COURSE OVERVIEW EE0145
Electrical Heat Trace - Basics

Course Title
Electrical Heat Trace – Basics

Course Date/Venue
Session 1: July 20-24, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: December 22-26, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
EE0145

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 Electrical Heat Trace – Basics. It covers the purpose of heat tracing and its applications in petroleum industries; the types of electrical heat tracing systems, heat tracing standards and regulations; the heat tracing components and accessories; the basics of heat loss calculation, electrical load and power supply requirements; the cable selection and sizing, temperature control and monitoring; and the insulation and cladding requirements.

Further, the course will also discuss the importance of proper grounding in heat tracing systems and protection against short circuits and electrical faults; the hazardous zones classification (zone 0, 1, 2); the explosion-proof and intrinsically safe installations; the pre-installation planning, site preparation and proper installation of heat tracing cables; the splicing, termination and connection methods including controller and sensor installation; and the insulation and jacketing materials and proper sealing techniques for moisture protection.

During this interactive course, participants will learn the post-installation testing and commissioning, routine inspection and preventive maintenance; the common heat tracing failures and causes; the use of thermal imaging for hot spot detection; the emergency response, safety procedures and upgrading and retrofitting existing systems; configuring and calibrating controllers; the insulation and weatherproofing application; the safe electrical work procedures, handling emergency shutdowns and PPE selection and usage; and the safe troubleshooting practices.

Course Objectives

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

- Apply and gain a fundamental knowledge on electrical heat trace
- Discuss the purpose of heat tracing and its applications in petroleum industries
- Identify the types of electrical heat tracing systems and review heat tracing standards and regulations
- Recognize heat tracing components and accessories including the basics of heat loss calculation
- Discuss electrical load and power supply requirements and apply cable selection and sizing
- Carryout temperature control and monitoring and identify insulation and cladding requirements
- Explain the importance of proper grounding in heat tracing systems and protection against short circuits and electrical faults
- Classify hazardous zones (zone 0, 1, 2) and apply explosion-proof and intrinsically safe installations
- Apply pre-installation planning, site preparation and proper installation of heat tracing cables
- Illustrate splicing, termination and connection methods including controller and sensor installation
- Apply insulation and jacketing materials and proper sealing techniques for moisture protection
- Employ post-installation testing and commissioning, routine inspection and preventive maintenance
- Identify the common heat tracing failures and causes and use thermal imaging for hot spot detection
- Implement emergency response, safety procedures and upgrading and retrofitting existing systems
- Configure and calibrate controllers and carryout insulation and weatherproofing application
- Demonstrate safe electrical work procedures, handle emergency shutdowns and apply PPE selection and usage including safe troubleshooting practices

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 a basic overview of all significant aspects and considerations of electrical heat trace – basics for electrical engineers, project managers, field technicians, facility managers, safety personnel, designers 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

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**. 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. Herman Eksten, PE, PgDiP, is a **Senior Electrical Engineer** with over **40 years** of extensive experience **Oil**, **Gas**, **Petrochemical**, **Refinery** & **Power** industries and **Water & Utilities** specializing in **Electrical Safety**, Certified **HV Electrical Safety**, **Low Voltage Electrical Safety**, **Electrical Circuits**: Series and Parallel Connection, **Electrical Faults & Protective Devices**, **Renewable Energy Integration**, **Smart Grid** & **Renewable Integration**, **Renewable Energy** Storage Systems, **Renewable Energy** Economics & Finance, Risk Control Methods, **LOTO – Breakers** Operation in Electricity Substation, **LOTO** Principles and Procedures, **Arc Flash Risk Assessment**, Safety in **Power Electronic Equipment & Lasers**, **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.

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.

Accommodation

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

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	***Overview of Electrical Heat Tracing*** *Definition & Purpose of Heat Tracing • Applications in Petroleum Industries • Key Components of a Heat Trace System • Basic Principles of Heat Transfer*
0930 – 0945	*Break*
0945 – 1040	***Types of Electrical Heat Tracing Systems*** *Self-Regulating Heat Tracing Cables • Constant Wattage Heat Tracing Cables • Mineral-Insulated (MI) Heat Tracing Cables • Series Resistance Heating Cables*
1040 – 1135	***Heat Tracing Standards & Regulations*** *Overview of IEEE 515 & IEC 60079-30-1 Standards • Industry Best Practices for Heat Tracing Installation • Regulatory Compliance for Hazardous Areas • Safety & Operational Guidelines*
1135 - 1230	***Heat Tracing Components & Accessories*** *Heating Cables & Power Connections • Junction Boxes & Connection Kits • End Seals & Splicing Techniques • Controllers & Thermostats*
1230 - 1245	*Break*

1245 – 1335	***Heat Tracing Applications in the Petroleum Industry*** *Flow Assurance in Pipelines • Preventing Wax & Hydrate Formation • Tank & Vessel Heating • Instrumentation & Process Line Protection*
1335 - 1420	***Basics of Heat Loss Calculation*** *Understanding Heat Loss Principles • Factors Affecting Heat Loss • Pipe Material & Insulation Considerations • Selecting the Right Heat Tracing Solution*
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	***Electrical Load & Power Supply Requirements*** *Voltage Requirements & Power Ratings • Single-Phase versus Three-Phase Power Supply • Electrical Load Balancing • Considerations for Long Pipeline Runs*
0830 - 0930	***Cable Selection & Sizing*** *Determining the Appropriate Heat Tracing Cable • Calculating Wattage Per Unit Length • Maximum Circuit Lengths • Selection Based on Ambient Conditions*
0930 – 0945	*Break*
0945 – 1040	***Temperature Control & Monitoring*** *Types of Temperature Controllers • Role of Thermostats in Heat Tracing Systems • Sensor Placement & Calibration • Smart Control Systems & Remote Monitoring*
1040 – 1135	***Insulation & Cladding Requirements*** *Types of Insulation Materials • Effect of Insulation on Heat Loss • Cladding Materials & Protection Methods • Thermal Insulation Thickness Calculations*
1135 - 1230	***Grounding & Electrical Safety*** *Importance of Proper Grounding in Heat Tracing Systems • Protection Against Short Circuits & Electrical Faults • Ground Fault Protection Devices (GFPE) • Safety Compliance for Electrical Systems*
1230 - 1245	*Break*
1245 - 1420	***Design Considerations for Hazardous Areas*** *Classifying Hazardous Zones (Zone 0, 1, 2) • Explosion-Proof & Intrinsically Safe Installations • ATEX & IECEX Certification Requirements • Selecting Heat Tracing Cables for Hazardous Locations*
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

0730 – 0830	***Pre-Installation Planning & Site Preparation*** *Reviewing Engineering Drawings & Schematics • Identifying Power Supply Points • Preparing Surfaces & Mounting Locations • Pre-Installation Testing & Verification*
0830 – 0930	***Proper Installation of Heat Tracing Cables*** *Step-By-Step Cable Laying Procedures • Securing Cables to Pipes & Equipment • Avoiding Mechanical Stress & Damage • Adhering to Manufacturer Installation Guidelines*
0930 – 0945	*Break*
0945 – 1040	***Splicing, Termination, & Connection Methods*** *Proper Use of Termination Kits • Cold Lead Connection & Power Supply Integration • Testing Connections for Continuity & Insulation Resistance • Preventing Moisture Ingress & Corrosion*
1040 – 1135	***Controller & Sensor Installation*** *Mounting Thermostats & Control Panels • Sensor Placement for Accurate Temperature Monitoring • Calibration & Testing of Controllers • Troubleshooting Controller Malfunctions*
1135 - 1230	***Insulation & Weatherproofing*** *Applying Insulation & Jacketing Materials • Proper Sealing Techniques for Moisture Protection • Identifying Weak Points & Potential Failures • Ensuring Compliance with Environmental Conditions*
1230 - 1245	*Break*
1245 - 1420	***Post-Installation Testing & Commissioning*** *Electrical Continuity & Insulation Resistance Tests • Checking Heat Output & Temperature Uniformity • Verifying Controller Functionality • Documenting & Reporting Installation Results*
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

0730 – 0830	***Routine Inspection & Preventive Maintenance*** *Scheduled Maintenance Activities • Identifying Early Signs of Failure • Cleaning & Inspecting Junction Boxes & Terminations • Recording & Analyzing System Performance Data*
0830 - 0930	***Common Heat Tracing Failures & Causes*** *Overheating & Insulation Damage • Electrical Faults & Short Circuits • Mechanical Damage & Wear • Environmental Degradation & Moisture Ingress*
0930 – 0945	*Break*
0945 – 1040	***Troubleshooting Techniques*** *Using Thermal Imaging for Hot Spot Detection • Resistance & Continuity Testing • Checking Controllers & Temperature Sensors • Replacing Damaged Cables & Faulty Components*
1040 – 1135	***Emergency Response & Safety Procedures*** *Handling Heat Tracing System Failures in Hazardous Areas • Electrical Safety During Troubleshooting • Emergency Shutdown Procedures • Ensuring Compliance with Company's Safety Protocols*

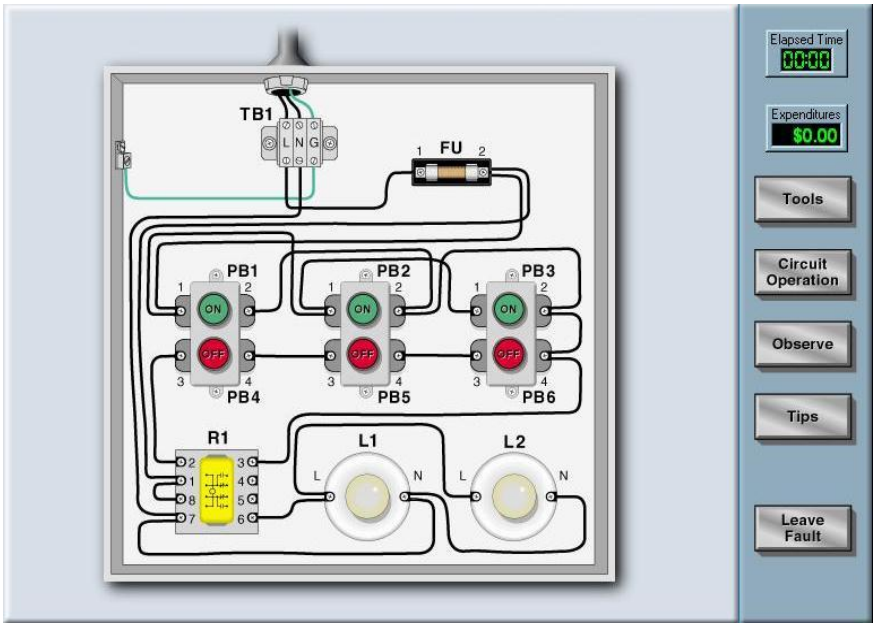
1135 - 1230	***Upgrading & Retrofitting Existing Systems*** *Evaluating Performance of Older Heat Tracing Systems • Integrating Modern Smart Controls • Upgrading Insulation for Improved Efficiency • Compliance with Updated Industry Standards*
1230 - 1245	*Break*
1245 - 1420	***Case Studies & Real-World Applications*** *Lessons Learned from Previous Heat Tracing Failures • Best Practices from Installations • Comparing Different Heat Tracing Technologies • Group Discussion & Problem-Solving Exercises*
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

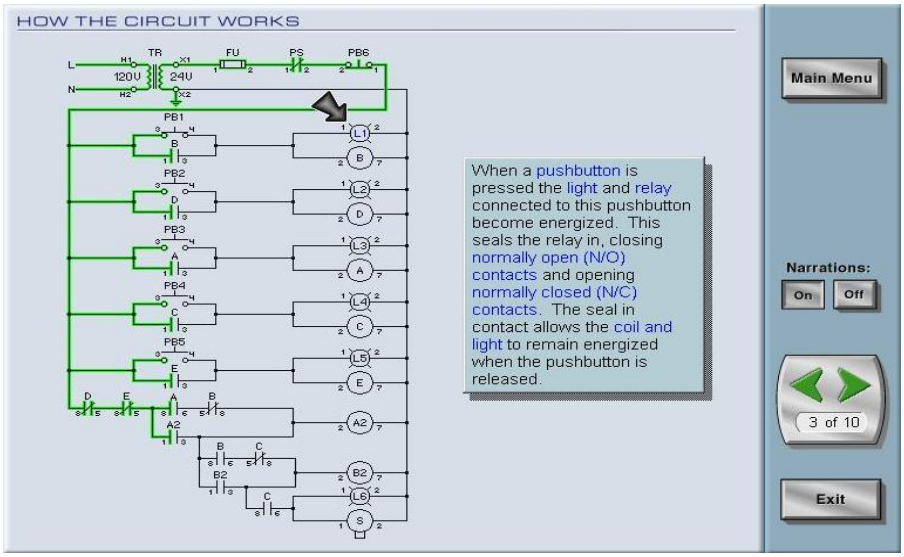
0730 – 0830	***Practical Hands-On Cable Installation*** *Step-By-Step Installation of Heat Tracing Cables • Proper Termination & Splicing Methods • Verifying Cable Placement & Securing Techniques • Testing Continuity & Resistance*
0930 – 0945	*Break*
0945 - 1100	***Configuring & Calibrating Controllers*** *Programming Temperature Controllers • Setting Up Alarm Systems • Sensor Placement Adjustments • Testing & Validating Control Accuracy*
1100 – 1230	***Insulation & Weatherproofing Application*** *Applying Insulation to Pipes & Vessels • Sealing Techniques for Different Environments • Identifying Vulnerabilities in Insulation Applications • Quality Assurance Checks*
1230 - 1245	*Break*
1245 – 1300	***Troubleshooting Real-World Scenarios*** *Simulating Common Faults in Heat Tracing Systems • Diagnosing & Fixing Issues Using Testing Tools • Hands-On Practice with Resistance & Continuity Testing • Implementing Corrective Actions*
1300 - 1345	***Safety Demonstrations & Best Practices*** *Demonstrating Safe Electrical Work Procedures • Handling Emergency Shutdowns • PPE Selection & Usage • Safe Troubleshooting Practices*
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*

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 simulators “Haward Troubleshooting”, “Power World”, “GE Multilin Relay 469” and “GE Multilin Relay 750.

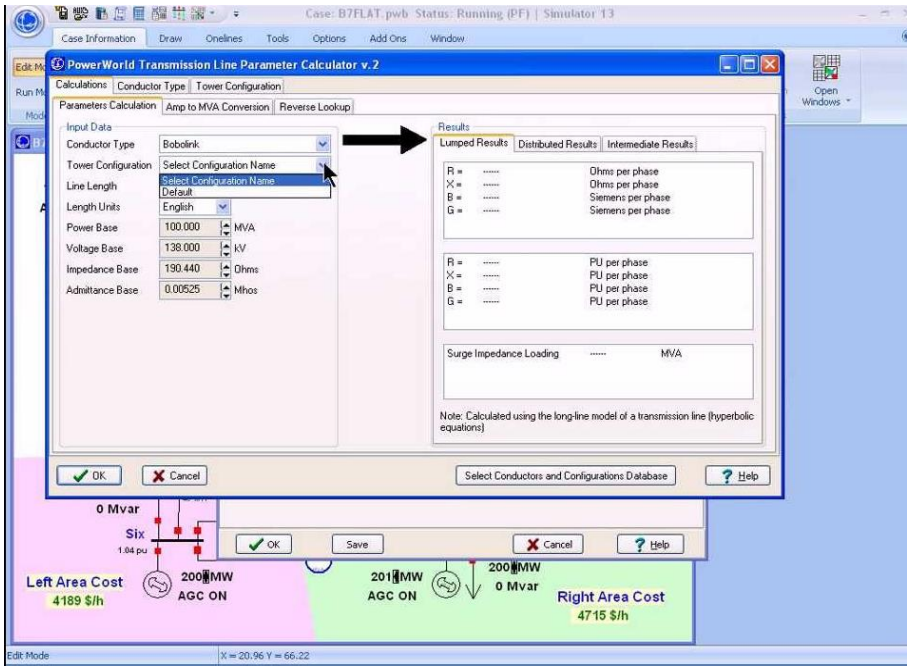


Basic Techniques



Basic Control Circuits

Motor Control Techniques



Power World Simulator

GE Multilin Relay 469 Simulator

GE Multilin Relay 750 Simulator

Course Coordinator
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