

## COURSE OVERVIEW ME0669-4D Centrifugal, Reciprocating & Screw Compressor

**Course Title**

Centrifugal, Reciprocating & Screw Compressor

**Course Date/Venue**

September 09-12, 2024/Crowne Meeting Room,  
Crowne Plaza Al Khobar, an IHG Hotel, Al  
Khobar, KSA

**Course Reference**

ME0669-4D

**Course Duration/Credits**

Four days/2.4 CEUs/2.4 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 participants with a detailed and up-to-date overview of Centrifugal, Reciprocating & Screw Compressor. It covers the various types of compressors and the principles of gas compression; the effect of staging, stage and interstage cooling; the mechanical design and systematic alignment techniques; the support criteria of centrifugal compressors; the centrifugal compressor parameters and selecting centrifugal process compressors; and the positive displacement compressors, reciprocating compressor cycle and effect of staging.



During this interactive course, participants will learn the oil free cylinders of floating pistons; the condensation and liquid slugs; the valve response, capacity control of reciprocating compressor and performance considerations; the gas pulsations and reduction of pulsations; the proper techniques in starting up, running and shutting down compressors; and the screw compressors, its areas of application, operating principles, capacity control and performance.

### Course Objectives

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

- Apply and gain a good working knowledge on centrifugal, reciprocating and screw compressor
- Discuss the various types of compressors and employ the principles of gas compression
- Identify the effect of staging, stage and interstage cooling
- Illustrate mechanical design, employ systematic alignment techniques and determine the support criteria of centrifugal compressors
- Describe centrifugal compressor parameters and select centrifugal process compressors
- Recognize positive displacement compressors, reciprocating compressor cycle and effect of staging
- Discuss oil free cylinders of floating pistons as well as condensation and liquid slugs
- Describe the valve response and capacity control of reciprocating compressor
- Explain performance considerations as well as gas pulsations and reduction of pulsations
- Employ proper techniques in starting up, running and shutting down compressors in a professional manner
- Discuss screw compressors, its areas of application, operating principles, capacity control and performance

### Who Should Attend

This course is intended for rotating equipment/machinery engineers, plant engineers and/or maintenance engineers involved in turbomachinery operations and/or maintenance, superintendents, supervisors, foremen and other technical staff involved in turbomachinery management, operation and/or maintenance, operations, process and/or process unit contact engineers and mechanical and/or project engineers.

### 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 conveniently saved in a **Tablet PC**.*

### Course Fee


**US\$ 4,500** per Delegate + **VAT**. This rate includes H-STK® (Howard 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


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. Den Bazley, PE, BSc**, is a **Senior Mechanical Engineer** with over **30 years** of industrial experience in **Oil, Gas, Refinery, Petrochemical, Power and Utilities** industries. His wide expertise includes **Pumps & Compressors Maintenance & Troubleshooting, Centrifugal Pump Design, Hydraulic Turbines, Axial Flow Compressor, Centrifugal Pump Installation & Operation, Centrifugal Pump Maintenance & Troubleshooting, Centrifugal & Positive Displacement Pump Technology, Pumps & Valves Operation, Bearings, Seals & Couplings, Compressors & Turbines Maintenance & Troubleshooting, Gas Turbine Design & Maintenance, Gas Turbine Troubleshooting, Pressure Vessel Design, Fabrication & Testing, Tank & Tank Farms, Heat Exchangers Operation & Maintenance, Boilers & Steam System Management, Re-tubing & Tube Expanding Technology, Propylene Compressor & Turbine, Valve Installation & Repair, Safety Relief Valve Sizing & Troubleshooting, Dry Gas Seal Operation, Mechanical Seal Installation & Maintenance, Industrial Equipment & Turbomachinery, Pumps, Compressors, Turbines & Motors, Boiler & Steam System Management, Tune-Up, Heat Recovery & Optimization, Bearing & Lubrication, Installation & Failure Analysis, Boiler Operation & Maintenance, Process Control Valves, Steam Turbine Operation, Bearing Mounting/Dismounting, Valve Types, Troubleshooting & Repair Procedure, Pressure Vessels & Heat Exchangers, Corrosion Inspection, PSV Maintenance & Testing, Pump Maintenance, Machinery Troubleshooting, Valves, Safety Relief Valves, Strainers & Steam Traps, Pipeline Rules of Thumb, Analytical Prevention of Mechanical Failure, Gear Boxes Troubleshooting & Repair, Piping & Pipeline Design & Inspection, Pigging & Integrity Assessment, Process Piping Design, Pipeline Operation & Maintenance, Welding & Fabrication, Brazing, Fitness-for-Service (FFS), Process Plant Equipment, Pressure Vessels, Piping & Storage Facilities, Layout of Piping Systems & Process Equipment, Pipe Work Design & Fabrication, Mechanical Integrity & Reliability, Mechanical Rotating Equipment & Turbomachinery, Motors & Variable Speed Drives, Mechanical Engineering Design, Process Plant Shutdown, Turnaround & Troubleshooting, Mechanical Alignment, Laser & Dial-Indicator Techniques, Material Cataloguing, Condition Based Monitoring, Maintenance Management, Reliability Management, Reliability Centred Maintenance (RCM), Total Plant Maintenance (TPM) and Reliability-Availability-Maintainability (RAM), Engineering Drawings, Codes & Standards, P&ID Reading, Interpretation & Developing, Maintenance & Reliability Best Practices, Maintenance Auditing, Benchmarking & Performance Improvement, Excellence in Maintenance & Reliability Management, Preventive & Predictive Maintenance & Machinery Failure Analysis (RCFA), Total Plant Reliability Centered Maintenance (RCM), Rotating Equipment Reliability Optimization, Machinery Failure Analysis, Prevention & Troubleshooting, Maintenance Planning, Scheduling & Work Control and Maintenance Planning & Cost Estimation.**

During his career life, Mr. Bazley has gained his practical and field experience through his various significant positions and dedication as the **General Manager, Branch Manager, Refinery Chairman, Engineering Manager, Maintenance Engineer, Construction Engineer, Project Engineer, Mechanical Engineer, Associate Engineer, Oil Process Engineer, Mechanical Services Superintendent, Quality Coordinator, Planning Coordinator, Consultant/Instructor, Lecturer/Trainer and Public Relations Officer** for numerous international companies like **ESSO, FFS Refinery, Dorbyl Heavy Engineering (VECOR), Vandenberg Foods (Unilever), Engen Petroleum, Royle Trust and Pepsi-Cola**.

Mr. Bazley is a **Registered Professional Engineer** and has a **Bachelor degree in Mechanical Engineering**. Further, he is a **Certified Engineer** (Government Certificate of Competency GCC Mechanical Pretoria), a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership and Management (ILM)**, an active member of the **Institute of Mechanical Engineers (IMechE)** and has delivered numerous trainings, courses, seminars and workshops internationally.

### 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: Monday, 09<sup>th</sup> of September 2024**

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	<b>PRE-TEST</b>
0830 – 0930	<b>Compressor Types</b>
0930 – 0945	Break
0945 – 1030	<b>Principles of Gas Compression</b>
1030 – 1115	<b>Effect of Staging, Stage and Interstage Cooling</b>
1115 – 1230	<b>Mechanical Design of Centrifugal Compressors</b>
1230 – 1245	Break
1245 – 1330	<b>Centrifugal Compressor Alignment Techniques &amp; Support Criteria</b>
1330 – 1420	<b>Centrifugal Compressor Parameters</b>
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day One

#### **Day 2: Tuesday, 10<sup>th</sup> of September 2024**

0730 – 0830	<b>Selection of Centrifugal Process Compressors</b>
0830 – 0930	<b>Positive Displacement Compressors</b>
0930 – 0945	Break
0945 – 1100	<b>Reciprocating Compressor Cycle</b>
1100 – 1230	<b>Effect of Staging</b>
1230 – 1245	Break
1245 – 1330	<b>Oil Free Cylinders–Floating Pistons</b>
1330 – 1420	<b>Condensation</b>
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day Two

#### **Day 3: Wednesday, 11<sup>th</sup> of September 2024**

0730 – 0830	<b>Liquid Slugs</b>
0830 – 0930	<b>Reciprocating Compressor Valves–Valve Response</b>
0930 – 0945	Break

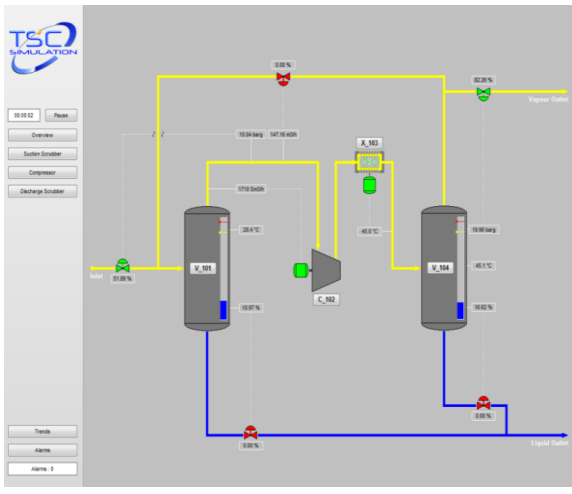
0945 – 1100	<b>Reciprocating Compressor Capacity Control</b>
1100 – 1230	<b>Performance Considerations</b>
1230 – 1245	Break
1245 – 1330	<b>Gas Pulsations–Reduction of Pulsations</b>
1330 – 1420	<b>Starting up, Running, Shutting Down</b>
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day Three

**Day 4: Thursday, 12<sup>th</sup> of September 2024**

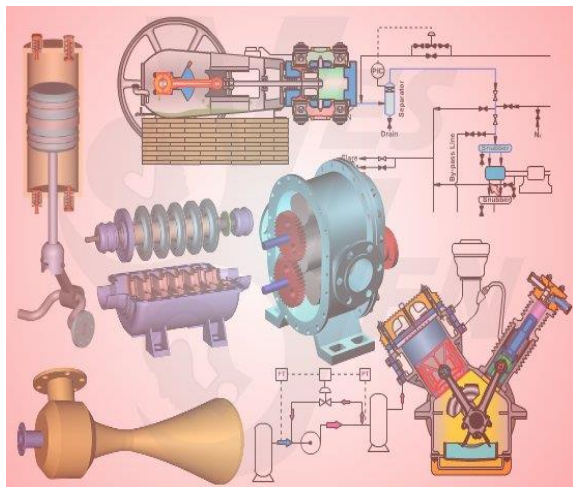
0730 – 0830	<b>Screw Compressors</b>
0830 - 0930	<b>Areas of Application</b>
0930 – 0945	Break
0945 – 1100	<b>Operating Principles</b>
1100 – 1230	<b>Capacity Control</b>
1230 – 1245	Break
1245 – 1345	<b>Performance</b>
1345 – 1400	<b>Course Conclusion</b>
1400 – 1415	<b>POST-TEST</b>
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course

**Simulator (Hands-on Practical Sessions)**

Practical 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” and “CBT on Compressors”.



**SIM 3300 Centrifugal Compressor Simulator**



**CBT on Compressors**

**Course Coordinator**

Mari Nakintu, Tel: +971 2 30 91 714, Email: [mari1@haward.org](mailto:mari1@haward.org)