COURSE OVERVIEW TE0296
Generation & Desalination Technologies

Course Title
Generation & Desalination Technologies

Course Date/Venue
Session 1: May 12-16, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: September 15-19, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
TE0296

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 Generation & Desalination Technologies. It covers the basics of thermodynamics for power and water systems; the types of power generation technologies; the water-energy nexus principles, basics of desalination technologies and process flow in IWPP plants; the steam power plants (rankine cycle), gas turbine and combined cycle systems; and the nuclear energy fundamentals, solar power integration and electricity grid integration and dispatch.

Further, the course will also discuss the fuel types and combustion issues, corrosion and material degradation, environmental compliance and maintenance and outage planning; the multi-stage flash (MSF) desalination, multi-effect distillation (MED), reverse osmosis (RO) desalination and hybrid desalination systems; the seawater intake and brine discharge; and the intake system design, screening and filtration, environmental impact of brine discharge, mitigation strategies and regulations.

During this interactive course, participants will learn the energy efficiency in desalination and energy consumption comparison; the recovery systems and integration, renewable energy-powered desalination and desalination cost components; the DCS and SCADA systems in IWPP plants; the performance monitoring and optimization and maintenance management practices; the water quality assurance, parameters to monitor, laboratory testing and online sensors, compliance with WHO/GCC standards, disinfection and post-treatment; the occupational hazards, emergency shutdown procedures, chemical handling in desalination, confined space and hot work safety; the environmental regulations and compliance, international standards, emission control systems, wastewater treatment and reuse, auditing and reporting; the smart grids and digital utilities, energy storage and desalination and carbon reduction in power and water sector; and the predictive maintenance, leak detection in water systems, real-time analytics in generation and AI-assisted dispatch and load balancing.

Course Objectives

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

- Apply and gain an in-depth knowledge on generation and desalination technologies
- Discuss the EWEC's integrated role, basics of thermodynamics for power and water systems and types of power generation technologies
- Explain water-energy nexus principles, basics of desalination technologies and process flow in IWPP plants
- Illustrate steam power plants (rankine cycle) and gas turbine and combined cycle systems as well as recognize nuclear energy fundamentals, solar power integration and electricity grid integration and dispatch
- Identify fuel types and combustion issues, corrosion and material degradation, environmental compliance and maintenance and outage planning
- Illustrate multi-stage flash (MSF) desalination, multi-effect distillation (MED), reverse osmosis (RO) desalination and hybrid desalination systems
- Describe seawater intake and brine discharge including intake system design, screening and filtration, environmental impact of brine discharge, mitigation strategies and regulations
- Discuss the energy efficiency in desalination covering energy consumption comparison, recovery systems and integration, renewable energy-powered desalination and desalination cost components
- Recognize DCS and SCADA systems in IWPP plants and apply performance monitoring and optimization and maintenance management practices
- Employ water quality assurance covering parameters to monitor, laboratory testing and online sensors, compliance with WHO/GCC standards, disinfection and post-treatment
- Identify occupational hazards and apply emergency shutdown procedures, chemical handling in desalination, confined space and hot work safety

- Describe environmental regulations and compliance including international standards, emission control systems, wastewater treatment and reuse, auditing and reporting
- Discuss smart grids and digital utilities and apply energy storage and desalination and carbon reduction in power and water sector
- Apply predictive maintenance, leak detection in water systems, real-time analytics in generation and AI-assisted dispatch and load balancing

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 generation and desalination technologies for mechanical engineers, electrical engineers, civil engineers, chemical engineers, operators and technicians, project managers, environmental and sustainability specialists, utility managers and supervisors, research and development (R&D) professionals, regulatory and compliance professionals and other 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

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 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. Paul Patsi, MSc, BSc, is a **Senior Analytical Chemist** and an **International Expert** in **Water & Waste Water Treatment Technology** with over **25 years** of extensive experience in **Analytical Laboratory** and **Water & Wastewater Treatment Engineering**. His expertise covers **Laboratory Assessment**, **Microbiological Quality Assurance**, **Analytical Chemistry**, **Statistical Analysis**, **Laboratory Safety**, **Equipment & Infrastructure Management**, **Budgeting & Planning of Laboratory Consumables**, **Business Administration**, **Personnel Management**, **Laboratory Management**, **Chemical Analysis**, **Laboratory Auditing**, **Risk Assessment**, **Microbiological Analysis of Water & Waste Water**, **Waste Water Treatment Analysis**, **Water Chemistry**, **HACCP**, **ISO 22000**, **ISO 17025**, **ISO 9001**, Good Manufacturing Practice (**GMP**), Good Hygiene Practice (**GHP**) and Good Laboratory Practice (**GLP**). He is also an expert in microbiological indoor air quality, water biology, food sampling and calibration. He is currently the **Head of Industrial Analytical Laboratory** of PINDOS wherein he is in-charge of the budgeting, auditing, consumables, suppliers, personnel management, equipment and infrastructure management along with waste water treatment and water/environmental legislation.

During his career life, Mr. Paul has held key positions such as the **Head of Microbiology & Chemical Laboratory**, **Head of Quality Control**, **Technical Consultant**, **Research Projects Specialist**, **Scientific Consultant**, **Biologist-Scientific Expert** and **Biologist** for multi-billion companies like the **European Union**, **Help LTD**, **Lake Pamvotis Municipality Company**, **Hellenic Centre for Marine Research**, **Cargill** and **Nestle** just to name a few.

Mr. Paul has a **Master's** degree in **Food Science and Food Technology** from the **University of Ioannina** (**Greece**) and a **Bachelor's** degree in **Biology** from the **Aristotle University of Thessaloniki** (**Greece**). He is a **Certified Instructor/Trainer** and a **Member** of the **Society for Applied Microbiology**, **Society of Biological Scientist** and the **Global Coalition for Sustained Excellence in Food & Health Protection**.

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 EWEC's Integrated Role*** *Mandate & Mission in the UAE Energy-Water Nexus • Generation & Desalination Portfolio • Regional Infrastructure Overview • Integrated Water & Power (IWP/IWPP) Models*
0930 – 0945	*Break*
0945 – 1030	***Basics of Thermodynamics for Power & Water Systems*** *First & Second Laws of Thermodynamics • Energy & Work Concepts • Entropy & Efficiency • Application in Thermal & Desalination Processes*
1030 – 1130	***Types of Power Generation Technologies*** *Thermal Power Generation (Steam Turbine-Based) • Gas Turbine & Combined Cycle Power Plants • Nuclear Power Overview • Renewables (Solar PV, CSP, Wind) Basics*
1130 - 1230	***Water-Energy Nexus Principles*** *Interdependence of Water & Electricity Systems • Energy Consumption in Water Production • Water Use in Power Generation • Optimization Strategies for Resource Sustainability*
1230 – 1245	*Break*
1245 – 1335	***Basics of Desalination Technologies*** *Overview of Desalination in UAE & GCC • Thermal versus Membrane Processes • Key Performance Indicators (KPIs) • Environmental Considerations*
1335 - 1420	***Process Flow in IWPP Plants*** *Typical Plant Layout (Generation + Desalination) • Heat Integration & Steam Extraction • Key Process Equipment & Control • Water & Power Dispatch Planning*
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	***Steam Power Plants (Rankine Cycle)*** *Plant Components & Process Flow • Boiler Types & Steam Generation • Steam Turbines & Generators • Efficiency Improvements & Losses*
0830 - 0930	***Gas Turbine & Combined Cycle Systems*** *Brayton Cycle & Simple Gas Turbines • Combined Cycle Configurations • Heat Recovery Steam Generators (HRSG) • Cooling Systems & Integration*
0930 – 0945	*Break*
0945 – 1100	***Nuclear Energy Fundamentals (Barakah Plant Case)*** *Basic Nuclear Fission Principles • Reactor Components & Safety Systems • Steam Generation & Turbine Coupling • Regulatory & Waste Handling*

1100 – 1230	***Solar Power Integration*** *PV & CSP Technologies • Solar Desalination Potential • Storage Systems & Hybrid Solutions • Limitations & Opportunities in UAE*
1230 – 1245	*Break*
1245 – 1330	***Electricity Grid Integration & Dispatch*** *Load Demand & Generation Mix • Power Purchase Agreements (PPA) • Load Following & Spinning Reserves • Black-Start & Reliability*
1330 - 1420	***Operational Challenges in Generation Plants*** *Fuel Types & Combustion Issues • Corrosion & Material Degradation • Environmental Compliance • Maintenance & Outage Planning*
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	***Multi-Stage Flash (MSF) Desalination*** *Principle of Operation & Heat Recovery • Flash Chambers & Brine Circulation • Energy Balance & Efficiency • Scaling & Anti-Scaling Practices*
0830 - 0930	***Multi-Effect Distillation (MED)*** *Working Principle & Flow Configuration • Heat Transfer Mechanisms • Comparison with MSF • Operational Considerations*
0930 – 0945	*Break*
0945 – 1100	***Reverse Osmosis (RO) Desalination*** *Membrane Technology Overview • Pretreatment Systems • Energy Recovery Devices • Membrane Fouling & Cleaning*
1100 – 1230	***Hybrid Desalination Systems*** *MED-TVC-RO Combinations • Benefits of Hybrid Operation • Flexibility & Energy Optimization • Control & Monitoring Systems*
1230 – 1245	*Break*
1245 – 1330	***Seawater Intake & Brine Discharge*** *Intake System Design (Open versus Subsurface) • Screening & Filtration • Environmental Impact of Brine Discharge • Mitigation Strategies & Regulations*
1330 - 1420	***Energy Efficiency in Desalination*** *Energy Consumption Comparison • Recovery Systems & Integration • Renewable Energy-Powered Desalination • Desalination Cost Components*
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	***DCS & SCADA Systems in IWPP Plants*** *Control System Architecture • Real-Time Monitoring & Diagnostics • Alarm Management • Integration with Corporate Systems*
0830 - 0930	***Performance Monitoring & Optimization*** *KPI Tracking (GWh, m³, kWh/m³) • Online Analyzers & Sensors • Benchmarking Techniques • Digital Twins & AI Applications*

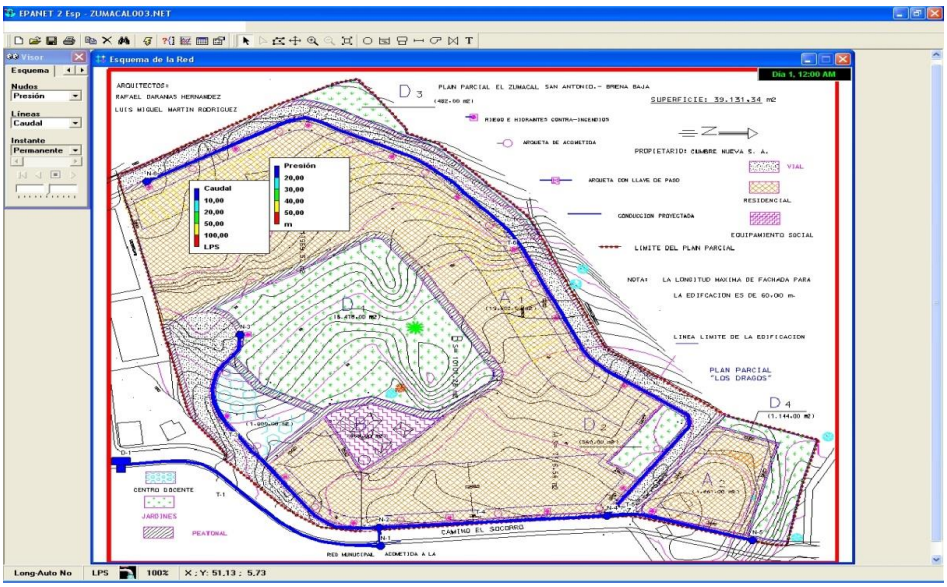
0930 – 0945	*Break*
0945 – 1100	***Maintenance Management Practices*** *Preventive versus Predictive Maintenance • Condition Monitoring Tools • Asset Management Systems (EAMS/CMMS) • Failure Analysis & Case Studies*
1100 – 1230	***Water Quality Assurance*** *Parameters to Monitor (TDS, Turbidity, pH) • Laboratory Testing & Online Sensors • Compliance with WHO/GCC Standards • Disinfection & Post-Treatment*
1230 – 1245	*Break*
1245 – 1330	***HSE in Generation & Desalination Facilities*** *Occupational Hazards • Emergency Shutdown Procedures • Chemical Handling in Desalination • Confined Space & Hot Work Safety*
1330 - 1420	***Environmental Regulations & Compliance*** *UAE & International Standards • Emission Control Systems • Wastewater Treatment & Reuse • Auditing & Reporting*
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	***Smart Grids & Digital Utilities*** *Advanced Metering Infrastructure • Demand Response & Load Control • Smart Water Networks • Integration with AI & Blockchain*
0830 - 0930	***Energy Storage & Desalination*** *Battery Systems for Grid Support • Thermal Energy Storage in MED/MSF • Desalination with Stored Renewable Energy • Role of Hydrogen*
0930 – 0945	*Break*
0945 – 1100	***Carbon Reduction in Power & Water Sector*** *Carbon Capture in Power Plants • Low-Carbon Desalination Technologies • EWEC Decarbonization Roadmap • Reporting & Sustainability Metrics*
1100 – 1230	***AI & IoT Applications*** *Predictive Maintenance • Leak Detection in Water Systems • Real-Time Analytics in Generation • AI-Assisted Dispatch & Load Balancing*
1230 – 1245	*Break*
1245 – 1315	***Case Studies from UAE & GCC*** *Taweelah RO Plant • Mirfa IWPP • Shuweihat S3 • DEWA's Solar-Desalination Pilot*
1315 - 1345	***Workshop: Integrated Planning & Scenario Simulation*** *Balancing Water & Power Output • Demand Forecasting Exercises • Crisis Response Scenarios • Group Presentations & Feedback*
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 latest revision of “EPANET” simulators.



EPANET Simulator

Course Coordinator

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