COURSE OVERVIEW ME1108
Torque Tightening

Course Title
Torque Tightening

Course Date/Venue
Session 1: April 05-09, 2026/Ruwayda 1& 2 Meeting Room, Dusit D2 Salwa, Doha, Qatar
Session 2: April 12-16, 2026/Ruwayda 1& 2 Meeting Room, Dusit D2 Salwa, Doha, Qatar

Course Reference
ME1108

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

Course Description

This practical and highly-interactive course includes practical sessions and exercises where participants will visit the workshop to observe and operate bolt torquing and tensioning tools. They will be familiarized with the proper use, calibration procedures, and safety aspects of hydraulic torque wrenches, tensioners and associated equipment. Practical exercises will be conducted using actual bolting tools to apply the theoretical knowledge gained in the classroom.

This course is designed to provide participants with a detailed and up-to-date overview of Bolt Torquing & Tensioning. It covers the purpose and function of bolted joints, advantages and limitations, common failure modes and key terminology; the types of fasteners and their applications, joint integrity principles, gasket technology and selection; the torque and load relationship, standards and guidelines, torque tools, and manual torque application; and the hydraulic torque tools, components of hydraulic systems, pump selection and setup, safety during hydraulic torquing and troubleshooting hydraulic issues.

Further, the course will also discuss the torque procedure development, error prevention and troubleshooting, bolt tensioning and hydraulic tensioning systems; and the tensioning procedures and planning, advanced tensioning methods, tensioner safety and troubleshooting and controlled bolting assembly procedures.

During this interactive course, participants will learn the flange management and joint control, joint integrity testing and maintenance of bolted joints; the advanced bolting challenges on large diameter bolts, high-temperature joints, cryogenic sealing and subsea bolt tensioning; the bolt length and grip considerations, joint stiffness and relaxation, fatigue and vibration impacts and expansion/contraction handling; the load-sensing bolts, digital torque and tension monitors, IoT integration in bolted joints and real-time condition tracking; the industry applications and standards, oil and gas pipelines, pressure vessels and heat exchangers; and the wind turbines and energy sector and offshore platforms.

Course Objectives

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

- Apply and gain an in-depth knowledge on bolt torquing and tensioning
- Discuss the purpose and function of bolted joints, advantages and limitations, common failure modes and key terminology
- Identify the types of fasteners and their applications as well as joint integrity principles, gasket technology and selection
- Explain torque and load relationship, standards and guidelines, torque tools and manual torque application
- Recognize hydraulic torque tools covering components of hydraulic systems, pump selection and setup, safety during hydraulic torquing and troubleshooting hydraulic issues
- Apply torque procedure development, error prevention and troubleshooting as well as recognize bolt tensioning and hydraulic tensioning systems
- Employ tensioning procedures and planning, advanced tensioning methods, tensioner safety and troubleshooting and controlled bolting assembly procedures
- Carryout flange management and joint control, joint integrity testing and maintenance of bolted joints
- Discuss advanced bolting challenges on large diameter bolts, high-temperature joints, cryogenic sealing and subsea bolt tensioning
- Determine bolt length and grip considerations, joint stiffness and relaxation, fatigue and vibration impacts and expansion/contraction handling
- Identify load-sensing bolts, digital torque and tension monitors, IoT integration in bolted joints and real-time condition tracking
- Review industry applications and standards review on oil and gas pipelines, pressure vessels and heat exchangers, wind turbines and energy sector and offshore platforms

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 bolt torquing and tensioning for mechanical technicians and fitters, maintenance engineers and supervisors, piping and mechanical inspectors, plant and equipment operators, QA/QC engineers and technicians, construction and commissioning personnel and other technical staff.

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

Haward's 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**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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 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. Andrew Ladwig is a **Senior Process & Mechanical Maintenance Engineer** with over **25 years** of extensive experience within the **Oil & Gas**, **Refinery**, **Petrochemical & Power** industries. His expertise widely covers in the areas of **Bolted Joint Technology**, **Torque & Load Relationship**, **Controlled Bolting Assembly Procedure**, **Gasket** Technology & Selection, **Torque Tightening**, **Centrifugal & Reciprocating Compressor**, **Screw Compressor** Troubleshooting, **Heat Exchanger** Overhaul & Testing, **Pipe Stress** Analysis, **Control Valves & Actuators**, **Vent & Relief System**, **Centrifugal & Reciprocating Pump** Installation & Repair, **Ammonia Manufacturing & Process Troubleshooting**, **Distillation Towers**, **Crude Oil Distillation**, **Ammonia Storage & Loading** Systems, **Operational Excellence** in **Ammonia Plants**, **Fertilizer Storage** Management (Ammonia & Urea), **Fertilizer Manufacturing** Process Technology, **Sulphur Recovery**, Phenol Recovery & Extraction, **Refining Process & Petroleum Products**, **Refinery Planning & Economics**, **Hydrotreating & Hydro-processing**, **Separators** in **Oil & Gas** Industry, **Gas Testing & Energy** Isolations, **Industrial Liquid Mixing**, **Extractors**, **Fractionation**, **Water Purification**, **Water Transport** & Distribution, **Environmental Emission Control**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Plant Performance**, **Plant Startup & Shutdown**, **Process Troubleshooting** Techniques and Oil & Gas Operation/Surface Facilities. Further, he is also well-versed in **Rotating Machinery** (**BRM**), **Rotating Equipment** Operation & Troubleshooting, Root Cause Analysis (**RCA**), **Process Plant** Shutdown, Turnaround & Troubleshooting, Planning & Scheduling **Shutdowns & Turnarounds**, Optimizing **Equipment Maintenance** & Replacement Decisions, **Maintenance Planning & Scheduling**, **Material Cataloguing**, Maintenance, Reliability & Asset Management Best Practices, **Storage Tanks Operations** & Measurements, **Tank** Inspection & Maintenance, **Pressure Vessel** Operation, **Flare & Relief** System, **Flaring System** Operation, **PSV** Inspection & Maintenance, **Heat Exchanger** Troubleshooting & Maintenance, **Steam Trapping & Control**, **Control & ESD** System and Detailed Engineering Drawings, Codes & Standards.

During his career life, Mr. Ladwig has gained his practical experience through his various significant positions and dedication as the **Mechanical Engineer**, **Project Engineer**, **Reliability & Maintenance Engineer**, **Maintenance Support Engineer**, **Process Engineer**, **HSE Supervisor**, **Warehouse Manager**, **Quality Manager**, **Business Analyst**, **Senior Process Controller**, **Process Controller**, **Safety Officer**, **Mechanical Technician**, **Senior Lecturer** and **Senior Consultant/Trainer** for various companies such as the Sasol Ltd., Sasol Wax, Sasol Synfuels, just to name a few.

Mr. Ladwig has a **Bachelor's** degree in **Chemical Engineering** and a **Diploma** in **Mechanical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and has delivered various trainings, workshops, seminars, courses and conferences 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 Fee

US$ 6,750 per Delegate. 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 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

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Bolted Joint Technology*** *Purpose & Function of Bolted Joints • Advantages & Limitations • Common Failure Modes • Key Terminology*
0930 – 0945	*Break*
0945 – 1030	***Types of Fasteners & their Applications*** *Bolt Grades & Classifications • Stud Bolts, Nuts & Washers • Thread Types & Pitch • Material Selection Criteria*
1030 – 1130	***Joint Integrity Principles*** *Forces Acting on a Bolted Joint • Preload & Clamp Force Concepts • Torque versus Tension Overview • Elastic Interaction*
1130 – 1215	***Gasket Technology & Selection*** *Gasket Types & Materials • Gasket Seating Stresses • Handling & Storage of Gaskets • Effects of Temperature & Pressure*
1215 – 1230	*Break*
1230 – 1330	***Torque & Load Relationship*** *Friction's Role in Torque Application • Torque Scatter & its Impact • Lubrication Effects • Calculating Preload*

1330 – 1420	***Standards & Guidelines*** *ASME PCC-1 Overview • API 610 & 682 References • EN & ISO Norms • Site Procedures & Compliance*
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	***Torque Tools Overview*** *Manual Torque Wrenches • Pneumatic Torque Tools • Hydraulic Torque Wrenches • Electronic Torque Measurement Tools*
0830 – 0930	***Manual Torque Application*** *Types of Torque Wrenches • Calibration & Care • Correct Usage Techniques • Torque Value Verification*
0930 – 0945	*Break*
0945 – 1100	***Hydraulic Torque Tools*** *Components of Hydraulic Systems • Pump Selection & Setup • Safety During Hydraulic Torquing • Troubleshooting Hydraulic Issues*
1100 – 1215	***Torque Procedure Development*** *Bolt Sequence Patterns • Multi-Pass Tightening • Lubrication Protocols • Torque Verification Techniques*
1215 – 1230	*Break*
1230 – 1330	***Error Prevention & Troubleshooting*** *Causes of Under/Over-Torquing • Common Field Issues • Detecting Improper Bolting • Prevention Strategies*
1330 – 1420	***Practical Hands-On Exercises*** *Bolt Tightening Using Various Tools Lubrication Application Practice Applying Correct Torque Values Team-Based Tightening Drills*
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	***Basics of Bolt Tensioning*** *Differences from Torquing • When to Use Tensioning • Advantages & Limitations • Industry Applications*
0830 – 0930	***Hydraulic Tensioning Systems*** *Tensioner Types & Configurations • Power Packs & Hoses • Setting Up Tensioning Tools • Tool Compatibility with Bolt Size*
0930 – 0945	*Break*
0945 – 1100	***Tensioning Procedures & Planning*** *Load Calculation Methods • Sequence & Load Control • Stretch Measurement • Multiple Bolt Simultaneous Tensioning*
1100 – 1215	***Advanced Tensioning Methods*** *Elastic Recovery & Nut Rotation • Split Load Tensioning • Bolt Elongation Monitoring • Sequential Tensioning Optimization*
1215 – 1230	*Break*

1230 – 1330	***Tensioner Safety & Troubleshooting*** *Pressure Relief & Bleed-off • Risk Control for Hydraulic Failure • Leak Detection • Preventive Maintenance of Tools*
1330 – 1420	***Practical Exercises in Tensioning*** *Equipment Setup • Load Application & Monitoring • Parallel versus Sequential Tensioning • Demonstrating Correct Tensioning Sequences*
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	***Controlled Bolting Assembly Procedures*** *Flange Alignment & Preparation • Thread Inspection & Cleaning • Gasket Centering Techniques • Lubrication Control & Tagging*
0830 – 0930	***Flange Management & Joint Control*** *Flange Condition Assessments • Pre- & Post-Tightening Inspections • Recordkeeping for Bolted Joints • Leak Prevention Strategies*
0930 – 0945	*Break*
0945 – 1100	***Joint Integrity Testing*** *Bolt Load Verification Techniques • Ultrasonic Measurement of Bolt Stretch • Leak Testing Procedures • Documenting Joint Integrity Status*
1100 – 1215	***Maintenance of Bolted Joints*** *Monitoring Strategies • Retorquing Intervals • Corrosion Prevention Practices • Bolt Replacement Protocols*
1215 – 1230	*Break*
1230 – 1330	***Case Studies & Failures*** *Real-World Flange Failure Examples • Analysis of Poor Torquing/Tensioning Practices • Lessons Learned from Incidents • Corrective Action Development*
1330 – 1420	***Hands-on Flange Assembly Workshop*** *Complete Flange Bolting Under Supervision • Simulated Leak Testing • Documentation & Checklists • QA/QC Checks During Assembly*
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 – 0830	***Advanced Bolting Challenges*** *Large Diameter Bolts • High-Temperature Joints • Cryogenic Sealing • Subsea Bolt Tensioning*
0830 – 0930	***Design Considerations for Bolted Joints*** *Bolt Length & Grip Considerations • Joint Stiffness & Relaxation • Fatigue & Vibration Impacts • Expansion/Contraction Handling*
0930 – 0945	*Break*
0945 – 1100	***Digital & Smart Bolting*** *Load-Sensing Bolts •Digital Torque & Tension Monitors • IoT Integration in Bolted Joints • Real-Time Condition Tracking*

1100 – 1215	***Industry Applications & Standards Review*** *Oil & Gas Pipelines • Pressure Vessels & Heat Exchangers • Wind Turbines & Energy Sector • Offshore Platforms*
1215 – 1230	*Break*
1230 – 1345	***Final Practical Assessment*** *Torquing Task with Error Analysis • Tensioning Sequence Execution • Joint Integrity Inspection • Report Preparation & Review*
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/ Site Visit

Site visit will be organized during the course for delegates to practice the theory learnt:-

Course Coordinator

Jaryl Castillo, Tel: +974 6652 9196, Email: jaryl@haward.org