WHITEPAPER

# Data-driven water: how operations data is enabling digital transformation

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## Executive summary:

Between large consumers of water and profitability lies a dizzying array of challenges: leaking pipes and rising power costs, toxic algae blooms and drought, aging infrastructure and flurries of new environmental regulations. Water utilities and other large water consumers need to contend with all these challenges and more with only limited capital to invest in new equipment. They answer, they are finding, lies in their operations data.

The PI System, a real-time data infrastructure, empowers large water consumers to keep pace with mounting budgetary pressures without replacing or retrofitting equipment. Real-time access to operations data enables large water consumers to optimize efficiencies across the entire enterprise, reduce energy usage and water consumption, and address potential problems before they cause delays in production. Smart data infrastructures and new analytic tools give decision-makers unprecedented visibility into operations, and the ability to turn raw data into actionable information.

# Introduction

Rising power prices, ever-changing environmental regulations, and budgetary constraints are putting immense pressure on water utilities. Large water consumers are turning to big data, predictive analytics, connected devices, and other digital transformation tools to reduce costs and environmental impact while avoiding major capital investments or expensive retrofits. Thanks to operations data and accompanying tools, water utilities and large water consumers are moving beyond traditional supervisory control and data acquisition (SCADA) systems and unlocking real-time insights to optimize operations and do more with less.

## The energy and water nexus

Energy costs for water utilities account for approximately 30% of all operational expenses. That amount is second only to personnel. Often, these utilities are the largest, or even second-largest, consumers of energy within a particular region. In the United States, the amount of energy it takes to treat and distribute water and wastewater accounts for approximately 2% of the nation's entire energy consumption. In the United Kingdom, Thames Water uses approximately 2% of all national electricity to serve its 15 million London-based customers.

Energy savings is critical, and even small changes can net big results. Utilities can reduce the number of active assets at a site, repair equipment before it fails, or harvest biogas for internal operations. Internet of things (IoT) devices streaming critical asset data into a centralized data management platform offer unprecedented visibility and insights, empowering utilities to make real-time decisions.

Thames Water created its internal Asset and Operations Real-Time Analytics (AORTA) initiative to optimize the overall efficiency and energy performance of its water and wastewater infrastructure. The company estimates that this will save multiple millions of euros over a five-year period.

Great Lakes Water Authority (GWLA) used its Real-time Efficiency Evaluation for Pumping Stations (REEPS) program to analyze pump efficiency. REEPS uses real-time data from smart meters and monitoring sensors to evaluate and improve efficiency for each of the 120 booster pumps and 54 high lift pumps. GWLA analyzed pump, flow, and head efficiency for its Adams Station and used this information to optimize pumping schedules to reduce energy demand during peak times. REEPS enabled GWLA to increase pump efficiency from less than 70% to 82%, reduce pump discharge throttling from 50% to 10%, and save approximately 180,000 kWh in energy usage, or 6% annually.

> Thames Water, London's water utility, consumes 2% of all electricity in the U.K.

> Treating and distributing water and wastewater accounts for 3% of the U.S. national energy consumption.

# The cost of leakage

Leaky pipes pose huge problems for water utilities. In many cities, 30% or more of potable water prepared by utilities leaks away before ever making it to customers.

White House Utility District's (WHUD) data-driven leak remediation strategies dramatically impacted operational efficiencies. Serving over 600 square miles in Tennessee, WHUD deployed an operations data management platform and Esri's ArcGIS mapping software to pinpoint leaks.

Using real-time insights from operations data, WHUD:

- Identified and mitigated a leak that was costing the utility 147M gallons per year – just three and a half days after deployment.
- Saved over $300,000 per year by fixing that one leak alone.
- Moved away from reactive maintenance and implemented proactive maintenance strategies.
- Saved $2M in future construction costs by reducing water pressure to remove transience and prevent pipe breakage.
- Recovered $30,000 in employee time.

"We can monitor customer data at their meter at their house ... and see changes before they get out of hand and cause major problems."

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**Pat Harrel,**
WHUD district engineer

## Using predictive data to anticipate environmental threats

Harmful algae blooms are a major environmental problem in all 50 states. As the temperature of lakes and reservoirs continue to rise, algae blooms are forming at a more rapid rate, many of which produce hazardous cyanotoxins. These blooms pose obvious challenges to water utilities, including grave safety risks, and costly interferences to treatment processes.

The City of Salem Public Works Department provides drinking water, stormwater, wastewater, and transportation services for the surrounding area. In 2018, Salem received a severe cyanotoxin scare – a four-day algae bloom in the drinking water reservoir – which resulted in a month-long drinking-water advisory, and eventually a declaration of emergency. To ensure that it was never surprised by such a scare again, the city installed a centralized data infrastructure in order to give engineers the ability to peer into critical infrastructure. Now the city of Salem can use its historical data to predict when algae blooms are coming, and give its engineers a head start to adjust processes accordingly. Not only did this enable teams to mitigate the harmful effects of algae, the organization is now using data from the past to predict future events for a number of other processes.

## Corporate water responsibility

Reducing water consumption isn't just for utilities. Corporations and organizations of all sizes are using real-time operations data to reduce water consumption.

The University of California, Davis, uses operations data to enable sustainable wine production facilities and processes. One of the university's goals for its Sustainable Wine and Food Processing Center is reducing water usage during its fermentation process. Capturing and reusing rainwater allows U.C. Davis to conserve precious water resources in a state plagued by drought. The university collects rain in watershed areas and pipes it to its filtering and storage building. Teams use real-time data to monitor all processes, including reverse osmosis, flow, and filtration, to ensure the water meets food-grade standards.

The Seattle Mariners professional baseball organization reduced its water consumption by 10%, or 2M gallons, over the course of three years. The organization accomplished this through a combination of hard and soft upgrades, which included low-flow toilets and better visibility into operations data.

"There was a month in the offseason when we saw a large spike in water use that didn't make sense," Joe Myhra, groundsman for the Mariners, told The Guardian UK. "We were able to look at data and realized we had a leak in one of the fire hydrant lines. The leak wouldn't have been visible until it was too late."

## Conclusion

Energy usage and water consumption go hand in hand. Increasing efficiencies while reducing demand requires real-time access to operations data. With rapid visibility, decision-makers can easily – and accurately – leverage real-time and historical data to make informed decisions to mitigate leakage and usage while maximizing efficiencies.

# About AVEVA

The world's most essential and complex industries rely on AVEVA to manage the lifeblood of the industrial enterprise: operations data.

AVEVA is a pioneer and global leader in operations data management software, with over 40 years' experience helping industrial organizations meet next-generation demands for efficiency, reliability, security, sustainability, and resilience.

AVEVA's market-leading PI System is the proven system of record for operations data in essential sectors such as power generation and utilities, water, oil & gas, mining, metals, manufacturing, pharmaceutical, facilities, transportation, food and beverage and more. Every day, industrial professionals in 146 countries rely on the PI System to improve operational performance, protect health and safety, keep the lights on, and make the world run more smoothly.

Learn why two-thirds of Fortune 500 industrial organizations choose PI System at www.aveva.com.

The PI System manages more than two billion sensor-based data streams that enable better operations management and outcomes. For example, plant operators can spot problems with a remote pump before it fails. Environmental scientists can predict the accumulation of harmful elements in city water before it is tainted, while process engineers can finetune production variables to increase profitability. With the PI System's high-quality curated data, data scientists can rapidly construct smarter AI algorithms, and executives can review dashboards that inform better business decisions.

The PI System is comprised of three software suites:

- PI Core, the on-premises system of record for critical operations;
- PI Edge, for pervasive, real-time data collection in remote environments; and
- PI Cloud, supporting scalable, integrated data services for advanced analytics and serving new communities of data consumers.

## About the author

Gary Wong has extensive international experience providing sustainable, strategic and cost-effective business solutions, particularly in the water industry. Prior to joining Aveva, he has held positions with Metro Vancouver and as a consultant directing both public and private sectors on sustainability, IT strategy, planning, operations, and engineering. Mr. Wong holds a Bachelor's Degree in Chemical Engineering, is registered as a Professional Engineer in Computer Engineering, holds an M.B.A. from the Queen's School of Business and is also a Chartered Professional Accountant.