COURSE OVERVIEW TE0130-4D
Water Network Systems & Pumping Stations

Course Title
Water Network Systems & Pumping Stations

Course Date/Venue
August 12-15, 2024/ Boardroom, Warwick Hotel Doha, Doha, Qatar

Course Reference
TE0130-4D

Course Duration/Credits
Four days/2.4 CEUs/24 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.

Water network systems use interconnected elements such as pipes, pumps and service reservoirs to convey treated water from one or more sources to customers spread over a wide area. Given that capital costs and ongoing maintenance and repair costs of these systems are often enormous, the need for more economic and efficient designs is very important.

Water network systems are composed of three major components: pumping stations, distribution storage, and distribution piping. These components may be further divided into subcomponents, which in turn can be divided in sub-subcomponents. For example, the pumping station component consists of structural, electrical, piping and pumping unit sub-components. The pumping unit can be divided further into sub-subcomponents: pump, driver, controls, power transmission.

The exact definition of components, subcomponents and sub-subcomponents depends on the level of detail of the required analysis and to a somewhat greater extent, the level of detail of available data. In fact, the concept of component-subcomponent-sub-subcomponent merely defines a hierarchy of building blocks used to construct the water distribution system.

The water network system operates as a system of independent components. The hydraulics of each component is relatively straightforward; however, these components depend directly upon each other and as a result effect the performance of one another. The purpose of design and analysis is to determine how the systems perform hydraulically under various demands and operation conditions. All engineers like to think that they produce good, safe designs that are operationally efficient and cost effective. However, it is rare for a designer to have the time to consider more than a handful of solutions to a problem. In the planning phase of a project there are often many alternatives to each individual component of a scheme. The number of different designs for a complete scheme can thus be extremely large, if not infinite. Even with detailed design, there are usually far too many possibilities for each to be considered and evaluated.

This state-of-the art course is designed to provide participants with a good overview of the latest methods, materials, techniques and tools for water system networking and pumping stations. This course will present an up-to-date overview of the current water network design procedures and develop basic guidelines to be followed in both the design and the redesign of water networks and pumping stations.

The course treats the water network design problem in a comprehensive and systematic framework, starting with objectives and elaborating on various technical design features. It will show how to apply the fundamentals of various disciplines and subjects to produce a well-integrated pumping station that will be reliable, easy to operate and maintain and free from design mistakes. In a field where, inappropriate design can be extremely costly, there is simply no excuse for not taking expert advice from this course. Further, this course will tackle the Industry-specific issues and problems that engineers face every day. It will cover design, installation, operation, maintenance, retrofitting and rehabilitation of water network system and pumping stations.

A copy of the **EPANET Simulator on CD** will be given to each participant. Participants are encouraged to bring their own laptops for the practical sessions.

Course Objectives

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

- Apply and gain an in-depth knowledge on water network systems and pumping stations
- Design and analyze water network systems and pumping stations
- Explain the principles of pressurized flow & water distribution systems hydraulics
- Select proper valves for water distribution systems and pumping stations
- Describe the performance of centrifugal pumps
- Identify the different types of pumps and the selection criteria for each application
- Demonstrate knowledge of the procedure for installation of pumping stations

- Discuss variable-speed pumping and identify pump-driver specifications
- Identify the problem of vibration and noise in pumping station and learn the methods of vibration correction and elimination
- Employ proper methods for operation, maintenance and rehabilitation of existing water distribution systems and pumping stations
- Illustrate the process of retrofitting existing water pumping systems
- Discuss the importance of reliability analysis of water network systems and learn the methods of improving system reliability and availability

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 water network systems and pumping stations for utility managers, mechanical engineers, civil engineers, water engineers, engineering managers, design consultants, utility managers, superintendents, supervisors and other senior 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.

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: -

- 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 **2.4 CEUs** (Continuing Education Units) or **24 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 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 Maintenance & Water Engineer** with extensive years of practical experience within the **Oil & Gas**, **Power & Water Utilities** and other **Energy** sectors. His expertise includes **Condition Monitoring** System, **Maintenance Planning & Scheduling**, **Maintenance Planning Process**, **Maintenance Shutdown & Turnaround**, **Maintenance Audit** Best Practices, **Maintenance & Reliability** Management, **Reliability** Engineering, **Maintenance & Reliability** Best Practices, Reliability, Availability & Maintainability (**RAM**), **Root Cause** Analysis, **Reliability-Centered Maintenance** (**RCM**), **Reliability Engineering Analysis** (**RE**), **Root Cause Analysis** (**RCA**), **Asset Integrity Management** (**AIM**), **Reactive & Proactive** Maintenance, **Mechanical & Rotating Equipment** Troubleshooting & Maintenance, **Maintenance Management & Cost Control**, **Preventive & Predictive** Maintenance, **Pumps & Troubleshooting**, **Compressors**, **Gas & Steam Turbines**, **Valves**, **Bearings & Lubrication** and **Boiler** Inspection & Maintenance. Further, he is also well-versed in **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**). 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**, **Water Engineer**, **Maintenance Engineer, Mechanical 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 Fee

US$ 5,000 per Delegate. 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 course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will be always met:

Day 1: ***Monday, 12th of August 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Water Transport & Distribution System*** *Background ● Historical Aspects of Water Transport & Distribution ● Modern Water System Networking*
0930 – 0945	*Break*
0945 – 1130	***Hydraulics of Pressurized Flow*** *Importance of Pipeline Systems ● System Capacity: Problems in Time & Space ● Steady Flow*
1130 – 1230	***Hydraulics of Water Transport & Distribution System*** *Steady-State Hydraulic Analysis ● Unsteady Flow in Pipe Network Analysis ● Computer Modeling of Water Distribution Systems*
1230 – 1245	*Break*
1245 – 1420	***Water Transport & Distribution System Design*** *Transport & Distribution System Planning ● Pipeline Preliminary Design ● Piping Materials ● Pipeline Design ● Distribution & Transport System Valves*
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, 13th of August 2024***

0730 – 0930	***Designing for Easy Operation & Maintenance*** *Site Selection ● Landscaping ● Hydraulics ● Mechanical Considerations ● Electrical Considerations ● Architectural Considerations ● Standby Facilities ● Specifications ● Operator's Preferences*
0930 – 0945	*Break*
0945 - 1030	***System Design for Water Pumping*** *Types of Water Pumping Stations ● Pumping Station Flow & Pressure Requirements ● Raw Water Pumping from Rivers & Lakes ● Raw Water Pumping from Aqueducts ● Well Pumps with Elevated Tanks ● Booster Pumping Station*
1030 - 1130	***Water Valves*** *Isolation Valves ● Sluice Gates, Shear Gates, Flap Valves & Stop Plates ● Check Valves ● Control Valves ● Valve Actuators ● Air & Vacuum Valves ● Materials of Construction ● Installation of Valves ● Corrosion Protection*

1130 - 1230	***Performance of Centrifugal Pumps*** *Classification of Centrifugal Pumps ● Pump Application Terminology, Equations & Performance Curves ● Pump Operating Characteristics ● Cavitation ● Pump Characteristic Curves ● Pump Operating Curves ● Pump Operating Ranges ● Elementary Pump System Analysis ● Practical Pumping System H-Q Curve Analysis ● Complex Pumping System H-Q Curves*
1230 – 1245	*Break*
1245 – 1420	***Types of Pumps*** *Classification of Centrifugal Pumps ● Construction of Centrifugal Pumps ● Overhung-Impeller Pumps ● Impeller-between-Bearing Pumps ● Classification of Vertical Pumps ● Construction of Vertical Pumps ● Types of Vertical Pumps ● Positive-Displacement Pumps*
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, 14th of August 2024***

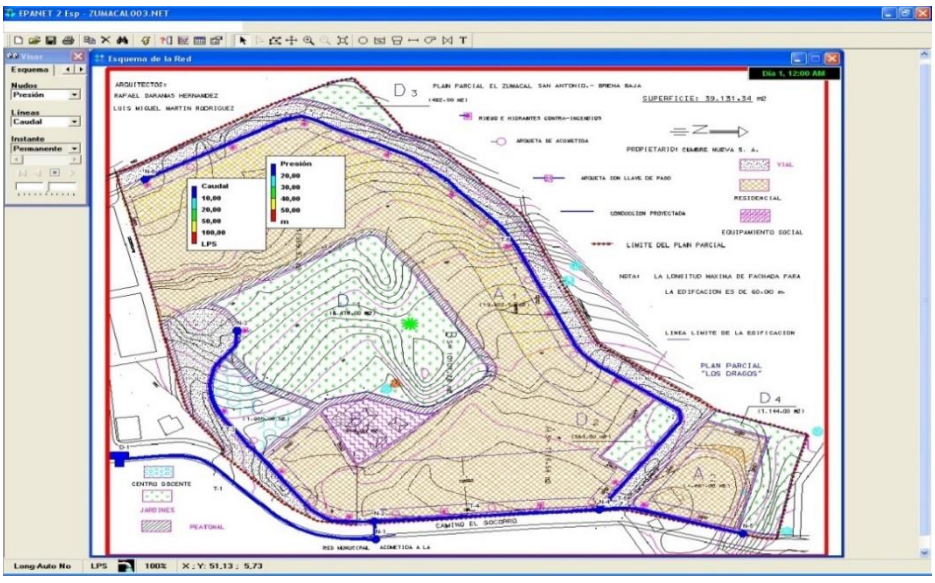
0730 – 0930	***Pump Selection, Installation & Intakes*** *Initial Screening ● Final Selection ● Considerations in Pump Selection ● Installation ● Pump Intake Basing*
0930 – 0945	*Break*
0945 - 1030	***Variable-Speed Pumping*** *Variable-Speed versus Constant Speed ● Design Considerations ● Pump Selection ● Variable- & Constant-speed Pumps in Simultaneous Operation ● Special Design Considerations ● Analysis of Variable-Speed Booster Pumping ● Minimum Discharge Rate ● Operations in Booster Pumping ● Simultaneous Operation of V/S & C/S Booster Pumps ● Adjustable- & Variable-Speed Drives*
1030 - 1130	***Pump-Driver Specifications*** *Comparison of Two Approaches to Writing Specifications ● Methods for Specifying Quality of Equipment ● Nondestrictive Specifications ● Operating Conditions ● Mass Elastic Systems & Critical Speeds ● Pump Testing ● Shipping Major Pumping Units ● Submittals ● Information to be Provided ● Seals ● Pump Shafts ● Pump Shaft Bearings ● Vertical Drive Shafts ● Electric Motors ● Optimum Efficiency*
1130 - 1230	***Installation of Water Pumps & Pumping Systems*** *Pre-installation Procedures ● Pump & Pumping System Bases*
1230 – 1245	*Break*
1245 – 1420	***Vibration & Noise*** *Problems of Vibration & Noise ● Avoiding Vibration Problems ● Troubleshooting Excessive Vibration ● Introduction to Vibration & Calculation ● Vibration & Noise Characteristics ● Applicable Codes ● Equipment Vibration ● Vibration Isolation Theory ● Vibration Isolators ● Piping Vibration ● Vibration of Structures ● Noise ● Reducing Exterior Noise*
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, 15th of August 2024**

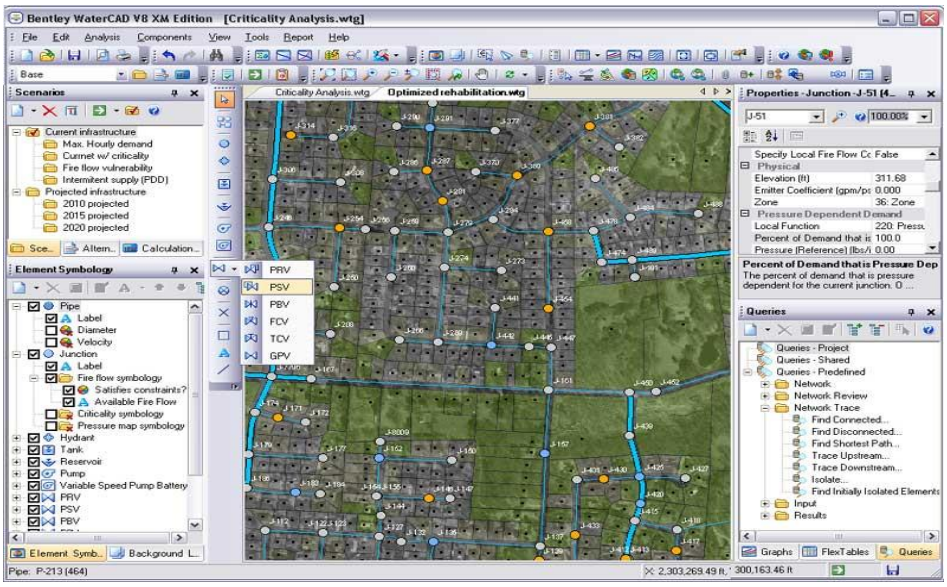
0730 – 0930	***Operating & Maintaining Water Pumps*** *Checking for Efficient Selection of Water Pumps ● Constant- or Variable-Speed Pumps ● Proper Selection & Operation of Variable-Speed Pumps ● Checking Pump Performance ● Control Signals for Speed Control ● Sequencing & Alteration ● Maintaining Pumping Equipment at High Efficiency ● Maintenance Schedules*
0930 – 0945	*Break*
0945 - 1115	***Retrofitting Existing Water Pumping Systems*** *System Evaluation ● Graphical Description of Flow in an Existing System ● Evaluation of Existing Procedures ● Trimming the Pump Impeller ● Changing to a Variable-Speed Pump ● Evaluation of Existing Pumps & Motors ● Evaluation of the Number of Pumps ● Actual Generation of a System Head Area for an Existing System ● Synopsis*
1115 - 1230	***Maintenance & Rehabilitation*** *Unaccounted-For Water ● Pipe Breaks ● Hydraulic Carrying Capacity ● Maintenance Information Systems*
1230 – 1245	*Break*
1245 – 1345	***Reliability Analysis*** *Failure Modes for Water Distribution Systems ● Practical Aspects of Providing Reliability ● Component Reliability Analysis ● Review of Models Fore Reliability of Water Distribution ● Systems ● Measure of Link Importance*
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 and WATERCAD Simulators.



EPANET Simulator



WATERCAD Simulator

Course Coordinator

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