COURSE OVERVIEW TE0180
Hydraulic Modelling

Course Title
Hydraulic Modelling

Course Date/Venue
September 23-27, 2024/Fujairah Meeting Room,
Grand Millennium Al Wahda Hotel,Abu Dhabi, UAE

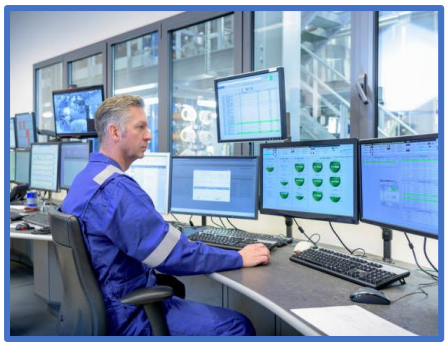
Course Reference
TE0180

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

Course Description

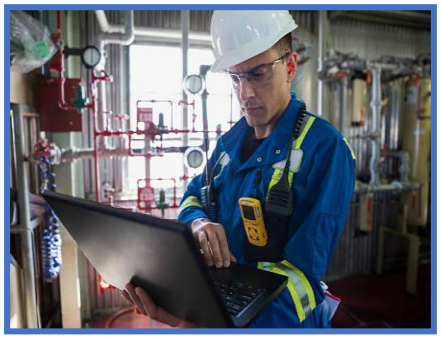
This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

The course is designed to provide delegates with a detailed and up-to-date overview on the systematic hydraulic modeling techniques for water network design.



Participants will be provided with knowledge and skills to analyze the hydraulics of water distribution systems, correct design criteria for planning a water distribution system and perform hydraulic designs of pipeline system, pump system and water distribution storage tanks as well as build and run a hydraulic simulation.

The course will discuss how to handle mapping, graphing and reporting the simulation results; allocate water demand and calibrate static and dynamic models; prepare a water master plan including future demand projection, water network analysis and existing system rehabilitation; apply advanced modeling tools and generate water quality modeling; and optimize models for operations and calibrate hydraulic network models.



Participants are encouraged to bring their own laptops for the practical sessions. A copy of the hydraulic modelling simulator will be given to each participant for free.

Course Objectives

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

- Apply systematic hydraulic modeling techniques for water network design
- Analyze the hydraulics of water distribution systems
- Employ the correct design criteria for planning a water distribution system
- Perform hydraulic designs of pipeline system, pump system and water distribution storage tanks
- Build and run a hydraulic simulation
- Handle mapping, graphing and reporting the simulation results
- Allocate water demand and calibrate static and dynamic models
- Prepare a water master plan including future demand projection, water network analysis and existing system rehabilitation
- Apply advanced modeling tools and generate water quality modeling
- Optimize models for operations and calibrate hydraulic network models

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, sample video clips of the instructor's actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.*

Who Should Attend

This course covers systematic techniques and methodologies on hydraulic modelling for utility, municipal, water and hydraulic engineers, developers, planners, designers and other technical staff who are responsible for or oversee water distribution facilities. The course is also suitable for civil and mechanical engineers.

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 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: -

- 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.

- 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 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 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 **Hydraulic Modelling Water Network Design**, **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.

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, 23rd of September 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Water Distribution System*** *Background • Historical Aspects of Water Distribution • Modern Water Distribution Systems*
0930 – 0945	*Break*
0945 – 1100	***Hydraulics of Pressurized Flow*** *Importance of Pipeline Systems • Numerical Models: Basis for Pipeline Analysis • Modeling Approach • System Capacity: Problems in Time & Space • Steady Flow • Quasi-Steady Flow: System Operation • Unsteady Flow: Introduction of Fluid Transients*
1100 – 1215	***Hydraulics of Water Distribution Systems*** *Steady-State Hydraulic Analysis • Unsteady Flow in Pipe Network Analysis • Computer Modeling of Water Distribution Systems*
1215 – 1230	*Break*
1230 – 1420	***Water Distribution System Planning*** *Water Demands • Planning & Design Criteria • Peaking Coefficients • Computer Models & System Modeling*
1420 - 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2: ***Tuesday, 24th of September 2024***

0730 – 0930	***Hydraulic Design of Pipeline System*** *Alignment • Subsurface Conflicts • Rights-of-Way • Piping Materials • Internal Pressures • Loads on Buried Pipe • Thrust Restraint • Distribution & Transmission System Valves*
0930 – 0945	*Break*
0945 – 1100	***Hydraulic Design of Pump System*** *Pump Types & Definitions • Pump Hydraulics • Concept of Specific Speed • Net Positive Suction Head • Corrected Pump Curves • Hydraulic Considerations in Pump Selection • Application of Pump • Hydraulic Analysis to Design of Pumping Station Components • Implications of Hydraulic Transients in Pumping Station Design*
1100 – 1215	***Hydraulic Design of Water Distribution Storage Tanks*** *Basic Concepts • Design Issues • Location • Tank Levels • Tank Volume • Other Design Considerations*
1215 – 1230	*Break*
1230 – 1420	***Basic of Computer Models*** *Need for Computer Models • Uses of Computer Models • Simulator Program Features • Simulator User Interface • Simulator Solver Module • Simulator Programmer's Toolkit*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3: **Wednesday, 25th of September 2024**

0730 – 0930	***Use of a Computer Model*** *Network Representation • Compilation of Data • Estimation of Demand • Operating Characteristics • Reaction-Rate Information • Model Calibration*
0930 – 0945	*Break*
0945 – 1100	***Computer Model Internals*** *Input Processing • Topological Processing • Hydraulic Solution Algorithms • Linear-Equation Solver • Extended-Period Solver • Water-Quality Algorithms • Output Processing*
1100 – 1215	***Building & Running a Hydraulic Simulation*** *Building a Model • Create Network Components • Operation Data Tools • Run a Hydraulic Simulation • Steady-State Simulation • Extended Period Simulation*
1215 – 1230	*Break*
1230 – 1420	***Mapping, Graphing & Reporting Simulation Results*** *Output Graphs • Output Reports • Additional Reporting Tools*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4: **Thursday, 26th of September 2024**

0730 – 0930	***Demand Allocation & Model Calibration*** *Steps for Demand Allocation (Existing and Future Scenarios) • Demand Allocation Methods (Pros and Cons) • Demand Projections • Steps for Model Calibration*
0930 – 0945	*Break*
0945 – 1100	***Demand Allocation & Model Calibration (cont'd)*** *Types of Calibration (Static or Dynamic) Including Limitations • Matching Tank Levels, Flows, Pressures • Calibration Tolerances (Agreement Between Model and Field)*
1100 – 1215	***Water Master Planning & Modeling*** *Reasons for Preparing a Master Plan • How to Prepare a Water Master Plan • Future Demand Projections • Water Network Analysis • System Deficiencies • Replacement of Existing Infrastructure • Identify System Deficiencies • Evaluate Operating Strategies • Assess Rehabilitation Methods • pUsing Model to Evaluate Alternatives*
1215 – 1230	*Break*
1230 – 1420	***Advanced Modeling Tools*** *Logical Controls • Variable Speed Pumps • Pump Costing & Energy Simulation • Network Connectivity and Tracing Tools*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Four*

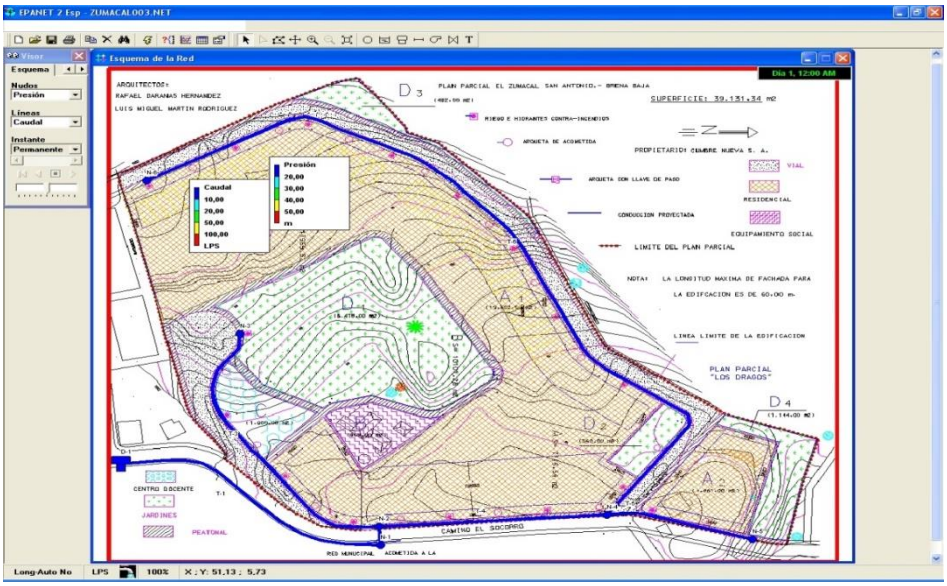
Day 5: **Friday, 27th of September 2024**

0730 – 0930	***Water Quality Modeling-Case Studies*** *Design of Distribution Systems • Water Quality in Networks • Hydraulic & Water-Quality Models • Early Applications of Water-Quality Modeling • Evolution of Water Quality Modeling • Modeling Propagation of Contaminants • Current Trends in Water-Quality Modeling*
0930 – 0945	*Break*

0930 – 1100	***Hydraulic Transient Design for Pipeline Systems*** *Water hammer • Surging • Hydraulic Characteristics of Valves • Hydraulic Characteristics of Pumps • Surge Protection and Surge Control Devices • Design Considerations • Negative Pressures & Water Column Separation in Networks • Time Constants for Hydraulic Systems • Case Studies*
1100 – 1230	***Optimization Models for Operations*** *Formulations for Minimizing Energy Cost • Formulations to Satisfy Water Quality • Solution Methods & Applications for Water-Quality Purposes • Optimal Scheduling of Booster Disinfection*
1230 – 1245	*Break*
1245 – 1345	***Calibration of Hydraulic Network Models*** *Identify the Intended Use of the Model • Determine Estimates of the Model Parameters • Collect Calibration Data • Evaluate the Results of the Model • Perform a Macro-Level Calibration of the Model • Perform a Sensitivity Analysis • Perform a Micro-Level Calibration of the Model • Future Trends*
1345 – 1400	***Course Conclusion***
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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