COURSE OVERVIEW FE0433
Welding Defects Analysis

Course Title
Welding Defects Analysis

Course Date/Venue
Please see page 3

Course Reference
FE0433

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 carryout welding inspection. Theory learnt in the class will be applied using our state-of-the-art simulators.

This course is designed to provide participants with an up-to-date overview on welding defects analysis. It covers the identification of various welding imperfections and defects; the relevant welding technology related to visual inspection, documentation in welding and code and standards related to inspection requirements; the proper inspection of parent materials and consumables; the visual inspection of welds; the reporting and assessing with specified acceptance criteria; the factors which influence the quality of fusion welds in steels; and the characteristics of commonly used welding process in relation to quality control and specifications of drawing instructions and symbols.

The course will further discuss the validity of a welding procedure; the origin of weld defects; the features of a fracture surface; the detailed reports plan, the use of skilled inspectors and NDT personnel; the various types of weld defects and how it is expected to appear on a radiographic image and what causes them; the gas pour, linear porosity and lack of fusion; and the various types of cracks and weld repair methods.

During the course, participants will be able to cover the theoretical background of phased array applications; the scan data for location and size of defects in typical welded butt joints; the basic theory of X- and gamma radiography and radiograph; the proper radiographic techniques and the difference between film faults and defect indications; the basic principles of magnetic particles inspection methods; the magnetic particle inspection and detection of cracks, surface and near-surface in welds; the PWSCC effects on reactor welds; the reactor vessel nozzle weld problems, the hellion time effect on aging reactor welds; and the stream generator weld problems.

Course Objectives

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

- Apply and gain a comprehensive knowledge on welding defects analysis
- Identify the various welding imperfections and defects and discuss the relevant welding technology related to visual inspection, documentation in welding and code and standards related to inspection requirements
- Determine proper inspection of parent materials and consumables covering the visual inspection of welds as well as reporting and assessing their compliance with specified acceptance criteria
- Analyse the factors which influence the quality of fusion welds in steels and describe the characteristics of commonly used welding process in relation to quality control and specifications of drawing instructions and symbols
- Assess the validity of a welding procedure, recognize the origin of weld defects, interpret features of a fracture surface, prepare detailed reports plan, organize and supervise use of skilled inspectors and NDT personnel, etc
- Describe the various types of weld defects and analyse how it is expected to appear on a radiographic image and what causes them
- Recognize gas pour, linear porosity and lack of fusion as well as the various types of cracks and weld repair methods
- Explain the theoretical background of phased array applications
- Analyse scan data for location and size of defects in typical welded butt joints and explain the basic theory of X- and gamma radiography and radiograph
- Employ proper radiographic techniques and differentiate between film faults and defect indications
- Explain the basic principles of magnetic particles inspection methods, carryout magnetic particle inspection and detect cracks, surface and near-surface in welds
- Discuss PWSCC effects on reactor welds and identify the reactor vessel nozzle weld problems, hellion time effect on aging reactor welds and stream generator weld problems

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 welding defects analysis for engineers, product designers, tools and dye makers, welding maintenance and launch personnel.

Course Date/Venue

Session(s)	Date	Venue
1	April 26-30, 2026	Meeting Plus 9, City Centre Rotana, Doha, Qatar
2	May 17-21, 2026	Salon Expo, NH Hotel Plaza de Armas, Seville, Spain
3	July 06-10, 2026	Ruben Boardroom, The Rubens at The Palace, Buckingham Palace Road, London, United Kingdom
4	August 16-20, 2026	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
5	October 18-22, 2026	Pierre Lotti Meeting Room, Movenpick Hotel Istanbul Golden Horn, Istanbul, Turkey
6	November 22-26, 2026	Meeting Room 4, Four Seasons Hotel Cairo at Nile Plaza, Corniche El Nil, Garden City, Cairo, Egypt
7	January 17-21, 2027	Meeting Plus 9, City Centre Rotana, Doha, Qatar
8	February 08-12, 2027	Salon Expo, NH Hotel Plaza de Armas, Seville, Spain
9	March 21-25, 2027	Pierre Lotti Meeting Room, Movenpick Hotel Istanbul Golden Horn, Istanbul, Turkey

Course Fee

Doha	**US$ 6,000** per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Seville	**US$ 8,800** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
London	**US$ 8,800** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Dubai	**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.
Istanbul	**US$ 6,000** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Cairo	**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

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. Mohamed Kader, BSc, PgDip, PMI-PMP, NDT, CSWIP, API is a **Senior Inspection Engineer** with over **20 years** of practical experience within the **Oil & Gas**, **Petrochemical** and **Refinery industries**. His expertise widely covers in the areas of **Material Science & Selection**, **Composite Repair Materials**, **Material Selection & Properties**, **Material & Inspection Foundation**, **Refractory Material Design, Application**, **Installation & Inspection**, **Tank Repairs**, **Design**, **Fabrication**, **Construction**, **Installation**, **Commissioning**, **Inspection & Maintenance** of **Process Equipment**, **Aboveground Storage** Tank Inspection, **Tank Repair**, **Alteration & Reconstruction**, **Tank & Vessels** Inspection, Repair & Modification, **Pressure Vessels** Inspection, **Steam Generator** Repair, **Boilers**, **Piping** Systems, **Pipeline** Operation & Maintenance, **Pipeline** Systems, **Pipeline** Design & Construction, **Pipeline** Inspection & Rehabilitation, **Corrosion**, Fitness for Service (**FFS**), Risk Based Inspection (**RBI**), **Integrity** Management, **Pipeline** Rehabilitation & Repair, **Pipeline** Design & Maintenance, **Pipeline Integrity** Assessment, **Corrosion Monitoring & Cathodic Protection**, **Pressure & Leak** Testing, Piping Inspection, Pipe Lines, Piping Fabrication, Pipe Flow, Gas Pipe Line, Non-Destructive Testing & Engineering Materials, NDT Methods & Application, Magnetic Particle Inspection & Testing, Radiographic Inspection & Testing, Visual Inspection, Leak Testing, Cathodic Protection, Welding Inspection, Welding Technology, Welding & Fabrication, Welding Defects Analysis, Welding Engineering, Welding Procedure Specification, Welding Quality & Control, Damage Mechanisms, Pressure Vessels, Tanks, Heat Exchangers, RT Films Interpretation, Fire Heaters Revamping, Waste Water Heater, Distillation Towers, Crude Oil Tank, Steam Power Plant, Spherical Tanks and Asset Integrity Management. Further, he is also well-versed in **Contract** Management & Administration, **Project** Management, **Project** Scheduling & Cost Control, **Project** Supervision, **Project** Reporting, **Project Investment** & **Risk Analysis**, **Project** Delivery & Governance Framework, **Project Risk** Management, **Risk** Identification Tools & Techniques, **Project** Life Cycle, **Project Stakeholder** & **Governance**, **Project Time** Management, **Project Cost** Management, **Project Quality** Management and **Quality** Assurance. He is currently the **Project Manager** of SOPCO wherein he is managing the project team, evaluating projects and ensuring that the projects meet the quality standards.

During his career life, Mr. Mohamed occupied several significant positions and dedication as the **Projects Engineer**, **Piping & QC Leader**, **Piping Engineer**, **QA/QC Engineer** and **Senior Trainer/Instructor** for various international companies like the Gulf of Suez Petroleum Company (GUPCO), Khalda Petroleum Company (KPC), ADMA-OPCO, Kahalda Petroleum Company, East Gas and MASSA Inspection and Consultation Company.

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 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	***Weld Imperfections (Defects)*** *Welding Technology related to Visual Inspection ● Understand the Need for Documentation in Welding ● Codes & Standards related to Inspection Requirements*
0930 – 0945	*Break*
0945 – 1100	***Inspection of Parent Materials & Consumables*** *Visual Inspection of Welds, Report on them & Assess their Compliance with Specified Acceptance Criteria*
1100 – 1230	***Inspection of Parent Materials & Consumables (cont'd)*** *Factors which Influence the Quality of Fusion Welds in Steels*
1230 - 1245	*Break*
1245 – 1420	***Inspection of Parent Materials & Consumables (cont'd)*** *Characteristics of Commonly Used Welding Processes in Relation to Quality Control*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0930	***Inspection of Parent Materials & Consumables (cont'd)*** *Drawing Instructions & Symbols to ensure that Specifications are Met*
0930 – 0945	*Break*
0945 – 1100	***Validity Assessment of a Welding Procedure*** *Origins of Weld Defects*
1100 – 1230	***Validity Assessment of a Welding Procedure (cont'd)*** *Interpret Features of a Fracture Surface & Prepare Detailed Reports ● Scrutinise & Correct Inspection Reports*

1230 – 1245	*Break*
1245 – 1420	***Validity Assessment of a Welding Procedure (cont'd)*** *Scrutinise & Correct Inspection Reports ● Plan, Organise & Supervise Use of Skilled Inspectors & NDT Personnel ● Conduct Pre, During & Post Welding Audits*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Types of Weld Defects in Cross Section*** *How it is Expected to Appear on a Radiographic Image? ● What Causes Them: Worm Hole or Linear Slag Inclusion?*
0930 – 0945	*Break*
0945 – 1100	***Gas Pore, Linear Porosity & Lack of Fusion***
1100 – 1230	***Various Types of Cracks***
1230 – 1245	*Break*
1245 – 1420	***Weld Repair Methods***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0830	***Theoretical Background of Phased Array Applications*** *Select Probe/Wedge to Examine Welded Butt Joints ● Calibrate & Set up the Phased Array Ultrasonic Equipment ● Locate & Evaluate Flaws in the Weld Body, HAZ & Parent Metal Lamination*
0830 – 0930	***Scan Data Analyzation for Location & Size of Defects in Typical Welded Butt Joints*** *Accurately Report Weld Condition ● Differentiate Defects from Geometric Features*
0930 – 0945	*Break*
0945 - 1100	***Basic Theory of X - & Gamma Radiography*** *Select Film Type & Energy Levels, Select & Prepare Techniques for a Given Specimen ● Theory of Film Processing & Carryout Practical Dark-Room Work ● Working Knowledge of Basic Radiation Safety ● Plot & Evaluate Film Characteristics (Sensitometry)*
1100 – 1230	***Film Faults - Basic Theory of Radiograph***
1230 – 1245	*Break*
1230 – 1315	***Radiographic Techniques*** *List of Radiographic Techniques ● State Origins of Defects ● Recognise & Differentiate between Film Faults & Defect Indications*
1315 – 1345	***Radiographs Interpretation*** *Basic Principles of Magnetic Particle Inspection Methods ● Magnetic Particle Inspection*
1345 – 1420	***Detection of Cracks, Surface & Near-Surface in Welds***
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5

0730 – 0930	***PWSCC Effect on Reactor Welds***
0930 – 0945	*Break*
0945 – 1100	***Reactor Vessel Nozzle Weld Problems***
1100 – 1230	***Helion Time Effect on Aging Reactor Welds***
1230 – 1245	*Break*
1245 – 1345	***Steam Generator Weld Problems***
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

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 welding inspection using the "American Welding Society (AWS) Tool Kit" and "Structural Weld Replica Kit", suitable for classroom training.

American Welding Society (AWS) Tool Kit and Structural Weld Replica Kit

Course Coordinator

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