



Beyond SCADA

The North American Water and Wastewater Industry Faces Serious Issues,
and Your Current SCADA System Might Be Able To Help

Author: Jürgen "Rudy" Engert, Business Development Manager, Water and Wastewater, Invensys

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1. Water–You Don’t Appreciate It Until It’s Gone

Author and humorist Mark Twain once said “Whiskey is for drinking; water is for fighting over.” Research and intelligence indicate the possibility of a water war in the future. While it seems like oil gets the lion’s share of media attention, studies by U.S. intelligence agencies reveal that while oil was a 20th-century issue, water is a 21st-century issue.

We can clearly define the worth of oil and gas, but water remains a ubiquitous commodity that most people just simply feel entitled to. Not only is water essential for human life, it plays a critical part in many extended aspects of our society as well. Without water, nothing gets manufactured, not even oil. Without water, nothing grows. Without water, life ceases to exist.

Benjamin Franklin, a U.S. Founding Father, scientist and inventor, observed in the 1700s that when the well is dry, we learn the worth of water. We need to bring everything to bear on this issue. From consumer opinion to politics, technology can play an important part in understanding this problem through data, awareness, standards and communication.



2. Consumers, Politics and Money

In North America, and presumably much of the developed world, the mission of the Water and Wastewater Industry is to provide a reliable service at affordable rates that delivers high quality water (to consumers and the environment) in a sustainable manner.

The industry is facing significant issues, and municipalities are challenged to stay on-mission. In other industries like Food and Beverage, Consumer Packaged Goods, and Life Sciences, software vendors have helped successfully address industry issues for years through the use of data-driven technologies – why should water and wastewater be any different?

For one, a water and wastewater business is unlike any other industrial or manufacturing operation. In most cases, profit does not come from the quality of the product produced. Consumers may be willing to pay extraordinary money for water in a bottle, but if water comes from the tap, the general feeling is it should be free. Secondly, municipalities are primarily tax-payer owned and government-operated, and during tough economic times there is a pervasive mentality to focus on higher priority initiatives. Also, unlike other industries, supply must precede demand. Infrastructure must be put in place prior to houses being built and sold. In an unpredictable economy this sometimes results in an investment in infrastructure with no short-term return, which further stresses government budgets. The industry is responsible for the care and quality of the world’s most precious resource, and it is expected to treat and distribute it, without fail, for next to nothing. In order to make a difference, and stay on-mission, we must treat the industry like a business, address its challenges and reduce the total cost to manufacture (treat) water.

Since 2004, the American Water Works Association (AWWA), www.awwa.org, has conducted an annual State of the Water Industry survey in North America. This survey identifies and prioritizes the most critical issues AWWA members face. While top issues vary somewhat regionally, it is important to note that in recent years they have remained essentially the same except for their order of priority (see table on the next page).

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AWWA: Industry Issues – Trends					
	2007	2008	2009	2010	2011
1	Regulatory	Source Water	Business Factors	Business Factors	Business Factors
2	Source Water	Business Factors	Infrastructure	Infrastructure	Infrastructure
3	Business Factors	Regulatory	Regulatory	Regulatory	Regulatory
4	Infrastructure	Infrastructure	Source Water	Source Water	Source Water
5	Workforce	Workforce	Workforce	Workforce	Workforce

Will Rogers, humorist and actor, once said, “Last year we said, ‘Things can’t go on like this’, and they didn’t, they got worse.”

In the survey, business factors were defined by the number one worry, the financing of repairs, replacements and upgrades for infrastructure. Municipalities have been putting off this needed rehabilitation due to federal, state and local budget shortfalls. When facing serious issues like education, police and fire funding, fixing an old pipe gets last billing. This decision, while politically sound, adversely affects every aspect of water and wastewater operations. Consequently, infrastructure is failing dramatically, and it will cost even more money down the road. The United States Environmental Protection Agency (U.S. EPA) announced in 2013 that ensuring safe drinking water for Americans in 20 years will require a \$384 billion dollar investment in infrastructure alone.

A broken main on the water side plays into another main issue, source water. If you break a water pipe, precious source water is lost. This water is even more precious if it is on the distribution-to-consumer side, where it has been treated and is ready to drink. Along with the loss of water and the cost to treat, you may find yourself under legal action for destruction of property, sickness or even death, further exacerbating issue number one.

A broken main on the wastewater side of the business is potentially catastrophic no matter where it happens. There is the potential for contaminating water sources, major sickness leading to death and all of the aforementioned issues with a water main break, just multiplied exponentially. The U.S. EPA is responsible for ensuring compliance to the Clean Water Act and has the ability to leverage significant fines and force system upgrades to ensure it does not happen again. This type of event is game-changing in its ability to destabilize a struggling municipality, further exacerbating issue number one.



The last main issue is the life and blood of the Water and Wastewater Industry, the workforce. As estimated by the AWWA and other industry groups, a large percentage of qualified workers will retire over the next 10 years. The resulting shortage of industry knowledge and operating experience could increase the likelihood of operational failures and accidents. In order to attract new, qualified personnel, there is a need to create a higher level of prestige for the industry, while at the same time controlling salary and training costs.

In addition to the top five industry issues, there are other concerns that also merit attention. Some of these may present as great a challenge to the industry's mission.

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Consider, for example, the consumer. Whereas the number one issue overall is business factors, the quickest way to help address this is money. Rate increases that reflect the “true” cost of water are critically needed. Public awareness of the cost to treat water and maintain systems is very poor, and yet a typical consumer will fight rate increases, perhaps without any understanding of the need to treat water as a critical resource. This can then turn political, as appropriation of tax-based money that could address these issues is instead diverted to other, seemingly more important projects.

Other issues to consider:

- Energy Consumption (electricity, chemicals)
- Water Treatment (pharmaceutical waste, industrial contaminants)
- Industry Leadership (consultants, hardware and software vendors, integrators)
- Security (critical infrastructure, homeland security)
- Technology

3. How Your SCADA System Might Be Able To Help

SCADA systems have been around for decades, and despite technology improvements in hardware and software, a very large percentage of SCADA applications provide the same level of operational functionality today that they did from the beginning. From a control room perspective, the information acquired from control devices enables the operator to visualize what is happening in the field, and when things are not in order, provide alarms to elicit an appropriate response. Although data is acquired – perhaps even stored in a historian for the purpose of viewing trend information and reporting – it is rarely used in a meaningful, issue-changing way. Consider the following questions:

- When an alarm occurs, does your workforce have enough information to act accordingly?
- What do you do with the data collected from daily maintenance rounds?
- Does your SCADA system allow you to perform maintenance when it is needed or only when something breaks?
- Are all of your systems integrated to provide one version of the truth?
- Can you determine whether your processes today are better or worse than last week?
- Can you guarantee an event response is conducted to a standard process or, if not, what happened?
- Is your workforce accountable in a measurable way?
- Is your workforce properly trained to handle any situation?
- Can your SCADA system help you capture and analyze energy consumption data, in context, and help you reduce it to actionable information?

All of the data necessary to answer these questions flows in and out of your SCADA system at near real-time speed. Going beyond the traditional mindset delivered by SCADA systems is what Beyond SCADA is all about.

Beyond SCADA solutions can provide long-term value, and a tremendous return on investment for a municipality. Leveraging the existing SCADA framework, these solutions enable:

Condition-based Maintenance

Easy-to-configure, powerful integration between the SCADA system and asset management system avoids a “run-to-failure” maintenance strategy. Data collected from field devices tracks how many hours a pump has run, how many times a valve has cycled, etc. Using manufacturer recommendations or base-line historical data, a device can indicate a need for maintenance, automatically request a work order from the asset management system and notify maintenance personnel. Bi-directional communication enables operations to visualize equipment disposition and progress. Maintenance procedures can also be digitized and delivered electronically via workflows to ensure proper execution. When properly implemented and utilized, condition-based maintenance can significantly reduce costs, empower the workforce and potentially prevent the conditions that lead up to infrastructure failure.

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Energy Management

Understanding energy usage and costs of water or wastewater operations can save significant revenue for a municipality. Looking at the industry, major cost factors are labor, energy and chemicals. Leveraging energy management solutions, one can track the consumption of electricity and chemicals through metering, then find ways to optimize operations. For example, would it be beneficial to understand how much water is pumped during peak energy times, and how to reduce or avoid excessive cost? The bad news is none of these cost factors are ever expected to go down, so the sooner action is taken, the greater the return can be. When properly implemented and utilized, energy management strategies can reduce electricity costs significantly through simple awareness alone. The potential return on investment in this area is so significant that it can actually fund Beyond SCADA practices in a very short period of time.

Workforce Mobility

Stranded (non-automated) assets represent a tremendous risk to municipal operations. Important data must be collected and analyzed separately from data collected by the SCADA system. With workforce mobility, one can leverage the experience of senior operators to create electronic rounds previously executed with clipboards. Then as operators conduct their rounds, they do so with the best and most accurate routines available. The data is collected and stored directly in a mobile device. Upon round completion, instead of turning in a clipboard or putting it on somebody's desk, the mobile device is cradled, taking the results of the round and synchronizing them with previously collected data. Any values collected that may deviate from normal are automatically evaluated and may trigger, for example, a maintenance request order or automatically generate an alarm within the system. When properly implemented and utilized, workforce mobility can significantly reduce maintenance costs and increase workforce efficiency. Through the use of this technology, round execution can be guaranteed, and a workforce becomes accountable for their actions.

Process and Management Workflows

Workflows ensure standard, approved and consistent responses to alarms and events. Many municipalities have workflows in place to guide the workforce; these are typically called standard operating procedures (SOPs). A problem with these procedures, though, is that they are usually paper documents stored in binders and rarely readily available. With a retiring workforce, situational awareness of these standards must be captured and transferred properly through training in order to prevent improper actions. In a Beyond SCADA solution, workflows monitor the real-time data transfer, looking for triggers. When the system detects a possible main break, the last thing an operator should do is get up to find the right procedure or to start calling people because they risk losing situational awareness. Automatic workflows can, in this possible main break scenario, send automatic notifications to the lab, to the police to shutdown roads and notify the utilities and maintenance crews. As the maintenance crew gets a notification, they have awareness to activate an alternate flow, close valves for a faulty line, and there is collaboration with the lab to check for contamination. In this example, how confident would you be in a new operator handling this sequence of events the right way to prevent a force main break? With a Beyond SCADA solution, automated workflow, it is built into the process, and your operator stays on-station and manages the situation while the workflow goes about doing everything within this routine to make sure it is done correctly. The result is a predictive response that ensures a more efficient workforce, and there is workforce accountability. If something in the chain of workflows does not react in a timely manner, it can escalate up to a supervisor. Everything within the workflow procedure is reported in the event of an EPA or OSHA audit. When properly implemented, and utilized, workflows enforce municipal standard operating procedures on how to react to significant events. Proper response ensures process failures do not turn into social and economic disasters. Workflows address every significant industry issue.



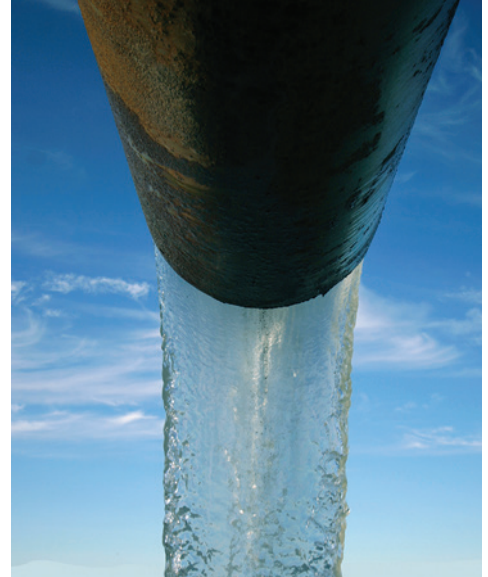
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4. Summary

We know water is a precious resource, necessary for life. What we often don't realize is how easily we take it for granted. At the end of the day, there are NO renewable alternatives to water, nor are we capable of making any NEW water. It is perhaps perplexing, but it is not unreasonable to think that dinosaurs drank the very same water we consume today. And, of course, demand for water is dramatically increasing as the world's population grows and modernizes. We need to be concerned; we need to change our culture.

Municipalities are in trouble. Economic challenges and uncertainty have eroded the growth needed to sustain operations, drying up municipalities' necessary tax base. Water and wastewater operations are struggling to make ends meet, risking potential decline on a daily basis. In the U.S., the federal government is enforcing regulatory compliance to the Clean Water Act, and state and local governments are adding on regulations as well. Regulatory activity is certainly not limited to the U.S. Accidents can be major events that not only incur cost but also bring heavy fines and consent decrees and can dramatically affect a municipality's ability to stay on-mission.



Despite the challenges, technology is readily available today that can help. In much the same way technology has helped other industries, it can help the Water and Wastewater Industry achieve significant operational improvements and cost reductions. SCADA systems have played an important role up to now, but they can do so much more.

A Beyond SCADA solution:

- Empowers your workforce with increased mobility, communication and intelligence
- Enforces operational standards with workflows and mobile, intelligent rounds
- Enables return on investment by reducing maintenance and energy costs
- Energizes municipalities with collaborative data in one environment delivering one version of the truth
- Ensures consistent and accurate data to protect you against compliance concerns

It's time the Water and Wastewater Industry moved Beyond SCADA, and Invensys can help. As a leading software vendor with deep roots in the industry, we have an obligation to provide municipalities with viable solutions that address their major issues and keep them on-mission.



Invensys • 10900 Equity Drive, Houston, TX 77041 • Tel: (713) 329-1600 • Fax: (713) 329-1700 • iom.invensys.com

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