COURSE OVERVIEW FE0096

Welding & Fabrication, Material Science & Corrosion

Course Title

Welding & Fabrication, Material Science & Corrosion

Course Date/Venue

November 24-28, 2024/Fujairah Meeting Room-Day 1, Zafran Meeting Room-Day 2-5, The Tower Plaza Hotel, Dubai, UAE

Course Reference

FE0096

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 Welding & Fabrication, Material Science & Corrosion. It covers the different welding methods (MIG, TIG, Arc welding, etc.); and their applications in petrochemical settings; the common welding joints (butt, lap, corner, edge, and tee joints); and their uses in pipeline and structural fabrication; the fabrication techniques specific to heat exchangers, pressure vessels, and piping systems; the criteria for selecting materials based on petrochemical industry requirements and the stress and corrosion resistance; the influence of welding on the microstructure of metals, heat-affected zones (HAZ); and the properties of welded joints.

Further, the course will also discuss the ASME, AWS, and API standards governing welding practices and quality control in the petrochemical industry; the welding in high-pressure, high-temperature environments, and welding defects including causes and prevention; the NDT methods covering radiographic testing, ultrasonic testing, and magnetic particle inspection for quality control; the PWHT and its importance in reducing residual stresses and improving the mechanical properties of welds; the weld qualification and procedure specifications and identify the common fabrication challenges covering thermal expansion, vibration, and material selection; the structure of materials (metals, alloys, polymers, and composites) and their properties.

During this interactive course, participants will learn the stress-strain relationships, hardness, toughness, fatigue, and creep in the context of petrochemical applications; the role of stainless steel, carbon steel, specialty alloys in resisting corrosion and high-temperature environments; the heat treatment of metals, failure analysis of metals and corrosion-resistant materials; the corrosion types like the uniform corrosion, galvanic corrosion, pitting, and stress corrosion cracking; the electrochemical reactions and corrosion, corrosion in petrochemical processes, corrosion prevention methods, inspection techniques for corrosion, corrosion standards and codes; the impact of welding on corrosion resistance and the role of weld chemistry in preventing corrosion; the corrosion control, and the life cycle assessment of materials and welds; the comprehensive corrosion management plan including monitoring, inspection and mitigation practices.

Course Objectives

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

- Apply and gain a comprehensive knowledge on welding and fabrication, material science and corrosion
- Discuss the different welding methods (MIG, TIG, Arc welding, etc.) and their applications in petrochemical settings
- Review the common welding joints (butt, lap, corner, edge, and tee joints) as well as their uses in pipeline and structural fabrication
- Discuss the fabrication techniques specific to heat exchangers, pressure vessels, and piping systems
- Identify the criteria for selecting materials based on petrochemical industry requirements including stress and corrosion resistance
- Explain the influence of welding on the microstructure of metals, heat-affected zones (HAZ), as well as the properties of welded joints
- Review ASME, AWS, and API standards governing welding practices including quality control in the petrochemical industry
- Describe welding in high-pressure, high-temperature environments, and welding defects including causes and prevention
- Employ NDT methods covering radiographic testing, ultrasonic testing, and magnetic particle inspection for quality control
- Explain the PWHT and its importance in reducing residual stresses and improving the mechanical properties of welds
- Develop weld qualification and procedure specifications and identify the common fabrication challenges covering thermal expansion, vibration, and material selection
- Identify the structure of materials (metals, alloys, polymers, and composites) and their properties
- Explore the stress-strain relationships, hardness, toughness, fatigue, and creep in the context of petrochemical applications

- Discuss the role of stainless steel, carbon steel, specialty alloys in resisting corrosion and high-temperature environments
- Recognize the heat treatment of metals, failure analysis of metals and corrosion-resistant materials
- Identify the corrosion types like the uniform corrosion, galvanic corrosion, pitting, and stress corrosion cracking
- Determine the electrochemical reactions and corrosion, corrosion in petrochemical processes, corrosion prevention methods, inspection techniques for corrosion, corrosion standards and codes
- Discuss the impact of welding on corrosion resistance and the role of weld chemistry in preventing corrosion
- Design corrosion control, and illustrate the life cycle assessment of materials and welds
- Develop the comprehensive corrosion management plan including monitoring, inspection and mitigation practices

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 welding and fabrication, material science and corrosion for welders and fabricators, materials engineers, corrosion engineers, quality control inspectors and other technical staff.

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: -

- 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.

- 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 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.

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. George Poulos, MBA, MSc, BSc, CEng, is a **Senior Corrosion & Welding Engineer** with over **45 years** of extensive experience within the **Oil & Gas**, **Petrochemical, Refinery**, **Construction**, **Aircraft & Shipbuilding** Industry. His wide experiences covers in the areas of **Metallurgy**, **Corrosion & Prevention** of **Failures**, **Material Selection & Properties**, **Metallurgy** Techniques, **Metallurgical** Failure Analysis & Prevention, **Oilfield Corrosion Monitoring & Control**, **Corrosion** Fabrication & Inspection, **Fabrication** & **Repair**, **Corrosion** Prevention, **Corrosion** Engineering, **Corrosion Control**, **Corrosion Inhibition**, **Corrosion** Management in Process Operations, **Corrosion** & Prevention of Failures, **Material** Selection, **Cathodic Protection** Systems, **Welding** & **Cutting**, **Welding** Inspection, **Welding** & **Machine** Techniques, **TIG** & **Arc Welding**, **Shielded Metal Arc Welding**, **Gas Tungsten** & **Gas Metal Arc Welding**, **Welding** Procedure Specifications & Qualifications, **Aluminium Welding**, **Hot & Cold Tapping** Techniques, **Hot Work-Safety**, **SMAW**, **GTAW**, **Welding** Techniques, **Pipeline Welding** Practices, **Welding** Engineering, **Welding** Fatigue & Fracture Mechanics, **Welding Inspection Technology**, **Welding Safety**, **Welding** Defects Analysis, **Welding Technology**, **Welding Problems**, **Welding & Non Destructive** Testing,. Further, he is also well-versed in **Hot Rolling** Process, **Hot Strip Mill**, **Mill** Operations, **Roll Mill**, **Steel Making** Process, **Steel** Manufacturing, **Electric Arc Furnace** (**EAF**), **Steel Forging**, **Steel** Manufacturing & Process Troubleshooting, **Slit Rolling**, **Carbon Steel Pipe** Wall Thickness & Grade Selection, **Ferro-Alloys**, **Steel Metallurgy**, **Steel** Structure Welding, **Steelmaking** Slag, **Steel** Making Application, **Heat Treatment** & **Prevention Techniques**, **Corrosion** Fabrication & Inspection and **Post Weld Heat Treatment**.

During his career life, Mr. Poulos has gained his practical and field experience through his various significant positions and dedication as the **Chief Executive**, **Head of Technical Studies**, **Manager**, **Senior Consultant**, **Lead Welding Engineer**, **Senior Welding Engineer**, **Design Engineer**, **Sales Engineer**, **Author**, **Welding Instructor**, **Visiting Lecturer** and **Technical Proposal Research Evaluator** from various international companies such as Greek Welding Institute, Hellenic Quality Forum and International Construction Companies such as Shipbuilding, Aircraft Industry and Oil and Gas Industry.

Mr. Poulos is a **Registered Chartered Engineer** and has a **Master's** degree in **Naval Architecture**, a **Bachelor's** degree in **Welding Engineering** and a Master of Business Administration (**MBA**) from the **Sunderland University**, **Aston University** and **Open University**, **UK**, respectively. Further, he is a **Certified Trainer/Instructor**, an active Member of Chartered Quality Institute (**CQI**), The British Welding Institute (**TWI**), The Royal Institution of Naval Architects (**RINA**) and American Welding Society (**AWS**), a Registered **EWF/IW** (European Welding Federation-International Welding Institute W/E) and an **IRCA** Accredited External Quality Systems Auditor through BVQI. He is an **Author** of Technical Book dealing with Protection/Health/Safety in the Welding/Cutting domain and delivered various trainings, seminars, conferences, workshops and courses globally.

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 course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: ***Sunday, 24th of November 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Welding Processes*** *Overview of Different Welding Methods (MIG, TIG, Arc Welding, Etc.) & Their Applications in Petrochemical Settings*
0930 – 0945	*Break*
0945 – 1030	***Types of Welding Joints*** *Review of Common Welding Joints (Butt, Lap, Corner, Edge, & Tee Joints) & Their Use in Pipeline & Structural Fabrication*
1030 – 1130	***Fabrication Methods for Petrochemical Equipment*** *Discussion of Fabrication Techniques Specific to Heat Exchangers, Pressure Vessels, & Piping Systems*
1130 – 1230	***Material Selection for Welding*** *Criteria for Selecting Materials Based on Petrochemical Industry Requirements, Including Stress & Corrosion Resistance*
1230 – 1245	*Break*
1245 - 1330	***Welding Metallurgy*** *Influence of Welding on the Microstructure of Metals, Heat-Affected Zones (HAZ), & the Properties of Welded Joints*
1330 - 1420	***Welding Codes & Standards*** *An Introduction to ASME, AWS, & API Standards Governing Welding Practices & Quality Control in the Petrochemical Industry*
1420 - 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2: ***Monday, 25th of November 2024***

0730 – 0900	***Welding in High-Pressure & High-Temperature Environments*** *Techniques for Welding Materials Used in High-Pressure Systems & Dealing with Temperature Variations in Petrochemical Applications*
0900 – 0915	*Break*
0945 – 1030	***Welding Defects: Causes & Prevention*** *Identification of Common Defects Like Porosity, Cracking, & Incomplete Fusion, with Methods to Prevent Them*
1030 – 1130	***Non-Destructive Testing (NDT) of Welds*** *Introduction to NDT Methods Such as Radiographic Testing, Ultrasonic Testing, & Magnetic Particle Inspection for Quality Control*
1130 – 1230	***Post-Weld Heat Treatment (PWHT)*** *Explanation of PWHT & Its Importance in Reducing Residual Stresses & Improving the Mechanical Properties of Welds*

1230 – 1245	Break
1245 - 1330	***Weld Qualification & Procedure Specifications*** Requirements for Welding Procedure Qualification, Welder Performance Qualification, & Documentation
1330 - 1420	***Fabrication Challenges in the Petrochemical Industry*** Case Studies on Common Fabrication Challenges such as Thermal Expansion, Vibration, & Material Selection
1420 - 430	***Recap***
1430	Lunch & End of Day Two

Day 3: Tuesday, 26th of November 2024

0730 – 0900	***Fundamentals of Material Science*** Introduction to the Structure of Materials (Metals, Alloys, Polymers, & Composites) & Their Properties
0900 – 0915	Break
0945 – 1030	***Mechanical Properties of Metals*** Exploration of Stress-Strain Relationships, Hardness, Toughness, Fatigue, & Creep in the Context of Petrochemical Applications
1030 – 1130	***Alloys Used in the Petrochemical Industry*** The Role of Stainless Steel, Carbon Steel, & Specialty Alloys in Resisting Corrosion & High-Temperature Environments
1130 – 1230	***Heat Treatment of Metals*** Overview of Annealing, Quenching, Tempering, & Hardening Processes to Alter Material Properties for Specific Petrochemical Applications
1230 – 1245	Break
1245 - 1330	***Failure Analysis of Metals*** Techniques to Investigate & Analyze Material Failures, Focusing on Fracture Mechanics, Wear, & Fatigue
1330 - 1420	***Corrosion-Resistant Materials*** Materials Designed to Resist Corrosion, Including Duplex Stainless Steels, Nickel Alloys, & Corrosion-Resistant Coatings
1420 - 430	***Recap***
1430	Lunch & End of Day Three

Day 4: Wednesday, 27th of November 2024

0730 – 0900	***Basics of Corrosion Mechanisms*** Explanation of Corrosion Types such as Uniform Corrosion, Galvanic Corrosion, Pitting, & Stress Corrosion Cracking
0900 – 0915	Break
0945 – 1030	***Electrochemical Reactions & Corrosion*** The Role of Electrochemical Reactions in Corrosion & Their Impact on Petrochemical Structures
1030 – 1130	***Corrosion in Petrochemical Processes*** Factors Contributing to Corrosion in Refining, Storage, & Transportation of Petrochemical Products
1130 – 1230	***Corrosion Prevention Methods*** Review of Coatings, Cathodic Protection, & Material Selection as Methods of Corrosion Prevention
1230 – 1245	Break

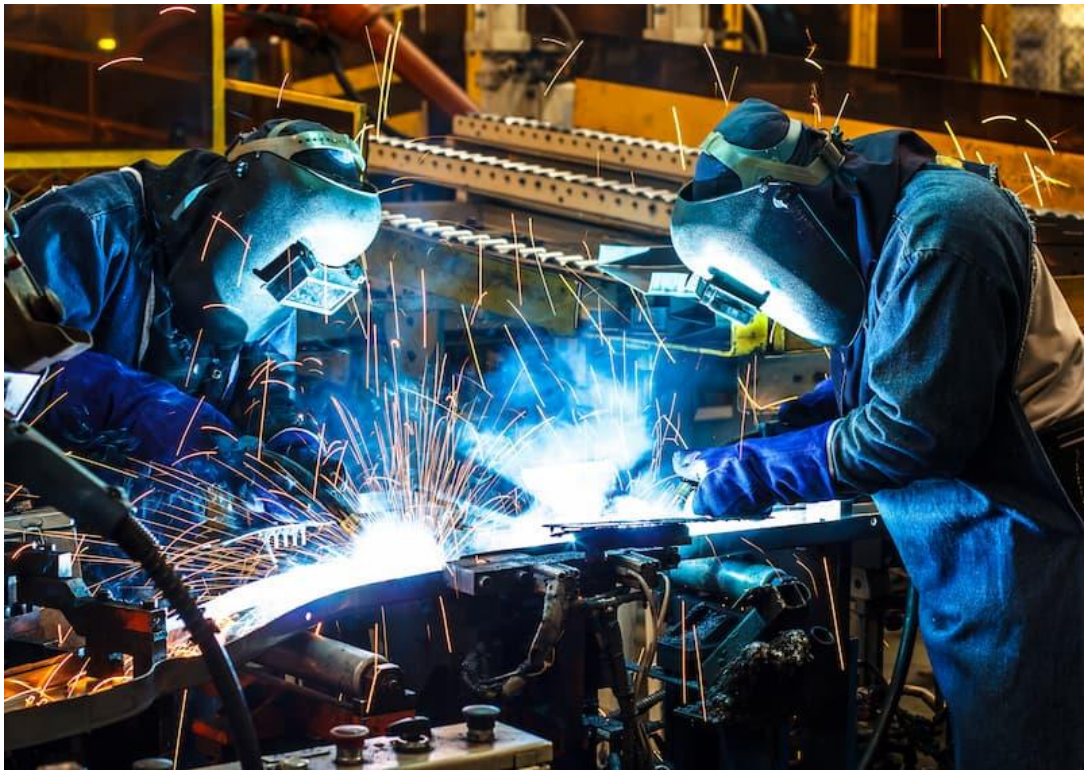
1245 - 1330	***Inspection Techniques for Corrosion*** *Methods of Inspecting for Corrosion Damage, Including Ultrasonic Testing, Eddy Current Testing, & Corrosion Probes*
1330 - 1420	***Corrosion Standards & Codes*** *Overview of International Standards Like NACE, ISO, & API for Corrosion Control in Petrochemical Environments*
1420 - 430	***Recap***
1430	*Lunch & End of Day Four*

Day 5: ***Thursday, 28th of November 2024***

0730 – 0830	***Welding & Corrosion Interaction*** *Exploring the Impact of Welding on Corrosion Resistance & the Role of Weld Chemistry in Preventing Corrosion*
0830 – 0930	***Designing for Corrosion Control*** *Strategies for Designing Welded Structures that Minimize Corrosion Risks in Petrochemical Plants*
0930 - 0945	*Break*
0945 – 1030	***Life Cycle Assessment of Materials & Welds*** *Techniques to Assess the Long-Term Performance & Cost-Effectiveness of Materials & Welds, Including Corrosion Management*
1030 – 1230	***Corrosion Management Strategies*** *Developing a Comprehensive Corrosion Management Plan, including Monitoring, Inspection, & Mitigation Practices*
1230 - 1245	*Break*
1245 - 1345	***Case Studies in Failure & Success*** *Analysis of Real-World Examples of Material Failures & Successes in Petrochemical Welding, Fabrication, & Corrosion Control*
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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