

Studying Water Distribution System Hydraulics and Flow Dynamics to Improve Water Utility Operational Decision Making

Protecting Our Nations Water Supply

Water system utility operators need to manage near real time demand estimation, water quality, and systems hydraulics parameters. To do so, hydraulics analysis programs must work in real time, and sensors that measure water quality and hydraulics parameters need to be carefully placed in the distribution system. This real time technology is also needed to appropriately guide efforts to decontaminate a water system that has been contaminated by biological or chemical agents.



Real-time Modeling

Current system models cannot be implemented reliably in the field without considerable development and prototype verification. Specifically, there is a lack of demonstrated capability in the areas of real time demand estimation and there are a host of issues that reduce the accuracy of real-time hydraulics models, including uncertainty in where to place sensors. Additionally, there is a lack of use of models to define mitigation approaches and responses to an identified contamination event.

Moving Forward

The University of Kentucky is improving the water utility operational decision making process (including

responses to contamination events) by studying distribution system hydraulics and flow dynamics. Dr. Lindell Ormsbee is developing an improved understanding about the impact of flow dynamic changes on distribution system water quality and the potential benefits of using real-time network models to improve operational decisions—including detection and response to potential contamination events.

In particular, the results of this work will:

- (1) Permit testing the efficiency and resiliency of the real-time hydraulic/water quality model using stored Supervisory Control and Data Acquisition (SCADA) data in order to understand the potential accuracy of such models, and understand the relationship between observed water quality changes and network flow dynamics.
- (2) Provide a toolkit for use by water utilities in selecting the appropriate level of support for their unique operations. The toolkit is expected to have the following functionality: (a) a graphical flow dynamic model, (b) guidance with regard to hydraulic sensor placement, and (c) guidance with regard to the appropriate level of technology needed to support their operational needs.

These tools will be demonstrated to the utility operators in a series of upcoming workshops.



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