Pro-active, not just re-active
DHI’s URBAN On-Line WD offers a comprehensive solution for the on-line and real-time control of water supply and distribution networks. It provides system managers and operators with operational decision support, system forecasts and automated simulations.

With the help of on-line network modelling, operators progress from a purely reactive to a more proactive network management. It ultimately results in a more efficient and economical network, faster and better response to system failures and improved customer service.

Pipes, pumps, regulators, valves—all relevant network components need to be dynamically integrated

Being prepared—for a better, faster, customer-oriented response
Network failures such as pipe bursts can be detected at an early stage. As a result, network operators can react at in a timely manner, thereby pre-empting or minimizing the later effects, e.g. by manipulating valves or providing an alternative supply. Improved customer care results from the fact that the model provides information about which customers were affected by an event and for how long.

DHI’s URBAN On-Line WD is a software concept based on DHI extensions to the worldwide standard EPANET engine. Using DHI Data Integration Management System (DIMS), the model receives real-time data from a SCADA (Supervisory Control and Data Acquisition) monitoring system. Subsequently, DHI’s model performs an on-line analysis of the system status and simulates possible response patterns to changing conditions. The results of these simulations can be downloaded back into the SCADA database for real-time display.

SUMMARY
Client
Regional water providers

Problem
- Outdated, static asset information
- Slow and/or wrong response to emergency situations
- Difficult maintenance

Solution
On-line simulation of the water distribution network

Benefits
- Improved, state-of-the-art system operation
- Automatic updating and alarming system
- Increased level of response in emergency situations
- Training tool for the systems operators
- Improved customer service

DHI’s versatile custom made solutions are suitable for an unlimited variety of applications
System failures can be prevented by continuously tracking the demand and all incidents in the network and adjusting the system operations accordingly. The early detection of system failures including an automatic alarming system moreover allows network operators to minimize downstream effects through fast and appropriate countermeasures.

**Offline Mode**

URBAN On-Line WD is also operational in an offline mode. The model then develops IF-THEN scenarios, models system breakdowns and predicts system behaviour. The predicted system response can be compared to the measured response to predict system reliability and validate the model.

**Real-Time Mode**

The real-time mode receives real-time data from the DIMS/SCADA system and performs an on-line analysis of system status and responses to changing conditions. It operates in a continuous cycle of predefined time steps (e.g. every 15 minutes). During each cycle, a hydraulic and water quality analysis is performed and the model parameters are updated with measured SCADA data. Subsequently, the output data from the model are displayed on screen as “virtual sensors” as well as stored in the DIMS/SCADA database.

**Hindcasting Mode**

Hindcast modelling can be performed for any past event within a defined period (e.g. last 6 hours, last week). Data are retrieved from the DIMS/SCADA historical database. The hindcast allows determining node demands including diurnal curves. Moreover, control rules can be established to change link status or settings based on tank water level, junction pressure or time of day. The simulation results can be presented within MIKE URBAN or DIMS/SCADA interface.

**Forecasting Mode**

System behaviour can also be short-forecasted within selected time intervals (e.g. 6 hours, 12 hours). Moreover, the forecasting mode can reproduce past events based on historical data. IF-THEN rules serve to adjust link settings or status. These rules can either be predefined and adjusted based on clock time, or developed in the hindcasting mode. The model offers various options for handling node demands (e.g. reading them from the SCADA system or adjusting a predefined node demand based on the measured inflow) depending on the cause of the demand.

**Extended Applications**

**Water Age**

Water-age is a good water quality performance indicator. It can be modelled on a real-time basis and help to understand travel times within the system as well as to report water quality problems.

**Demand Prediction**

Demand is very hard to predict, however this is required for the forecasting of system behaviour within the next hours or days. DHI developed a statistical method based on the analysis of historical data which accurately predicts consumption data for large water users as well as for residential areas.

**Control System Simulator**

The control system simulator provides an on-line forecast of flows and pressures and on-line scheduling of system elements. It evaluates the results of control decisions by predicting the behaviour of the pipeline system as a consequence of these decisions for up to 3 days. Once the simulation results are validated by system dispatchers, the new operating plans are used for the automatic scheduling of valves, pumps, and other control elements.

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