Introduction to Smart Water Networks

Operating a 21\textsuperscript{st}-century water utility is a serious business. Balancing aging pipes, increased pressures for efficiency and sustainability and a challenging outlook for water supplies is a complicated task. Many rules-of-thumb, traditional management tools and other policies are set by utilities to deal with the challenge they face. These are often inadequate and make the utility's network even more vulnerable to the issues arising from aged pipes.

With the increased instrumentation and telemetry of water networks, especially of distribution systems, a new layer of smart data applications has become possible. The “Smart Water Network” is that structure of data-driven components which helps operate the “dumb” or data-less physical layer of pipes, pumps, reservoirs, and valves.

Collecting and using comprehensive data about water network operations offers the promise of better operations through better knowledge and tighter control of the network’s extensive and complex assets. The water industry is not traditionally a fast-moving early adopter of such solutions, but it is rapidly adjusting to this new necessity. The reasons are a dire need on the one side and, on the other, the maturity of data-driven solutions. Other infrastructure industries are undergoing a similar revolution; electricity distribution is adopting Smart Grid approaches; the traffic infrastructure may follow as a late adopter.

Data technologies for water networks span water sources and production, transmission and distribution, consumer end-points and internal piping.

Smart water networks are layered, as any data ecosystem is, starting from sensors, remote control, and enterprise data sources, through data collection and communications, data management and display, and up to data fusion and analysis. The latter covers many categories, from decision support, automation to analytic solutions. Taking an enterprise view of the smart network, it is clear that the more data sources and analysis involved in the process, the higher the ‘enterprise value’ of the solution is.

Smart Water Network solutions improve the efficiency, longevity, and reliability of the underlying physical water network by better measuring, collecting, analyzing, and acting upon a wide range of network events. This can take shape in different phases of the utility process, such as real-time monitoring and automation, operational readiness, or network planning.

Key to the success of such a diverse and complex data ecosystem is that data can be used and reused simply and flexibly. Data that is confined or restricted to a single application presents considerably less value for money than multi-purpose data. Sadly, today’s Smart Water Network components do not take into account data compatibility or interoperability. This is because they are typically designed as isolated systems. Undoubtedly, this will improve as data technologies cover more ground at the utility and begin to converge or merge.

The availability of cheap, easy-to-use data technologies, as well as external pressures on the water industry, means that water networks will see much greater sensor and controller density, and inevitably a more central role for all the data systems built on top of them. Smart Water Networks should be a significant contribution in the efforts towards sustainable, efficient, affordable and pure water for all.