

COURSE OVERVIEW FE0266
Advanced Corrosion Technology

Corrosion Control, Corrosion Inhibitors and Corrosion Mitigation in Refinery Distillation, Recovery, Hydrotreating & Hydrocracking

Course Title

Advanced Corrosion Technology: Corrosion Control, Corrosion Inhibitors and Corrosion Mitigation in Refinery Distillation, Recovery, Hydrotreating & Hydrocracking

Course Date/Venue

April 26-30, 2026/TBA Meeting Room, Elite Byblos Hotel, Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference

FE0266



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 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 Advanced Corrosion Technology. It covers the corrosion thermodynamics and kinetics, electrochemical fundamentals and polarization and corrosion control; the electrochemical perspective of corrosion inhibitors, refinery corrosion mechanisms and monitoring and measurement; the atmospheric and vacuum distillation units (CDU/VDU), key damage mechanisms and overhead system corrosion control; the desalter and crude pretreatment, recovery units, materials selection and inspection and risk-based inspection (RBI); and the hydrotreating reaction chemistry, hydrocracking severity, pressure regimes and hydrogen partial pressure effects.



During this interactive course, participants will learn the major damage mechanisms, reactor and high-pressure equipment and effluent and cold sections; the mitigation strategies, inspection and integrity management covering advanced NDT for HTHA, acoustic emission monitoring and risk-based inspection in hydroprocessing units; the CP fundamentals, CP criteria and standards and CP interference; the isolation techniques, AC mitigation and CP monitoring and troubleshooting; the coating fundamentals, surface preparation, coating systems for refinery and coatings and CP interaction; and the failure analysis of coatings and integrated corrosion management strategy.



Course Objectives

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

- Apply and gain an advanced knowledge on corrosion technology
- Discuss corrosion thermodynamics and kinetics, electrochemical fundamentals and polarization and corrosion control
- Explain electrochemical perspective of corrosion inhibitors including refinery corrosion mechanisms and monitoring and measurement
- Identify atmospheric and vacuum distillation units (CDU/VDU), key damage mechanisms and overhead system corrosion control
- Apply desalter and crude pretreatment, recovery units, materials selection and inspection and risk-based inspection (RBI)
- Explain hydrotreating reaction chemistry, hydrocracking severity, pressure regimes and hydrogen partial pressure effects
- Describe major damage mechanisms, reactor and high-pressure equipment and effluent and cold sections
- Apply mitigation strategies, inspection and integrity management covering advanced NDT for HTHA, acoustic emission monitoring and risk-based inspection in hydroprocessing units
- Discuss CP fundamentals, CP criteria and standards and CP interference
- Apply isolation techniques, AC mitigation and CP monitoring and troubleshooting
- Discuss coating fundamentals, surface preparation, coating systems for refinery and coatings and CP interaction
- Carryout failure analysis of coatings and apply integrated corrosion management strategy

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 advanced corrosion technology for corrosion and materials engineers, maintenance and inspection engineers, asset integrity and reliability engineers/specialists, project engineers and design engineers, operations and plant managers, corrosion technicians and technologists, quality, HSE and risk management professionals and pipeline, refinery and petrochemical professionals.

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.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

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. Greg Combrink, MSc, BSc, is a Senior Corrosion Engineer with over 30 years of industrial experience within the Oil, Gas, Petrochemical, Refinery, Utilities and Power industries. His wide expertise widely covers in the areas of Corrosion Control & Monitoring, Corrosion Inhibition, Inhibitor Effectiveness Calculation, Metallurgy, Corrosion Failure Investigation, Environmental Testing for Corrosivity Classification, Stress Corrosion Cracking Investigations & Testing, Corrosion Testing & Evaluation, Corrosion Mitigation, Corrosion & Cathodic Protection Survey, Corrosion & Material Testing, Corrosion Cracking Investigations & Testing, Corrosion Prevention & Risk, Cathodic Protection Systems Design & Implementation, Coating Technology & Applications, Coating Inspection & Corrosion Mechanism, Coating Application & Quality Control, Metal Casting Technology, Material Sustainability Testing, Material Selection Testing, Electrochemical & Exposure Testing, Contamination Control of Lubricants/Fuels & Process Fluids, Tribology & Lubrication, Rust Removal, NDT Testing, Underground Minerals Corrosivity, Conventional & Air Spray Coating, Stainless Steel Welded Tanks, Heat & Mass Transfer, Metal Analysis and Friction Testing & Non-Skid Surfaces.

During his career life, Mr. Combrink has gained his practical and field experience through his various significant positions and dedication as the **CEO/Technical Director, Corrosion Engineering Director, Corrosion Engineer, Officer-in-Charge & General Manager, Technical Manager, Programme Manager, Corrosion Projects Manager, Corrosion Specialist, Metalworking Product Applications Engineer, Manager/Officer-In-Charge Materials Lab, Sub-Lieutenant, Senior Instructor/Trainer and Reactor Technician** for various companies such as the Corrosion Hub, Total Contamination Control SA (Pty) Ltd, Bora Corrosion Solutions, Solar Even Pty Ltd, University of Johannesburg, University of Witwatersrand, Castrol South Africa, Sa Navy, SA Police, Geyser Enode and Metal Casting Technology Station.

Mr. Combrink has a **Master's degree in Corrosion Science & Engineering** from the **University of Manchester Institute of Science and Technology (UMIST), UK** and a **Bachelor's degree in Chemical Engineering**. Further, he is an **Accredited Assessor & Moderator** from the South African Qualifications Authority (**SAQA**) and an **Accredited Assessor & Committee Member (Corrosion Protection)** from the South African Qualification & Certification Committee (**SAQCC**). He is also a **Fellow** from the Corrosion Institute Ghana (**CorrIGH**), an **Executive Committee Member/Former President** from the Corrosion Institute of Southern Africa (**CorrISA**) and a **Member** of the Southern African Institute of Tribology (**SAIT**) and has further 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 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 Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: Sunday, 26th April 2026

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 – 0900	Corrosion Thermodynamics & Kinetics Free Energy, ΔG and Spontaneity of Corrosion Reactions • Pourbaix (E-pH) Diagrams for Fe, Cr, Ni, H ₂ S, CO ₂ Systems • Stability Domains in Refinery Environments • Effect of Temperature and Pressure on Corrosion Equilibria • Multiphase Systems (Oil/Water/Gas)
0900 – 0930	Electrochemical Fundamentals Half-Cell Reactions and Mixed Potential Theory • Tafel Behavior and Polarization Curves • Activation, Concentration, and Resistance Polarization • Butler-Volmer Equation • Linear Polarization Resistance (LPR) Fundamentals
0930 – 0945	Break
0945 – 1030	Polarization & Corrosion Control Anodic versus Cathodic Control • Passivation Mechanisms (Cr, Mo Alloys) • Cathodic Protection Principles • Anodic Protection Theory • Practical Interpretation of Polarization Curves
1030 – 1130	Corrosion Inhibitors – Electrochemical Perspective Film-Forming Inhibitors • Anodic versus Cathodic Inhibitors • Adsorption Isotherms (Langmuir, Temkin) • Inhibitor Efficiency and Electrochemical Testing • High-Temperature Inhibitor Behavior
1130 – 1215	Refinery Corrosion Mechanisms Overview CO ₂ Corrosion • H ₂ S Corrosion • Sulfidation • Naphthenic Acid Corrosion (NAC) • Chloride Corrosion • Ammonium Bisulfide Corrosion • High-Temperature Hydrogen Attack (HTHA)
1215 – 1230	Break



1230 – 1330	Monitoring & Measurement Corrosion Probes (LPR, ER) • Coupons and Weight Loss • Hydrogen Probes • Electrochemical Noise • Online Monitoring in Refinery Systems
1330 – 1420	Practical Session Interpreting Real Refinery Polarization Curves • Case Study: Failure due to Poor Electrochemical Control
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: Monday, 27th April 2026

0730 – 0830	Atmospheric & Vacuum Distillation Units (CDU/VDU) Corrosion Zones: Overhead System Corrosion • Top Tower Condensation Corrosion • Desalter Corrosion • Vacuum Column Corrosion
0830 - 0930	Key Damage Mechanisms HCl Corrosion • Ammonium Chloride Salt Deposition • Ammonium Bisulfide Corrosion • Wet H ₂ S Corrosion • Erosion-Corrosion in Transfer Lines • Under-Deposit Corrosion
0930 – 0945	Break
0945 – 1030	Overhead System Corrosion Control Neutralizing Amine Programs • Filming Amine Inhibitors • Wash Water Design & Optimization • Salt Point Control • pH Control Strategies • Chloride Monitoring
1030 – 1100	Desalter & Crude Pretreatment Emulsion Breaking • Chloride Removal • Desalter Water Quality Control • Interface Corrosion
1100 – 1130	Recovery Units Sour Water Stripper Corrosion • Gas Recovery Systems • Amine Units Corrosion (DEA, MDEA Degradation) • CO ₂ and H ₂ S Loading Effects
1130 - 1215	Materials Selection 5Cr, 9Cr Alloys • Stainless Steels (304, 316, Duplex) • Clad Materials • Corrosion Allowance Decisions
1215 – 1230	Break
1230 – 1330	Inspection & Risk-Based Inspection (RBI) Thickness Monitoring Locations • CUI in Distillation Systems • Damage Mechanism Review (API 571 Alignment)
1330 – 1420	Case Studies Overhead Condenser Failure • Vacuum Unit Sulfidation Incident
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 Two



Day 3: Tuesday, 28th April 2026

0730 – 0830	Process Overview Hydrotreating Reaction Chemistry • Hydrocracking Severity and Pressure Regimes • Hydrogen Partial Pressure Effects
0830 – 0930	Major Damage Mechanisms High-Temperature Hydrogen Attack (HTHA) • Hydrogen Blistering • Hydrogen-Induced Cracking (HIC) • Sulfidation Corrosion • Ammonium Bisulfide Corrosion • NH ₄ Cl Salt Corrosion • Polythionic Acid Stress Corrosion Cracking • Wet H ₂ S Cracking (SSC, SOHIC)
0930 – 0945	Break
0945 – 1100	Reactor & High-Pressure Equipment Nelson Curves and Limitations • Cr-Mo Steels Performance • PWHT Requirements • Weld Degradation • Cladding Integrity
1100 – 1130	Effluent & Cold Sections Salt Deposition Control • Water Injection Optimization • Velocity Control • Dead-Leg Corrosion
1130 - 1215	Mitigation Strategies Process Control (Temperature, Velocity, Hydrogen Purity) • Inhibitor Injection Programs • Water Wash System Design • Materials Upgrade Decision Criteria
1215 – 1230	Break
1230 – 1330	Inspection & Integrity Management Advanced NDT for HTHA • Acoustic Emission Monitoring • Risk-Based Inspection in Hydroprocessing Units
1330 – 1420	Workshop Failure Analysis of Hydrotreater Effluent Line • Hydrogen Damage Assessment Exercise
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 Three

Day 4: Wednesday, 29th April 2026

0730 – 0830	CP Fundamentals (Advanced Review) Galvanic versus Impressed Current Systems • CP Design Calculations • Current Requirement Estimation • Anode Selection (MMO, Graphite, Silicon Iron) • Transformer Rectifier Operation
0830 – 0930	CP Criteria & Standards NACE SP0169 / ISO 15589 • -850 mV Criterion • Polarization Decay Testing • IR Drop Correction
0930 – 0945	Break
0945 – 1100	CP Interference Stray Current Interference • Foreign Pipeline Interference • AC Interference from Power Lines • DC Transit Systems Effects • Detection Methods • Interference Testing Protocols
1100 – 1130	Isolation Techniques Isolation Flanges & Kits • Dielectric Unions • Monolithic Joints • Isolation in Refinery Tank Farms • Bonding versus Isolation Philosophy





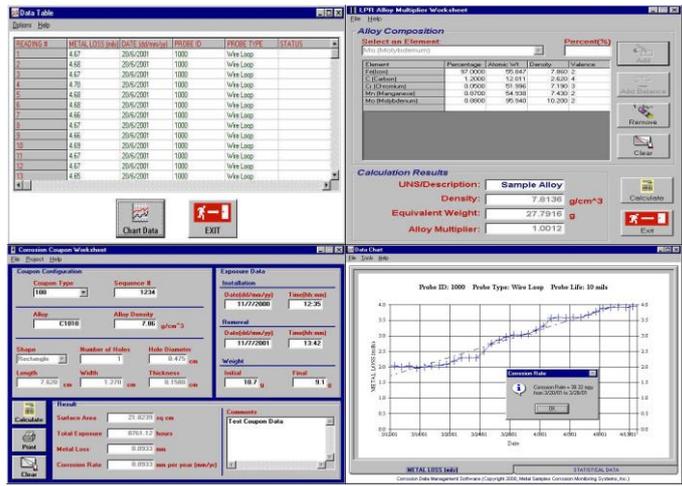
1130 - 1215	AC Mitigation Gradient Control Mats • Zinc Ribbon Systems • Decouplers
1215 - 1230	Break
1230 - 1330	CP Monitoring & Troubleshooting Remote Monitoring • Instant-Off Surveys • Close Interval Surveys (CIS) • Current Attenuation Surveys
1330 - 1420	Practical Exercise CP System Troubleshooting Scenario • Interference Case Evaluation
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 Four

Day 5: Thursday, 30th April 2026

0730 - 0830	Coating Fundamentals Coating Chemistry (Epoxy, Polyurethane, FBE) • Barrier Protection Principles • Adhesion Mechanisms • Permeability & Diffusion • Cathodic Disbondment
0830 - 0930	Surface Preparation SSPC/NACE Standards • Blast Profiles • Surface Contamination • Salt Testing
0930 - 0945	Break
0945 - 1100	Coating Systems for Refinery Tank Internal Linings • High-Temperature Coatings • CUI-Resistant Coatings • Splash Zone Coatings
1100 - 1130	Coatings & CP Interaction Shielding Effects • Disbondment • CP Compatibility
1130 - 1215	Failure Analysis of Coatings Blistering • Delamination • Osmotic Effects • Underfilm Corrosion
1215 - 1230	Break
1230 - 1300	Integrated Corrosion Management Strategy Corrosion Control Matrix • Process Control + Materials + Inhibitors + Coatings + CP • Risk-Based Corrosion Management • Corrosion KPIs
1300 - 1345	Emerging Technologies Corrosion Prediction Software • Smart Corrosion Monitoring • Nanotechnology Coatings • Digital Twins for Corrosion Management
1345 - 1400	Course Conclusion Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course
1400 - 1415	POST-TEST
1415 - 1430	Presentation of Course Certificates
1430	Lunch & End of Course

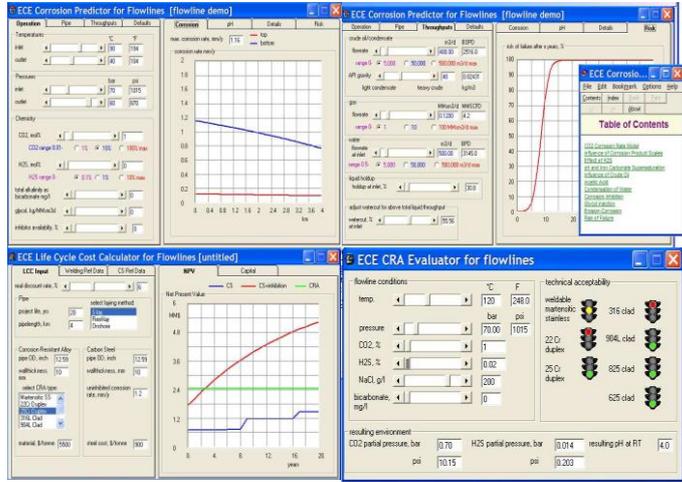
Simulator (Hands-on Practical Sessions)

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



The image displays four screenshots of corrosion simulation software. The top-left screenshot shows a 'Data Table' with columns for 'READING #', 'METAL LOSS (mm)', 'DATE', 'TEMPERATURE', 'PROBE ID', 'PROBE TYPE', and 'STATUS'. The top-right screenshot shows the 'Alloy Composition' window with a table of elements and their percentages, and 'Calculation Results' for UNS# description, density, equivalent weight, and alloy multiplier. The bottom-left screenshot shows the 'Corrosion Config' window with various input fields for alloy, shape, and environment. The bottom-right screenshot shows a 'Data Plot' graph of 'METAL LOSS (mm)' vs 'Date' with a data series and a 'Conversion Rate' dialog box.

Corrosion Data Management Software (CDMS)



The image displays four screenshots of the Electronic Corrosion Engineer (ECE®) 5 software. The top-left screenshot shows the 'ECE Corrosion Predictor for Flowlines' window with input fields for temperature, pressure, and flow rate, and a graph of corrosion rate vs. time. The top-right screenshot shows another instance of the 'ECE Corrosion Predictor for Flowlines' window with a different set of input parameters and a graph. The bottom-left screenshot shows the 'ECE Life Cycle Cost Calculator for Flowlines' window with a graph of cost vs. time. The bottom-right screenshot shows the 'ECE CRA Evaluator for flowlines' window with a table of technical acceptability criteria for different materials and conditions.

Electronic Corrosion Engineer (ECE®) 5

Course Coordinator

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org