

COURSE OVERVIEW TE0310 Water Losses/Non-Revenue Water Analysis

Course Title

Water Losses/Non-Revenue Water Analysis

Course Date/Venue

July 28-August 01, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE 3.0 CEUS

(30 PDHs)

Course Reference TE00310

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 Water Loss Revenue. Non-revenue Water & Management. It covers the water losses and NRW components, impact of NRW on water utilities and environment and global benchmarks and KPIs; the water balance and components, economic impacts of NRW, measurement and data requirements and regulatory frameworks and standards; the leakage detection techniques using acoustic methods, smart pressure sensors and loggers, night flow analysis and district metered areas (DMAs); and the leakage detection techniques using acoustic methods, smart pressure sensors and loggers, night flow analysis and district metered areas (DMAs).

Further, the course will also discuss the pipeline infrastructure condition assessment. asset management, DMA establishment and operation and field leak survey techniques; the customer meterina accuracy. unauthorized and consumption billing and and meter data management; and the customer categorization structures, data analytics and tariff for commercial losses and consumer engagement and complaint handling.



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During this interactive course, participants will learn how to develop NRW reduction strategy; the performance indicators and benchmarking, technology for NRW reduction and project management for NRW programs; the human resource and institutional capacity, monitoring, evaluating, auditing and integration with water utility operations; and the sustainable NRW reduction practices covering institutionalizing NRW management, climate change and water efficiency, embedding NRW KPIs in performance reviews and future trends and innovations.

Course Objectives

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

- Apply and gain an in-depth knowledge on water loss and revenue, non-revenue water management
- Classify water losses and discuss NRW components, impact of NRW on water utilities and environment and global benchmarks and KPIs
- Explain water balance and components, economic impacts of NRW, measurement and data requirements and regulatory frameworks and standards
- Illustrate leakage detection techniques using acoustic methods, smart pressure sensors and loggers, night flow analysis and district metered areas (DMAs)
- Distinguish relationship between pressure and leakage, pressure zoning and control valves, advanced pressure control technologies and real-time pressure monitoring systems
- Carryout pipeline condition assessment, infrastructure asset management, DMA establishment and operation and field leak survey techniques
- Recognize customer metering and accuracy, unauthorized consumption and billing and meter data management
- Identify customer categorization and tariff structures, data analytics for commercial losses and consumer engagement and complaint handling
- Develop NRW reduction strategy and apply performance indicators and benchmarking, technology for NRW reduction and project management for NRW programs
- Carryout human resource and institutional capacity, monitor, evaluate and audit and integration with water utility operations
- Implement sustainable NRW reduction practices covering institutionalizing NRW management, climate change and water efficiency, embedding NRW KPIs in performance reviews and future trends and innovations

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.



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Who Should Attend

This course provides an overview of all significant aspects and considerations of water loss and revenue, non-revenue water management for water utility managers and engineers, NRW specialists and water loss auditors, operations and maintenance (O&M) personnel, asset and infrastructure managers, water metering and billing professionals, environmental and sustainability officers, GIS and data analysts working on utility networks and those who involved in water utility operations, planning, and management.

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.



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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. Nikolas Karnavos, MSc, BSc, is an International Expert in Water Treatment Technology with over 30 years of extensive experience within the Oil, Gas, Refinery and Petrochemical industries. His expertise widely covers Wastewater Treatment, Oilfield Water Treatment, Best Practice in Sewage & Industrial Wastewater Treatment & Environmental Protection, Treating & Handling Oily Water, Water Chemistry for Power Plant,

Industrial Water Treatment in Refineries & Petrochemical Plants, Water Pollution Control, Permitting & Enforcing Drilling for Groundwater, Hydraulic Modelling, Network Design, Reverse Osmosis Treatment Technology and Water Chlorination System. Further, he is also well-versed in Laboratory Control of a Wastewater Treatment Plant, Environmental Online Analyzers (Air & Water), Gas Chromatography and various instrumental methods of analysis such as Water Analysis & Quality Control, Water and Wastewater Chemical Analysis, Statistical Data and Laboratory Analysis, Gas Analysis, Qualitative Fuel Analysis, Environmental Chemical Analysis, Laboratory Environmental Analysis including Water Quality Testing, Water Testing (ICP & Ion Chromatography), Process Water and Wastewater Effluents, Oily Sludge Treatment, Atomic Absorption and Spectroscopic Methods in Analytical Chemistry, Analytical Method Development and Methods of Environmental Measurements (Water, Air, Liquid & Solid Wastes).

Mr. Karnavos was the Laboratory Manager of Exxon wherein he was responsible for ISO 17025 certification, upgrading laboratory equipment in refinery, petrochemical and polypropylene plants, upgrading and extending LIMS, handling the transition plan process of the existing laboratory to a new as well as formulating and executing the plans for applied research and technology transfer. During his career life, he had occupied several significant positions as the Laboratory Analyst, Laboratory Professor, Quality Manager, Partner & Managing Director, Environmental Engineer, Process Engineer, Environmental Management Corporate Department Head and Quality Control & Plastics Application Head with different international companies like the AQUACHEM, Hellenic Petroleum (EXXON) and Technological Institute.

Mr. Karnavos holds a Master degree in Chemical Engineering and Bachelor degrees in Mechanical Engineering and Petroleum Engineering from the Aristotelian University of Thessaloniki, Technological Institute and KATEE Kavala respectively. He is an Accredited Trainer for the Organization for the Certifications & Vocational Guidance (EOPPEP) and an Accredited Environmental Auditor from the IEMA. Further, he is the President of Greek Association of Chemical Engineers and an active member of various professional engineering bodies internationally like the IEMA, Technical Chamber of Greece and the CONCAWE. He also published numerous books and scientific papers and delivered various trainings and workshops worldwide.



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Training Methodology

All our Courses are including Hands-on Practical Sessions using equipment, Stateof-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 workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1:	Monday, 28 th of July 2025
0730 – 0800	Registration & Coffee
0800 - 0815	Welcome & Introduction
0815 - 0830	PRE-TEST
0830 - 0930	Overview of Water Losses & NRW
	Definition and Classification of Water Losses • Understanding NRW
	Components • Impact of NRW on Water Utilities and Environment • Global
	Benchmarks and KPIs
0930 - 0945	Break
	Water Balance & Components
0945 – 1030	IWA Standard Water Balance Model • Authorized Consumption versus Losses
	Real versus Apparent Losses Best Practices in Quantification
	Economic Impacts of NRW
1030 - 1130	Revenue Loss Due to Unbilled Water • Cost-Benefit Analysis of NRW
	Reduction • Social and Environmental Costs • Economic Level of Leakage
	(ELL)
1130 - 1230	Measurement & Data Requirements
	Metering Hierarchy and Data Collection • Data Validation and Normalization
	• Importance of Accurate Customer Metering • SCADA and AMR Data
	Integration
1230 - 1245	Break



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1245 - 1330	Regulatory Frameworks & Standards
	International Best Practices (IWA, AWWA) • Governmental Policies and
	<i>Compliance</i> • <i>Reporting and Auditing Requirements</i> • <i>Strategic Importance for</i>
	National Goals
1330 - 1420	Case Studies: Successful NRW Programs
	Global Examples: Singapore, Germany, UAE • Lessons Learned from Low-
	NRW Countries • Urban versus Rural NRW Strategies • Qatari Context:
	Kahramaa Challenges and Targets
1420 - 1430	Recap
	<i>Using this Course Overview, the Instructor(s) will Brief Participants about the</i>
	Topics that were Discussed Today and Advise Them of the Topics to be
	Discussed Tomorrow
1430	Lunch & End of Day One

Day 2:	Tuesday, 29 th of July 2025
0730 – 0830	Leakage Detection Techniques
	Acoustic Methods (Correlators, Ground Mics) • Smart Pressure Sensors and
	Loggers • Night Flow Analysis • District Metered Areas (DMAs)
	Pressure Management
0830 - 0930	Relationship Between Pressure and Leakage • Pressure Zoning and Control
0000 - 0000	Valves • Advanced Pressure Control Technologies • Real-Time Pressure
	Monitoring Systems
0930 - 0945	Break
	Pipeline Condition Assessment
0945 - 1100	Pipe Material Deterioration Factors • Leak Localization Using Smart
0040 - 1100	Technologies • GIS Mapping and Asset Tagging • Predictive Maintenance
	Tools
	Infrastructure Asset Management
1100 - 1230	Asset Inventory and Lifecycle Costing • Rehabilitation Planning and Renewal
	Rates • Prioritizing High-Risk Areas • Linking Asset Management to NRW
1230 - 1245	Break
	DMA Establishment & Operation
1245 - 1330	<i>Principles of Creating DMAs</i> • <i>Boundary Valve Installation and Monitoring</i> •
1240 1000	Flow and Pressure Monitoring within DMA • Daily Water Balance within
	DMAs
	Field Leak Survey Techniques
1330 - 1420	Planning Proactive Leak Detection • Mobile Leak Detection Vans • Training
	Crews on Field Techniques • Recording and Reporting Leaks
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:	Wednesday, 30 th of July 2025
0730 - 0830	<i>Customer Metering & Accuracy</i> <i>Meter Types and Principles (Volumetric, Ultrasonic)</i> • <i>Meter Testing and</i> <i>Calibration</i> • <i>Meter Selection Criteria</i> • <i>Aging and Under-Registration Issues</i>
0830 – 0930	Unauthorized Consumption Illegal Connections and Theft Identification • Social Awareness and Enforcement • Use of Smart Metering to Reduce Theft • Case Tracking and Penalties
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0930 - 0945	Break
	Billing & Meter Data Management
0945 – 1100	Automated Meter Reading (AMR/AMI) • Data Integrity and Analysis •
	Meter-to-Cash (M2C) Cycle Optimization • CRM Integration with Metering
1100 - 1230	Customer Categorization & Tariff Structures
	Revenue from Different Consumer Types • Non-Domestic Consumer Metering
	<i>Issues • Aligning Tariff with Consumption • Subsidy Impact on NRW</i>
1230 - 1245	Break
	Data Analytics for Commercial Losses
1245 - 1330	Using AI/ML for Anomaly Detection • Consumption Pattern Analysis •
	<i>Cross-Checking Billing and Flow Data</i> • <i>Geo-Analytics for Identifying Losses</i>
1330 – 1420	Consumer Engagement & Complaint Handling
	Role of Customer Service in Reducing Losses • Consumer Education Programs
	• Complaint Logging and Resolution System • Feedback Loop into NRW
	Strategy
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:	Thursday, 31 st of July 2025
0730 - 0830	Developing an NRW Reduction Strategy
	Setting Realistic Reduction Targets • Phased Implementation Plans •
	Stakeholder Engagement • Cost Estimation and Budgeting
	Performance Indicators & Benchmarking
0830 - 0930	Key Performance Indicators (KPIs) • Water Loss Index (WLI), Infrastructure
	Leakage Index (ILI) • Setting Baseline and Target Metrics • Benchmarking with Other Utilities
0930 - 0945	Break
	Technology for NRW Reduction
0945 - 1100	Smart Metering and IoT • GIS and Hydraulic Modeling • AI in Leak
	Prediction • Digital Twin for Water Networks
	Project Management for NRW Programs
1100 - 1230	Planning Tools and Gantt Charts • Procurement of NRW Technologies •
	Contract Management • Quality Assurance & Control
1230 - 1245	Break
	Human Resource & Institutional Capacity
1245 1330	Building Internal Capacity for NRW Teams • Training Programs for
1245 - 1550	Technicians and Engineers • Role of NRW Champions • Institutional Reforms
	and Incentives
1330 - 1420	Monitoring, Evaluation & Auditing
	Setting Up Dashboards and Control Rooms • Periodic Audits and Field
	Verifications • Evaluation of Financial Returns • Continuous Improvement
	Methodology
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



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Day 5:	Friday, 01 st of August 2025
	Integration with Water Utility Operations
0720 0020	Linking NRW with Asset, Customer and Finance Systems • Role of NRW in
0750 - 0050	Business Planning • Sustainability and Resilience • Managing Change within
	Utilities
	Sustainable NRW Reduction Practices
0830 - 0930	Institutionalizing NRW Management • Climate Change and Water Efficiency
	• Embedding NRW KPIs in Performance Reviews • Future Trends and
	Innovations
0930 - 0945	Break
	Hands-On Group Exercise: DMA Design
0945 – 1100	Create a Sample DMA Layout • Meter Placement and Flow Path Analysis •
	Pressure Zone Planning • Leak Detection and Response Plan
	Hands-On Workshop: Water Balance Calculation
1100 – 1230	Data Collection and Validation • Calculating Annual Water Balance •
	Identifying Loss Components • Suggesting Mitigation Measures
1230 - 1245	Break
	Interactive Case Study Analysis
1745 1345	Participants Analyze Real-World NRW Data • Identify Key Weaknesses and
1245 - 1345	Potential Improvements • Present Solutions to Peer Groups • Feedback and
	Evaluation
	Course Conclusion
1345 - 1400	Using this Course Overview, the Instructor(s) will Brief Participants about t
	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.



Course Coordinator

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