COURSE OVERVIEW TE0240
Operational Water Demand Forecasting for Network and Plant Optimization

Course Title
Operational Water Demand Forecasting for Network and Plant Optimization

Course Date/Venue
April 13-17, 2026/Falcon 1 Meeting Room, voco Dubai by IHG, Dubai, UAE

Course Reference
TE0240

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

Course Description

This practical and highly-interactive course includes 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 Operational Water Demand Forecasting for Network and Plant Optimization. It covers the purpose of short- and medium-term operational forecasting including water supply systems and operational context; the data requirements for operational forecasting and demand drivers affecting short-term operations; the forecasting horizons for network and plant optimization and performance metrics for operational forecasts; and the time-series analysis, short-term statistical forecasting techniques and weather-based demand models.

Further, the course will also discuss the zone-level and plant-level forecasting and model calibration and validation; the interpretation of forecast outputs for operators; the machine learning in water operations, feature engineering for operational demand models and machine learning models for short-term forecasting; and the model training and hyperparameter tuning, forecasting uncertainty and risk awareness and comparing and selecting forecasting models.

During this interactive course, participants will learn the linking of demand forecasts to plant operations; the distribution network optimization, energy and cost optimization and integrated plant–network coordination; the forecast-driven operational decision support, operational resilience and flexibility as well as real-time and near-real-time forecasting; and the scenario-based operational planning, forecasting for asset and maintenance planning and model governance and continuous improvement.

Course Objectives

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

- Apply and gain an in-depth knowledge on operational water demand forecasting for network and plant optimization
- Discuss the purpose of short- and medium-term operational forecasting including water supply systems and operational context
- Identify data requirements for operational forecasting and demand drivers affecting short-term operations
- Discuss forecasting horizons for network and plant optimization and performance metrics for operational forecasts
- Carryout time-series analysis, short-term statistical forecasting techniques and weather-based demand models
- Apply zone-level and plant-level forecasting and model calibration and validation
- Interpret forecast outputs for operators and recognize machine learning in water operations
- Describe feature engineering for operational demand models and machine learning models for short-term forecasting
- Illustrate model training and hyperparameter tuning, forecast uncertainty and risk awareness and compare and select forecasting models
- Link demand forecasts to plant operations and apply distribution network optimization, energy and cost optimization and integrated plant–network coordination
- Employ forecast-driven operational decision support, operational resilience and flexibility as well as real-time and near-real-time forecasting
- Apply scenario-based operational planning, forecasting for asset and maintenance planning and model governance and continuous improvement

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 operational water demand forecasting for network and plant optimization for water supply and distribution network engineers, water resources and planning engineers, operations and production engineers at water treatment plants, network operation and control room staff, Scada, data analysis, and performance monitoring engineers, planning and asset management professionals, demand management and NRW (non-revenue water) specialists, process optimization and energy efficiency engineers, operations supervisors and technical managers, utility planners and decision-makers involved in system optimization 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

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. Kyle Bester is a **Senior Water Engineer** with extensive years of practical experience within the **Oil & Gas**, **Power & Water Utilities** and other **Energy** sectors. His expertise includes **Water Reservoir**, **Water Tanks**, **Water Pumping** Station, **Water Distribution** System, **Water Network** System, **Water Pipes & Fittings**, **Water Hydraulic** Modelling, **Water Storage Reservoir**, **Reservoirs & Pumping** Stations Design & Operation, **Pumping** Systems, Interconnecting **Pipelines**, **Water Network Hydraulic** Simulation Modelling, **Water Supply** Design, **Water Balance Modelling**, **Water Distribution Network**, **Water Network** System Analysis, **Water Forecasts** Demand, **Water Pipelines** Materials & Fittings, **Water Network** System Design, Pump Houses & Booster Pumping Stations, **Potable Water Transmission**, **Water Distribution Network**, Districts Meters Areas (DMAs), **Water Supply & Desalination Plants** Rehabilitation, **Water Reservoirs & Pumping Stations**, **Water Network System** Extension, Water Network System Replacement & Upgrade, **Water Networks** Optimization, **Water Supply & Distribution** Systems Efficiency & Effectiveness, **Pipe** Materials & Fittings, **Service Reservoir** Design & Operation, **Pipes & Fittings**, **Water Network** System Design & Operation, **Supply Water Network** Rehabilitation, **Water Loss** Reduction, **Main Water** System Construction, **Main Water Line** Construction, Transmission & Distribution **Pipelines**, **Water Distribution** Design & Modelling, **Water Supply** System, Oilfield **Water Treatment**, Best Practice in **Sewage** & Industrial **Wastewater Treatment** & Environmental Protection, **Water Distribution** Design & Modelling, **Desilting**, Treating & Handling Oily **Water**, **Water Chemistry** for **Power Plant**, **Water** Sector Orientation, Environmental Impact Assessment (**EIA**), **Potable Water**, **Reverse Osmosis** Treatment Technology and **Chlorination** System, **Well** Inventory, Monitoring & Conservation, **Qualitative Analysis** of Soil & Ground Water, **Water** Networking, **Hydraulic Modelling** Systems, **Pumping** Stations, **Centrifugal Pumps**, **Pipelines & Pumping**, **Water Reservoirs**, **Water Storage Tanks**, Extended Activated **Sludge** Treatment, **Sewage & Industrial Wastewater** Treatment & Environmental Protection, Supervising & Monitoring **Sewage Works**, **Water Desalination** Technologies, **Water Distribution & Pump** Station, Best **Water Equipment** Selection & Inspection, **Hydraulic Modelling** for Water Network Design, **Water Utility** Industry, **Water Desalination** Technologies & New Development, **Water Hydrology**, **Water Conveyors**, **Water Networks** Rehabilitation. He is currently the **Part Owner & Manager** of Extreme Water SA wherein he manages, re-designed and commissioned a water and wastewater treatment plants.

During his career life, Mr. Bester has gained his practical and field experience through his various significant positions and dedication as the **Project Manager**, **Asset Manager**, **Manager**, **Water Engineer**, **Supervisor**, **Team Leader**, **Analyst**, **Process Technician**, **Landscape Designer** and **Senior Instructor/Trainer** for various international companies, infrastructures, water and wastewater treatment plants from New Zealand, UK, Samoa, Zimbabwe and South Africa, just to name a few.

Mr. Bester holds a **Diploma** in **Wastewater Treatment** and a **National Certificate** in **Wastewater & Water Treatment**. Further, he is a **Certified Instructor/Trainer**, an **Approved Chemical Handler** and has delivered numerous courses, trainings, conferences, seminars and workshops 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.

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: ***Monday, 13th of April 2026***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Operational Water Demand Forecasting*** *Purpose of Short- and Medium-Term Operational Forecasting • Differences Between Strategic, Tactical and Operational Forecasting • Role of Forecasting in Daily Utility Operations • Key Challenges in Operational Water Demand Prediction*
0930 – 0945	*Break*
0945 – 1030	***Water Supply Systems & Operational Context*** *Overview of Water Production, Transmission and Distribution Systems • Interactions Between Treatment Plants and Distribution Networks • Operational Constraints in Plants and Networks (Capacity, Pressure, Storage) • Demand-Driven Versus Supply-Driven Operations*
1030 – 1130	***Data Requirements for Operational Forecasting*** *Types of Operational Demand Data (Hourly, Daily, Zone-Level) • SCADA, AMI and Meter Data Integration • Data Resolution and Time-Step Selection •Data Quality Issues and Operational Data Gaps*
1130 – 1215	***Demand Drivers Affecting Short-Term Operations*** *Weather and Climate Sensitivity in Daily Demand • Industrial, Commercial, and Municipal Usage Patterns • Seasonal, Weekly and Diurnal Variations • Event-Driven Demand (Maintenance, Shutdowns, Emergencies)*
1215 – 1230	*Break*

1230 – 1330	***Forecasting Horizons for Network & Plant Optimization*** *Intraday and Next-Day Forecasting • Weekly and Rolling Forecasts • Forecast Accuracy Versus Operational Usability • Aligning Forecasting Horizons with Decision Cycles*
1330 – 1420	***Performance Metrics for Operational Forecasts*** *Forecast Error Measures (MAE, RMSE, MAPE) • Reliability and Robustness Indicators • Impact of Forecast Errors on Plant Production and Pumping • Continuous Improvement Through Feedback Loops*
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: ***Tuesday, 14th of April 2026***

0730 – 0830	***Fundamentals of Time-Series Analysis*** *Time-Series Components (Trend, Seasonality, Noise) • Stationarity and Differencing Concepts • Autocorrelation and Partial Autocorrelation • Lag Selection for Operational Models*
0830 – 0930	***Short-Term Statistical Forecasting Techniques*** *Moving Averages and Exponential Smoothing • Holt-Winters Models for Hourly and Daily Demand • Regression-Based Operational Forecasting • Strengths and Limitations of Classical Methods*
0930 – 0945	*Break*
0945 – 1100	***Weather-Based Demand Models*** *Temperature, Humidity, and Heat Index Impacts • Lagged Weather Effects on Demand • Incorporating Weather Forecasts into Models • Managing Uncertainty in Meteorological Inputs*
1100 – 1215	***Zone-Level & Plant-Level Forecasting*** *Aggregated Versus Disaggregated Demand Forecasting • Distribution Zone Demand Modeling • Plant Inflow and Production Demand Forecasting • Balancing Local Accuracy and System-Wide Consistency*
1215 – 1230	*Break*
1230 – 1330	***Model Calibration & Validation*** *Training and Testing Data Separation • Cross-Validation for Operational Datasets • Sensitivity Analysis for Key Parameters • Updating Models with New Operational Data*
1330 – 1420	***Interpreting Forecast Outputs for Operators*** *Understanding Forecast Ranges and Confidence Intervals • Identifying Abnormal Demand Signals • Translating Forecasts into Operational Actions • Communicating Forecasts to Control Room Teams*
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, 15th of April 2026**

0730 – 0830	***Introduction to Machine Learning in Water Operations*** *Why Machine Learning for Short-Term Demand Forecasting • Supervised Learning Concepts for Operations • Comparison with Traditional Statistical Models • Data Volume and Computational Considerations*
0830 – 0930	***Feature Engineering for Operational Demand Models*** *Time-Based Features (Hour, Day, Season) • Weather-Derived Features • Lagged and Rolling Demand Variables • Operational Status and Event Indicators*
0930 – 0945	*Break*
0945 – 1100	***Machine Learning Models for Short-Term Forecasting*** *Linear and Regularized Regression Models • Decision Trees and Random Forests • Gradient Boosting Methods • Neural Networks for Hourly Demand Prediction*
1100 – 1215	***Model Training & Hyperparameter Tuning*** *Data Scaling and Normalization • Avoiding Overfitting in Operational Datasets • Hyperparameter Optimization Techniques • Model Retraining Frequency for Operations*
1215 – 1230	*Break*
1230 – 1330	***Forecast Uncertainty & Risk Awareness*** *Probabilistic Forecasting Concepts • Scenario-Based Demand Forecasts •Handling Extreme or Abnormal Conditions • Risk-Informed Operational Decision-Making*
1330 – 1420	***Comparing & Selecting Forecasting Models*** *Accuracy Versus Interpretability Trade-Offs • Computational Speed for Real-Time Use • Maintenance and Update Requirements • Selecting Models Aligned with Operational Needs*
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, 16th of April 2026**

0730 – 0830	***Linking Demand Forecasts to Plant Operations*** *Production Planning Based on Forecasted Demand • Treatment Process Optimization • Chemical Dosing and Energy Optimization • Managing Startup, Shutdown and Ramping Constraints*
0830 – 0930	***Distribution Network Optimization*** *Forecast-Driven Pump Scheduling • Pressure Management Strategies •Storage Tank Operation and Level Control • Reducing Leakage and Non-Revenue Water Impacts*
0930 – 0945	*Break*
0945 – 1100	***Energy & Cost Optimization*** *Energy-Demand Relationships in Water Systems • Load Shifting and Peak Demand Management • Electricity Tariff Considerations • Cost-Benefit Analysis of Operational Decisions*
1100 – 1215	***Integrated Plant–Network Coordination*** *Aligning Plant Output with Network Demand • Coordinated Operation of Multiple Plants • Transfer and Balancing Between Supply Zones • Minimizing Operational Conflicts and Inefficiencies*
1215 – 1230	*Break*

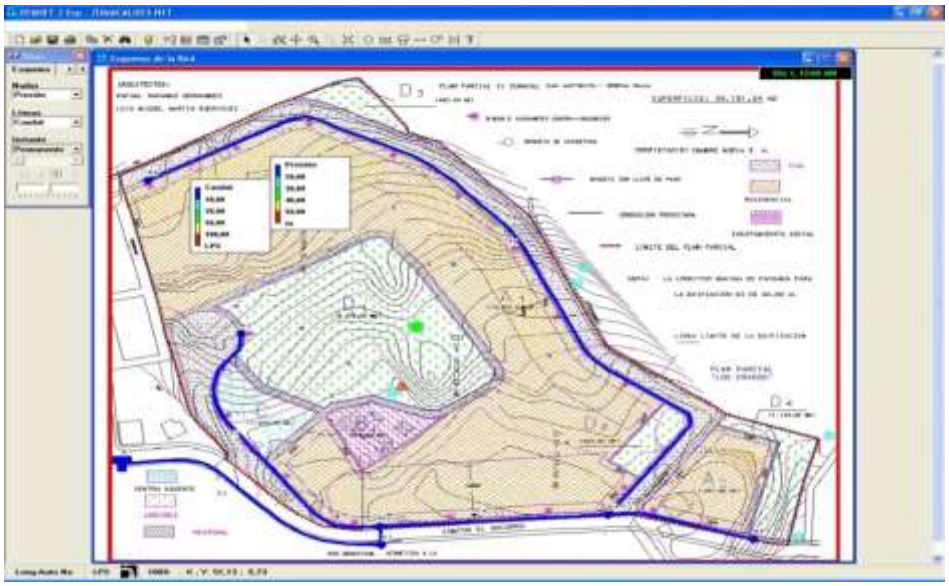
1230 – 1330	***Forecast-Driven Operational Decision Support*** *Decision Support System (DSS) Concepts • Real-Time Forecasting Dashboards • Alarm and Threshold-Based Responses • Human-in-the-Loop Operational Control*
1330 – 1420	***Operational Resilience & Flexibility*** *Managing Demand Variability and Uncertainty • Operational Buffers and Safety Margins • Adapting Forecasts During Disturbances • Lessons Learned from Operational Disruptions*
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: ***Friday, 17th of April 2026***

0730 – 0830	***Real-Time & Near-Real-Time Forecasting*** *Streaming Data and Real-Time Updates • Rolling Forecast Updates • Integration with SCADA and Control Systems • Latency and Reliability Considerations*
0830 – 0930	***Scenario-Based Operational Planning*** *Normal, Peak, and Low-Demand Scenarios • Emergency and Contingency Demand Forecasting • Maintenance and Outage Planning • Climate and Extreme Weather Considerations*
0930 – 0945	*Break*
0945 – 1100	***Forecasting for Asset & Maintenance Planning*** *Identifying Stress on Pumps and Pipelines • Forecast-Informed Preventive Maintenance • Reducing Asset Fatigue and Failure Risk • Linking Demand Forecasts with Asset Health Data*
1100 – 1215	***Model Governance & Continuous Improvement*** *Model Lifecycle Management • Monitoring Forecast Performance over Time •Updating Models with Operational Changes • Documentation and Knowledge Transfer*
1215 – 1230	*Break*
1230 – 1300	***Case Studies & Practical Applications*** *Operational Demand Forecasting for Treatment Plants • Network Optimization Success Stories • Lessons Learned from Implementation Challenges • Key Performance Improvements Achieved*
1300 - 1345	***Implementation Roadmap*** *Steps to Implement Operational Forecasting Systems • Organizational and Skill Requirements • Common Pitfalls and Mitigation Strategies • Summary, Key Takeaways, and Next Steps*
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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