# COURSE OVERVIEW ME0413
# The Advanced Rotating Equipment: Troubleshooting of Pumps, Compressors, Gearboxes and Dynamic Balance

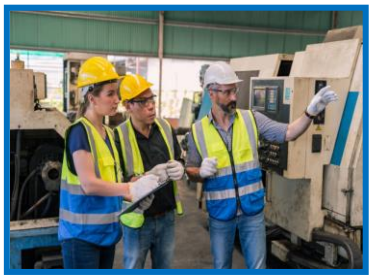
## Course Title
The Advanced Rotating Equipment: Troubleshooting of Pumps, Compressors, Gearboxes and Dynamic Balance


## Course Date/Venue
Session 1: May 05-09, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: September 21-25, 2025/Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE


## Course Reference
ME0413

## 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 provide participants with a detailed and up-to-date overview of Advanced Rotating Equipment: Troubleshooting of Pumps, Compressors, Gearboxes and Dynamic Balance. It covers the basic principles and the various types of rotating equipment; the different types of pumps and their applications; the pump components and design factors including pump curves; the impact of system changes on pump performance; the common pump problems and their causes; the troubleshooting techniques for pumps; and the types of compressors and their applications, components, design factors and compressor operation and maintenance.

During this interactive course, participants will learn the compressor troubleshooting, control and protection; the types of application and design factors of gearbox; the gearbox operation, performance, troubleshooting techniques, lubrication and maintenance; the basics and principles of dynamic balancing; the integrated troubleshooting approach; the predictive maintenance techniques; the condition monitoring and data collection; and use RCA for troubleshooting rotating equipment and strategies for improving equipment reliability.

## Course Objectives

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

- Apply and gain an advanced knowledge on rotating equipment and the troubleshooting of pumps, compressors, gearboxes and dynamic balance
- Discuss the basic principles and the various types of rotating equipment as well as the different types of pumps and their applications
- Identify pump components and design factors including pump curves and the impact of system changes on pump performance
- Recognize the common pump problems and their causes and apply troubleshooting techniques for pumps
- Identify the types of compressors and their applications including its components, design factors and compressor operation and maintenance
- Employ compressor troubleshooting, control and protection as well as discuss the types of application and design factors of gearbox
- Apply gearbox operation, performance, troubleshooting techniques, lubrication and maintenance
- Discuss the basics and principles of dynamic balancing and apply integrated troubleshooting approach
- Carryout predictive maintenance techniques covering condition monitoring and data collection
- Use RCA for troubleshooting rotating equipment and strategies for improving equipment reliability

## 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 advanced rotating equipment and troubleshooting of pumps, compressors, gearboxes and dynamic balance for maintenance managers, mechanical engineers, reliability engineers, engineers, supervisors, operations personnel, service and repair technicians, technicians, maintenance planners and plant operators.

## 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: -

- 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.

- 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 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 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**), Vandenbergh 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.

## Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

### *Day 1*

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|---|---|
| *0730 – 0800* | *Registration & Coffee* |
| *0800 – 0815* | *Welcome & Introduction* |
| *0815 – 0830* | ***PRE-TEST*** |
| *0830 – 0930* | ***Introduction to Rotating Equipment***<br>*Basic Principles of Rotating Equipment ● Various Types of Rotating Equipment* |
| *0930 – 0945* | *Break* |
| *0945 – 1030* | ***Pump Basics***<br>*Introduction to Pumps ● Different Types of Pumps & Their Applications* |
| *1030 – 1130* | ***Pump Components & Design***<br>*Pump Component Identification ● Pump Design Factors* |
| *1130 – 1215* | ***Pump Operation & Performance***<br>*Understanding Pump Curves ● Impact of System Changes on Pump Performance* |
| *1215 – 1230* | *Break* |
| *1230 – 1330* | ***Pump Troubleshooting***<br>*Common Pump Problems & Their Causes ● Troubleshooting Techniques for Pumps* |
| *1330 – 1420* | ***Case Study: Pump Troubleshooting***<br>*Real-life Case Analysis ● Group Discussion & Analysis* |
| *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 One* |

### *Day 2*

| | |
|---|---|
| *0730 – 0830* | ***Compressor Basics***<br>*Types of Compressors & Their Applications* |
| *0830 – 0930* | ***Compressor Components & Design***<br>*Compressor Component Identification ● Compressor Design Factors* |
| *0930 – 0945* | *Break* |
| *0945 – 1100* | ***Compressor Operation & Performance***<br>*Understanding Compressor Maps ● Factors Affecting Compressor Performance* |
| *1100 – 1215* | ***Compressor Troubleshooting***<br>*Common Compressor Problems & their Causes ● Troubleshooting Techniques for Compressors* |
| *1215 – 1230* | *Break* |
| *1230 – 1330* | ***Compressor Control & Protection***<br>*Surge Control Systems ● Safety Devices in Compressors* |
| *1330 – 1420* | ***Case Study: Compressor Troubleshooting***<br>*Real-life Case Analysis ● Group Discussion & Analysis* |
| *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 Two* |

**Day 3**

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|---|---|
| 0730 – 0830 | ***Gearbox Basics***<br>*Introduction to Gearboxes ● Types of Gearboxes & Their Applications* |
| 0830 – 0930 | ***Gearbox Components & Design***<br>*Gearbox Component Identification ● Gearbox Design Factors* |
| 0930 – 0945 | *Break* |
| 0945 – 1100 | ***Gearbox Operation & Performance***<br>*Understanding Gearbox Performance ● Impact of Load Changes on Gearbox Performance* |
| 1100 – 1215 | ***Gearbox Troubleshooting***<br>*Common Gearbox Problems & Their Causes ● Troubleshooting Techniques for Gearboxes* |
| 1215 – 1230 | *Break* |
| 1230 – 1330 | ***Gearbox Lubrication & Maintenance***<br>*Lubrication Basics & Importance ● Maintenance Strategies for Gearboxes* |
| 1330 – 1420 | ***Case Study: Gearbox Troubleshooting***<br>*Real-life Case Analysis ● Group Discussion & Analysis* |
| 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**

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|---|---|
| 0730 – 0830 | ***Basics of Dynamic Balancing***<br>*Introduction to Dynamic Balance ● Principles of Dynamic Balancing* |
| 0830 – 0930 | ***Balance Quality & Equipment***<br>*Understanding Balance Quality Grades ● Balancing Equipment & Techniques* |
| 0930 – 0945 | *Break* |
| 0945 – 1100 | ***Troubleshooting Unbalance***<br>*Identifying Symptoms of Unbalance ● Strategies for Correcting Unbalance* |
| 1100 – 1215 | ***Hands-on Exercise: Balancing***<br>*Real-world Balancing Practice ● Analysis & Correction of Unbalance* |
| 1215 – 1230 | *Break* |
| 1230 – 1330 | ***Basics of Vibration Analysis***<br>*Basic Vibration Theory ● Vibration Measurement & Analysis* |
| 1330 – 1420 | ***Case Study: Balancing & Vibration***<br>*Real-life Case Analysis ● Group Discussion & Analysis* |
| 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***

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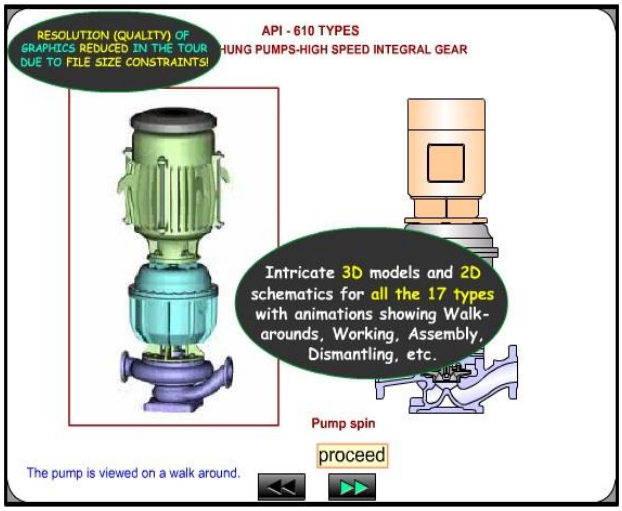
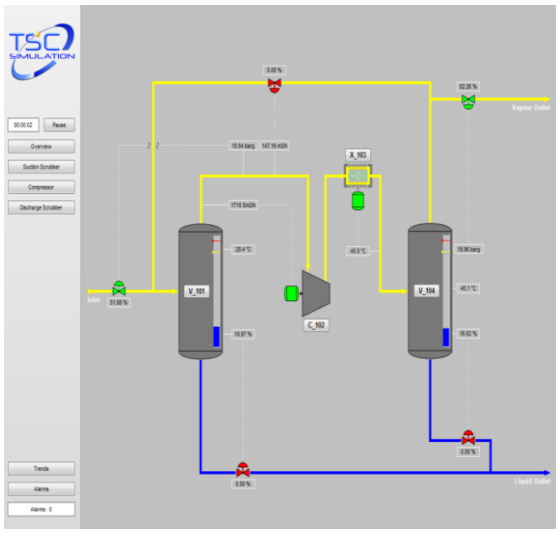
|---|---|
| *0730 – 0830* | ***Integrated Troubleshooting Approach***<br>*Analyzing Complex Systems ● Coordinating Troubleshooting Across Systems* |
| *0830 – 0930* | ***Predictive Maintenance Techniques***<br>*Condition Monitoring & Data Collection ● Understanding & Applying Predictive Maintenance Techniques* |
| *0930 – 0945* | *Break* |
| *0945 – 1100* | ***Root Cause Analysis***<br>*Principles of Root Cause Analysis (RCA) ● Using RCA for Troubleshooting Rotating Equipment* |
| *1100 – 1215* | ***Reliability Improvement***<br>*Reliability Engineering Basics ● Strategies for Improving Equipment Reliability* |
| *1215 – 1230* | *Break* |
| *1230 – 1345* | ***Practical Session: Comprehensive Troubleshooting***<br>*Guided Hands-on Troubleshooting Session ● Troubleshooting Scenarios Discussion & Solution Finding* |
| *1345 – 1400* | ***Course Conclusion***<br>*Using this Course Overview, the Instructor(s) will Brief Participants about t Topics that were Covered During the Course* |
| *1400 – 1415* | ***POST-TEST*** |
| *1415 – 1430* | *Presentation of Course Certificates* |
| *1430* | *Lunch & End of Course* |

## Simulator (Hands-on Practical Sessions)

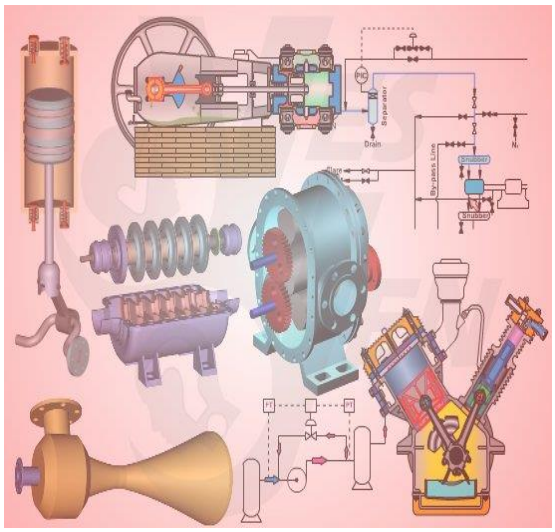
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the simulators "Centrifugal Pumps and Troubleshooting Guide 3.0", "SIM 3300 Centrifugal Compressor" and "CBT on Compressors".




**Centrifugal Pumps and Troubleshooting Guide 3.0**



**SIM 3300 Centrifugal Compressor Simulator**



**CBT on Compressors**

## Course Coordinator

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