COURSE OVERVIEW EE0904
Medium-Voltage Switchgear focused on Marine 6.6 kV Systems

Course Title
Medium-Voltage Switchgear focused on Marine 6.6 kV Systems

Course Date/Venue
November 23-27, 2025/TBA Meeting Room, The Tower Plaza Hotel, Dubai, UAE

Course Reference
EE0904

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description

This practical and highly-interactive course includes various practical sessions where participants will be engaged in HV power switching and other working practices.

This course is designed to provide participants with a detailed and up-to-date overview of Medium-Voltage Switchgear focused on Marine 6.6 kV Systems. It covers the marine electrical distribution architecture, medium-voltage switchgear fundamentals and system components and layout; the power flow and load distribution analysis, classification society and safety requirements and control and monitoring interfaces; the protection system, protection relays and settings and control and interlocking systems; the marine-specific redundancy and blackout prevention; and the communication, automation integration and operation of 6.6 kV switchgear.

Further, the course will also discuss the routine and preventive maintenance, safety and permit-to-work procedures and condition-based maintenance and diagnostics; the environmental challenges in marine installations, failure reporting and documentation and vacuum circuit breaker (VCB) principles; the testing and inspection procedures, commissioning and functional verification, troubleshooting VCBs and control circuits as well as relay and breaker interface testing; and the system reliability and redundancy concepts, power quality and harmonic control and classification and regulatory compliance.

During this interactive course, participants will learn the digital relays and self-diagnostic features and predictive maintenance using IoT sensors; the data analytics for switchgear health monitoring and integration into digital twins and remote dashboards; the arc-flash containment and post-incident recovery, emergency switching and isolation; the restoration sequences, load prioritization, black-start operation and synchronization; and the marine – specific protection schemes.

Course Objectives

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

- Apply and gain an in-depth knowledge on medium-voltage switchgear focusing on marine 6.6 kV systems
- Discuss marine electrical distribution architecture, medium-voltage switchgear fundamentals and system components and layout
- Carryout power flow and load distribution analysis, classification society and safety requirements and control and monitoring interfaces
- Recognize protection system, protection relays and settings and control and interlocking systems
- Apply marine-specific redundancy and blackout prevention, communication and automation integration and operation of 6.6 kV switchgear
- Employ routine and preventive maintenance, safety and permit-to-work procedures and condition-based maintenance and diagnostics
- Review environmental challenges in marine installations, failure reporting and documentation and vacuum circuit breaker (VCB) principles
- Apply testing and inspection procedures, commissioning and functional verification, troubleshooting VCBs and control circuits as well as relay and breaker interface testing
- Explain system reliability and redundancy concepts, power quality and harmonic control and classification and regulatory compliance
- Identify digital relays and self-diagnostic features and apply predictive maintenance using IoT sensors, data analytics for switchgear health monitoring and integration into digital twins and remote dashboards
- Carryout arc-flash containment and post-incident recovery, emergency switching and isolation, restoration sequences and load prioritization and black-start operation and synchronization
- Discuss marine – specific protection schemes

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 medium-voltage switchgear focused on marine 6.6 kV systems for marine electrical engineers, shipboard electricians and technicians, marine superintendents and technical managers, electrical design engineers, maintenance engineers and supervisors, shipyard and dockyard personnel, classification society inspectors and surveyors and naval architects and marine consultants.

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. William Loock, is a **Senior Electrical Engineer** with over **30 years** of extensive experience in **Oil & Gas**, **Refining**, **Energy** and **Utility** industries. His expertise widely includes in the areas of **Electrical Distribution**, **HV/MV Switchgear**, **HV Switching** & Live Working Restrictions, **Arc-Flash** Risk Assessment, Vacuum Circuit Breaker (**VCB**), Variable Frequency Drives (**VFDs**), **Fuses & Circuit Breakers**, Portable Electronic Tools & Equipment, **Batteries & Battery Rooms**, **Power Flow & Load Distribution** Analysis, **Protection System & Relays**, **Electrical Isolation**, **Tagging & Locking**, **Partial Discharge** Detection & Interpretation, Emergency **Switching & Isolation**, **Busbars**, **Circuit Breakers**, Instrument **Transformers**, **Cable** Terminations, Control & Interlocking Systems, **Relay & Breaker** Interface Testing, **Digitalization & Smart Switchgear**, Redundancy & Blackout Prevention, **Communication & Automation** Integration, Factory Acceptance Tests (**FAT**), Site Acceptance Tests (**SAT**), **Power Quality & Harmonic Control**, Electrical Safety in the Workplace, Safety-Related Work Practices & Procedures, Electrically Safe Work Condition, **Substation Automation** Systems & Application, Safety Instrumented Systems (**SIS**), Safety Integrity Level (**SIL**), Emergency Shutdown (**ESD**), Electrical **Switching** Practices, Electrical Safety (**IEC**, **OSHA**, **NFPA & EN** Standards), **Electricity & Electrical Codes**, **Renewable Energy & Solar** Systems, Integrated **Renewable Energy** Resources, **Smart Grid & Renewable** Integration, **Solar Photovoltaic** Systems, **Solar Energy & Electrical System** Designs, **Nuclear** Engineering, **CCTV** Monitoring, **CCTV** Equipment Operation & Corresponding Maintenance, **CCTV** Operating System & Report Writing, Strategic **Security** Management, **Security Risk** Management, **Security Threat** Identification, **Risk Analysis** Evaluation & Management, **Security** Operations & Management, **Investigation & Security** Surveying, **Security Crisis** Management, Corporate **Security** Planning and **Security** Policies & Procedures.

During his career life, Mr. Loock has gained his practical and field experience through his various significant positions and dedication as the **CEO**, **Electroplating Plant Manager**, **Qualified Electroplating Engineer**, **Electroplating Instructor & Curriculum Designer** and **Senior Instructor/Lecturer** for various international companies such as the **SASOL**, SAPPI, MONDI, South African Air Force (Electroplating Engineering), Circuit Breaker Industries, C.Y Security, Tusk Security, Sanibonani Facility Management and Rooiberg Solar Companies, just to name a few.

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

Day 1: ***Sunday, 23rd of November 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Marine Electrical Distribution Architecture*** *Main and Emergency Switchboards Configuration • Power Generation and Distribution Hierarchy (Main, Emergency, Essential) • Ring Main and Radial Feeder Arrangements in Vessels • Typical Single-Line Diagrams for 6.6 kV Systems*
0930 – 0945	*Break*
0945 – 1030	***Medium-Voltage Switchgear Fundamentals*** *Role and Function in Marine Electrical Systems • 6.6 kV Voltage Level Selection and Rating Criteria • Differences Between Shore and Marine Switchgear Design • Standards and Classification References (IEC 60092, ABS, DNV, Lloyd's)*
1030 – 1130	***System Components & Layout*** *Busbars, Circuit Breakers, Contactors, Instrument Transformers • Compartmentalization and Segregation (Form 3b/Form 4a) • Cable Terminations, Gland Plates and Space Optimization • Marine Switchroom Environmental Conditions (Humidity, Vibration)*
1130 – 1215	***Power Flow & Load Distribution Analysis*** *Load Balance Between Generators and Propulsion Motors • Parallel Operation and Synchronization • Redundancy and Power Continuity Concepts (N+1, Split Bus) • Fault Current Paths and Coordination*

1215 – 1230	*Break*
1230 – 1330	***Classification Society & Safety Requirements*** *DNV, ABS, and Lloyd's Register Switchgear Approval Criteria • IP Ratings, Shock Protection and Arc Containment • Short-Circuit Withstand and Temperature Rise Testing • Earthing Philosophy for Marine Installations*
1330 – 1420	***Control & Monitoring Interfaces*** *Mimic Diagrams and HMI Integration • Remote Control and Indication Features • Integration with Ship Automation and PMS • Alarm and Event Logging*
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, 24th of November 2025

0730 – 0830	***Protection System Overview*** *Protection Objectives in Shipboard Networks • Overcurrent, Short-Circuit, and Earth-Fault Protection Principles • Zone Discrimination and Selectivity • Arc-Flash Protection Schemes*
0830 - 0930	***Protection Relays & Settings*** *Numerical Relay Types for 6.6 kV (Generator, Feeder, Motor, Transformer) • CT/VT Selection and Burden Considerations • Relay Coordination Curves and Grading Margins • Parameterization and Configuration Examples*
0930 – 0945	*Break*
0945 – 1100	***Control & Interlocking Systems*** *Manual, Electrical, and Mechanical Interlocks • Dead-Bus and Live-Bus Transfer Logic • Synchronizing Check Relays and Intertripping Schemes • Preventing Backfeed and Islanding*
1100 – 1215	***Marine-Specific Redundancy & Blackout Prevention*** *Split Bus Operation and Bus Tie Interlocks • Automatic Load Shedding Systems • Emergency Switchboard Interconnection • Black-Start Procedures and Control Logic*
1215 – 1230	*Break*
1230 – 1330	***Communication & Automation Integration*** *Interface with PMS, SCADA, and ECR Systems • Data Exchange Protocols (Modbus, IEC 61850, CANbus) • Event Recording and Fault Analysis • Remote Diagnostic Access and Cyber Security Aspects*
1330 – 1420	***Case Studies: Protection & Control Failures*** *Analysis of Past Marine Switchgear Incidents • Lessons Learned on Protection Coordination • Best Practices for Reliability and Safety Improvement • Hands-On Review of Relay Event Records*
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, 25th of November 2025

0730 – 0830	***Operation of 6.6 kV Switchgear*** *Normal Switching, Transfer, and Isolation Procedures • Generator Paralleling and Load Transfer Sequences • Interlocking Verification Before Switching • Safe Energization and De-Energization Protocols*
0830 – 0930	***Routine & Preventive Maintenance*** *Periodic Inspection Schedules (Daily, Monthly, Annual) • Cleaning, Lubrication, and Torque Checking • Contact Wear Measurement and Replacement Intervals • Infrared and Partial Discharge Monitoring*
0930 – 0945	*Break*
0945 – 1100	***Safety & Permit-to-Work Procedures*** *Electrical Isolation, Tagging and Locking • HV Switching and Live Working Restrictions • Arc-Flash Risk Assessment and PPE Requirements • Marine Confined-Space and Environmental Safety*
1100 – 1215	***Condition-Based Maintenance & Diagnostics*** *Partial Discharge Detection and Interpretation • Online Monitoring Sensors (Temperature, Humidity, Vibration) • CBM Data Trending and Analysis • Integration with Asset Management Systems*
1215 – 1230	*Break*
1230 – 1330	***Environmental Challenges in Marine Installations*** *Salt Corrosion and Condensation Effects • Vibration and Mechanical Shock Mitigation • Space Constraint Management and Modular Design • Fire Detection and Suppression Within Switchboards*
1330 – 1420	***Failure Reporting & Documentation*** *Maintenance Records and Class Audit Requirements • Fault Incident Logging and Corrective Actions • Root Cause Analysis Procedures • Integration of Reports into PMS*
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, 26th of November 2025

0730 – 0830	***Vacuum Circuit Breaker (VCB) Principles*** *Design and Construction of Marine-Rated VCBs • Vacuum Interrupter Characteristics and Arc Quenching • Contact Erosion Limits and Monitoring • Comparison with SF_6 and Air Circuit Breakers*
0830 – 0930	***Testing & Inspection Procedures*** *Visual Inspection and Mechanical Operation Tests • Contact Resistance and Insulation Resistance Tests • Hi-Pot and Dielectric Withstand Testing • Timing and Travel Curve Analysis*
0930 – 0945	*Break*
0945 – 1100	***Commissioning & Functional Verification*** *Factory Acceptance Tests (FAT) and Site Acceptance Tests (SAT) • Interlock Checks and Operational Simulations • Protection Relay Coordination Verification • Integration with PMS/SCADA*

1100 – 1215	***Troubleshooting VCBs & Control Circuits*** *Common Trip Faults and Failure Modes • Secondary Circuit and Control Wiring Checks • Undervoltage and Shunt Trip Malfunctions • Fault Isolation Through Diagnostic Tools*
1215 – 1230	*Break*
1230 – 1330	***Relay & Breaker Interface Testing*** *Secondary Injection and Trip Testing • Primary Injection Current Tests • Simulation of Protection Operations • Testing Under Marine Environmental Stress Conditions*
1330 – 1420	***Hands-On Practical Session / Case Exercises*** *Use of Relay Testing Kits (Omicron/ISA) • VCB Dismantling and Contact Examination • Interpretation of Test Reports • Class Verification Documentation Practices*
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*

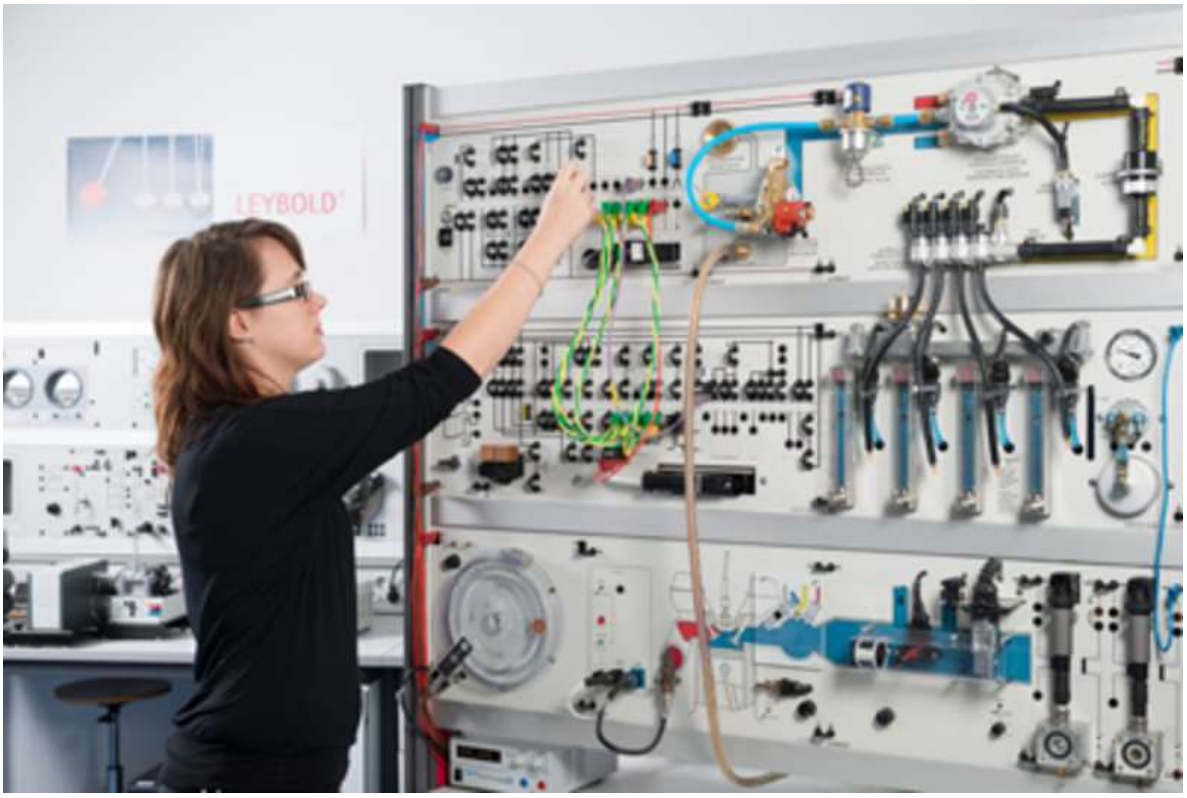
Day 5: Thursday, 27th of November 2025

0730 – 0830	***System Reliability & Redundancy Concepts*** *N+1 Design Principle and Dual Bus Systems • Failure Mode and Effect Analysis (FMEA) • Blackout Recovery and Redundancy Management • Reliability-Centered Maintenance (RCM)*
0830 – 0930	***Power Quality & Harmonic Control*** *Harmonics Due to Variable Frequency Drives (VFDs) • Power Factor Correction and Reactive Power Management • Harmonic Filters and Active Compensators • Marine EMC/EMI Standards Compliance*
0930 – 0945	*Break*
0945 – 1100	***Classification & Regulatory Compliance*** *DNV/ABS Inspection and Test Protocols • SOLAS and IMO Electrical Requirements • Documentation for Class Surveyors • Change Management and Modification Approvals*
1100 – 1215	***Digitalization & Smart Switchgear Trends*** *Digital Relays and Self-Diagnostic Features • Predictive Maintenance Using IoT Sensors • Data Analytics for Switchgear Health Monitoring • Integration into Digital Twins and Remote Dashboards*
1215 – 1230	*Break*
1230 – 1300	***Emergency Scenarios & Fault Management*** *Arc-Flash Containment and Post-Incident Recovery • Emergency Switching and Isolation • Restoration Sequences and Load Prioritization • Black-Start Operation and Synchronization*

1300 - 1345	***Marine – Specific Protection Schemes (e.g., PMS, Blackout Recovery)***
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*

Practical Sessions

This practical and highly-interactive course includes the following practical sessions using Haward's HV Switchgears:-



(1) Switching Programs
(2) Isolation Certificates
(3) Electrical Permit to Work
(4) Danger Notices & Pre-Cautions
(5) Sanction for Test
(6) Lock-Out & Tag-Out
(7) Safe Key Systems
(8) Electrical Safety Systems-Interlocks-Earthing-Isolation & Access Control
(9) Fault Reports

Switchgear Simulator

Switchgear Simulator

Switchgear Simulator

Course Coordinator

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