COURSE OVERVIEW ME0727
Bolt Torquing & Tensioning

Course Title
Bolt Torquing & Tensioning

H-STK© INCLUDED

Course Date/Venue
Session 1: August 03-07, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: December 22-26, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
ME0727

3.0 CEUs (30 PDHs) AWARD

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.

In this course we shall be analyzing circular flanges used in the power, petrochemical, oil and gas industries for the jointing of pipes, for the blinding of pipes and the blinding of pressure vessels/ heat exchangers.

The selection of pipe flanges is well documented in the ASME code and is fairly straight forward when pressures and temperatures are known. Use of the code makes the specific selection of components such as flanged valves, meters, pumps and compressors also fairly straight forward in most instances.

As a piping designer or engineer, it is essential to have an understanding of the flange joint make-up as a unit. To this end, it is essential to understand the meaning of bolt preload and its importance in the flange joint when considering external loadings due to: (1) internal pressure, (2) cyclic conditions (leading to possible fatigue), (3) the effect of temperature, (4) shear and bending loads, and (5) vibration.

Material selection will also be discussed. Once materials have been selected for flanges, bolts and gasket, for a particular joint, the engineer should be able to specify and calculate initial torque requirements and to ensure that the joint will not fail or leak.

This course will have practical demonstrations in KPO industrial facility to view the various types of flanges and talk to the technicians about problems encountered in the field relating to Flange Management. Likewise, KPO procedures will be discussed and a flange demonstration torque-up will be carried out, if possible.

The aspect of fatigue loadings will also be covered. However, in practice the cyclic conditions encountered can be extremely difficult to estimate. Sometimes, at best, a designer/engineer can only make assumptions (and judgments based on experience), regarding expected vibration. Only in special instances will a full finite element analysis have to be carried out for a critical joint. This is best left to the specialists and in this course no attempt will be made to teach the participants the FEA techniques. However, research will be discussed to illustrate the process and to give the participants some understanding of FEA techniques when applied to a flange joint.

When a flange joint is subjected to critical high temperature and pressures it is always recommended to give the design to a specialist who has the necessary software available. Accurate bending and shear loads on flange joints can sometimes only be established from a pipe stress analysis programme. In this course, circular flat plates will be analyzed and compared to blind flanges, and pressure vessel heat exchanger applications.

Course Objectives

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

- Apply and gain a comprehensive knowledge on torquing, hydraulic tensioning and tightening control of flange joints
- Identify the different types of flanges and gaskets used in the industry, become familiar with their applications and be able to determine their effect in the flange joint
- Discuss the system components of flange joint and analyze torque equations, stiffness of members, pre-tensioning, bolt strength, external loads and torques vs. tension
- Determine the various torque requirements needed and compare theory versus manufacturer/contractor recommendations
- Apply the selection process of flanges and ratings and identify the parameters that can cause flange leakage
- Identify blind end flange design for both pipelines and pressure vessels
- Use ASME/ANSI charts, bolting charts and torque charts in the selection of flange components
- Carryout fatigue loading and the effect of temperature and why FEA techniques are necessary in critical flange design applications
- Identify some of the software packages available for specific locations

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 torquing, hydraulic tensioning and tightening control of flange joints for engineers, lead technicians and technicians involved in the design, construction or maintenance of pressurized equipment utilizing flanged joints for the petroleum, refining, chemical, power and process industries, maintenance technicians working with pressurized fluids piping and pipelines, shop supervisors in charge of crews working in process plant environments and for piping and pipeline inspectors.

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$ 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 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 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**, 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**, **Rotating Equipment**, **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 – 0900	***Introduction***
0900 – 0930	***Course Overview***
0930 – 0945	*Break*
0945 – 1100	***Types of Flanges and Gaskets Used in the Industry*** *Weld Neck Flanges • Slip-on Flanges • Thread Flanges • CG Gaskets • CGI Gaskets • Composite Gasket Applications*
1100 – 1200	***Power Screws – Basic Theory Summary*** *Torque Equations • Stiffness of Members • Pre-Tensioning • Bolt Strength • External Loads • Torque vs. Tension*
1200 – 1215	*Break*
1215 – 1245	***Bolts/Studs Tightening Methods*** *Flogging • Torque Tightening • Bolt Tensioning*
1245 – 1330	***Torque Requirements and Examples*** *What is Torque? • Torque Requirements for Lubricated vs. Non-Lubricated Bolts*
1330 – 1420	***Tutorial***
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Bolt Strength and Preload – Theory and Examples***
0830 – 0930	***Gaskets and their Effect in the Flange Joint*** *Gasket Compressibility • Composite Gaskets*
0930 – 0945	*Break*
0945 – 1100	***The Effect of Temperature*** *Expansion • Pre-Tension Relaxation*
1100 – 1200	***Bolted Joints in Shear*** *Misalignment • Pipe Bending Moments Carried by Flanged Joints*
1200 – 1215	*Break*
1215 – 1330	***Selection of Flanges and Ratings*** *Flat Face Flanges • Raised Face Flanges • ASME Flange Ratings*
1330 – 1420	***Video Presentation*** ***VME-55 "Modern Marvels: Hydraulics"****; Time: 50:00 video from Haward Library*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Fatigue Loading of Tension Joints and Examples*** *Long Bolts vs. Normal Bolts*
0930 – 0945	*Break*
0945 – 1100	***Visit to KPO Facility*** *The Clients' Own In-House Procedures for Flange Joint Make-up will be Discussed and a Workshop Demonstration of Hydraulic Torque-up will be Arranged*
1100 – 1200	***Practical Exercise*** *Practice the Use of ASME/ANSI Charts, Bolting Charts and Torque Charts • Torque Charts vs. Tension*
1200 – 1215	*Break*
1215 – 1300	***Practical Exercise*** *Use a Specific Manufacturers' Catalogue to Choose and Discuss Gasket Types for Various Applications*
1300 – 1333	***Video Presentation***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0830	***Discussion Session*** *Special Cases of Flange Design • Special Flanges at KPO*
0830 – 0930	***Site Visit Findings and Review*** *Discussion Session*
0930 – 0945	*Break*
0945 – 1100	***Site Visit Findings and Review*** *Discussion Session (cont'd)*
1100 – 1200	***Introduction to Finite Element (FE) Analysis of a Flange Joint Under the Combined Effect of Preload, Pipe Internal Pressure and Temperature*** *Stress Levels • Stress Concentrations • Geometry Analysis*
1200 – 1215	*Break*
1215 – 1420	***Consequences of Bolt Tightening Deficiencies*** *Under-Tight Bolts • Over-Tight Bolts • Flange Rotation • Bolt Necking*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0930	***Standard Procedures for the Assembly of Flange Joints*** *Using the Proper Gasket for High Pressure/Temperature Service • Choosing the Right Flange Face • Applying the Proper Specified Bolt Pre-Tension*
0930 – 0945	*Break*
0945 – 1100	***Why Joints Fail*** *Case Studies*
1100 – 1200	***Discussion Around Various Aspects of Pipe Restraints and Using Anchors at Equipment Flange Connections***
1200 – 1215	*Break*
1215 – 1345	***Case Studies*** *Fire Started at Flange Joints • Protecting Long Bolts From Fire*
1345 – 1400	***Course Conclusion***
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

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