COURSE OVERVIEW ME0990
Basic Torque & Bolt Tensioning

Course Title
Basic Torque & Bolt Tensioning

Course Date/Venue
Session 1: August 03-07, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: December 15-19, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
ME0990

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

Course Description

This practical and highly-interactive course includes practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

In this course, we shall be analyzing the riveted and bolted joints used in the oil refineries for jointing of pipes & plates, for the blinding of pipes, pressure vessels and 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, however, 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/ or calculate initial torque requirements and to ensure that the joint will not fail or leak.

The aspect of fatigue loadings will be covered, however in practice the cyclic conditions encountered can be extremely difficult to estimate. An example of a pipeline in Alaska will be discussed in this regard. Sometimes, at best, a designer/ engineer can only make assumptions (and judgments based on experience), regarding expected vibration. Accurate bending and shear loads on flange joints can sometimes only be established from a pipe stress analysis programme.

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 (e.g. Nuclear Specials).
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.

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 a comprehensive knowledge and techniques on bolted flange and gasket design and stress analysis in accordance with ASME/ANSI Standards
- Identify the different types of flanges and gaskets used in the industry and become familiar with their applications
- Enumerate the system components of flange joint and analyze torque equations, stiffness of members, pretensioning, bolt strength, external loads and torques versus tension
- Determine the various torque requirements needed and compare theory versus manufacturer/contractor recommendations
- Analyze a joint in shear and explain fatigue loading and the effect of temperature
- Determine the system components of gaskets and their effect in the flange joint
- Employ the selection process of flanges and ratings and identify the parameters that can cause flange leakage
- Distinguish 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
- Recognize 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 systematic techniques and methodologies on bolted flange, gasket design and stress analysis for engineers involved in the design, construction or maintenance of pressurized equipment utilizing flanged joints for the petroleum, refining, chemical, power and process industries.

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)

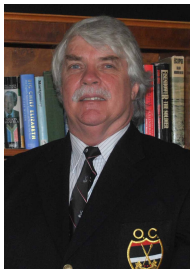
  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** 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:



Mr. Den Bazley, PE, BSc, is a **Senior Mechanical Maintenance Engineer** with over **25 years** of industrial experience in **Oil**, **Gas**, **Refinery**, **Petrochemical**, **Power** and **Utilities** industries. His wide expertise includes **Condition Based Monitoring**, **Piping System**, **Process Equipment**, **Mechanical Integrity**, **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**. His experience covers **Design**, **Construction** and **Maintenance** of **Storage Tank**, **Hydraulic Control Valves**, **rotating and static equipment** including **Safety Relief Valves**, **Boilers**, **Pressure Vessels**, **Tanks**, **Heat Exchangers**, **Bearings**, **Compressors**, **Pumps**, **Pipelines**, **Motors**, **Turbines**, **Gears**, **Lubrication Technology** and **Mechanical Seals**. Further, he has experience in Waste Water Treatment, **Water Treatment**, **Welding**, **NDT**, Vehicle Fleet and Budgeting & Cost Control. He is well-versed in **CMMS** and various International Standards including ISO 14001.

During his career life, Mr. Bazley has gained his practical and field experience through his various significant positions and dedication as the **Engineering Manager**, **Maintenance Manager**, **Construction Manager**, **Project Engineer**, **Mechanical Engineer**, **Mechanical Services Superintendent**, **Quality Coordinator** and **Planning Manager** 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 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 & Course Overview***
0900 – 0930	***Types of Flanges & Gaskets Used in the Industry***
0930 – 0945	*Break*

0945 – 1100	***Power Screws–Basic Theory Summary*** *Torque Equations • Stiffness of Members • Pretensioning • Bolt Strength • External Loads • Torque vs. Tension*
1100 – 1215	***Bolt Strength & Preload–Theory & Examples***
1215 – 1230	*Break*
1230 – 1330	***Torque Requirements & Examples***
1330 – 1420	***Tutorial***
1420 - 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Gaskets & their Effect in the Flange Joint***
0830 – 0930	***Flange Joints in Shear & Examples*** *Fatigue Revision*
0930 – 0945	*Break*
0945 – 1100	***The Effect of Temperature***
1100 – 1215	***Fatigue Loading of Tension Joints & Examples***
1215 – 1230	*Break*
1230 – 1420	***Tutorial***
1420 - 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Selection of Flanges & Ratings***
0930 – 0945	*Break*
0945 – 1100	***Bolted Joints in Shear***
1100 – 1215	***Application in Pressure Vessels–Circular Flat Plate Theory & Examples***
1215 – 1230	*Break*
1230 – 1330	***Use of ASME/ANSI Charts, Bolting Charts & Torque Charts*** *Torque Charts vs. Tension*
1330 – 1420	***Tutorial***
1420 - 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

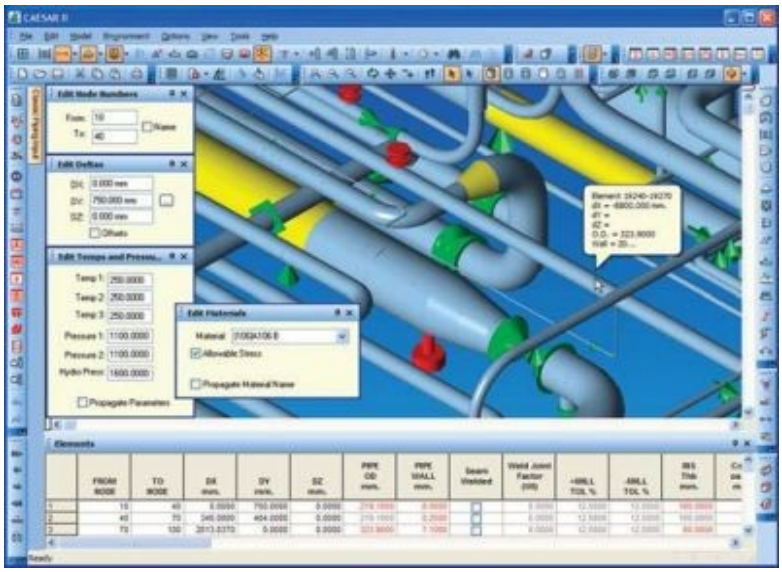
0730 – 0930	***Causes of Flange Leakage***
0930 – 0945	*Break*
0945 – 1100	***Special Cases of Flange Design***
1100 – 1215	***Introduction to Finite Element (FE) Analysis of a Flange Joint Under the Combined Effect of Preload, Pipe Internal Pressure & Temperature***
1215 – 1230	*Break*
1230 – 1420	***Why Joints Fail***
1420 - 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0930	***Discussion Around Various Aspects***
0930 – 0945	*Break*
0945 – 1100	***Standard Procedures for the Assembly of Flange Joints***
1100 – 1215	***Practical Question Time***
1215 – 1230	*Break*
1230 – 1345	***More Worked Examples***
1345 - 1400	***Course Conclusion***
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 state-of-the-art "CAESAR II Software".



Course Coordinator

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