COURSE OVERVIEW EE0071-4D
Switchgear Life Assessment

Course Title
Switchgear life assessment

Course Reference
EE0071-4D

Course Duration/Credits
Four days/2.4 CEUs/24 PDHs

Course Date/Venue

Session(s)	Date	Venue
1	March 04-07, 2024	Club B, Ramada Plaza By Wyndham Istanbul City Center, Istanbul, Turkey
2	June 24-27, 2024	Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
3	September 23-26, 2024	Al Aziziya Hall, The Proud Hotel Al Khobar, Al Khobar, KSA
4	December 09-12, 2024	Ajman Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Date/Venue

This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

Switchgear represents a significant capital investment in the electric power grid. The reliable performance of low & medium voltage distribution switchgear within industries is a basic requirement for overall reliability of the plant.

A traditional equipment management strategy, which is often followed by plant management, is to replace switchgear when it has reached the end of its economic life. This choice provides maximum equipment lifespan whilst incorporating the latest technology and safety features upon replacement; however, it usually requires high economic investment. Conscious end of life decisions often mean a struggle to balance both a minimum investment and economic life cycle costs. The traditional replacement strategy does not necessarily fit with the overall needs of a particular plant.

Asset managers are fully assisted in moving from conventional approaches such as corrective maintenance and preventive maintenance to advanced strategies as well as risk-based maintenance and condition-based maintenance. This way, the service activity is no longer driven by predefined timeframes, observations and past experiences, but takes the actual condition of the equipment, the required reliability level and the life time extension expectation into account.

This course is designed to provide participants with a detailed and an up-to-date knowledge on switchgear life assessment. It covers the switching phenomena, switchgear components, system configurations, switch gear mechanisms, switchgear fundamentals, switchgear specifications and switchgear life span.

At the completion of the course participants will be able to employ switchgear lifespan practice; assess switchgear lifespan; carryout switchgear lifecycle management, apply various tips to optimize the life of electrical switchgear and consider the right decision for renewal or upgrading switchgear that includes budget limitations, risk limitations, risk limitations, operational limitations and safety limitations.

Course Objectives

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

- Apply and gain an in-depth knowledge on switchgear life assessment
- Discuss switchgear covering switching phenomena, switchgear components, system configurations (LV, MV, HV) and switchgear mechanisms
- Explain the fundamentals of switchgear that includes bulk oil switchgears, minimum oil switchgears, air blast switchgears, vaccum switchgears, SF6 switchgears, indoor and outdoor switchgears
- Specify switchgear comprising of full load rated current, fault capacity, make and break operations, impulse withstand voltage, switch gear KA ratings, switchgear auxiliaries, related insulation level, switchgear cable terminations, auxiliary contacts and electrical interlocks
- Identify the switchgear lifespan pertaining to its load effects, number of switching cycles, mechanical lifespan, electrical lifespan and ageing
- Employ switchgear lifespan practice that includes electrical lifespan calculation as well as switchgear diagnostics and maintenance
- Assess switchgear lifespan and apply switchgear cost/benefit practice
- Carryout switchgear lifecycle management and describe its active phase, classic phase, limited phase, obsolete phase, effects of environment, rationalization and customer support agreements
- Comply with the NFPA 70E, upgrade switchgear and apply tips to optimize the life of electrical switchgear
- Enumerate the reasons that force to upgrade or renew the switchgear including effects of aging and distribution, technical efficiency and lack of maintenance
- Consider the right decision for renewal or upgrading switchgear that includes the budget limitations, risk limitations, operational limitations and safety limitations

Who Should Attend

This course provides all significant aspects and considerations of switchgear life assessment for asset managers, operational managers, maintenance managers, asset integrity engineers, project engineers, maintenance engineers and other plant/grid technical staff.

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

Istanbul	**US$ 5,000** per Delegate + **VAT**. This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Dubai	**US$ 4,500** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Al Khobar	**US$ 4,500** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Abu Dhabi	**US$ 4,500** per Delegate + **VAT**. 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

Certificates are accreditation by the following international accreditation organizations:

- 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 **2.4 CEUs** (Continuing Education Units) or **24 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.

- 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.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, Haward Technology has the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Mr. Herman Eksten, PE, PgDiP, is a **Senior Electrical Engineer** with over **40 years** of extensive experience within the **Petrochemical**, **Oil & Gas** and **Power** industries specializing in **Circuit Breakers & Switchgears**, **Switchgear Assets Management**, **Circuit Breakers Control Circuits**, **Substation Maintenance** Techniques, **High Voltage Operation, Electrical Protection**, **Overhead Lines & Substation**, **Power Supply**, **High Voltage Substation**, **Electrical Protection Design**, **Earthing & Lightning Protection Design, Underground Equipment**, **Distribution Network Maintenance & Construction**, **Transformers Operation & Maintenance**, **Electric Power System, Power Plant Management**, **Substation Commissioning & Troubleshooting**, **Cable Splicing & Termination, Electrical Installation & Maintenance**, **Power Generation Operation & Control, Switchgear Life Assessment**, **Structured Cabling, Electric Power System, Power System Stability, Power System Planning & Economics**, **Power Flow** Analysis, **Combined Cycle Power Plant**, **UPS & Battery System, Variable Speed Drives,** and **HV Motors & Transformers**. He is currently the **Lead Electrical Engineer** of **SNC-LAVALIN** wherein he is responsible for basic designs and successful implementation of electrical engineering to plant overhead lines and substations.

During his career life, Mr. Eksten held various positions such as the **Lead Electrical Engineer**, **Operations Manager**, **Project Engineer**, **Technical Specialist**, **Customer Executive**, **District Manager**, **Electrical Protection Specialist**, **High-Voltage Operator** and **Apprentice Electrician** for FOX Consulting, UHDE (ThyssenKrupp Engineering), TWP Projects/Consulting (EPMC-Mining), ISKHUS Power, Rural Maintenance (PTY) Energia de Mocambique Lda., Vigeo (PTY) Ltd and ESKOM.

Mr. Eksten is a **Registered Professional Engineering Technologist** and has a Postgraduate Diploma in Management Development Programme and a National Higher Diploma (NHD) in Electrical Power Engineering. Further, he is a **Certified Instructor/Trainer**, a Senior member of the South African Institute Electrical Engineers (**SAIEE**) and holds a Certificate of Registration Membership Scheme from the Engineering Council of South Africa (**ESCA**). He has further delivered numerous trainings, courses, seminars, 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 – 0745	*Registration & Coffee*
0745 – 0800	*Welcome & Introduction*
0800 – 0815	***PRE-TEST***
0815 – 0930	***Introduction to Switchgear*** *Switching Phenomena ● Switchgear Components*
0930 – 0945	*Break*
0945 - 1115	***Introduction to Switchgear (cont'd)*** *System Configurations (LV, MV, HV) ● Switchgear Mechanisms*
1115 – 1215	***Switchgear Fundamentals*** *Bulk Oil Switchgears ● Minimum Oil Switchgears*
1215 – 1230	*Break*
1230 – 1420	***Switchgear Fundamentals (cont'd)*** *Air Blast Switchgears ● Vacuum Switchgears ● SF6 Switchgears ● Indoor & Outdoor Switchgears*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0930	***Switchgear Specifications*** *Full Load Rated Current ● Fault Capacity (Symmetrical & Asymmetrical Short Circuit Withstand Capability) ● Make & Break Operations ● Impulse Withstand Voltage ● Switchgear KA Ratings*
0930 – 0945	*Break*
0945 - 1115	***Switchgear Specifications (cont'd)*** *Switchgear Auxiliaries (CT's, VT's, Protection Relays) ● Rated Insulation Level ● Switchgear Cable Terminations ● Auxiliary Contacts & Electrical Interlocks*
1115 - 1230	***Switchgear Lifespan*** *Load Effects ● Number of Switching Cycles ● Mechanical Lifespan ● Electrical Lifespan ● Ageing*
1230 - 1245	*Break*
1245 – 1420	***Switchgear Lifespan Practice*** *Electrical Lifespan Calculation Exercise*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 00900	***Switchgear Diagnostics & Maintenance*** *Switchgear Defects ● Switchgear Inspection ● Routine Testing of Switchgears ● Dielectric Test on the Main Circuit (Oil, Air, Vacuum & SF6 Type Devices) ● Tests on Auxiliary & Control Circuits*
0900 - 0915	*Break*
0915 - 1015	***Switchgear Diagnostics & Maintenance (cont'd)*** *Mechanical Operating Tests ● Tightness Test ● Condition Based Maintenance (CBM) ● Reliability Centred Maintenance (RCM) ● Asset Register*

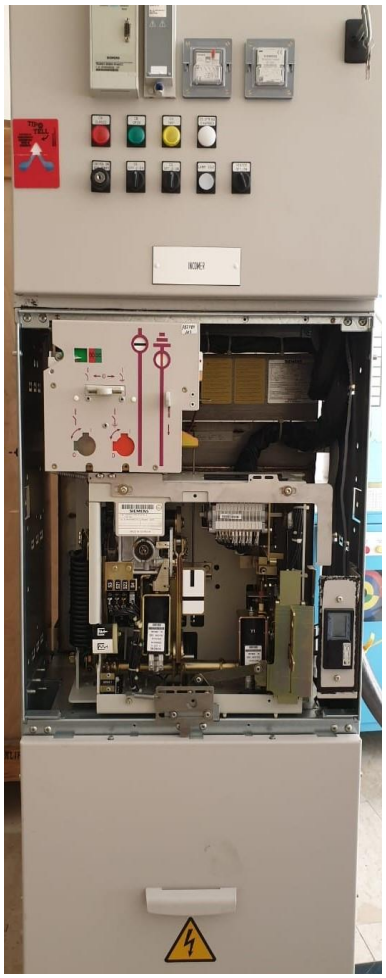
1015 – 1215	***Switchgear Lifespan Assesment*** *Maintenance Costs ● Spare Parts Availability ● Suitability with Existing Fault Conditions*
1215 – 1230	*Break*
1230 - 1300	***Switchgear Lifespan Assesment (cont'd)*** *Risk Assessment ● Cost/Benefit Analysis*
1300 - 1420	***Switchgear Cost/Benefit Practice*** *Cost/Benefit Calculation Exercise*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

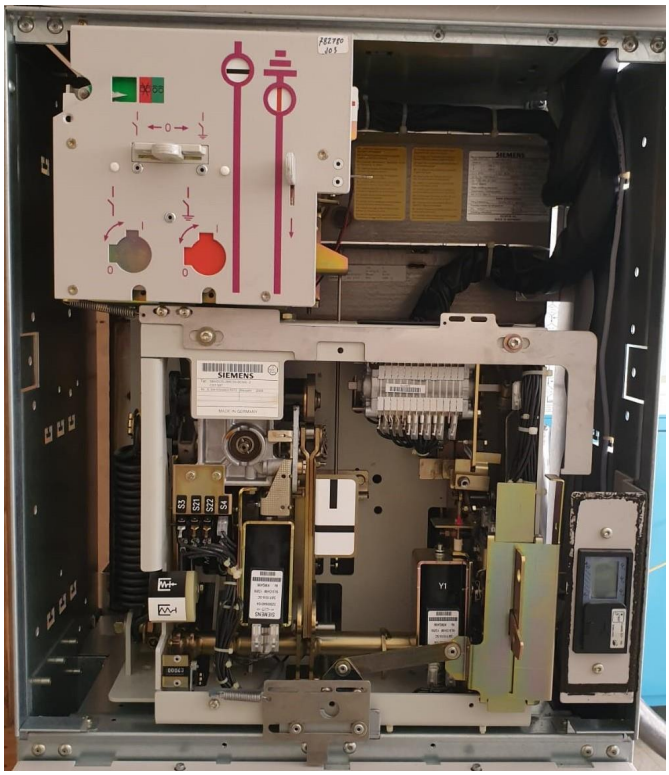
Day 4

0730 – 0930	***Switchgear Lifecycle Management*** *Active Phase ● Classic Phase ● Limited Phase ● Obsolete Phase ● Effects of Environment*
0930 – 0945	*Break*
0945 – 1145	***Switchgear Lifecycle Management (cont'd)*** *Rationalization ● Customer Support Agreements ● Comply with NFPA 70E ● Upgrading the Switchgear ● Tips to Optimize the Life of Electrical Switchgear*
1145 – 1215	***Reasons Force to Upgrade or Renew the Switchgear*** *Effects of Aging & Deterioration ● Technical Inefficiency ● Lack of Maintenance*
1215 – 1230	*Break*
1230 – 1345	***Decision for Renewal or Upgrade*** *Budget Limitations ● Risk Limitations ● Operational Limitations ● Safety Limitations*
1345 - 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

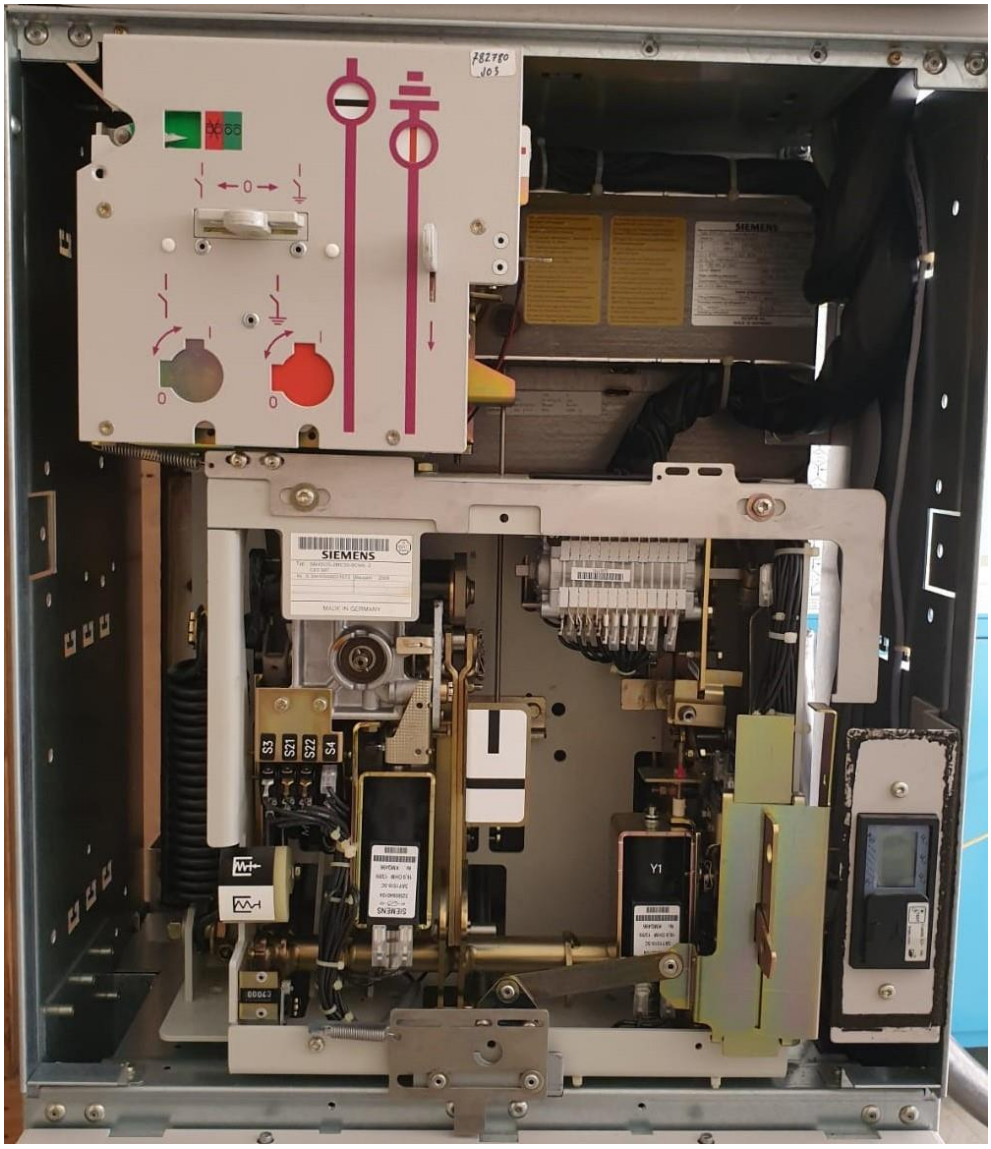
Simulators (Hands-on Practical Sessions)

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 our state-of-the-art “Switchgear Simulator”, “GE Multilin Relay 469” and “GE Multilin Relay 750”.





Switchgear Simulator



Switchgear Simulator

GE Multilin Relay 469 Simulator

GE Multilin Relay 750 Simulator

Course Coordinator

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