

Research equipment for simulating contamination of drinking water supply

Background

When the water supply is no longer able to support the population in a specific area, dehydration, deficiency diseases and epidemics often set in soon after. Today, the supply of drinking water is handled by means of well-established pipe networks operated by electric pump stations. Usually, such networks are designed to secure a reliable supply of water to end users in a specific geographical region under nominal operating conditions. Dynamic effects such as contamination and leaks may, nonetheless, interrupt planned operation, which may lead to inconveniences for the end users and, at worst, shut down large parts of the supply network. By improving and automating the detection and handling of contamination and leaks, it is possible to increase reliability and lower the operating costs of the network as a whole.

Purpose of the equipment

Professor Rafael Wisniewski, Department of Electronic Systems, Aalborg University, has received a grant of DKK 221,113 from COWIfonden for extending the laboratory to cover research in the regulation and monitoring of algorithms in water supply systems.

The equipment will be used for extending an existing laboratory plant, *AAU Water Supply Lab*, which can emulate a drinking water supply. The existing plant was developed in a past project, *Distributed Pump Control in Hydraulic Networks*, sponsored by TechFunding and Grundfos. The purpose of the laboratory extension is to have the capacity to emulate contamination in drinking water supplies, with the purpose of verifying advanced regulation and monitoring algorithms for handling contamination entering the drinking water supply. In practice, contamination must be emulated by injecting salt/brackish water in the system. Through continuous desalination, the 'contaminated' water can be purified and reused in the setup. Therefore, the large cost item related to the extension is a desalination plant based on reverse osmosis technology.

A secondary purpose of the desalination plant is the possibility of developing and testing control algorithms for these types of plants.

The planned extension of the existing setup will render *AAU Water Supply Lab* unique in the world, and will allow AAU to emulate realistic consumption scenarios in combination with leaks and the presence of contamination entering water supply systems.

Expected results

An important element in the research at the Department of Electronic Systems, Aalborg University, is that new theories and algorithms are verified not only by means of simulation, but also in practice on real systems. The planned research equipment will be used for verifying advanced control algorithms for drinking water distribution. Algorithms for distributed estimation and control of water flow in different parts of the system will contribute to swiftly detecting contamination and leaks and maintaining the supply of high-quality drinking water at a low cost.