COURSE OVERVIEW ME1136-4D

Energy-Efficient Rotating Equipment Operation

Course Title
Energy-Efficient Rotating Equipment Operation

Course Date/Venue
Please see page 3

Course Reference
ME1136-4D

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 participants with a detailed ad up -to-date overview of Energy-Efficient Rotating Equipment Operation. It covers the fundamentals of rotating equipment and the importance of energy efficiency in refinery operations; the criteria for selecting efficient pumps, compressors and motors; the mechanical losses and their impact; the preventive maintenance strategies for energy efficiency, vibration analysis for detecting inefficiencies and monitoring temperature and load conditions; the principles of pump and compressor energy efficiency, electrical efficiency of rotating equipment and control systems for energy efficiency; and the heat recovery in rotating equipment systems and the impact of system design on energy efficiency.

During this interactive course, participants will learn the energy audits and assessments for rotating equipment and diagnosing energy inefficiencies; the condition monitoring for energy efficiency and continuous improvement and energy efficiency programs; the digitalization in rotating equipment energy efficiency and energy management systems (ENMs); the advanced materials for energy-efficient equipment and renewable energy integration with rotating equipment; the importance of workforce training for energy efficiency and developing a culture of energy awareness in the workforce; and the proper tools and techniques for engaging employees in efficiency initiatives.

Course Objectives

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

- Apply and gain a comprehensive knowledge on energy-efficient rotating equipment operation
- Discuss the fundamentals of rotating equipment and the importance of energy efficiency in refinery operations
- Identify the criteria for selecting efficient pumps, compressors and motors as well as the mechanical losses and their impact
- Carryout preventive maintenance strategies for energy efficiency, vibration analysis for detecting inefficiencies and monitoring temperature and load conditions
- Explain the principles of pump and compressor energy efficiency, electrical efficiency of rotating equipment and control systems for energy efficiency
- Recognize heat recovery in rotating equipment systems and the impact of system design on energy efficiency
- Apply energy audits and assessments for rotating equipment as well as identify and diagnose energy inefficiencies
- Optimize pump and motor operations, improve system efficiency through variable speed drives and discuss the role of bearings and seals in energy efficiency
- Employ condition monitoring for energy efficiency and develop continuous improvement and energy efficiency programs
- Apply digitalization in rotating equipment energy efficiency and energy management systems (ENMs)
- Recognize advanced materials for energy-efficient equipment and apply renewable energy integration with rotating equipment
- Discuss the importance of workforce training for energy efficiency, develop a culture of energy awareness in the workforce and apply proper tools and techniques for engaging employees in efficiency initiatives

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 energy-efficient rotating equipment operation for maintenance engineers, mechanical engineer, energy managers, plant engineers and supervisors, operations and production personnel, facility managers, technical consultants, reliability engineers, process engineers, utility engineers and those who involved in the operation, maintenance and optimization of rotating equipment in industrial, energy and manufacturing environments.

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 Date/Venue

Session(s)	Date	Venue
1	June 30-July 03, 2025	Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
2	July 06-09, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
3	September 29-October 02, 2025	Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
4	November 23-26, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE

Accommodation

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

Course Fee

US$ 4,500 per Delegate + **VAT**. 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.

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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 **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.

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 Engineer** with over **30 years** of industrial experience. His expertise covers **Pumps, Compressors, Turbines & Troubleshooting**, **Centrifugal Pumps**, **Rotating Equipment**, Maintenance of **Gas Compressors**, **Compressor & Steam Turbine**, **Pressure Safety Relief Valve** Repair & Recalibration, **PSV/PRV** Troubleshooting, **PRV** Testing & Repair, **Valve** Testing & Inspection, **Valve** Sealing, **Valve** Calibration, **Process Equipment**, **Vibration Analysis**, **Heat Exchanger**, **Siemens Steam Turbine Maintenance**, **Electromechanical Maintenance**, **Machinery Alignment**, **Lubrication Technology**, **Compressors**, **HVAC & Refrigeration Systems**, **Piping System**, **Blower & Fan**, **Shaft Repair**, **Control Valve & Actuator**, **Safety Relief Valves**, **Pipelines**, **Piping Vibration Analysis**, **Pressure Vessels**, **Dry Gas Seal**, **Process Equipment**, **Diesel Engine & Crane Maintenance**, **Maintenance Management** (**Preventive**, **Predictive**, **Breakdown**), **Reliability Management**, **Condition-Based Monitoring**, **Tanks & Tank Farms**, **Pneumatic System**, **Static Equipment**, **Failure Analysis**, **FMEA**, **Corrosion**, **Metallurgy**, Planning, Scheduling, Cost Control, Preventive and Predictive Maintenance. Currently, he is the Maintenance Manager of the PPC Incorporation wherein he is responsible for the maintenance and upgrade of all plant components, monitoring the thermal stresses and the remaining life of steam pipes, turbine casing, mills, fans and pumps. He is in-charge of the metallurgical failure analysis and the usage of fracture mechanics for determining crack propagation in impellers of turbines, assessing all alterations and developments for upgrading the plant.

During his career life, Dr. Dimitry was a **Senior Engineer** in **Chloride Silent** (**UK**) wherein he was responsible for the mechanical, thermal and electrical modelling of battery problems for electric vehicles and satellites as well as an **Operations Engineer** of the **National Nuclear Corporation** (**UK**) wherein he was responsible for the optimization of the plant. Prior to this, he was a **Professor** at the **Technical University of Crete** and an Assistant **Professor** of the **University of Manchester** (**UK**).

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

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Fundamentals of Rotating Equipment*** *Types of Rotating Equipment in Refineries • Basic Principles of Operation • Performance Parameters (e.g., Efficiency, Power Consumption) • Key Challenges in Maintaining Energy Efficiency*
0930 – 0945	*Break*
0945 - 1030	***Energy Efficiency Overview*** *Importance of Energy Efficiency in Refinery Operations • Energy Consumption Patterns in Rotating Equipment • Benefits of Energy-Efficient Operations • Regulatory and Environmental Considerations*
1030 – 1130	***Selection of Energy-Efficient Rotating Equipment*** *Criteria for Selecting Efficient Pumps, Compressors and Motors • Impact of Equipment Size and Design on Energy Consumption • Importance of Matching Equipment to Operational Conditions • Role of Advanced Materials and Technology*
1130 – 1215	***Mechanical Losses & Their Impact*** *Types of Mechanical Losses (Friction, Windage, etc.) • Effect of Mechanical Losses on Efficiency • Ways to Minimize Mechanical Losses • Example Calculations of Mechanical Losses in Rotating Equipment*
1215 – 1230	*Break*
1230 – 1330	***Efficiency Optimization through Maintenance*** *Preventive Maintenance Strategies for Energy Efficiency • Lubrication and Its Impact on Energy Consumption • Vibration Analysis for Detecting Inefficiencies • Monitoring Temperature and Load Conditions*
1330 – 1420	***Case Study: Improving Energy Efficiency in a Refinery*** *Real-World Examples of Energy-Saving Projects • Key Performance Indicators (KPIs) for Energy Efficiency • Lessons Learned from Past Efficiency Projects • Discussion of Results and Improvements*
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

0730 – 0830	***Pump & Compressor Efficiency*** *Principles of Pump and Compressor Energy Efficiency • Hydraulic Losses in Pumps and How to Reduce them • Energy-Saving Techniques for Centrifugal Compressors • Efficiency Optimization Through Variable-Speed Drives*
0830 – 0930	***Electrical Efficiency of Rotating Equipment*** *Power Factor and its Role in Energy Consumption • Types of Motors and their Efficiency Characteristics • Energy-Saving Tips for Electric Motors • Benefits of Using Variable Frequency Drives (VFDs)*
0930 – 0945	*Break*

0945 – 1100	***Control Systems for Energy Efficiency*** *Role of Automation and Control Systems in Efficiency • PID Control and its Impact on Equipment Performance • Energy-Saving Algorithms in Control Systems • Advanced Sensors for Energy Management*
1100 – 1215	***Heat Recovery in Rotating Equipment Systems*** *Principles of Heat Recovery and its Importance • Methods for Recovering Waste Heat from Rotating Equipment • Integration of Heat Recovery with Energy-Efficient Operations • Case Studies of Successful Heat Recovery Applications*
1215 – 1230	*Break*
1230 – 1330	***Impact of System Design on Energy Efficiency*** *Designing Systems for Optimal Energy Use • Importance of Piping, Valves and Pressure Control in System Efficiency • Integrating Energy Efficiency into the Initial Design Phase • Using Simulation Tools to Assess System Efficiency*
1330 – 1420	***Energy Audits & Assessments for Rotating Equipment*** *Conducting Energy Audits of Rotating Equipment • Tools and Techniques for Evaluating Energy Efficiency • Interpreting Audit Results and Identifying Improvement Areas • Developing an Action Plan Based on Audit Findings*
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

0730 – 0830	***Identifying & Diagnosing Energy Inefficiencies*** *Common Signs of Energy Inefficiencies in Rotating Equipment • Troubleshooting Steps to Identify Root Causes of Inefficiency • Using Diagnostic Tools (Vibration, Thermal, Acoustic) • Examples of Inefficiencies Caused by Misalignment and Imbalance*
0830 – 0930	***Optimizing Pump & Motor Operations*** *Flow Control and its Effect on Pump Efficiency • Methods for Optimizing Motor Operations • Reducing Cavitation and its Energy Impact • Energy-Efficient Pump Speed and Pressure Control*
0930 – 0945	*Break*
0945 – 1100	***Improving System Efficiency through Variable Speed Drives*** *Benefits of Variable Speed Drives (VSDs) in Rotating Equipment • How VSDs Reduce Energy Consumption in Compressors and Pumps • Selecting and Installing VSDs for Optimal Energy Savings • Case Studies of VSD Applications*
1100 – 1215	***Bearings & Seals: Their Role in Energy Efficiency*** *Impact of Bearing and Seal Friction on Energy Consumption • Selecting Energy-Efficient Bearings and Seals • Maintenance Practices to Minimize Friction Losses • Innovations in Bearing and Seal Technology*
1215 – 1230	*Break*
1230 – 1330	***Condition Monitoring for Energy Efficiency*** *Overview of Condition Monitoring Tools • How to Monitor Energy Efficiency Through Equipment Data • Using Predictive Maintenance to Prevent Energy Losses • Case Study: Monitoring Performance in Real-Time*

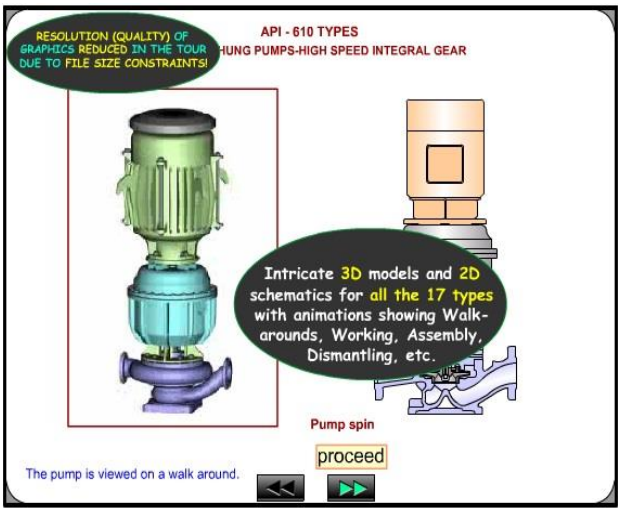
1330 – 1420	***Continuous Improvement & Energy Efficiency Programs*** *Developing an Energy Efficiency Program in the Refinery • Setting Goals and Benchmarks for Continuous Improvement • Implementing Best Practices in Rotating Equipment Operation • Role of Employees in Sustaining Energy Efficiency*
1420 – 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 Three*

Day 4

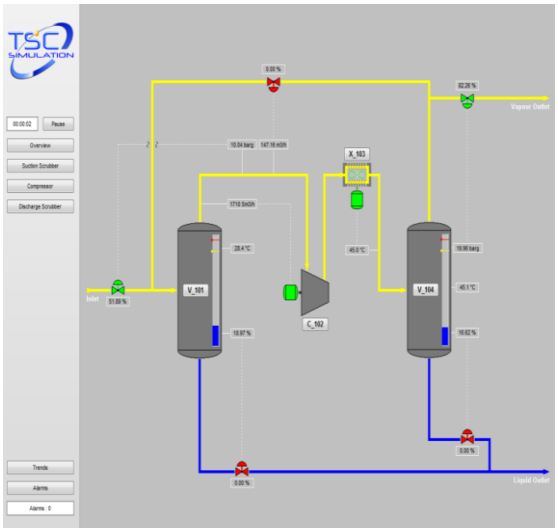
0730 – 0830	***Digitalization in Rotating Equipment Energy Efficiency*** *Introduction to Digitalization and IoT in Rotating Equipment • How Sensors and Real-Time Data Improve Efficiency • Digital Twin Technology for Energy Efficiency Monitoring • Case Studies of Successful Digitalization Projects*
0830 – 0930	***Energy Management Systems (EnMS) & Rotating Equipment*** *Overview of Energy Management Systems (EnMS) • Integrating EnMS with Rotating Equipment Operations • Benefits of Real-Time Energy Monitoring and Management • Key Features of an EnMS for Refinery Operations*
0930 – 0945	*Break*
0945 – 1100	***Advanced Materials for Energy-Efficient Equipment*** *Role of Advanced Materials in Reducing Energy Consumption • High-Performance Coatings and Surface Treatments • Low-Friction Materials for Bearings and Seals • Materials for Improving Heat Resistance and Durability*
1100 – 1215	***Renewable Energy Integration with Rotating Equipment*** *Role of Renewable Energy in Reducing Energy Consumption • Integrating Solar and Wind Power with Refinery Systems • Benefits and Challenges of Renewable Energy in Rotating Equipment • Case Study: Renewable Energy Integration in Refinery Operations*
1215 – 1230	*Break*
1230 – 1330	***Employee Training & Engagement in Energy Efficiency*** *Importance of Workforce Training for Energy Efficiency • Developing a Culture of Energy Awareness in the Workforce • Tools and Techniques for Engaging Employees in Efficiency Initiatives • Role of Leadership in Promoting Energy-Saving Practices*
1330 - 1345	***Future Trends in Energy-Efficient Rotating Equipment*** *Emerging Technologies and Innovations in Rotating Equipment • The Role of Artificial Intelligence in Energy Efficiency • Smart Systems for Autonomous Energy Optimization • Predictions for the Future of Energy-Efficient Equipment in Refineries*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course 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)

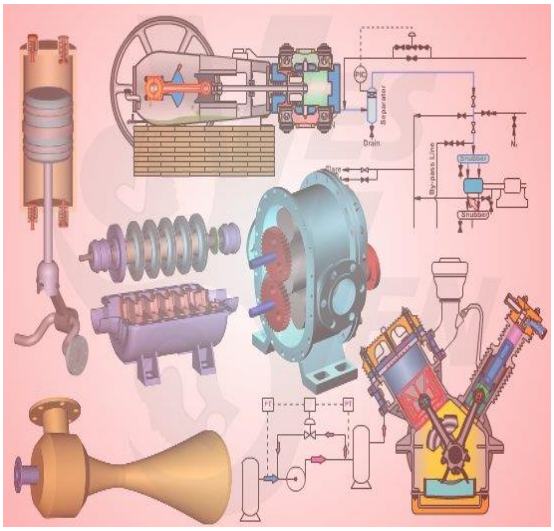
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the simulators “Centrifugal Pumps and Troubleshooting Guide 3.0”, “SIM 3300 Centrifugal Compressor”, “CBT on Compressors”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



Centrifugal Pumps and Troubleshooting Guide 3.0



SIM 3300 Centrifugal Compressor Simulator



CBT on Compressors

iLearnVibration

Course Coordinator

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