

COURSE OVERVIEW FE0336

Microstructural Characterization & Inclusion Rating of Steels

Course Title

Microstructural Characterization & Inclusion Rating of Steels

Course Date/Venue

Session 1: April 13-17, 2025/Crowne Meeting Room, Crowne Plaza Al Khobar, KSA

Session 2: October 05-09, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE



Course Reference

FE0336



Course Duration/Credits

Five days/3.0 CEUs/30 PDHs

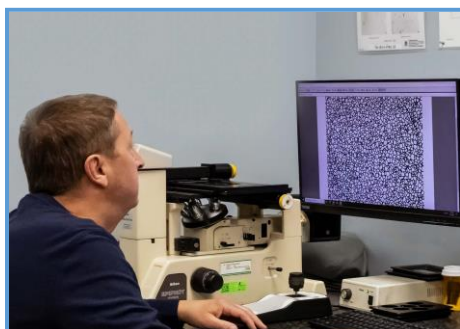
Course Description



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 covers the main experimental techniques used for characterizing the microstructure of materials with applications in engineering. Participants will be able to distinguish the relationship between microstructure and properties of engineering materials.



The course explores a systematic approach on the inclusion rating of steels, using the ASTM E45 and E1245 and other NMI standards.

During this interactive course, participants will learn the engineering steels; optical microscopy (OM); scanning and transmission electron microscopy (SEM and TEM); electron backscatter diffraction, energy dispersive x-ray analysis and surface profilometry (SP); sample preparation; non metallic inclusions in steel; microstructural characterization and non metallic inclusions in steel; ASTM E45; and other NMI standards.

Course Objectives

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

- Apply and gain a comprehensive knowledge on microstructural characterization and inclusion rating of steels
- Recognize the application of optical microscopy, transmission electron microscopy, scanning electron microscopy, electron backscatter diffraction, energy dispersive x-ray analysis and surface profilometry techniques to engineering steels
- Determine the crystal structure of metals and the chemical structure of non metallic inclusions
- Identify the effects of non metallic inclusions on the properties of engineering steels
- Appreciate the capabilities of different microstructural analysis techniques for characterizing the microstructure of engineering steels
- Analyse technical reports and scientific papers that relate to microstructural analysis and /or the presence of non metallic inclusions
- Select appropriate sample preparation techniques for optical microscopy, TEM, SEM and surface profilometry
- Assess the relevance of of common microstructural features in engineering steels observed by optical microscopy, TEM, SEM and surface profilometry
- Use ASTM E45 to assess the type, size and distribution of non metallic inclusions

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 microstructural characterization and inclusion rating of steels for manufacturing personnel and engineers that specify steels and their heat treatment, steel company operating personnel and sales engineers, heat treatment managers, heat treatment personnel, heat treatment operators, metallographers, forensic laboratory personnel, failure analysts and troubleshooters and quality control personnel.

Course Fee

US\$ 10,000 per Delegate + **VAT**. This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), 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: -

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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.

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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. Salah Younes, MSc, BSc, is a **Senior Pipeline & Corrosion Engineer** with over **30 years** of extensive **onshore & offshore** experience within the **Oil, Gas, Refinery** and **Petrochemical** industries. His wide expertise covers in the areas of **Inspection and Corrosion Foundations, Pipeline Inspection, Corrosion & Repair, LP/HP Gas, Condensate & Fuel Production, Corrosion Control, Corrosion Mechanism & Chemical Reactions, Corrosion Prevention & Control Techniques, Corrosion Management & Monitoring, Corrosion Inhibitors, Corrosion**

Analysis & Remedial Actions, Corrosion Inspection, Facility Integrity Assessments & Rehabilitation, Production Corrosion Control, Cathodic Protection Testing, Painting Inspection, Pipeline Integrity Management, Pipeline Pigging & Assessment, Pipeline Design, Facility Integrity & Assessment, Risk Based Inspection, Process Piping, Storage Tanks, Tank Farm Piping Network, Pigging, ANSI/ASME B31, Pressure Vessels Design & Fabrication, Offshore Structure & Facilities, Onshore Facilities & Storage Tanks, Pressure Vessels, Inhibitors, Protective Coatings, Water Treatment & Injection, Water Flooding, Chemical Treatment & Injection, Oil & Gas Process and Steel Structure Painting. Further, his expertise includes soil resistivity, platform structures, atmospheric tanks, safety relieves valves, heat exchangers, fire heaters, fireproofing materials, lifting equipment, tubing, casing and gas lifting systems, fabrication yards, coatings & non-metallic materials, external & internal coatings, linear polarization and hot tapping. Currently, he is the **Engineering General Manager** wherein he prepares and follow-up periodical inspection plans for all plant equipment internally and externally during downtime and/or maintenance programs at oil processing plant, gas plant, water flooding plant and production platforms.

Earlier in Mr. Salah's career, he acquired his practical and technical expertise and held key positions as the **Engineering Manager, Corrosion Department Manager, Facilities Integrity Manager, Corrosion Specialist, Offshore Engineer, Pipeline Integrity Consultant, Corrosion & Chemical Treatment Head, Coating Engineer, Corrosion Engineer, Chemical Engineer, Lecturer/Trainer** and **Senior Consultant** from international companies like the **ADMA-OPCO, Qatar Petroleum (QP), RASGAS, MAERSK Oil Qatar, GUPCO** and **Bureau Veritas**.

Mr. Salah has a **Master** and **Bachelor** degrees in **Chemical Engineering**, a **Post Graduate Diploma in Chemical Engineering** and a **Diploma in Corrosion & Water Treatment**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership and Management (ILM)**, a **Certified BGAS-CSWIP Painting Inspector** and a **Certified ASNT-NDT Level II** in **Magnetic Particles Testing (MT)**, **Penetrant Testing (PT)** and **Radiographic Testing (RT)**. Moreover, he has published various technical papers related to **Corrosion Management** and **Cathodic Protection** that have been presented at several international courses and conferences and has delivered numerous trainings, courses, seminars, conferences and workshops globally.

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	<i>Registration & Coffee</i>
0800 – 0815	<i>Welcome & Introduction</i>
0815 – 0830	PRE-TEST
0830 – 0900	Engineering Steels <i>Processing & Properties • Crystal Structure of Metals • Chemical Structure of Non Metallic Inclusions • Effects of Non Metallic Inclusions on Properties</i>
0900 – 0915	<i>Break</i>
0915 – 1015	Optical Microscopy (OM)
1030 – 1215	Scanning & Transmission Electron Microscopy (SEM & TEM)
1215 – 1230	<i>Break</i>
1230 – 1420	Electron Backscatter Diffraction, Energy Dispersive X-Ray Analysis and Surface Profilometry (SP)
1420 – 1430	Recap
1430	<i>Lunch & End of Day One</i>

Day 2

0730 – 0900	Sample Preparation <i>OM • SEM • TEM • SP</i>
0900 – 0915	<i>Break</i>
0915 – 1015	Workshop <i>Microstructural Analysis and Characterization</i>
1030 – 1215	Workshop (cont'd) <i>Relevance of Common Microstructural Features</i>
1215 – 1230	<i>Break</i>
1230 – 1420	Review <i>Microstructural Characterisation of Steels</i>
1420 – 1430	Recap
1430	<i>Lunch & End of Day Two</i>



Day 3

0730 – 0900	Non Metallic Inclusions in Steel What are they? • Steelmaking
0900 – 0915	Break
0915 – 1015	Non Metallic Inclusions in Steel (cont'd) Indigenous • Exogenous
1030 – 1215	Non Metallic Inclusions in Steel (cont'd) Control • Classification
1215 – 1230	Break
1230 – 1420	Non Metallic Inclusions in Steel (cont'd) Microcopy Techniques
1430	Lunch & End of Day Three

Day 4

0730 – 0900	Microstructural Characterization & Non Metallic Inclusions in Steel Workshop Analyzing Technical and Scientific Reports
0900 – 0915	Break
0915 – 1015	ASTM E45 Inclusion Rating • Morphology • Size
1030 – 1215	ASTM E45 (cont'd) Shape • Concentration • Distribution
1215 – 1230	Break
1230 – 1420	ASTM E45 (cont'd) Chemical Identity • Classification
1430	Lunch & End of Day Four

Day 5

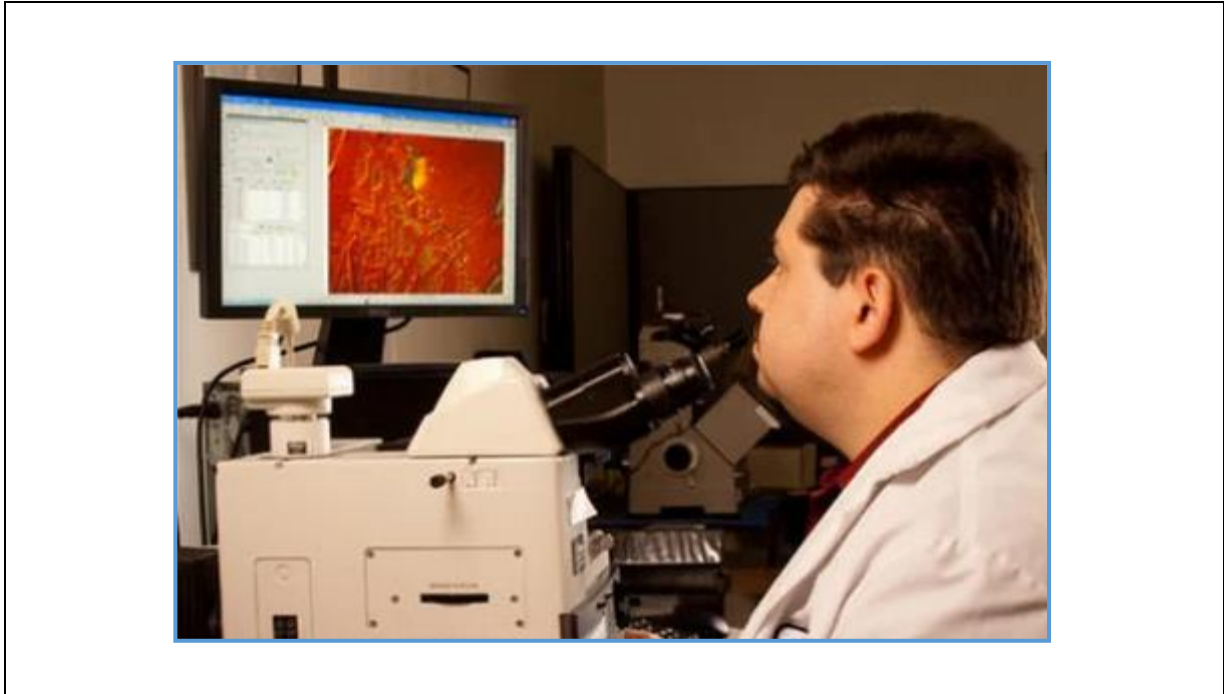
0730 – 0900	ASTM E45 (cont'd) Type A • Type B • Type C • Type D • Procedure • Comparison Charts
0900 – 0915	Break
0915 – 1015	ASTM E45 (cont'd) Workshop Exercise Using ASTM E45
1030 – 1215	Other NMI Standards ASTM E1245 • EN10247 • ISO 4967 • Software
1215 – 1230	Break
1230 – 1345	Review Non Metallic Inclusion Rating of Steels
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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