



COURSE OVERVIEW FE0077 Material Selection & Properties

Course Title

Material Selection & Properties

Course Date/Venue

Please refer to page 3

Course Reference

FE0077

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs



Course Description



This practical and highly-interactive course includes various practical sessions and exercises. Theory learned 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 Material Selection & Properties. It covers the importance of material selection in engineering maintenance; the types of engineering materials; the physical properties, mechanical properties and metallurgical and chemical properties of materials; the importance in ensuring material quality and performance according to relevant standards like ASTM/NACE/API; the application in design and construction of refinery equipment using API and ASME construction codes; the process units and operating parameters as well as corrosive species in refinery operations; the behavior of materials in various environments; and the degradation mechanisms in the oil and gas industry.



During this interactive course, participants will learn the different types of corrosion and corrosion morphology; the corrosion inhibitors and protective coatings using corrosion control methods; the principles of cathodic protection and criteria for selecting materials based on corrosion resistance; the standards and testing for corrosion control; the properties of carbon steel (CS) and low alloy steel (LAS), stainless steels, nickel base alloys, copper base alloys and titanium alloys; the comparative analysis of materials; and the material failures and the principles of failure analysis.

By the end of the training, participants will demonstrate clear understanding of various engineering materials used in refinery services, their properties and corrosion behavior with relevance to international codes and standards.

Course Objectives

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

- Apply and gain a comprehensive knowledge in material selection and properties
- Identify the types of engineering materials as well as determine physical properties, mechanical properties and metallurgical and chemical properties of materials
- Ensure material quality and performance according to relevant standards like ASTM/NACE/API
- Apply design and construction of refinery equipment using API and ASME construction codes
- Identify process units and operating parameters as well as corrosive species in refinery operations
- Explain the behavior of materials in various environments and degradation mechanisms in the oil and gas industry
- Recognize the different types of corrosion and corrosion morphology
- Apply corrosion inhibitors and protective coatings using corrosion control methods
- Understand the principles of cathodic protection and criteria for selecting materials based on corrosion resistance
- Apply standards and testing for corrosion control as well as discuss the properties of carbon steel (CS) and low alloy steel (LAS), stainless steels, nickel base alloys, copper base alloys and titanium alloys
- Carryout comparative analysis of materials and analyze material failures including its causes and prevention
- Develop steps in conducting a failure analysis of metal using proper tools and techniques like fractography and metallography
- Evaluate material performance and analyze life cycle cost in material selection

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 material selection and properties for mechanical, metallurgical and chemical engineers with one/two years of relevant experience in QA and maintenance. The course is also beneficial for experienced engineers, it would be refreshing and upscaling their skills.

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 Date/Venue

Session(s)	Date	Venue
1	February 09-13, 2026	Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
2	June 26-30, 2026	Crowne Meeting Room, Crowne Plaza Al Khobar, an IHG Hotel, Al Khobar, KSA
3	August 30 – September 03, 2026	Meeting Plus 9, City Centre Rotana, Doha, Qatar
4	October 18-22, 2026	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE

Course Fee

Abu Dhabi/Al Khobar/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.
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.

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: -

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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**. 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.

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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:



Dr. Tony Dimitry, PhD, MSc, BSc, is a **Senior Corrosion & Metallurgical Engineer** with over **30 years** of industrial experience. His expertise covers **Corrosion Prevention, Cathodic Protection Systems, Corrosion Control, Corrosion Inhibition, Corrosion Management in Process Operations, Corrosion Engineering, Metallurgical Failure Analysis & Prevention, Fabrication & Repair, Corrosion & Prevention of Failures, Material Selection, Welding Technology, Welding Defects Analysis, Brazing/Soldering, Steel Manufacturing, Facility Integrity, Ladle Furnace Treatment, Ferro-Alloys Production, Tank Farm & Tank Terminal Safety, Integrity Management, Fitness-for-Service (FFS), Process Plant Equipment, Pressure Vessels, Piping & Storage Facilities, Piping Vibration Analysis & Practical Engineering Solutions, Remaining Life Assessment & Repair of Pressure Equipment & Piping, Pipeline Operations & Maintenance, Gas Transportation Piping Code, Maintenance Management, Reliability Management, Rotating Equipment, Static Equipment, Failure Analysis, FMEA and Preventive & Predictive Maintenance**. Currently, he is in charge of the **metallurgical failure analysis** and the usage of fracture mechanics for determining crack propagation in impellers of turbines.

During his career life, Dr. Dimitry held a significant position such as the **Operations Engineers, Technical Trainer, HSE Contracts Engineer, Boilers Section Engineer, Senior Engineer, Trainee Mechanical Engineer, Engineer, Turbines Section Head, Professor, Lecturer/Instructor and Teaching Assistant** from various multinational companies like **Chloride Silent Power Ltd., Technical University of Crete, National Nuclear Corporation, UMIST Aliveri Power Station and HFO Fired Power Station**.

Dr. Dimitry has **PhD, Master and Bachelor** degrees in **Mechanical Engineering** from the **Victory University of Manchester** and the **University of Newcastle, UK** respectively. Further, he is a **Certified Instructor/Trainer, a Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management (ILM)** and an associate member of the **American Society of Mechanical Engineers (ASME)** and **Institution of Mechanical Engineers (IMechE)**. He has further delivered various trainings, seminars, courses, workshops 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	Types of Engineering Materials Metals: Ferrous and Non-Ferrous • Non-Metals: Polymers, Ceramics, Composites • Special Materials: Smart Materials and Nanomaterials
0930 - 0945	Break
0945 - 1200	Physical Properties of Materials Density, Melting Point, Thermal Conductivity, Electrical Conductivity • Examples and Applications in Refinery Services
1200 – 1300	Mechanical Properties of Materials Strength, Hardness, Toughness, Ductility, Fatigue Resistance • Testing Methods: Tensile Testing, Hardness Testing, Impact Testing
1300 - 1315	Break
1315 – 1345	Metallurgical & Chemical Properties Phase Diagrams, Microstructure Analysis • Chemical Composition and Its Impact on Properties
1345 - 1420	ASTM/NACE/API Standards Overview of Relevant Standards • Importance in Ensuring Material Quality and Performance
1420 - 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day One

Day 2

0730– 0830	API & ASME Construction Codes Overview of API and ASME Codes • Application in Design and Construction of Refinery Equipment
0830 – 0915	Process Units & Operating Parameters Major Process Units in Refineries: Distillation, Hydrocracking, Reforming, etc. • Key Operating Parameters: Temperature, Pressure, Flow Rates
0915 – 0930	Break
0930– 1100	Corrosive Species in Refinery Operations Common Corrosive Species: H ₂ S, CO ₂ , Water, Chlorides • Impact on Materials and Equipment
1100 – 1215	Behavior of Materials in Various Environments Atmospheric, Aqueous, Soil Environments • Effects of Acids, Alkalis and other Refinery Chemicals
1215 – 1230	Break
1230 – 1300	API 571 - Damage Mechanisms Overview of Degradation Mechanisms in the Oil & Gas Industry • Common Damage Types: Corrosion, Erosion, Fatigue



1300 – 1420	Case Studies on Material Performance <i>Real-world Examples of Material Performance and Failure • Lessons Learned and Best Practices</i>
1420 – 1430	Recap <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow</i>
1430	<i>Lunch & End of Day Two</i>

Day 3

0730 – 0830	Corrosion Fundamentals <i>Basic Principles of Corrosion • Types of Corrosion: Uniform, Galvanic, Pitting, Crevice, Intergranular</i>
0830 – 0915	Corrosion Morphology <i>Visual Identification of Different Corrosion Types • Microscopic Examination Techniques</i>
0915 – 0930	<i>Break</i>
0930 – 1100	Corrosion Control Methods <i>Design Considerations to Minimize Corrosion • Use of Corrosion Inhibitors and Protective Coatings</i>
1100 – 1215	Cathodic Protection Systems <i>Principles of Cathodic Protection • Types: Sacrificial Anode, Impressed Current Systems</i>
1215 – 1230	<i>Break</i>
1230 – 1300	Material Selection for Corrosion Resistance <i>Criteria for Selecting Materials Based on Corrosion Resistance • Examples of Materials Suitable for Different Corrosive Environments</i>
1300 – 1420	Standards & Testing for Corrosion Control <i>Relevant Standards: ASTM, NACE • Corrosion Testing Methods: Salt Spray, Immersion Tests</i>
1420 – 1430	Recap <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow</i>
1430	<i>Lunch & End of Day Three</i>

Day 4

0730 – 0830	Carbon Steel (CS) & Low Alloy Steel (LAS) <i>Properties, Advantages and Limitations • Applications in Refinery Services</i>
0830 – 0915	Stainless Steels <i>Types: Austenitic, Ferritic, Martensitic, Duplex • Properties and Applications</i>
0915 – 0930	<i>Break</i>
0930 – 1100	Nickel Base Alloys <i>Characteristics and Uses in High-Temperature and Corrosive Environments • Common Alloys: Inconel, Monel</i>
1100 – 1215	Copper Base Alloys <i>Properties and Applications in Heat Exchangers, Piping • Common Alloys: Brass, Bronze</i>
1215 – 1230	<i>Break</i>



1230 – 1300	Titanium Alloys <i>Properties and Advantages in Corrosive Environments • Typical Applications in Refineries</i>
1300 – 1420	Comparative Analysis of Materials <i>Strengths and Weaknesses of Different Materials • Case Studies Comparing Material Performance in Similar Applications</i>
1420 – 1430	Recap
1430	<i>Lunch & End of Day Four</i>

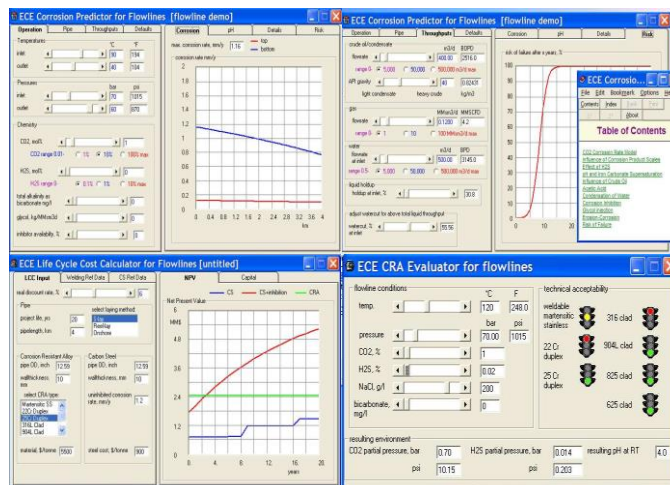
Day 5

0730 – 0845	Material Failures <i>Types of failures: Brittle, Ductile, Fatigue, Creep • Causes and Prevention</i>
0845 – 0915	Principles of Failure Analysis <i>Steps in Conducting a Failure Analysis • Tools and Techniques: Fractography, Metallography</i>
0915 – 0930	<i>Break</i>
0930 – 1100	Case Studies of Material Failures <i>Real-life Examples of Material Failures • Analysis of Failure Causes and Preventive Measures</i>
1100 – 1215	Evaluating Material Performance <i>Methods to Assess Material Performance in Service • Importance of Regular Inspection and Maintenance</i>
1215 – 1230	<i>Break</i>
1230 – 1330	Life Cycle Cost Analysis of Materials <i>Cost Considerations in Material Selection • Balancing Initial Costs with Long-Term Performance and Maintenance</i>
1330 – 1420	Course Conclusion <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course</i>
1420 – 1430	POST-TEST
1430	<i>Lunch & End of Course</i>

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 simulators “Corrosion Data Management Software (CDMS)” and “Electronic Corrosion Engineer (ECE®) 5”.



Corrosion Data Management Software (CDMS)



Electronic Corrosion Engineer (ECE®) 5

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