EFFICIENCY

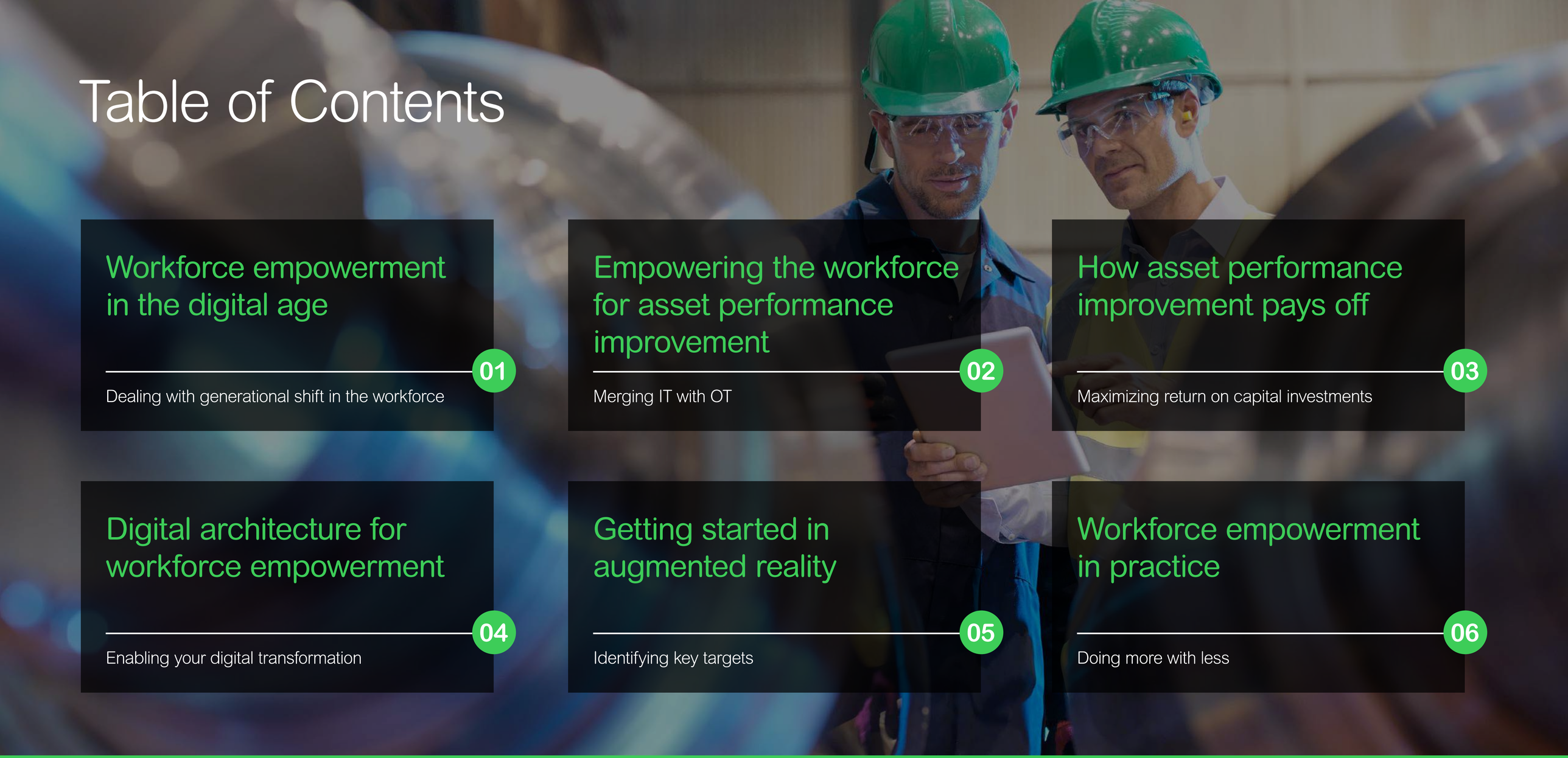
Empowering the water industry workforce for asset performance improvement

How the IIoT, big data, and augmented reality are enabling a new era of cost reduction, asset management, and worker safety in water and wastewater processing

www.se.com/assetperformance-water

Life Is On | Schneider Electric

Table of Contents



About this eGuide

This guide is part of a Schneider Electric series designed for managers, engineers, and operators in the water industry to improve asset performance through digital maintenance.

It describes how the IIoT, big data, and applications such as augmented reality are connecting the workforce, equipping it with real-time decision support, and enabling collaboration with anyone at any time, empowering your workforce to:

- Maximize return and capital invested
- Reduce downtime
- Lower operating and maintenance costs
- Accomplish more with fewer resources
- Improve worker safety
- Operate sustainably
- Optimize overall asset performance

Read on to learn more about how the coming age of digitalization is empowering the water industry workforce by facilitating asset performance improvement.

Return on data transparency

50%
reduction in time to locate relevant resource materials

3%
higher revenue

10%
higher margins

Workforce empowerment in the digital age

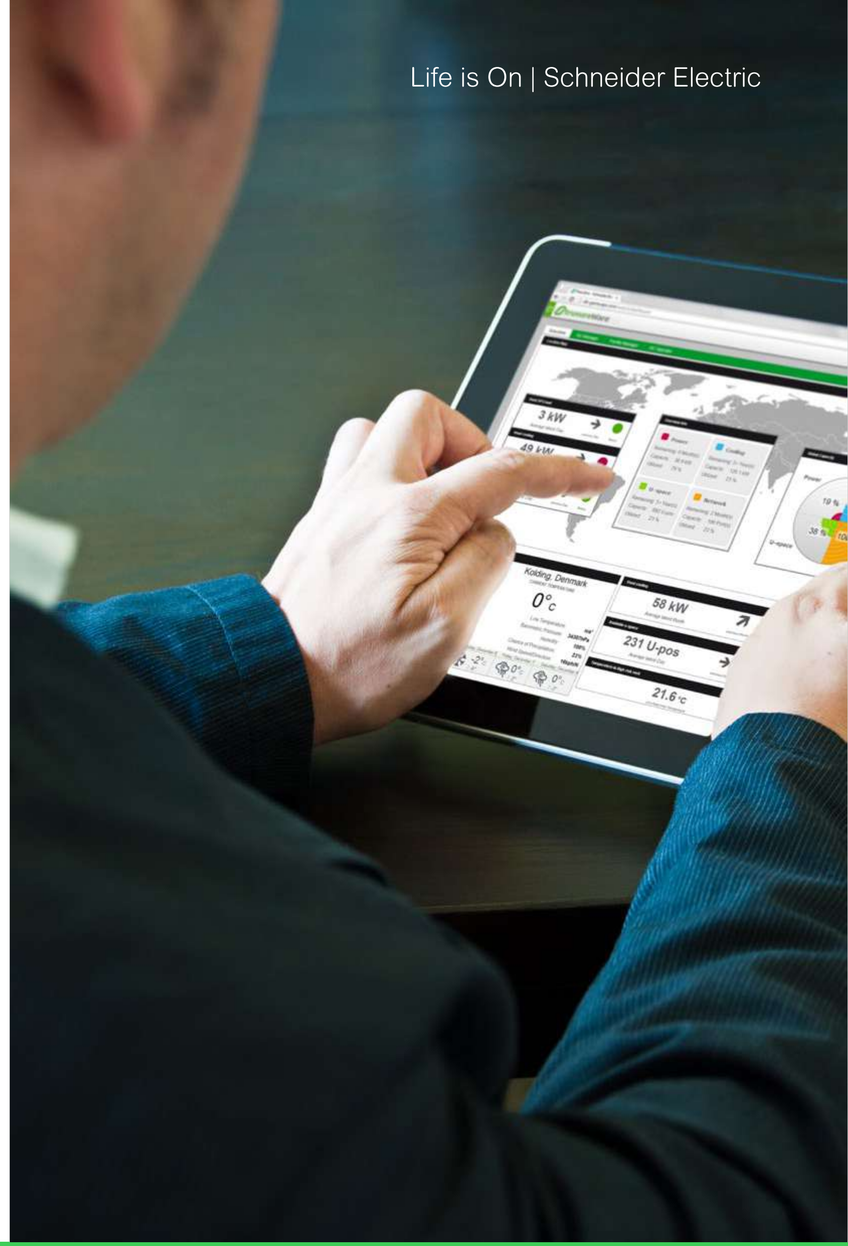
Workforce empowerment in the digital age

If you are concerned about having a sufficiently-trained workforce to run your water treatment plant or distribution network, you are not alone. Four of five water industry users interviewed in this year's *Water and Wastes Digest* "State of the Industry Report" cited workforce as their major concern – and with good reason.

A 2018 U.S. Government Accountability Office report estimates that about one in three water and wastewater utility workers in the U.S. will retire within the next decade. All indications are that this is not just a U.S. issue. As a result, competition for the most talented workers is increasing, which puts additional strains on already strapped budgets and jeopardizes critical water operations.

Digitalization comes into play here in at least two ways:

1. It enables workers to be more effective by giving them real-time access to operational insight, gleaned from analysis of previously unfathomable amounts of operating data. This also equips them for collaboration with remote expertise.
2. It speaks to the digitally-native and increasingly-mobile workforce in a format with which they are comfortable. They increasingly view the world through phones and tablets, so why not have them carry this into their work. Today's hand-held devices, for example, can deliver highly accurate information to guide responses to operating or emergency scenarios.



Empowering the water industry workforce for asset performance improvement

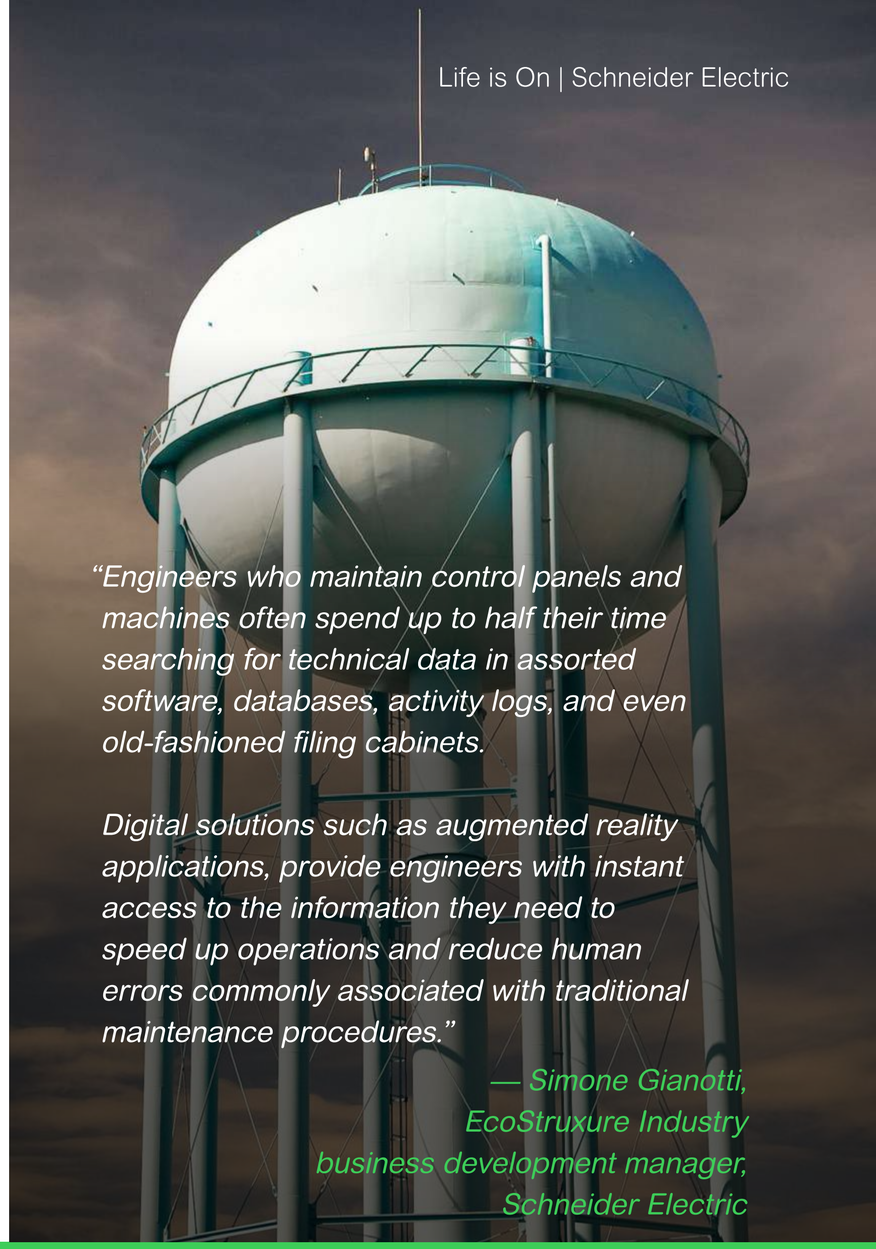
Empowering the water industry workforce for asset performance improvement

Although digital transformation is bringing us closer to the day when machines will maintain themselves, we are not quite there yet.

Human judgment and feet-on-the street will still be essential for many years to come, so the water industry has much to gain from emerging digitalization that is enabling its workforce to optimize assets around key performance indicators (KPIs).

Digitalization is empowering the water industry workforce for asset performance optimization by presenting operating data with transparency and accuracy not previously possible. In a previous eGuide, titled “Managing Pump Station Assets for Lowest TCO and Maximum Effectiveness,” available for download from se.com/assetperformance-water we described an application for optimizing pump performance. This empowers workers by corralling vast amounts of data from connected assets, analyzing it for historical and predictive insight, and serving it up to operators and technicians for real-time decision support.

In this guide we take a deep dive into augmented reality as another example of an IT application that connects the IT and OT worlds. Like virtual reality, augmented reality simulates industrial operations so that people can learn to operate and maintain equipment safely with minimal need to disturb real systems.



“Engineers who maintain control panels and machines often spend up to half their time searching for technical data in assorted software, databases, activity logs, and even old-fashioned filing cabinets.

Digital solutions such as augmented reality applications, provide engineers with instant access to the information they need to speed up operations and reduce human errors commonly associated with traditional maintenance procedures.”

— Simone Gianotti, EcoStruxure Industry business development manager, Schneider Electric

Empowering the water industry workforce for asset performance improvement

But augmented reality goes beyond just modeling a procedure or asset. It puts contextual information and insights at the fingertips of maintenance workers, blending physical, real-life objects with their virtual counterparts. The objects are linked to databases containing digitized manuals, processed data, troubleshooting guides, and other information that can help increase efficiency, reduce costs, and otherwise improve maintenance productivity.

Asset performance is real-time answers...	...to key questions
Predictive information	☑ How will this problem develop if unchecked?
Real-time contextual information	☑ What pumps are running now? At what speed? Are they running optimally?
Procedural displays	☑ What do I do next?
Vendor manuals	☑ How do I troubleshoot this pump?
Historical data	☑ Is this the first time this has happened?
Connections to remote experts	☑ Can you walk me through this?

Empowering the water industry workforce for asset performance improvement

Maintenance workers in a water treatment plant, for example, might run augmented reality software on a tablet or other mobile device.

Aiming the tablet at a specific area of the plant, an asset or pump or other real-world point of interest (POI), would reveal real-time data such as flow volume, flow ratios, drive frequencies, and other information critical for effective maintenance. It would also link to guidance materials such as manuals and troubleshooting guides, making them easily accessible on that equipment (Figure 1).

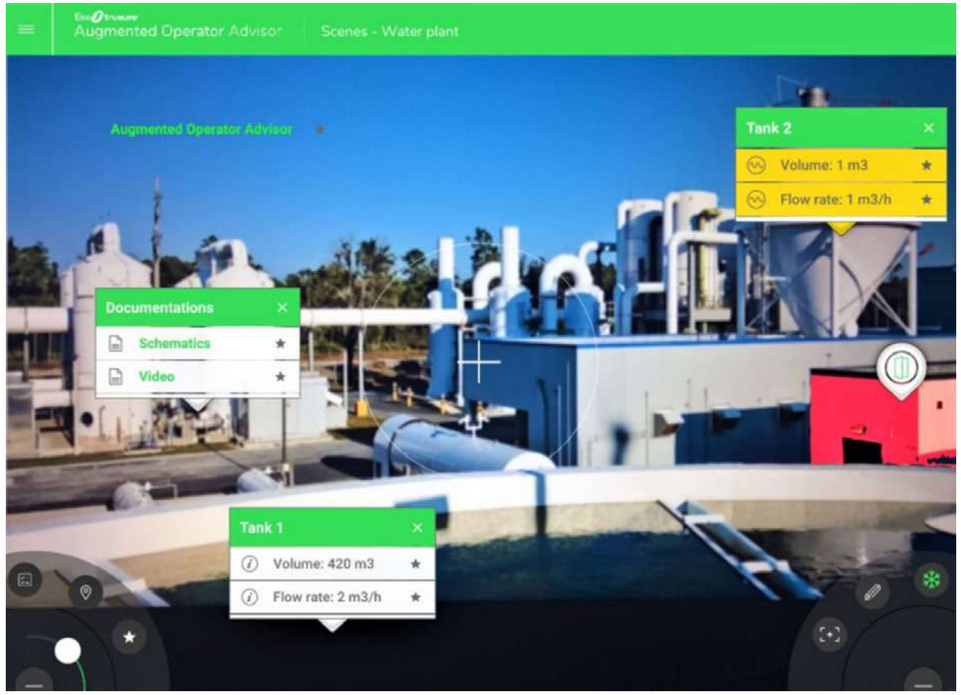


Figure 1: Aiming a tablet at an asset or a group of assets reveals operational details such as volume and flow rate.

Empowering the water industry workforce for asset performance improvement

Augmented reality in operation

1. Operator points a tablet at the site or equipment to be monitored.

2. The system matches the visible image with stored images through markers called points of interest (POIs).

3. When a match is made, POIs are overlaid on the live scene visible on the tablet.

4. The operator taps the POI markers to display information, process variables, operating and maintenance insights; technical documents, audiovisual materials such as web pages, videos, audio, and stored procedures.

Such instant access to critical information shortens response time as well. If there is an alarm in the pumping room the technician sees it immediately. Instead of taking 15 minutes to walk to the location and wait another 10 or so minutes for an authorized person to open the door, he or she can begin diagnosis immediately based on the information displayed on the mobile device.

Additionally, he or she can access multiple views even access multiple views and levels of the system (Figure 2) and, depending on how the application is populated, zoom in even deeper to get schematics or blueprints.

Figure 2: Depending on how the application is configured, operators can drill deeper into assets.

How asset performance improvement pays off

How asset performance improvement pays off

Asset performance improvement increases return on capital investment (ROCI) by:

- ☑ reducing downtime
- ☑ reducing operating costs
- ☑ improving safety
- ☑ reducing human error
- ☑ improving collaboration
- ☑ supporting sustainability
- ☑ optimizing overall asset performance

Reducing downtime

Approximately 70% of a water utility's capital goes into its assets and maximizing return on those capital expenditures requires those assets to be running at peak performance. Responding to downtime threats consumes a good part of the day of many maintenance workers. Virtual reality delivers context-sensitive insights that direct technicians in performing the actions that will help avoid downtime or troubleshoot it when it does occur. Operators can quickly find information with immediate access in the field to real-time data, user manuals, instructions, diagrams, and more. Spare parts management is also a very important contributor because of knowing where to find the spares when something breaks.

In addition, virtual reality reduces downtime by enabling transition from reactive to proactive maintenance. This results from freeing up maintenance teams to devote more time to analyze historical trending data that identify causes of failure and prescribe actions to mitigate it. Such proactive activity also maximizes ROCI in maintenance and repair supplies by avoiding overstocking.

Reducing operating costs

As maintenance itself constitutes about a third of the operating cost of a typical water or wastewater pump station, it also has a significant impact on other cost factors, including energy consumption and pump operations. Therefore, anything that is done to improve maintenance will also contribute to lowering overall operating costs. Aiming an augmented reality tablet at a piping segment, for example, might present data revealing atypical flow rates indicative of leakage.

How asset performance improvement pays off

Improving Safety

Safety is one of the key benefits of digital maintenance. By being able to open panel doors virtually, technicians can diagnose potential problems with minimal risk of contact with hazardous energy. This also has significant training benefits: before workers perform maintenance in a fully-pressurized environment, they can learn safe procedures and even experience simulated consequences of a mistake.

Reducing human error, improving collaboration

In addition to presenting maintenance teams with the right information at the right time, digital maintenance enforces data and format consistency and significantly minimizes human error. The software locates the right equipment and guides operators step-by-step through complete maintenance procedures applying standard operating procedures.

When judgment calls are needed, technicians can augment their observations with access to specialists anywhere in the world. The information presented on the screen from a live expert, not only helps the technician make better decisions on-site, it also maximize ROCI even further by reducing travel costs.

This has training implications as well: instead of sending multiple people to multiple remote sites for training, they could receive much of their training in a group at a single location.

Sustainability

Identifying inefficiencies in areas such as energy consumption has implications for sustainability as well as cost and performance. Displaying a dial on an AR dashboard that compares actual power consumption against the ideal consumption at a designated flow rate, for example, can tell the operator whether the pump is consuming the right amount of fuel. If pumping 1.1M gallons per minute should consume only 800kW but is using 850kW, either something is wrong with the pump or it is wasting energy. Either way, AR can put that right in front of the eyes of people walking the floor in the pump station.

How asset performance improvement pays off

Optimizing asset performance

The ultimate benefit of digital maintenance goes beyond the downtime reduction, energy, or even operator efficiency. By cost-efficiently optimizing maintenance quality, human resources can be redeployed away from putting out fires that threaten uptime and on to high-value improvement of plant and network performance.

When confident about keeping the plant running, they can devote time to answering questions like: “How do we make this plant run better?” or “How do we reduce the overall cost of water?”

Digital architecture for workforce empowerment

Digital architecture for workforce empowerment

Augmented reality is already used in many industries and is now gaining traction in the water and wastewater industry.

Advancements in digital and mobile technology have made it economically feasible within municipal budgets.

A key enabler for augmented reality is deployment in the context of an IIoT integration platform such as EcoStruxure (Figure 3).

** The Schneider Electric industrial software business and AVEVA have merged to trade as AVEVA Group plc, a UK listed company. The Schneider Electric and Life is On trademarks are owned by Schneider Electric and are being licensed to AVEVA by Schneider Electric.*

Click to zoom

Figure 3. Platform for integrating operational data from connected production assets with advanced productivity and analytical software applications.

Digital architecture for workforce empowerment

The EcoStruxure architecture provides a server platform for collecting data from connected operational technology (OT) instruments and smart devices and standardizing it for sharing with information technology (IT) analysis and decision support applications. Such a platform simplifies the creation of plug-and-play applications built on five core competencies:

- Integrated connectivity and information technologies
- Intelligent operations building blocks
- Advisors and other applications to turn process data into business insights
- A cloud-connected digital services infrastructure
- Cybersecurity protection

As shown in Figure 3 on the previous page, the OT assets sit at the base Connected Products layer. This might include pumps, motors, drives, sensors, piping, and other utilities. Such equipment is increasingly intelligent, networked, and capable of storing and sharing operational and diagnostic data. In an IIoT architecture these devices would be discoverable by the engineering software used in designing systems.

At the middle Edge Control layer, servers receive field data from multiple sources, such as programmable logic controllers (PLCs), Structured Query Language (SQL) databases and OPC Unified Architecture (UA) servers, and share it with IT applications through communications gateways, such as internet boxes.

At the top Apps, Analytics & Services layer, are standards-based solutions for which domain specialists are building new software to meet pressing industry needs. Much like smartphone app developers, they are continually bringing new functionalities to market, with new ways to empower your workforce. Schneider Electric's EcoStruxure Augmented Operator Advisor is only one such application. The EcoStruxure Pumping Performance Advisor, described elsewhere in this eGuide series, is another application and these can be integrated for even greater empowerment.

Digital architecture for workforce empowerment

Like the Augmented Operator Advisor, the Pumping Performance Advisor might access the flow volume, drive speed, and similar data collected from the field devices, and would analyze it mostly for proactive maintenance strategies instead of to support break/fix intervention. The same information is used to optimize pump performance and can also be displayed before the eyes of the technician who is maintaining that pump.

Figure 3 on page 16 shows additional examples of applications that can empower the water industry for asset performance improvement. For example: virtualization, enterprise asset management, and SCADA software applications from Schneider Electric affiliate AVEVA.

Getting started in augmented reality

Getting started in augmented reality

Thanks to the emergence of communications standards, lower-cost computing, and more secure and reliable networking, implementing an augmented reality program is easier than ever before.

A successful augmented reality program begins with top-down analysis of the operations you want to support, which includes identifying the following kinds of targets:

- The sites at which the application will be deployed
- The areas within each site to be monitored – such as pump stations, wastewater lift stations, motors, control rooms, and parts storage areas
- The device scenes within each area, such as pumps, motors, and electrical cabinets
- Subscenes, the parts of each scene into which the technician may need to zoom

Getting started in augmented reality

After identifying targets and checking all are in working order and connected to the plant network where relevant, you then decide whether to use photographs or tags to identify each scene. If using photographs, you then take high-resolution pictures of all the areas, scenes, and subscenes, and store them on a hard disk drive, USB key, or network folder. If you are using tags, you uniquely identify physically similar or identical items of equipment and attach database tags to them.

The files must be accessible from a device running an augmented reality engineering application such as EcoStruxure Augmented Operator Advisor software, a free trial of which is available here. The application will guide you through the process of connecting all photographs or tagged content.

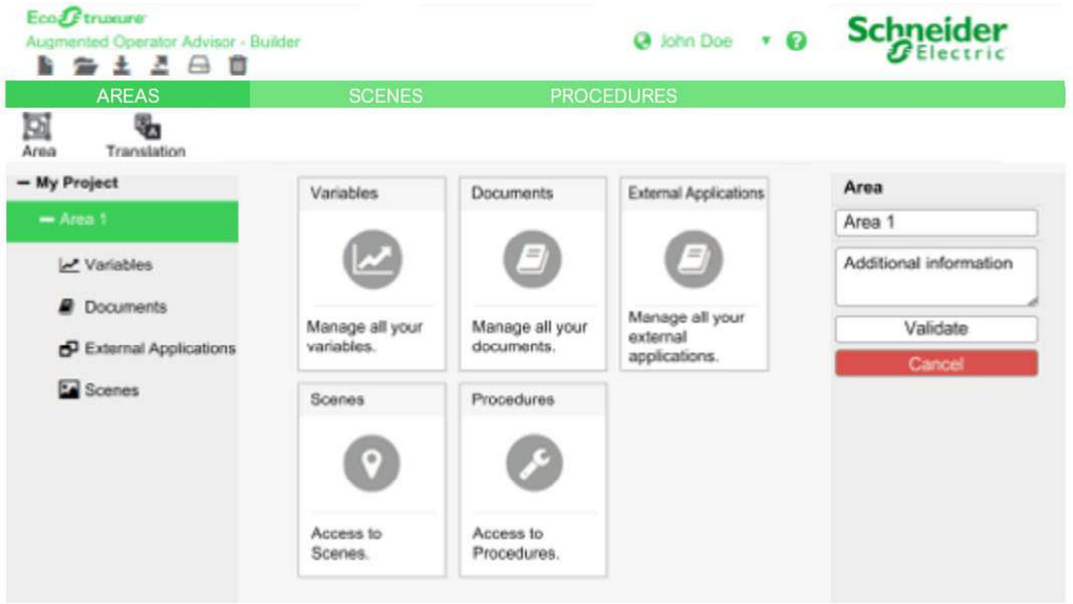


Figure 4. Schneider Electric offers a free trial of an augmented reality engineering application that simplifies linking of content to plant locations.

Workforce empowerment in practice

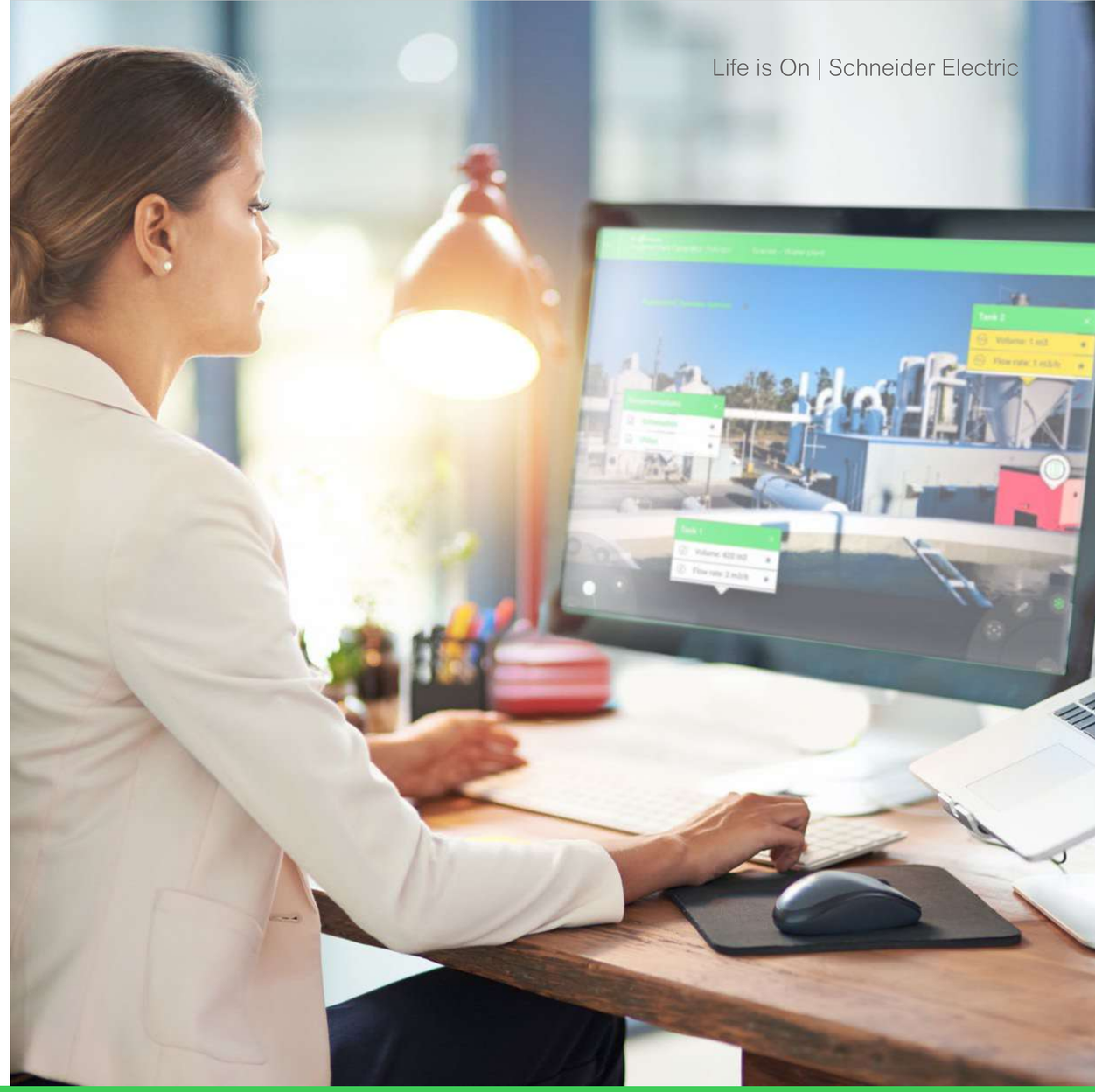
Workforce empowerment in practice

Case study: a South American integrated steel tube mill sought to reduce downtime through improved maintenance.

To achieve this an augmented reality system was implemented, enabling technicians to diagnose maintenance problems faster, thereby accelerating maintenance. Through their smartphones they were able to open panel doors virtually to see the data that enabled them to evaluate production and maintenance operation in real time.

The system superimposed data from the PLC, SCADA, or SQL databases near images of the equipment, providing instant information on KPI progress and feedback in the context of the assets they were looking at.

To get started, download the free trial of Schneider Electric's Augmented Reality project building software.



Life Is On | Schneider Electric

Improve operational efficiency with augmented reality.

se.com/augmented-operator

Schneider Electric
35 rue Joseph Monier
92500 Rueil-Malmaison, France
Tel : +33 (0)1 41 29 70 00

998-20575363