

Municipal Challenges and the Importance of Advanced Automation Solutions

By Doug Johnson, Emerson Process Management

Municipal leaders are facing a time of unprecedented challenges. It doesn't seem that long ago that water industry professionals could crystalize the focus of their planning, worries and daily efforts into one key word – Compliance. Meeting regulatory requirements was, of course, not the only concern, but certainly topped the list of spending drivers.

A Time of Change

In the past, automation demands in the water industry were relatively simple. Basic regulation of flows, pressures and temperatures, along with regulatory reports and a little water chemistry, were about the most that was expected from an instrumentation and control system. Unfortunately, these low expectations led some suppliers to cobble together only rudimentary control systems for many of their clients, often installed in piecemeal fashion as older equipment became obsolete. In the absence of pressures to improve operations, only the more forward thinking authorities sought the benefits that advanced automation solutions could bring.

Today's municipal water and wastewater authorities, and the municipal executives to whom they are responsible, are facing unprecedented pressures on a variety of fronts:

- Aging infrastructure and associated capital needs
- Funding reductions
- Sustainability needs
- Energy costs and carbon responsibility
- Security threats, both cyber and physical
- Equipment failures, leaks and pipe bursts
- Retirement of experienced workers
- Media and public scrutiny
- New regulations
- Safety
- Lawsuits and consent orders
- Source water protection

Given the gravity of these concerns, municipal executives are in desperate need of solutions. Let's face it, even the most dutiful of elected officials and their appointees live in highly charged political environments, and problems with the water and wastewater authorities under their control represent a threat to their reputation and tenure. To help manage the rapid-fire world of municipal water and wastewater in today's environment, several needs rise to the top of the list:

Operations and maintenance savings can help offset funding reductions and provide capital for critical infrastructure needs.

Energy solutions that reduce electricity expenses, one of the largest for many authorities, and improve carbon

footprints can both reduce costs and demonstrate environmental responsibility.

Workforce solutions can help when experienced workers retire, helping less experienced replacements get up to speed faster while reducing the risk of costly mistakes.

Security capabilities are an essential element of operations in the post-9/11 era to safeguard the public and protect critical assets.

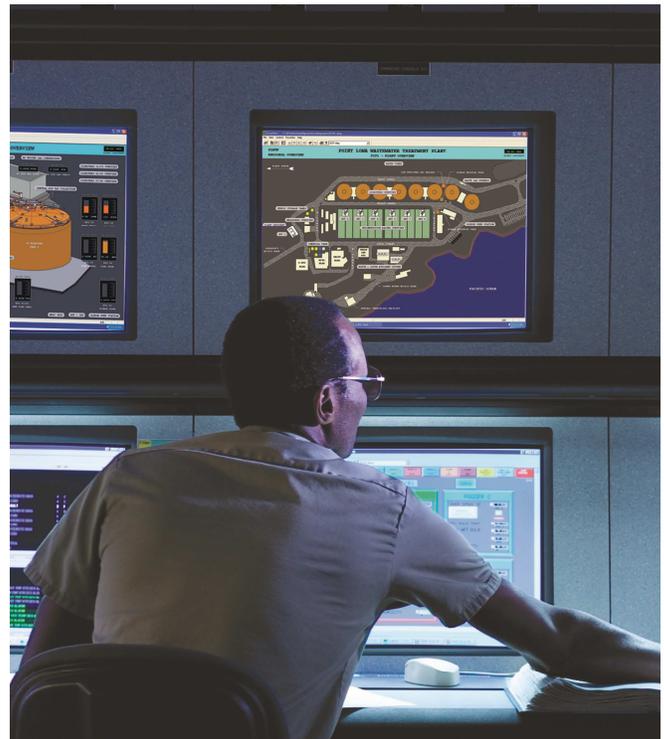
Critical infrastructure protection is necessary to protect what's working, and reduce unplanned major expenses.

While few would argue the importance of these needs in our changing world, many have a tough time understanding how automation can help. Given their experiences with the basic control systems installed at many authorities today, that's no surprise.

The "Right Stuff" - Advanced Automation to the Rescue

Advancements in automation technologies can help municipalities with some of their toughest challenges. A checklist of some of the important features that you should consider for an automation system includes:

Unified Plant Controls and Remote SCADA – Integrated plant and remote systems provide the control and communications foundation needed to expand operational visibility, and set the stage for deploying the advanced solutions needed to improve operations.



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Smart Process Optimization – Process economic optimization solutions can help manage water and wastewater treatment and transport processes to minimize costs, reduce equipment wear and tear, and balance trade-offs such as low/high flow and pump usage. In both water and wastewater treatment applications, these advanced solutions can be applied to many key areas of operation, including energy management and chemical usage using customized plant models.

Process optimization can reduce energy by minimizing the amount of electricity consumed. Additionally, the energy consumption of aeration blowers can be enhanced by automating the operations that balance the oxygenation of the aeration tanks.

Smart applications can also be deployed to better manage utilization of acid and base chemicals. As an example, an optimizer can adjust the pH and optimize chemical use, while maintaining process excursions within acceptable levels.

Economic optimization solutions can be deployed where pump network models are used in a strategy to not only recommend the most efficient arrangement of the pumping resources, but to also indicate individual pump flow loadings based on actual efficiency, cost of power, and corrected pump head.

Cyber Security Capabilities – Since 9/11, the world has changed for all of us. Whether you realize it or not, the need to protect the public and our critical infrastructure puts water industry professionals, literally, on the front line. Beyond the direct devastation of a successful attack, loss-of-service to critical functions such as hospitals, fire-fighting and businesses could likely exacerbate health, safety and economic losses.

Capabilities available with today's advanced automation solutions can strengthen the security of municipal water and wastewater operations. In the absence of definitive cyber regulations in the water industry for most jurisdictions, many water districts are looking to other industries such as the power industry as a model for cyber security. In the US for example, one model of particular interest is the NERC-CIP (National America Electricity Reliability Corporation – Critical Infrastructure Protection) requirements to help safeguard the public and protect their assets. Other non-regulatory standards such as ISA99 are also gaining interest as well.

Simulation, Operator Guidance and Alarm Management – A recent industry survey noted that nearly a quarter of experienced workers are expected to retire from municipal water and wastewater authorities within the next five years. That loss of experience can have a big impact on operations as replacement workers, short on experience, learn the ropes. This can translate to an increased risk of mistakes which could impact safety and security, regulatory compliance, and costs.

The best of today's advanced automation solutions include capabilities to help municipal authorities through these tough times. By including simulation capabilities in an automation system, new workers can improve their skills and confidence with little risk. This is especially true for operators, who can become familiar with operations in a benign environment. It also provides a way for operators and engineers to test new control configurations before they are deployed, removing one of the key concerns with trying new approaches to process control problems. Users can choose from a variety of simulator types – from simple tie-back simulation for operator familiarity training to more complex model-based simulation that allows trainers to trigger simulated catastrophes.

New operators are often in need of step-by-step guidance. Automation solutions can provide built-in guidance, with features that keep operators on track and shorten their learning curve. Advanced alarm management techniques help ensure that operators focus on the right information when upset conditions threaten an information overload.

Wireless – Process visibility is the cornerstone of operational excellence, and can lead directly to improved safety and control. Nearly every authority has a wish-list of points that they'd like to instrument, but can't due to installation cost, location safety, or access problems. And although we'd hate to admit it, many authorities have installations that are plagued with problems due to substandard installation, wires that run where they shouldn't, or faulty conduit and cable trays. Wireless can be a quick, easy and inexpensive way to correct problems like these. Based on industry-standard technology, wireless has been proven in a variety of process industries, while reducing installation costs up to 90% in many cases. Today's best wireless mesh networks have come a long way in terms of being self-organizing and easy to use, with an added bonus of increased reliability as more and more devices are added to the network.

Advanced Machinery Health and Asset Management Solutions – Major rotating machinery such as pumps, motors, compressors and centrifuges are the lifeblood of most water and wastewater authorities. In many ways, ignoring these critical assets is ignoring the integrity of your operations. Advanced automation solutions can provide early detection of mechanical asset degradation. The inclusion of these capabilities can help you make the most informed decisions possible based on the exact condition of your equipment. Technologies such as vibration analysis, infrared thermography (especially helpful with bearings), lube oil analysis, sonic and ultrasonic analysis, motor analysis and laser alignment and balancing can help you protect your capital investment while reducing maintenance expenses.

Connectivity Solutions and Enterprise Data – Your responsibilities don't end when you leave your office or plant. In many ways, ensuring the integrity of your operations is even more important after hours. For that, you need quick, secure access to information from your automation system at

any time, regardless of your location. Your automation solution should include these capabilities.

Unlocking the potential of district-wide management and control strategies can only occur with fully integrated automation. Consider your ability to integrate information from across your enterprise as a foundation for future operational improvements.

Getting There – Automation Master Planning

It can be relative easy to achieve many of the benefits that advanced automation can bring, even in light of today’s financial pressures. Many features, such as energy reduction, can generate good financial returns. Even small projects can result in significant operational savings with short pay back periods on capital expenditures. The key to making the transition to an advanced automation system across the enterprise is careful planning. Many municipalities have undertaken the development of formal Automation Master Plans as a way to develop automation excellence. Some are developing these internally, while others are employing the services of consulting engineers to help.

A well-developed plan will lay out the architecture, technology, implementation and financial return timelines needed to provide the most effective automation system available at a cost-effective price. Master Planning can help municipal authorities, big and small, to strengthen their operations by realizing the benefits that advanced automation solutions can provide.

ABOUT THE AUTHOR

Doug Johnson is the Director of Business Development for Emerson Process Management’s Power and Water Solutions Business Unit. He holds a BS in Electrical Engineering from West Virginia University, and an MBA from the University of Pittsburgh. His career has been focused on service to critical infrastructures including nuclear and fossil power, defense, and the water industry. Doug’s interests in water and our environment extend to his personal life, where he enjoys fly fishing and sailing.

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