



OPTIMIZE

A Practical Approach to Digitization of Water Network Management

Digitization opportunities for the water network -
Modernize operations while optimizing CAPEX and reducing OPEX

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A tall, cylindrical water tower stands against a dramatic sky at sunset. The sky is a mix of deep blue and orange, with wispy clouds and a prominent white contrail from an aircraft. The tower's structure is silhouetted against the bright part of the sky. Below the tower, the dark silhouettes of trees and rooftops are visible.

Water trends
and
operational
challenges

01

Digital
transformation
opportunities

02

Guidance
for new
technology
deployment

03

Real world
project
execution

04





Global water network trends

Water trends and operational challenges



Digital transformation opportunities



Guidance for new technology deployment



Real world project execution



Global water network trends

As the human demand for water increases (global water consumption is growing at an annual rate of 2.5% while the population is growing at 1%), the private and public utilities that process and deliver that water are facing unprecedented challenges. Declining budgets for capital improvements slow down the modernization of aging water networks, leading to increases in water leakages and deficiencies in water pressure control.

Leakage is a particularly acute problem, with non-revenue water being one of the main concerns for water operators. The World Bank estimates that utilities worldwide lose 25-35% of their water due to leaks and bursts, with the American Water Works Association citing the loss of 2 trillion gallons (7.6 million m³) of water each year in the US alone.

In addition, as instances of pumping and distribution network breakdown increase, costs go up and operator efficiency goes down. Maintenance procedures are often performed in a reactive mode (only after an asset breaks). As a result, expensive on-site experts are forced to work in emergency mode while customer satisfaction drops.

Global water consumption is growing at an annual rate of 2.5%



Water trends and operational challenges

Digital transformation opportunities

Guidance for new technology deployment

Real world project execution





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Guidance for new technology deployment



Real world project execution

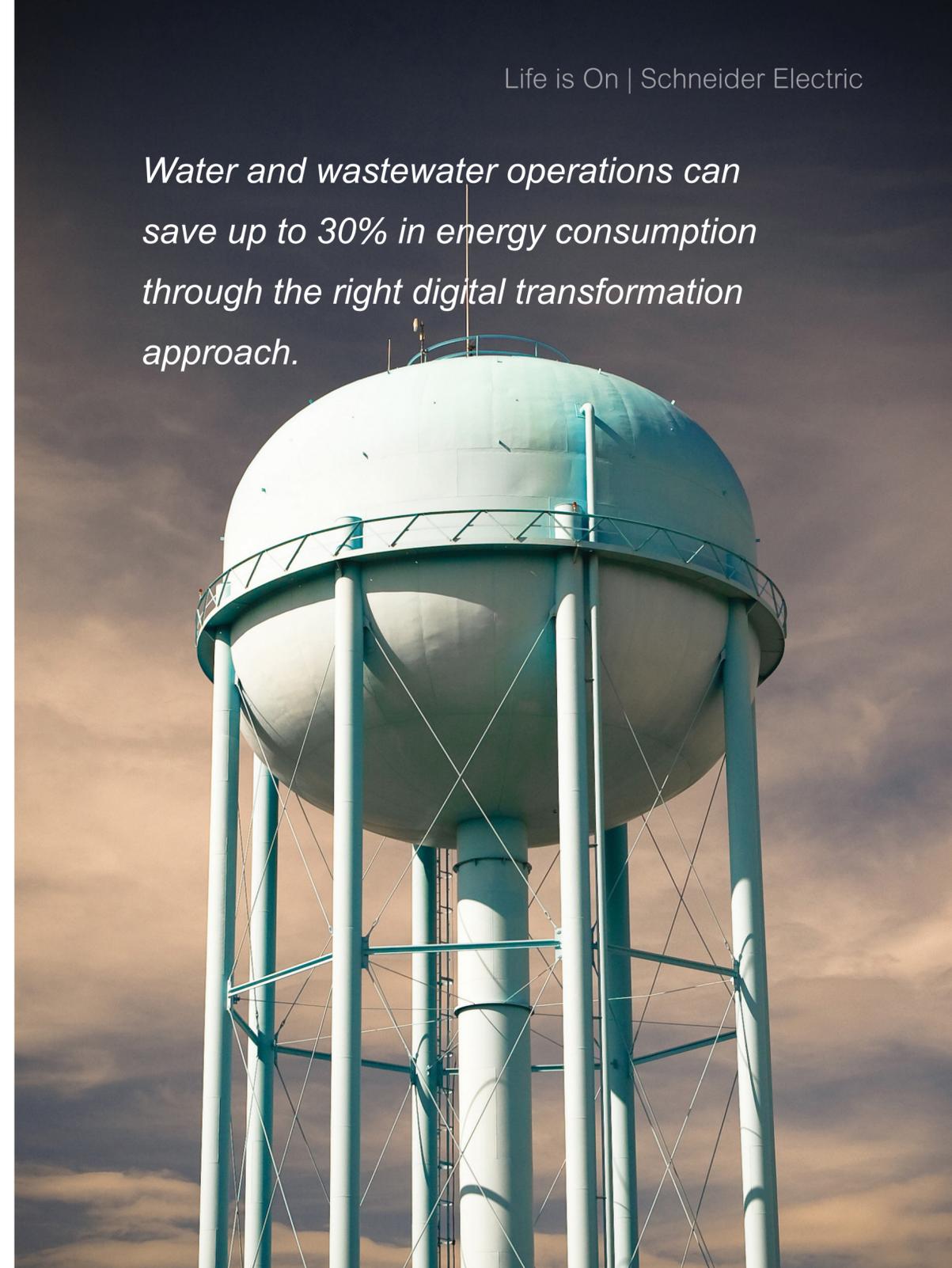


Digital transformation opportunities

These challenges open up new opportunities for water operators to make the most of technology trends such as digitization, Internet of Things (IoT) and big data. With the right approach, digital transformation can be an OPEX reduction opportunity for water operators that does not require high up-front CAPEX in order to realize business benefits. In a digitally-transformed water operation, it's possible to experience:

- **Operational savings** - Water and wastewater operations can save up to 30% in energy consumption. Water treatment plants and water distribution networks can increase operational efficiency by up to 25%, and total cost of ownership (TCO) can be reduced up to 20% when comparing digitized assets to traditional assets.
- **Improved customer service** - When digitization drives operational savings, water utilities can save money. Water pressure and supply can be more tightly controlled. Assets like pumps can be precisely controlled to more closely align pipe pressure and flow with actual user demand. This results in significant energy savings, longer pump life, and overall improved reliability versus today's way of doing things. With access to more accurate asset performance data, network issues can be communicated ahead of time to consumers, and these issues can be resolved faster reducing downtime and enhancing systems reliability.

Water and wastewater operations can save up to 30% in energy consumption through the right digital transformation approach.



Water trends and operational challenges

Digital transformation opportunities

Guidance for new technology deployment

Real world project execution





Guidance for new technology deployment

Water trends and operational challenges



Digital transformation opportunities



Guidance for new technology deployment



Real world project execution



Guidance for new technology deployment

EcoStruxure for Water & Wastewater

Taking the first step towards digital transformation can seem daunting, but open architectures such as EcoStruxure for Water & Wastewater make it easy to get started with solutions like Integrated Water Network Management. The EcoStruxure architecture is based on a three-tiered technology stack and brings energy, automation, and software together, across all three levels with world class cybersecurity integrated into each layer of the stack:

- **Connected product layer** – This layer accounts for intelligent devices that serve as the foundation for smarter buildings and plants.
- **Edge control layer** – At this connected control systems layer, simple design, commissioning, and monitoring are enabled resulting in less management complexity.
- **Apps, analytics, and services layer** – A full portfolio of hardware-agnostic software, apps, analytics, and services converts data into business insight. This intelligence enables optimization and works with any hardware, and any control systems without the need for additional hardware (e.g., bridges, protocol converters), which reduces cost and improves reliability.



Water trends and operational challenges

Digital transformation opportunities

Guidance for new technology deployment

Real world project execution



Guidance for new technology deployment

Water networks

Schneider Electric automates and manages water distribution in many of the world's largest cities, including London, Barcelona, Sydney, Rio de Janeiro, Shanghai, and Las Vegas. We continue to invest and build our portfolio of solutions to address more and more applications including:

- **Integrated Water Network Management Solution** - A fully integrated system which natively connects the different layers of water network applications from software, to control, to field devices. Control and supervisory systems are linked together when water networks are initially automated then remain linked for the entire life of the system. This reduces initial network automation engineering design time and cost and, further down the line, makes it easier and less costly to accurately optimize systems during operation.

The Integrated Water Network Management Solution acts as a digital twin of the water network. That is, it can act as a virtual model that uses operational data to run simulations and benchmark performance, allowing operators to pinpoint where efficiency gains can be made. By pairing the physical world with its virtual world 'digital twin', analysis of data and monitoring of systems can identify performance optimization actions and actively avert problems before they occur, preventing downtime and developing new efficiency opportunities.



Water trends and operational challenges

Digital transformation opportunities

Guidance for new technology deployment

Real world project execution



Guidance for new technology deployment

Imagine a scenario where operators want to access information regarding their pumping station performance. A digital twin provides information about what's going on inside the network. Data can be analyzed at each point in the pipeline determining water pressure, velocity and quality. All of this information is made available for the operators. Now operators can know ahead of time what will happens to the network if a particular pump station fails or if a particular valve is closed. This helps in contingency planning, allowing the utility to recover faster from any performance issues.

In addition, the system can automatically turn on pumps and calculate the optimal set point (pressure, flow, velocity) for valves and pumps so the consumer experiences the correct pressure and flow. Adjustments are made to pump set points in real time making sure demand is met while consuming as little energy as possible. Pump internal wear is reduced, and the pump runs more reliably.

Water trends and operational challenges

Digital transformation opportunities

Guidance for new technology deployment

Real world project execution



Guidance for new technology deployment

In order to deploy such an integrated water network management solution, three key elements are required:

1. Knowledgeable technology partners and committed utility stakeholders
2. Proper knowledge of the complete pipeline network (i.e., dimensions, length, junctions)
3. Historical data surrounding water network performance

When properly implemented, the digital twin will allow operators to manage all water assets through their complete lifecycle and will generate a return on investment (ROI) within 12 to 24 months.



Guidance for new technology deployment

Implementing a solution like Integrated Water Network Management, water operators can experience the following benefits:

- **Optimized engineering** – With seamless integration of control and supervisory systems, engineers can design with more speed and precision. Libraries of control and supervisory objects can be configured based upon identified business requirements, and can then be deployed across the entire asset lifecycle. When systems are updated, process control changes are delivered with increased speed and accuracy, saving workforce hours and reducing downtime. Through use of a hydraulic model, engineering is optimized through simpler network design and planning. When planning engineers can identify potential bottlenecks ahead of time and resolve potential issues before assets are deployed in the field. The seamless integration between the model and supervisory systems, saves time and fosters efficiency for a faster deployment.



Water trends and operational challenges

Digital transformation opportunities

Guidance for new technology deployment

Real world project execution



Guidance for new technology deployment

- **Smooth operations** – Insights from the integrated solution offer a more complete picture of operations, enabling operations managers to make smarter business decisions, in real-time. More accurate supervisory data of network operations can drive better operational decisions to accommodate changing demands. Any changes required to optimize operations are easy to make and easy to verify thanks to the tight linkage between asset control and supervisory objects.
- **Comprehensive maintenance** – More precise control of pumps reduces energy use and asset wear and tear, while intelligent monitoring of pipes quickly identifies instances of leakage. For example, thanks to network modelling and simulation, virtual sensors can provide pressure data for non-instrumented locations, allowing software to monitor pressure limits in those locations. This makes it easier to identify leakage areas which are difficult to access (e.g. underground pipes). Asset data is captured and analyzed which drives more proactive and efficient maintenance planning.



Guidance for new technology deployment

Key system enablers include critical hardware and software tools that act in unison to simplify operations and to enhance water network performance:

Water Network Management and Optimization

– The most advanced, water-specific software that enables SCADA operators to optimize water distribution networks in real time.

AVEVA System Platform – System Platform is the industry’s number one solution for SCADA, HMI, and IIoT applications that integrates operational processes within the enterprise. System Platform provides a collaborative, standards-based foundation that unifies people, processes, and assets for continuous operational improvement and real-time decision support.

EcoStruxure Control Expert - Asset Link – This tool connects the control and supervision of water industry assets in Schneider Electric’s

Modicon PLCs with AVEVA’s system platform software. Since the way assets appear to operators in the supervisory system are linked to the asset’s control system, engineers can quickly deploy control systems for pumps, valves, and other critical assets, to build complete water network control and supervisory schemes. Asset Link makes it quick and easy to design and make changes to water systems. Integrity and accuracy are maintained and the life of the water network is extended.

Modicon Controllers – Modicon M580 delivers enhanced capabilities for better performance and availability to help maximize total cost of ownership. The Ethernet-based Modicon M580 offers secure transparent connectivity to help

operators react faster to information demands in a safe and cyber secure environment.



Water trends and operational challenges

Digital transformation opportunities

Guidance for new technology deployment

Real world project execution





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Water trends and
operational challenges

Digital transformation
opportunities

Guidance for new
technology deployment

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project execution**



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Field application example

As more and more municipalities look to reduce costs and improve operations, they are finding that digitizing their water networks yields promising new ways to reduce costs and optimize operations.

Acqua Novara, for example, an Italian-based water utility, recently merged multiple municipal management organizations into one. Their water network supplies 450,000 people across 140 municipalities, and covers 3,600 square kilometers of area. Water network leaks and inefficient use of energy were resulting in high operating costs.

In order to address these issues and strengthen their network, they moved to a centralized management system and standardized their procedures. To support this process, they adopted EcoStruxure digitization technologies including smart sensors, variable speed drives (VSDs), analytics software for water loss management and water network optimization, integrated SCADA and telemetry, and Modicon PLCs. Following a smooth and rapid integration, they were able to benefit from a 10% reduction in water loss, 6 Mm³/year of water saved, and a 15% reduction in water supply energy consumption.

Acqua Novara (AVNCO)

10% reduction in water loss

6 Mm³/year of water saved

15% reduction in water supply energy consumption

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Digital transformation opportunities

Guidance for new technology deployment

Real world project execution



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Take action today!

For those water and wastewater organizations ready to investigate and embrace digitization as a means to improve operational efficiency, a number of short-term and long-term steps can be taken:

- **Within the next month** – Identify initial areas within the operational environment where engineering and operational costs are high and where project delivery times could potentially be reduced. Begin to seek out solution providers who offer platforms that are easy to adopt and that allow for phased transitions to enable process optimization.
- **Within the next 6 months** – Explore funding options and begin to assemble a cross functional team of interested internal stakeholders.
- **Within the next year** – Implement at least one new digital platform solution pilot. Track expenses and quantify benefits during this pilot and test period. Leverage suppliers and partners to fill in knowledge gaps where required.

There are many water networks operating – and some even under construction today – that are failing to optimize engineering and operational processes. New, non-disruptive digitized platforms like EcoStruxure are now available at an affordable cost to help water network operators take full advantage of these hidden financial benefits.

Want to learn more? Visit www.se.com/www.

Water trends and
operational challenges

Digital transformation
opportunities

Guidance for new
technology deployment

Real world
project execution



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Gain seamless, reliable and accurate data flow for a complete picture of your water operations with the Integrated Water Network Management solution.

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