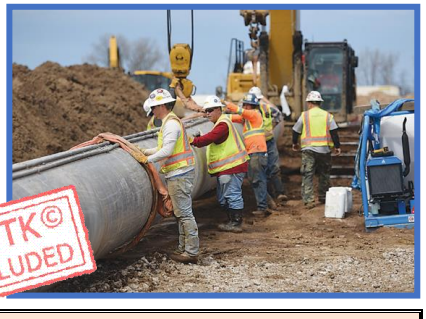
COURSE OVERVIEW FE0015-4D
Piping Mechanical Design & Specification

Course Title
Piping Mechanical Design & Specification

Course Reference
FE0015-4D

Course Duration/Credits
Four days/2.4 CEUs/24 PDHs



Course Date/Venue

Session(s)	Date	Venue
1	January 15-18, 2024	Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
2	April 22-25, 2024	Ajman Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
3	July 08-11, 2024	Jubail Hall, Signature Al Khobar Hotel, Al Khobar, KSA
4	October 14-17, 2024	Business Center, Concorde Hotel Doha, Doha Qatar

Course Description

This practical 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 and up-to-date overview of Piping Mechanical Design and Specification. It covers the principles of piping mechanical design and the role of mechanical design in piping systems; the codes and standards relevant to piping mechanical design and considerations for various process conditions and materials; the material selection criteria based on process conditions and fluid properties; the piping material specifications and standards; the corrosion resistance and material compatibility considerations, temperature and pressure limitations for different materials; and the documentation and traceability requirements for piping materials.

Further, the course will also discuss the types of loads acting on piping systems; the methods for determining loads and stresses; the stress categories and allowable stress analysis, thermal expansion, contraction analysis and software tools for stress analysis; the pipe wall thickness calculation, pressure design thickness calculation methods, accounting for corrosion allowances and mill tolerance; the external pressure design calculations and verification of pipe wall thickness using applicable codes and standards; the piping supports and restraints; the load distribution and selection of support types; the design considerations for spring hangers, snubbers and restraints; and the analysis of piping systems with variable loads and movements.

During this interactive course, participants will learn the pipe stress analysis, load case development and analysis procedure, flexibility analysis and pipe displacement evaluation; the piping vibration analysis and mitigation measures for addressing excessive vibration; the piping component design and selection, expansion joints and flexible joints; and the piping specification development and documentation.

Course Objectives

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

- Apply and gain an in-depth knowledge on piping mechanical design and specification
- Discuss the principles of piping mechanical design and the role of mechanical design in piping systems
- Explain the codes and standards relevant to piping mechanical design and considerations for various process conditions and materials
- Discuss material selection criteria based on process conditions and fluid properties and identify piping material specifications and standards
- Analyze corrosion resistance, material compatibility considerations, temperature and pressure limitations for different materials and documentation and traceability requirements for piping materials
- Identify the types of loads acting on piping systems and calculate methods for determining loads and stresses
- Recognize stress categories and allowable stress analysis, thermal expansion and contraction analysis and software tools for stress analysis
- Carryout pipe wall thickness calculation, pressure design thickness calculation methods, accounting for corrosion allowances and mill tolerance, external pressure design calculations and verification of pipe wall thickness using applicable codes and standards
- Identify piping supports and restraints, load distribution and selection of support types, design considerations for spring hangers, snubbers and restraints and analysis of piping systems with variable loads and movements
- Apply pipe stress analysis, load case development and analysis procedure, flexibility analysis and pipe displacement evaluation
- Employ piping vibration analysis and mitigation measures for addressing excessive vibration
- Determine piping component design and selection, expansion joints, flexible joints and piping specification development and documentation

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, sample video clips of the instructor's actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of piping mechanical design and specification for piping engineers, mechanical engineers, plant designers, project managers, construction professionals, piping inspectors and those who are interested in pursuing a career in mechanical engineering or related fields.

Training Methodology

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Workshops & Work Presentations
30% Case Studies & Practical Exercises
20% Software, Simulators & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Fee

Dubai	**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.
Abu Dhabi	**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.
Al Khobar	**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.
Doha	**US$ 5,500** 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 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: -

- 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.

- 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.

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 Engineer** with over **25 years** of extensive experience within the **Oil & Gas**, **Refinery**, **Petrochemical & Power** industries. His expertise widely covers in the areas of **Ammonia Manufacturing & Process Troubleshooting**, **Distillation Towers**, **Fundamentals of Distillation** for Engineers, **Distillation** Operation and Troubleshooting, **Advanced Distillation** Troubleshooting, **Distillation** Technology, Vacuum **Distillation**, **Ammonia Storage & Loading** Systems, **Ammonia Plant** Operation, Troubleshooting & Optimization, **Ammonia Recovery**, **Ammonia Plant Safety**, Hazard of **Ammonia Handling**, Storage & Shipping, **Operational Excellence** in **Ammonia Plants**, **Fertilizer Storage** Management (Ammonia & Urea), **Fertilizer Manufacturing** Process Technology, **Sulphur Recovery**, Phenol Recovery & Extraction, **Wax Sweating & Blending**, **Petrochemical & Fertilizer** Plants, **Nitrogen Fertilizer** Production, **Petroleum Industry Process** Engineering, **Separators** in **Oil & Gas** Industry, **Gas Testing & Energy** Isolations, Gas Liquor Separation, **Industrial Liquid Mixing**, **Wax Bleachers**, **Extractors**, **Fractionation**, Operation & Control of **Distillation**, Process of **Crude ATM & Vacuum Distillation** Unit, **Water Purification**, **Steam & Electricity**, **Flame Arrestors**, **Coal Processing**, **Environmental Emission Control**, R&D of **Wax Blending**, **Wax Molding/Slabbing**, **Industrial Drying**, Principles, Selection & Design, Certified **Process Plant Operations**, Control & Troubleshooting, **Operator** Responsibilities, **Storage Tanks Operations** & Measurements, **Process Plant Troubleshooting & Engineering Problem Solving**, **Process Plant Performance**, Efficiency & Optimization, Continuous Improvement & Benchmarking, **Process Troubleshooting** Techniques, Oil & Gas Operation/Introduction to **Surface Facilities**, **Pressure Vessel** Operation, **Process Equipment** Performance & Troubleshooting, **Plant Startup & Shutdown**, **Startup & Shutdown** the Plant While Handling Abnormal Conditions, **Process Gas Plant** Start-up, Commissioning & Problem Solving, **Process Liquid, Process Handling & Measuring** Equipment, **Steam Trap** Design, Operation, Maintenance & Troubleshooting, **Steam Trapping & Control**, **Column, Pump & Exchangers**, Troubleshooting & Design, Rotating Equipment Operation & Troubleshooting, **Control & ESD** System, Root Cause Analysis (**RCA**), **Dangerous Goods**, **Production Optimization**, Permit to Work (**PTW**), Project Engineering, Data Analysis, **HAZOP** Study, Sampling & Analysis, **Job Analysis** Techniques, **Hazardous Material** Classification & Storage/Disposal, **Risk** Monitoring Authorized Gas Tester (**AGT**), Confined Space Entry (**CSE**), **Process Hazard** Analysis (**PHA**), Personal Protective Equipment (**PPE**), Fire & Gas, First Aid and Occupational Health & Safety.

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.

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	***Introduction to Piping Mechanical Design*** *Piping Mechanical Design Principles • The Role of Mechanical Design in Piping Systems • Codes & Standards Relevant to Piping Mechanical Design • Mechanical Design Considerations for Various Process Conditions & Materials • Stress Analysis & Its Relationship to Mechanical Design*
0930 – 0945	*Break*
0945 – 1100	***Piping Material Selection & Specifications*** *Material Selection Criteria Based on Process Conditions & Fluid Properties • Piping Material Specifications & Standards (ASME B31.3, ASTM, etc.)*
1100 – 1215	***Piping Material Selection & Specifications (cont'd)*** *Corrosion Resistance & Material Compatibility Considerations • Temperature & Pressure Limitations for Different Materials*
1215 – 1230	*Break*
1230 – 1300	***Piping Material Selection & Specifications (cont'd)*** *Documentation & Traceability Requirements for Piping Materials*
1300 - 1420	***Piping Loads & Stresses*** *Types of Loads Acting on Piping Systems (Thermal, Pressure, Deadweight, etc.) • Calculation Methods for Determining Loads & Stresses • Stress Categories & Allowable Stress Criteria (ASME B31.3)*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Piping Loads & Stresses (cont'd)*** *Thermal Expansion & Contraction Analysis • Introduction to Software Tools for Stress Analysis (e.g., Caesar II)*
0830 - 0930	***Pipe Wall Thickness Calculation*** *Design Considerations for Determining Pipe Wall Thickness • Pressure Design Thickness Calculation Methods (ASME B31.3) • Accounting for Corrosion Allowances & Mill Tolerance*
0930 – 0945	*Break*
0945 – 1100	***Pipe Wall Thickness Calculation (cont'd)*** *External Pressure Design Calculations • Verification of Pipe Wall Thickness Using Applicable Codes & Standards*
1100 – 1215	***Piping Supports & Restraints*** *Introduction to Piping Support Design Principles • Types of Supports & Restraints in Piping Systems • Load Distribution & Selection of Support Types*
1215 – 1230	*Break*
1230 – 1420	***Piping Supports & Restraints (cont'd)*** *Design Considerations for Spring Hangers, Snubbers & Restraints • Analysis of Piping Systems with Variable Loads & Movements*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

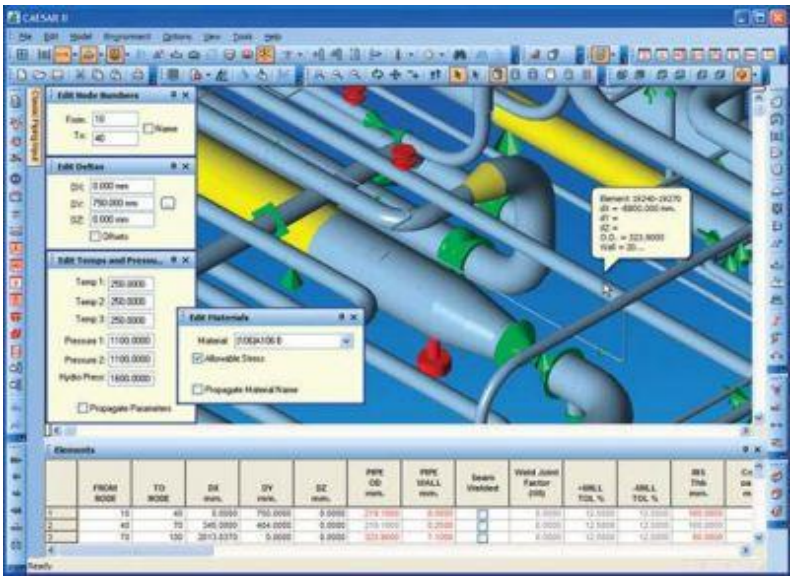
0730 – 0830	***Pipe Stress Analysis & Flexibility*** *Pipe Stress Analysis Principles • Load Case Development & Analysis Procedures • Flexibility Analysis for Accommodating Thermal Expansion & Contraction*
0830 - 0930	***Pipe Stress Analysis & Flexibility (cont'd)*** *Evaluating Pipe Displacements, Nozzle Loads & Equipment Interactions • Case Studies & Practical Exercises Using Stress Analysis Software*
0930 – 0945	*Break*
0945 – 1100	***Piping Vibration Analysis & Mitigation*** *Piping Vibration & Its Impact on Mechanical Design • Types of Vibration & their Causes (Flow-Induced, Mechanical, etc.) • Vibration Analysis Techniques & Criteria*
1100 – 1215	***Piping Vibration Analysis & Mitigation (cont'd)*** *Mitigation Measures for Addressing Excessive Vibration • Design Considerations for Supporting & Isolating Vibrating Equipment*
1215 – 1230	*Break*
1230 – 1300	***Piping Component Design & Selection*** *Design Considerations for Pipe Fittings, Valves & Flanges • ASME B16.5 & ASME B16.9 Standards for Flange & Fitting Design • Material Selection & Specifications for Components*
1300 - 1420	***Piping Component Design & Selection (cont'd)*** *Gasket Selection & Flange Face Design Considerations • Valve Selection Criteria Based on Process Requirements*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0830	***Expansion Joints & Flexible Elements*** *Introduction to Expansion Joints & Their Function in Piping Systems • Types of Expansion Joints (Bellows, Gimbal, Universal, etc.) • Selection Criteria & Design Considerations for Expansion Joints*
0930 – 0945	*Break*
0945 – 1100	***Expansion Joints & Flexible Elements (cont'd)*** *Flexible Hoses & Connectors in Piping Systems • Installation, Maintenance & Inspection of Expansion Joints*
1100 – 1215	***Piping Specification Development & Documentation*** *Creating Piping Specifications Based on Project Requirements • Documenting Mechanical Design Considerations in Specifications • Piping Material Takeoff & Bill of Materials Development*
1215 – 1230	*Break*
1230 - 1345	***Piping Specification Development & Documentation (cont'd)*** *Coordinating with Other Engineering Disciplines (Civil, Electrical, etc.) • Reviewing & Finalizing Piping Mechanical Design Deliverables*
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 "CAESAR II" simulator.



CAESAR II

Course Coordinator

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