COURSE OVERVIEW ME0121
Basics of High Torque Machines

Course Title
Basics of High Torque Machines

Course Date/Venue
Session 1: August 10-14, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: December 08-12, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
ME0121

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description

This practical and highly-interactive course includes real-life case studies and exercises where participants will be engaged in a series of interactive small groups and class workshops.

This course is designed to provide participants with a detailed and up-to-date overview of Basics of High Torque Machines. It covers the fundamentals and types of high torque machines; the torque and load characteristics and the components of high torque machines; the industry applications of high torque machines and safety considerations for high torque equipment; the power transmission in high torque machines; the working principles of hydraulic torque machines, pneumatic torque and electric torque machines; and the mechanical torque multiplication techniques, measurement and calibration.

During this interactive course, participants will learn the installation and setup of high torque machines; the operating procedures for hydraulic torque wrenches, pneumatic torque machines and electric torque machines; the common failures and troubleshooting in high torque machines; the preventive maintenance, servicing of torque machines and high torque machines in drilling operations; the torque control in pipeline and flange assembly, bolting techniques using high torque machines and smart torque machines and digital torque control; and the advanced torque measurement, verification techniques, practical torque measurement and calibration.

Course Objectives

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

- Apply and gain a basic knowledge on high torque machines
- Discuss the fundamentals and types of high torque machines
- Describe torque and load characteristics and identify the components of high torque machines
- Carryout industry applications of high torque machines and safety considerations for high torque equipment
- Discuss power transmission in high torque machines and the working principles of hydraulic torque machines, pneumatic torque and electric torque machines
- Employ mechanical torque multiplication techniques, measurement and calibration
- Install and setup high torque machines and implement operating procedures for hydraulic torque wrenches, pneumatic torque machines and electric torque machines
- Identify the common failures and troubleshooting in high torque machines
- Apply preventive maintenance, servicing of torque machines and high torque machines in drilling operations
- Carryout torque control in pipeline and flange assembly, bolting techniques using high torque machines and smart torque machines and digital torque control
- Employ advanced torque measurement, verification techniques, practical torque measurement and calibration

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 basics of high torque machines for mechanical engineers, maintenance technicians/engineers, operations managers, machine operators, project managers, electrical engineers, automation engineers, production supervisors, safety officers and those who involved in the operation, maintenance and design of high-torque machines.

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. Dimitry Rovas, CEng, MSc, PMI-PMP, SMRP-CMRP is a **Senior Mechanical & Maintenance Engineer** with extensive industrial experience in **Oil**, **Gas**, **Power** and **Utilities** industries. His expertise includes **Pipeline** System Design, Construction, Maintenance and Repair, Facilities & **Pipeline** Integrity Assessment, **Pipeline** Welding Practices, Internal **Corrosion of Pipelines, Pipeline Integrity Management & Risk Assessment**, **Thermal Insulation**, **Insulation** Standards & Regulations, **Insulation** Materials & Selection, **Piping System Insulation**, **Insulation Installation** Techniques, **Insulation** Inspection & Quality Control, **Insulation** Thickness Calculation, **Insulation** & Corrosion Protection, **Heat Exchanger & Boiler Insulation**, **Tanks & Vessels Insulation**, **Pipeline & Piping Insulation**, **Insulation** Testing & Quality Assurance, **Insulation** Maintenance & Repair, **Insulation** Retrofitting, **Impulse Tube** Installation & Inspection, **Parker Compression Fittings**, **Pipes & Fittings**, **PSV Inspection**, **Boiler** Operation, Maintenance & Inspection, **Root Cause Failure Analysis**, **Tank** Design & Engineering, **Tank Shell**, **Tanks & Tank Farms**, **Vacuum Tanks**, **Gas Turbine** Operating & Maintenance, **Diesel Engine**, **Engine Cycles**, **Governors & Maintenance**, **Crankshafts** & Maintenance, **Lubrication** System Troubleshooting & Maintenance, **Engines/Drivers**, **Motor** Failure Analysis & Testing, **Motor** Predictive Maintenance, **Engine** Construction & Maintenance, **HP Fuel Pumps & Maintenance**, **Fired Equipment** Maintenance, Combustion **Techniques**, **Process Heaters**, 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, **CAESAR**, **Pipe Stress Analysis**, **Pipe Cuttings**, **Flange Bolt Tightening** Sequence, **Hydro Testing**, **Pump** Technology, Fundamentals of **Pumps**, **Pump** Selection & Installation, **Centrifugal Pumps & Troubleshooting**, **Reciprocating & Centrifugal Compressors**, **Screw Compressor**, **Compressor** Control & Protection, **Gas & Steam Turbines**, **Turbine** Operations, **Gas Turbine** Technology, **Valves**, **Process Control Valves**, **Bearings & Lubrication**, Advanced **Machinery Dynamics**, **Rubber Compounding**, **Elastomers**, **Thermoplastic**, **Industrial Rubber Products**, **Rubber** Manufacturing Systems, **Heat Transfer**, **Vulcanization Methods**, **Process Plant Shutdown & Turnaround**, **Professional Maintenance Planner**, Advanced **Maintenance Management**, **Maintenance Optimization & Best Practices**, **Maintenance Auditing & Benchmarking**, **Material Cataloguing**, **Reliability** Management, **Rotating Equipment**, **Energy Conservation**, **Energy Loss Management** in Electricity Distribution Systems, **Energy Saving**, **Thermal Power Plant** Management, **Thermal Power Plant** Operation & Maintenance, **Heat Transfer**, **Machine Design**, **Fluid Mechanics**, **Heating & Cooling Systems**, **Heat Insulation Systems**, **Heat Exchanger & Cooling Towers**, **Mechanical Erection**, **Heavy Rotating Equipment**, Material Unloading & Storage, Commissioning & Start-Up. Further, he is also well-versed in MS project & AutoCAD, EPC Power Plant, Power Generation, Combined Cycle Powerplant, Leadership & Mentoring, Project Management, Strategic Planning/Analysis, Construction Management, Team Formation, Relationship Building, Communication, Reporting and Six Sigma. He is currently the **Project Manager** wherein he is managing, directing and controlling all activities and functions associated with the domestic heating/cooling facilities projects.

During his life career, Mr. Rovas has gained his practical and field experience through his various significant positions and dedication as the **EPC Project Manager**, **Field Engineer**, **Thermal Insulation Engineer**, **Mechanical Engineer**, **Preventive Maintenance Engineer**, **Senior Thermal Insulation Technician**, **Researcher**, **Instructor/Trainer**, **Telecom Consultant** and **Consultant** from various companies such as the Podaras Engineering Studies, Metka and Diadikasia, S.A., **Hellenic Petroleum Oil Refinery** and COSMOTE.

Mr. Rovas has a **Master's** degree in **Energy Production & Management** and **Mechanical Engineering** from the **National Technical University of Athens** (**NTUA**), **Greece**. Further, he is a **Certified Instructor/Trainer**, a **Certified Maintenance and Reliability Professional** (**CMRP**) from the Society of Maintenance & Reliability Professionals (**SMRP**), **Certified Project Management Professional** (**PMI-PMP**), **Certified Six Sigma Black Belt**, **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**), **Certified Construction Projects Contractor**, **Certified Energy Auditor** and a **Chartered Engineer**. Moreover, he is an active member of **American Society for Quality**, Project Management Institute (**PMI**), **Body of Certified Energy Auditors** and **Technical Chamber of Greece**. He has further received various recognition and awards and delivered numerous 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 – 0830	*Registration & Coffee*
0830 – 0845	*Welcome & Introduction*
0845 – 0900	***PRE-TEST***
0900 – 0930	***Fundamentals of High Torque Machines*** *Definition and Characteristics of High Torque Machines • Differences Between Torque and Power in Machines • Applications in the Petroleum Industry • Importance of Torque Control in Industrial Processes*
0930 – 0945	*Break*
0945 – 1030	***Types of High Torque Machines*** *Hydraulic Torque Machines • Pneumatic Torque Machines • Electric Torque Machines • Mechanical Torque Multipliers*
1030 - 1100	***Torque & Load Characteristics*** *Relationship Between Torque and Speed • Load Variations and Impact on Torque Output • Torque Curves and Efficiency Considerations • Case Studies on Torque-Load Performance*
1100 – 1230	***Components of High Torque Machines*** *Gearing and Transmission Systems • Motors and Drive Mechanisms • Torque Sensors and Control Systems • Safety and Overload Protection Mechanisms*
1230 – 1245	*Break*
1245 - 1330	***Industry Applications of High Torque Machines*** *Drilling Rigs and Pipeline Construction • Flange Tightening and Bolting Applications • Hydraulic Systems in Heavy Machinery • Case Studies on Torque Machine Applications*
1330 – 1420	***Safety Considerations for High Torque Equipment*** *Common Hazards and Risk Assessment • Personal Protective Equipment (PPE) Requirements • Lockout/Tagout (LOTO) Procedures • Safety Standards and Compliance*
1420 – 1330	***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	***Power Transmission in High Torque Machines*** *Principles of Power Transmission • Gear Ratio and Torque Multiplication • Efficiency Factors in Power Transmission • Impact of Mechanical Losses*
0830 - 0930	***Hydraulic Torque Machines – Working Principle*** *Basic Hydraulic System Components • Hydraulic Torque Wrenches and Their Applications • Pressure and Flow Control in Hydraulic Systems • Advantages and Limitations of Hydraulic Torque Machines*
0930 – 0945	*Break*
0945 – 1100	***Pneumatic Torque Machines – Working Principle*** *Working Principle of Pneumatic Torque Tools • Compressed Air Systems and Pressure Regulation • Torque Output Adjustments in Pneumatic Machines • Maintenance of Pneumatic Torque Systems*

1100 – 1230	***Electric Torque Machines – Working Principle*** *Electric Motor Fundamentals for Torque Generation • Variable Frequency Drives (VFD) and Torque Control • Direct Drive versus Geared Electric Torque Machines • Overload Protection in Electric Torque Systems*
1230 – 1245	*Break*
1245 – 1330	***Mechanical Torque Multiplication Techniques*** *Spur and Planetary Gear Systems for Torque Enhancement • Use of Ratchet and Impact Mechanisms • Torque Reaction Arms and Load Balancing • Case Studies on Mechanical Torque Applications*
1330 - 1420	***Understanding Torque Measurement & Calibration*** *Importance of Torque Measurement in Industrial Applications • Calibration Techniques for Torque Machines • Torque Transducers and Strain Gauge Technology • Compliance with Torque Measurement Standards (ISO, ASME)*
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	***Installation & Setup of High Torque Machines*** *Pre-Installation Checks and Site Preparation • Mounting and Alignment Procedures • Initial Testing and Calibration • Compliance with Company's Operational Standards*
0830 - 0930	***Operating Procedures for Hydraulic Torque Wrenches*** *Step-by-Step Operation of Hydraulic Torque Wrenches • Pressure Setting Adjustments for Different Applications • Managing Hydraulic Fluid Levels and Contamination • Troubleshooting Common Hydraulic System Issues*
0930 – 0945	*Break*
0945 – 1100	***Operating Procedures for Pneumatic Torque Machines*** *Setting Up and Connecting Air Supply Systems • Adjusting Torque Levels for Bolting Applications • Safety Measures for Pneumatic Torque Tools • Troubleshooting Air Leaks and Pressure Drops*
1100 – 1230	***Operating Procedures for Electric Torque Machines*** *Configuring Electric Torque Settings for Various Tasks • Interfacing with Control Systems and Automation Integration • Temperature and Current Monitoring for Motor Protection • Common Issues in Electric Torque Machines and Troubleshooting*
1230 – 1245	*Break*
1245 – 1330	***Common Failures & Troubleshooting in High Torque Machines*** *Overheating and Motor Failure Analysis • Hydraulic Fluid Contamination and Leaks • Air Pressure Inconsistencies in Pneumatic Systems • Mechanical Wear and Fatigue in High Torque Applications*
1330 - 1420	***Preventive Maintenance & Servicing of Torque Machines*** *Scheduled Maintenance and Inspection Routines • Lubrication and Wear Prevention Techniques • Replacing Worn-Out Components and Seals • Record-Keeping and Compliance with Maintenance Schedules*
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	***High Torque Machines in Drilling Operations*** *Torque Applications in Drill String Assembly • Breakout and Makeup Torque Requirements • Controlling Torque in Rotary Drilling Systems • Case Studies on Drilling Torque Machine Applications*
0830 - 0930	***Torque Control in Pipeline & Flange Assembly*** *Importance of Precise Torque Application in Flange Tightening • Bolt Preload and Tensioning Techniques • Using Torque Machines for Leak Prevention in Pipelines • Case Studies on Bolted Joint Integrity*
0930 – 0945	*Break*
0945 – 1100	***Bolting Techniques Using High Torque Machines*** *Step-by-Step Bolting Procedures • Torque versus Tensioning Methods • Cross-Bolting and Sequential Tightening Techniques • Ensuring Uniform Load Distribution in Flanges*
1100 – 1230	***Smart Torque Machines & Digital Torque Control*** *Advancements in Automated Torque Control • Torque Data Logging and Wireless Monitoring • Integration of IoT in Torque Machines • Predictive Maintenance Using Digital Torque Data*
1230 – 1245	*Break*
1245 – 1330	***Advanced Torque Measurement & Verification Techniques*** *Dynamic versus Static Torque Measurement • Non-Contact Torque Sensors and Laser-Based Measurements • Real-Time Torque Monitoring in High-Load Applications • Case Studies on Precision Torque Control in Operations*
1330 - 1420	***Case Studies & Lessons Learned from Petroleum Industry Applications*** *High Torque Machine Applications in Facilities • Common Failures and Corrective Actions Case Studies • Industry Best Practices in Torque Machine Utilization • Future Trends and Improvements in High Torque Equipment*
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 Four*

Day 5

0730 – 0930	***Operating Hydraulic Torque Wrenches*** *Setup and Connection of Hydraulic Torque Wrenches • Adjusting Pressure for Different Torque Requirements • Performing Bolt Tightening and Loosening Operations • Troubleshooting and Maintenance Practices*
0930 – 0945	*Break*
0945 – 1030	***Operating Pneumatic Torque Machines*** *Air Pressure Adjustment and Tool Calibration • Handling Torque Variations in Pipeline Applications • Safety Measures and Emergency Shutdown Procedures • Performance Evaluation of Pneumatic Torque Tools*
1030 – 1230	***Operating Electric Torque Machines*** *Configuring Torque Levels and Drive Settings • Integrating Torque Control with Automation Systems • Running Diagnostic Tests and System Checks • Troubleshooting Electrical Issues in Torque Machines*
1230 – 1245	*Break*

1245 – 1345	***Torque Measurement & Calibration*** *Using Torque Transducers for Real-Time Measurements • Calibrating Torque Machines for Accuracy and Compliance • Identifying Deviations and Performing Corrective Actions • Hands-On Practice with Torque Verification Tools*
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*

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises:-

Course Coordinator

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org