



**COURSE OVERVIEW ME0670-4D**

**Centrifugal Gas Compressor**

*Operation, Control, Startup, Shutdown, Maintenance & Troubleshooting*

**Course Title**

Centrifugal Gas Compressor: *Operation, Control, Startup, Shutdown, Maintenance & Troubleshooting*

**Course Date/Venue**

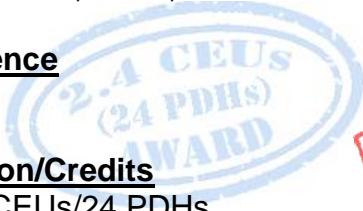
September 02-05, 2024/Boardroom, Warwick Hotel Doha, Doha, Qatar

**Course Reference**

ME0670-4D

**Course Duration/Credits**

Four days/2.4 CEUs/24 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 delegates with a good working knowledge on centrifugal MEK compressors - hands on training. It covers the general description and key features of compressors including shaft, impellers/blades, balance drum and thrust collar, casing and diaphragm bundle/stator vanes, journal and thrust bearing, oil seals and instrumentation.



The course will also discuss the gas path, abnormal operating conditions, compressor performance curves and regulations. It will further cover the compressor operations, compressor control system, line up procedure, startup procedure, shutdown procedure, safety protection system and troubleshooting.

After the completion of the course, participants will be able to apply compressor maintenance in general, antisurge protection system, lube oil system, sealing system, assembly, disassembly and maintenance procedures.

### Course Objectives

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

- Apply proper techniques, tools and procedures in the operation, control, startup, shutdown, maintenance and troubleshooting of centrifugal gas compressor
- Discuss the general description of compressors and identify its key features
- Identify the principles of gas path and fluid flow in a centrifugal compressor
- Recognize the abnormal operating conditions practices in centrifugal compressors
- Illustrate compressor performance curves including its design and efficiency
- Describe the compressor operations, control system, lineup procedure, startup procedure, shutdown procedure, safety protection system and troubleshooting
- Discuss the general overview of compressor maintenance
- Identify the proper compressor maintenance procedures used in antisurge protection system, lube oil system and sealing system
- Discuss the maintenance of compressors during assembly and disassembly
- Employ the detailed maintenance procedure used in centrifugal compressors

### 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 covers systematic techniques and methodologies on the operation, control, startup, shutdown, maintenance and troubleshooting of centrifugal gas compressors for engineers, shift supervisors, foremen and other technical staff.

### 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 **2.4 CEUs** (Continuing Education Units) or **24 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.

### 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. Karl Thanasis**, PEng, MSc, MBA, BSc, is **Senior Mechanical & Maintenance Engineer** with over **30 years** of extensive industrial experience. His wide expertise includes **Piping & Pipeline, Maintenance, Repair, Shutdown, Turnaround & Outages, Maintenance & Reliability Management, Mechanical Maintenance Planning, Scheduling & Work Control, Advanced Techniques in Maintenance Management, Predictive & Preventive Maintenance, Maintenance & Operation Cost Reduction Techniques, Reliability Centered Maintenance (RCM), Machinery Failure Analysis, Rotating Equipment Reliability Optimization & Continuous Improvement, Material Cataloguing, Mechanical & Rotating Equipment Troubleshooting & Maintenance, Root Cause Analysis & Reliability Improvement, Condition Monitoring, Root Cause Failure Analysis (RCFA), Steam Generation, Steam Turbines, Power Generator Plants, Gas Turbines, Combined Cycle Plants, Boilers, Process Fired Heaters, Air Preheaters, Induced Draft Fans, All Heaters Piping Work, Refractory Casting, Heater Fabrication, Thermal & Fired Heater Design, Heat Exchangers, Heat Transfer, Coolers, Power Plant Performance, Efficiency & Optimization, Storage Tank Design & Fabrication, Thermal Power Plant Management, Boiler & Steam System Management, Pump Operation & Maintenance, Chiller & Chiller Plant Design & Installation, Pressure Vessel, Safety Relief Valve Sizing & Selection, Valve Disassembling & Repair, Pressure Relief Devices (PSV), Hydraulic & Pneumatic Maintenance, Advanced Valve Technology, Pressure Vessel Design & Fabrication, Pumps, Turbo-Generator, Turbine Shaft Alignment, Lubrication, Mechanical Seals, Packing, Blowers, Bearing Installation, Couplings, Clutches and Gears.** Further, he is also versed in **Wastewater Treatment Technology, Networking System, Water Network Design, Industrial Water Treatment in Refineries & Petrochemical Plants, Piping System, Water Movement, Water Filtering, Mud Pumping, Sludge Treatment and Drying, Aerobic Process of Water Treatment that includes Aeration, Sedimentation and Chlorination Tanks.** His strong background also includes **Design and Sizing of all Waste Water Treatment Plant Associated Equipment such as Sludge Pumps, Filters, Metering Pumps, Aerators and Sludge Decanters.**

Mr. Thanasis has acquired his thorough and practical experience as the **Project Manager, Plant Manager, Area Manager - Equipment Construction, Construction Superintendent, Project Engineer and Design Engineer.** His duties covered **Plant Preliminary Design, Plant Operation, Write-up of Capital Proposal, Investment Approval, Bid Evaluation, Technical Contract Write-up, Construction and Sub-contractor Follow up, Lab Analysis, Sludge Drying and Management of Sludge Odor and Removal.** He has worked in various companies worldwide in the **USA, Germany, England and Greece.**

Mr. Thanasis is a **Registered Professional Engineer** in the **USA and Greece** and has a **Master's and Bachelor's** degrees in **Mechanical Engineering with Honours** from the **Purdue University** and **SIU in USA** respectively as well as an **MBA** from the **University of Phoenix** in **USA.** Further, he is a **Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management (ILM)** a **Certified Instructor/Trainer** and has delivered numerous trainings, courses, seminars, workshops and conferences worldwide.

**Course Fee**

**US\$ 5,000** per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

**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, 02<sup>nd</sup> of September 2024**

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	<b>PRE-TEST</b>
0830 – 0930	<b>Compressors - General Description &amp; Key Features</b> Shaft • Impellers/Blades • Balance Drum and Thrust Collar • Casing and Diaphragm Bundle/Stator Vanes • Journal & Thrust Bearings • Oil Seals • Instrumentation
0930 – 0945	Break
0945 – 1100	<b>Gas Path</b> Fluid Flow in Centrifugal Compressor • Axial Thrust
1100 – 1215	<b>Abnormal Operating Conditions - Overview</b> Centrifugal compressor Unsteady Flows • Rotating Stall • Surge • Choking
1215 – 1230	Break
1230 – 1420	<b>Compressor Performance Curves &amp; Regulations</b> Design Considerations • Efficiency Considerations • Operating Planes • Basic Principle of Compressors Operations • System Resistance Curve Modification
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 One

**Day 2: Tuesday, 03<sup>rd</sup> of September 2024**

0730 – 0830	<b>Compressor Operations</b>
0830 – 0930	<b>Compressor Control System</b>
0930 – 0945	Break
0945 – 1100	<b>Line Up Procedure</b>
1100 – 1230	<b>Startup Procedure</b>
1230 – 1245	Break
1245 – 1420	<b>Shutdown Procedure</b>
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day Two

**Day 3: Wednesday, 04<sup>th</sup> of September 2024**

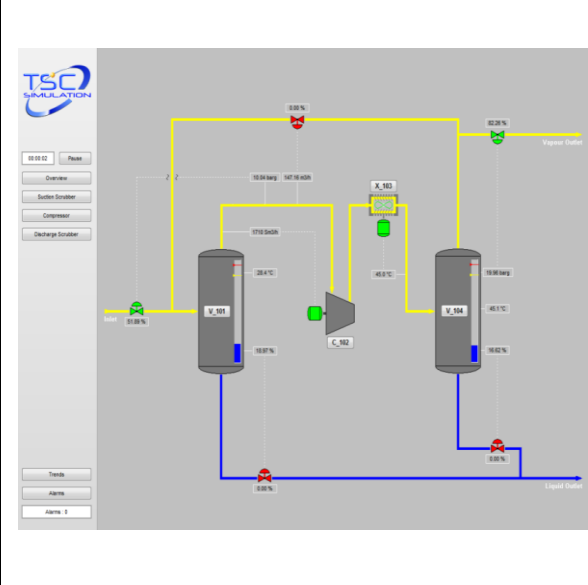
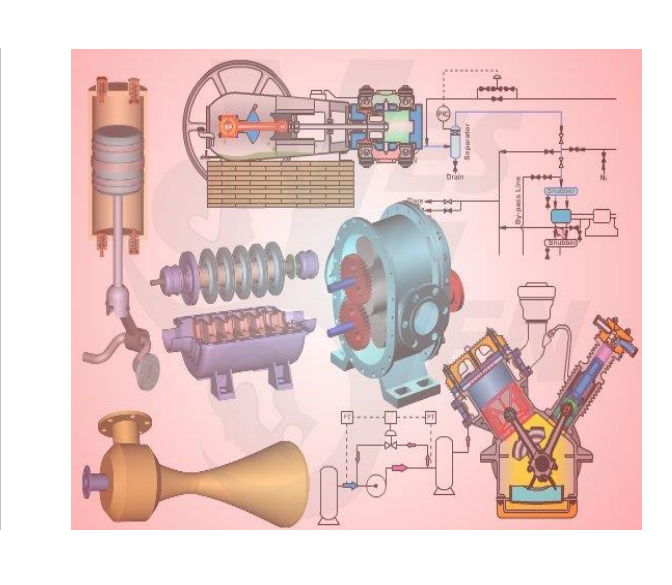
0730 – 0930	<b>Safety Protection System</b>
0930 – 0945	Break
0945 – 1230	<b>Troubleshooting</b>
1230 – 1245	Break
1245 – 1330	<b>Compressor Maintenance-General</b> Suction Temperature Variation • Suction Pressure Variation • Compressor Internal Leakage • Fouling Effect
1330 – 1420	<b>Compressor Maintenance-Antisurge Protection System</b> Protection System Philosophy • Mechanical Failure Alarm • Lube Oil Alarm • Seal Oil Alarm • Condition Monitoring
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, 05<sup>th</sup> of September 2024**

0730 – 0930	<b>Compressor Maintenance-Lube Oil System</b> Description of Components • Electrical Instruments-Typical Loops • Jacking Oil System (if applicable) • Alarm and Shut-Down • Routine Check During Normal Operation • Identifying Malfunctions & Faults
0930 – 0945	Break
0945 – 1100	<b>Compressor Maintenance-Sealing System</b> Scope of the System • Description of Components • Electrical Instruments-Typical Loops • Alarm and Shut-Down • Seal Operation • Routine Check During Normal Operation • Identifying Malfunctions & Faults
1100 – 1230	<b>Compressor Maintenance-Assembly &amp; Disassembly</b> Special Tools • Clearance Measurements
1230 – 1245	Break
1245 – 1345	<b>Compressor Maintenance-Maintenance Procedures</b> Minor and Major Maintenance • Preventive Maintenance • IMO&R Planning • Execution • Documentation • Q&As • Troubleshooting
1345 – 1400	<b>Course Conclusion</b> Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course
1400 – 1415	<b>POST-TEST</b>
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 “SIM 3300 Centrifugal Compressor” and “CBT on Compressors” simulators.

	
<p><b><u>SIM 3300 Centrifugal Compressor Simulator</u></b></p>	<p><b><u>CBT on Compressors</u></b></p>

**Course Coordinator**

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