy (GRE), Glass Reinforced Pipes (GRP), Glass Reinforced Vent (GRV), Mechanical Pipe Fittings, Flange Joint Assembly, Adhesive Bond Lamination, Butt Jointing, Joint & Spool Production, Isometric Drawings, Flange Assembly Method, Fabrication & Jointing, Jointing & Spool Fabrication, Pipe Cuttings, Flange Bolt Tightening Sequence, Hydro Testing, Failure Analysis Methodologies, Machinery Root Cause Failure Analysis (RCFA), Preventive Maintenance & Condition Monitoring, Reliability Centred Maintenance (RCM), Risk Based Inspection (RBI), Root Cause Analysis (RCA), Planning & Managing Plant Turnaround, Scheduling Maintenance, Data Archive Maintenance, Master Milestone Schedule (MMS), Piping & Mechanical Vibration Analysis, Preventive & Predictive Maintenance (PPM) Maintenance, Condition Based Monitoring (CBM), Risk Based Assessment (RBA), Planning & Preventive Maintenance, Maintenance Management (Preventive, Predictive, Breakdown), Reliability Management, Rotating Equipment, Scheduling & Cost Control, Maximo Foundation, Maximo Managing Work, Asset Management Best Practices, Resource Management, Inventory Set-up & Management, Work Management, Automatic & Work Flows & Escalations, Vibration Analysis, Heat Exchanger, Siemens, Turbo-Expanders, Fractional Columns, Boilers, Cryogenic Pumps for LNG, Electromechanical Maintenance, Machinery Alignment, Lubrication Technology, Bearing & Rotary Machine, Blower & Fan, Shaft Repair, Safety Relief Valves, Pipelines, Piping, Pressure Vessels, Process Equipment, Diesel Engine & Crane Maintenance, Tanks & Tank Farms, Pneumatic System, Static Equipment, FMEA, Corrosion, Metallurgy, Thermal and Electrical Modelling of Battery Problems. He is also well-versed in various simulators such as i-Learn Vibration, AutoCAD, Word Access, Aspen One, Fortran, VB, C ANSYS, ABAQUS, DYNA3D, Ceasar, Caepipe, MS Project, Primavera, MS Excel, Maximo, Automation Studio and SAP. Currently, he is the **Maintenance Manager of the PPC Incorporation wherein he is responsible for the maintenance and upgrading of all **Power Station** components.**

During his career life, Dr. Dimitry held a significant positions such as the **Operations Engineers, Technical Trainer, HSE Contracts Engineer, Boilers Section Engineer, Senior Engineer, Trainee Mechanical Engineer, Engineer, Turbines Section Head, Professor, Lecturer/Instructor and Teaching Assistant** from various multinational companies like **Chloride Silent Power Ltd., Technical University of Crete, National Nuclear Corporation, UMIST Aliveri Power Station and HFO Fired Power Station.**

Dr. Dimitry has **PhD, Master and Bachelor** degrees in **Mechanical Engineering** from the **Victory University of Manchester** and the **University of Newcastle, UK** respectively. Further, he is a **Certified Instructor/Trainer, a Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management (ILM)** and an associate member of the **American Society of Mechanical Engineers (ASME)** and **Institution of Mechanical Engineers (IMechE)**. He has further delivered various trainings, seminars, courses, 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: Sunday, 21st of December 2025

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 – 0930	Introduction to Compressor Types Centrifugal • Axial • Reciprocating • Helical Screw • Ranges of Application and Limitations
0930 – 0945	Break
0945 – 1100	Mechanical Design of Centrifugal Compressors Compressor Side Streams • Rotors • Balancing
1100 – 1215	Mechanical Design of Centrifugal Compressors (cont'd) Rotor Dynamics • Impellers • Casings
1215 – 1230	Break
1230 – 1420	Mechanical Design of Centrifugal Compressors (cont'd) Bearings • Seals • Couplings • Controls
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: Monday, 22nd of December 2025

0730 – 0930	Alignment Techniques & Support Criteria Review of Dial Indicator Methods • Laser Optic Cold Alignment • On-Stream (Hot) Alignment Verification Techniques
0930 – 0945	Break
0945 – 1100	Basic Compressor Parameters Thermodynamics • Capacity • Power • Efficiencies • Gas Properties • Intercooling
1100 – 1215	Selection of Centrifugal Process Compressors Calculation Methods • Characteristic Curves • Stability
1215 – 1230	Break
1230 – 1420	Compressor Train Inspection, Maintenance, Overhaul & Repair-IMO&R IMO&R Planning • Execution • Documentation
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: Tuesday, 23rd of December 2025

0730 – 0930	Compressor Train Inspection, Maintenance, Overhaul & Repair-IMO&R (cont'd) IMO&R • Q & As • Troubleshooting
0930 – 0945	Break
0945 – 1100	Steam Turbines Operating Principles & Mechanical Design • Impulse Turbines • Reaction Turbines



1100 – 1215	Steam Turbines (cont'd) <i>Application Ranges • Configurations • Application Constraints</i>
1215 – 1230	Break
1230 – 1420	Turbine Components <i>Turbine Rotors • Blading • Diaphragms • Nozzles • Steam Chests • Glands & Gland Systems • Bearings</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: Wednesday, 24th of December 2025

0730 – 0930	Turbine Components (cont'd) <i>Balancing • Rotor Dynamics • Governing Systems • Lube Oil Management</i>
0930 – 0945	Break
0945 – 1100	Selection & Sizing of Steam Turbines for Compressor Drives <i>Steam (Water) Rates • Condensing and Backpressure Turbines • Single and Multistage Types • Process Considerations</i>
1100 – 1215	Operation & Maintenance of Steam Turbines <i>Commissioning • Startup • Run-In & Shut-down • Surveillance & Health Monitoring • Performance Measurement • Monitoring and Tracking</i>
1215 – 1230	Break
1230 – 1420	Operation & Maintenance of Steam Turbines (cont'd) <i>Steam Turbine Washing • Steam Turbine Inspection • Maintenance Overhaul & Repair (IMO&R)</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

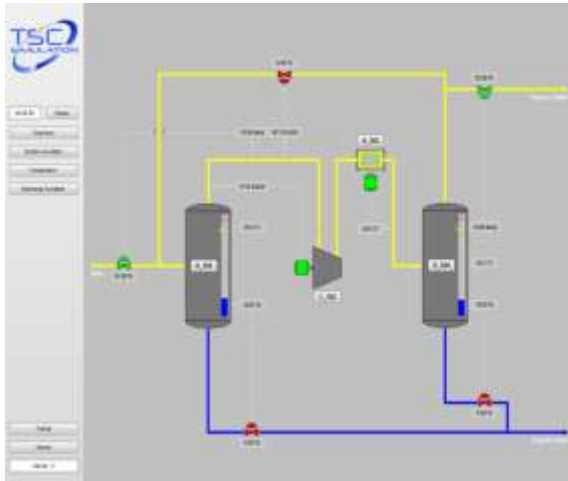
Day 5: Thursday, 25th of December 2025

0730 – 0930	Basic Approaches to Machinery Troubleshooting <i>Examples from Recent Failure Incidents Attributed to Design Defects • Processing & Manufacturing Deficiencies • Assembly Errors • Off-Design or Unintended Service Conditions • Maintenance Deficiencies, etc.</i>
0930 – 0945	Break
0945 – 1100	Predictive vs. Preventive Maintenance Techniques <i>Determination of Which Method to Use</i>
1100 – 1215	Machinery Reliability Audits & Reviews <i>Overview</i>
1215 – 1230	Break
1230 – 1345	Machinery Reliability Audits & Reviews (cont'd) <i>Reliability Impact on Plants</i>
1345 – 1400	Course Conclusion <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course</i>
1400 – 1415	POST TEST
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course

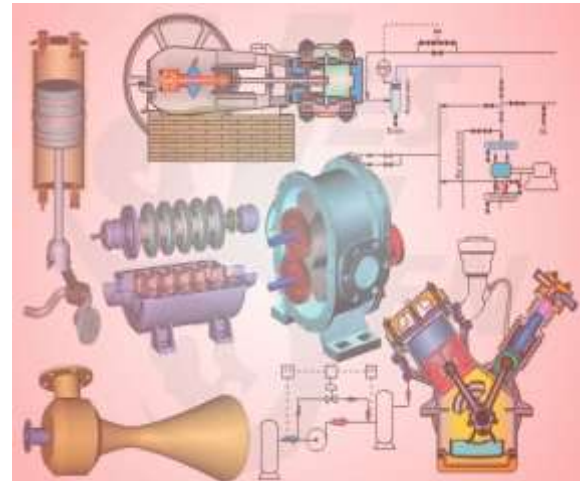


Simulator (Hands-on Practical Sessions)

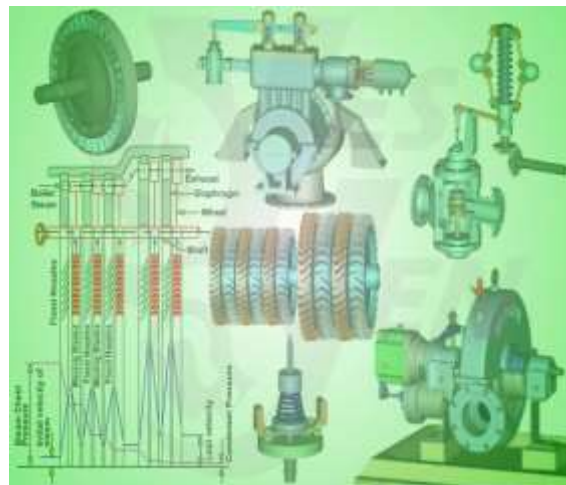
Practical session will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the state-of-the-art simulators “SIM 3300 Centrifugal Compressor”, “CBT on Compressors” and “Steam Turbines & Governing System CBT”.



SIM 3300 Centrifugal Compressor Simulator



CBT on Compressors



Steam Turbines & Governing System CBT

Course Coordinator

Reem Dergham, Tel: +974 4423 1327, Email: reem@haward.org