COURSE OVERVIEW FE0270
Modern Cathodic Protection Systems
Design, Installation, Testing & Repair

Course Title
Modern Cathodic Protection Systems: *Design, Installation, Testing & Repair*

Course Date/Venue
June 15-19, 2025/The Kooh Al Noor Meeting Room, The H Dubai Hotel, Sheikh Zayed Rd - Trade Centre, Dubai, UAE

Course Reference
FE0270

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 cathodic design, fabrication, installation, testing and repair. Theory learnt in the class will be applied using the "RE-5C Electrode" suitable for in-class training.

This course is designed to provide participants with a solid grounding in cathodic protection engineering. It provides theoretical knowledge and fundamentals for testing on both sacrificial and impressed current systems. It covers the cathodic protection systems for a wide range of industrial structures including buried and subsea pipelines, storage tanks, petrochemical plants and concrete structures.

The course is based on NACE International Standard Practices and NACE Official Cathodic Protection Technical Publications.

The course involves lectures and case studies describing equipment and instruments used in Cathodic Protection testing and In-Line current monitoring using new technology Cathodic Protection Current Measurement tool (CPCM).

Course Objectives

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

- Apply systematic techniques on the design, installation, testing and repair of modern cathodic protection systems
- Recognize the nature of corrosion, forms of corrosion and the various effects of soil condition and system operation
- Carryout cathodic protection and measurement and recognize their importance in the effectiveness of cathodic protection system
- Identify the associated aspects of corrosion control such as the materials selection, coatings and sacrificial cathodic protection including its design, types, selection and fabrication
- Discuss offshore cathodic protection design, operational integrity impact in offshore structures, CP anodes retrofitting forecast and replacement programs
- Discuss impressed current cathodic protection including their design, use and application
- Illustrate cathodic protection system design for tanks and explain the secondary containment, double bottom tanks and its monitoring issues
- Apply the impressed current cathodic protection design used in plants and explain stray current interaction with other structures
- Identify the corrosion and corrosion control present in reinforced concrete and employ the proper monitoring procedures of cathodic protection systems
- Employ the specialized survey techniques used in the evaluation of data for cathodic protection and demonstrate cathodic monitoring programmes
- Illustrate the technique of in-line cathodic protection current measurement (CPCM) to evaluate CP efficiency and possible interference currents as well as cathodic protection rectifiers

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 cathodic protection for those who are responsible for cathodic protection systems, measuring the effectiveness of cathodic protection systems and/or recording this data, including pipeline design engineers, pipeline operations engineers, corrosion engineers, materials engineers, design engineers, mechanical engineers, inspection engineers, chemical engineers, marine maintenance people, offshore structure design and operation people, CP field personnel, supervisors and other technical staff.

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:

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 positions 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.

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.

Accommodation

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

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

Day 1: ***Sunday, 15th of June 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Electrochemical Basis of Corrosion & Cathodic Protection*** *Electrochemistry • Electrochemical & Galvanic Series • Thermodynamics • Kinetics • Immunity & Passivity*
0930 – 0945	*Break*
0945 – 1130	***Introduction to Corrosion Forms*** *Nature of Corrosion • Forms of Corrosion • Effects of Soil Conditions • Effects of System Operation • Microbiological Corrosion • Electrolytic Corrosion*
1130 – 1230	***Cathodic Protection Fundamentals*** *Mechanism of Cathodic Protection • Energy Diagrams • Equivalent Circuits • Types of Cathodic Protection Systems • Synergy with Coatings*
1230 – 1245	*Break*
1245 – 1300	***Cathodic Protection Measurements*** *Reference Electrodes • Voltmeters • Field measurements*
1300 – 1420	***Cathodic Protection Design Fundamentals*** *Design Objectives • Required Information • Environment • Field Surveys • Current Requirement • Current Densities • Coatings • Sacrificial Anodes Design • Impressed Current Design*
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, 16th of June 2025***

0730 – 0830	***Associated Aspects of Corrosion Control*** *Materials Selection • Metals • Non Metals • Metal Alloys • Stainless Steels • Standards • Environment • Design Do's Don'ts • Cathodic Protection • Protective Coatings*
0830 – 0930	***Corrosion Control Using Coatings*** *Organic Coatings • Active (Galvanic) Coatings • Inhibitive Coatings • Application of Coatings • Failure Mechanism of Coatings • Test Methodologies*
0930 – 0945	*Break*

0945 – 1230	***Sacrificial CP Design – Offshore Structures & Pipelines*** *Platform Anodes • Design • Types of Anodes • Fabrication of Anodes • Effect of Temperature • Anodes Resistance • Connections • Crossings• Landfalls • Anodes Retrofittings • Anodes Sleds*
1230 – 1245	*Break*
1245 – 1315	***Offshore Sacrificial Cathodic Protection Systems - Statistics*** *Offshore CP Operational Integrity • CP Anodes Retrofitting Forecast & Replacement Plan • Case History Arabian Gulf*
1315 – 1420	***Cathodic Protection Design – Land Pipelines*** *Sacrificial Anodes • Types of Anodes • Impressed Currents Anodes • Type of Anodes • Ground Bed Designs • Design Steps • Example Calculations • Road Crossings • Casings*
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, 17th of June 2025

0730 – 0845	***Cathodic Protection Design – Production & Injection Well Casing*** *Well Completion & Construction • CP Current & CP Design • Ground Bed Designs • CP Deep Well • Transformer Rectifiers • Alternative Power Supplies • CP Monitoring*
0845 – 0930	***Impressed Current Cathodic Protection Design – Onshore Pipelines*** *Corrosion Cells • Design • Preliminary Steps & Site Survey • Current Densities• Basic Calculations • Road Crossings • Isolation Joints*
0930 – 0945	*Break*
0945 – 1100	***Impressed Current Cathodic Protection Design - Plants*** *Effects of Geometry • Earthing, Concrete Foundations • Drains & Slab-on-Grade • Anode Layouts • Remote • Close • Combination • Monitoring Using Coupons • Voltage Gradient • Pulse Techniques*
1100 – 1230	***Best Practices in Pipelines Cathodic Protection Design, Monitoring, Assessment & Maintenance*** *Best Practices during CP Design • CP Monitoring • CP Assessments • CP Maintenance • New Initiatives • Lessons Learnt*
1230 – 1245	*Break*
1245 – 1420	***Corrosion Management on Pipelines with Cathodic Protection*** *Pipeline Risks & Corrosion • Galvanic Sacrificial Anodes • Impressed Current System • Case Study SA • Case Study ICCP*
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, 18th of June 2025

0730 – 0820	***Cathodic Protection System Design for Tanks*** *New Systems • Retrofit Systems • Grid Systems • Secondary Containment • Double Bottom Tanks • Monitoring Issues*
0820 – 0930	***Cathodic Protection System Design for Tanks – Case History*** *Background • Investigation Methodology • Diagnostic & Troubleshooting • Findings • Proposed Strategies*

0930 – 0945	*Break*
0930 – 1015	***Cathodic Protection Systems Interactions*** *Areas of Interferences • CP Interference • HVAC Interference • DC Interference • AC interference • Mitigation Methods*
1015 – 1230	***Stray Current Interaction with Other Structures*** *Anodic Areas • Service Corridors • Pipeline Interactions • Stray Currents • Current Drainages • Electrical Fields • Traction Systems*
1230 – 1245	*Break*
1245 – 1320	***Reinforced Concrete – Corrosion & Corrosion Control*** *Rebar Corrosion • Types of Concrete Damage • Breakdown of Passive Film • Detection of Corrosion • Rust & Chloride Migration • Pourbaix • Current Densities • Cathodic Protection • Type of Anodes*
1320 – 1420	***Underwater CP Inspection Methods*** *Why CP Inspection • Stds & Regulations • Offshore Structures Life • CP Measurements • CP Surveys • ROV • Trailing Wire • Calibrations • Reporting • Data Analysis*
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, 19th of June 2025***

0730 – 0830	***Monitoring of Cathodic Protection Systems*** *Test Point Monitoring • On/Off Potential • Soil Gradient • CP Coupons • Current Surveys • Close Interval Surveys • Offshore CP Monitoring • ROV*
0830 – 0915	***Specialised CP Survey Techniques*** *CIPS • Pearson • DCVG • AC Attenuation • Combined Surveys • Evaluation of Data • CPCM Case History*
0915 – 0930	*Break*
0930 – 1015	***Cathodic Protection Construction*** *Sacrificial Anodes • Deep Wells • Cables & Connections • Circuit Resistance & Soil Resistivity • Backfills • Example Calculations • CP Materials • HSE*
1015 – 1230	***CP Troubleshooting Techniques*** *Measurements • Galvanic Anodes Troubleshooting • Potential Instant Off • Impressed Current Systems Troubleshooting*
1230 – 1245	*Break*
1245 – 1315	***Cathodic Protection Rectifiers*** *Basic Electrical Circuit • Output Regulation • Control Modes • Surge Protection • Fault finding*
1315 – 1345	***Summary / Open Forum***
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*

Equipment (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 "RE-5C Electrode".

RE-5C Electrode

Course Coordinator

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