FROST & SULLIVAN

Excellence in Resourcefulness— Water

Network Intelligence

NORTH AMERICA

Contents

Background and Company Performance

Industry Challenges

The North American municipal water industry is composed of thousands of water systems, many of which were established over a century ago and still operate in much the same way, despite the technological and operational improvements available. The gap between potential capabilities and actual operating conditions is further exacerbated by the fact that the conditions water utilities find themselves in are markedly more challenging than the conditions they were design to operate under. This results in many utilities not delivering the greatest value to their customers and underperforming on their commitments to resourcefulness in water use and management. Common, but unnecessary, challenges include operating disconnected network infrastructure and assets, operating with high levels of leakage and non-revenue water, and operating with low levels of transparency, which undermines a utility's ability to communicate internally and externally.

A water network is a single, connected system where each asset ultimately influences the performance of the other. Due to geographic distance and a lack of real-time data generation, however, these assets are often managed as single components or in small groups. This greatly reduces a utility's ability to optimize operations and management due to impaired visibility of the unified system. However, water utilities now have access to multiple solutions that deliver a broad and insightful view of an entire water network. These can ensure that operators and decision-makers understand what is happening and how different actions will impact the rest of the network.

Water loss is another weakness of water utilities across North America, and in particular those with aged infrastructure. Leaks and cracks in pipes and water mains, as well as leaks at residential and commercial end points, can result in substantial levels of water loss. The American Water Works Association 2016 Benchmarking Survey found an average of nine leaks per 100 miles of distribution system pipes, and these leaks relies on utility customers having an accurate appraisal of their underground network. These leaks compromise pressure in the distribution system, waste costly treated water, increase abstraction rates, and can result in bursts that have severe consequences. These water losses, which can easily amount to over 15% of the water provided by many North American utilities, are unnecessary and can be remedied with available technology solutions.

This ultimately compromises the ability of water utility operations to deliver operational transparency, which undermines internal organizational coordination and the utility's ability to effectively communicate and cooperate with their community and local government. When there are service interruptions or customer inquiries, water utility customer service and public communicators are unable to fully qualify and communicate a response. At best, this situation can result in frustration. At worst, this can lead to complaints and action being taken against the utility. Today, technology exists that can deliver a wealth of data and analytics to utility operators and customer service teams that enable utilities to be

transparent and accurate in their understanding of what and why issues arise. This would enable utilities to more quickly identify and advocate remedies that reduce chances for confusion and conflict.

Utilities that successfully leverage technology and service solutions can improve their resourcefulness and ensure optimal management of water use and water consumption. By operating a water network that is interconnected and leverages near real-time data, utilities can understand how localized anomalies undermine the wider network and work to improve conditions. Utilities that leverage solutions that reduce water loss not only responsibly protect their commodity and revenues, but can also identify network weaknesses that require attention. Lastly, water utilities that deploy technology and analytics that improve visibility and transparency will help improve their ability to communicate to customers and local government, there by improving water consumption habits and being a positive partner.

Focus on the Future and Best Practices Implementation

The city of Bismarck, North Dakota completed a major network improvement in 2017 to ensure 100% of its customer meters were Neptune smart meters. These are complemented with Itron's advanced metering infrastructure (21,000 water communication modules) with Itron Analytics, which deliver advanced analysis and insight. Before this significant technology shift and operational change, Bismarck used the services of five meter readers that walked throughout the city to capture meter readings, a landline system to deliver some readings, and approximately 50% of readings were estimated. This system was inefficient and infrequent, limiting the city's ability to be a responsive and fully knowledgeable partner to the community. After implementing the advanced metering infrastructure solution, Bismarck delivered a number of improvements and successes that are captured through the societal and business impact table below.

Societal Impact	1-3 Poor	4-6 Fair	7-8 Good	9-10 Excellent
Improving customer awareness and participation				X
Enabling behavioral change for reducing waste through customer engagement and technology- driven programs			X	
Yielding impressive waste reduction that benefits the overall served community				X
Business Impact	1-3 Poor	4-6 Fair	7-8 Good	9-10 Excellent
Drafting a clear vision to address excessive waste through technology implementation				X
Achieving operational efficiency as a result of a successful strategy for sustainability				X
Strengthening a utility's brand image as a leader for sustainability				X

Societal Impact

Improving Customer Awareness and Participation

Bismarck's water utility changed the way local residents and the city government understood water management and utility operations. One broad shift and one major event impacted the entire city.

The broad switchover to Itron's advanced metering infrastructure enabled customer service staff to quantifiably deliver consumption data, including spikes and anomalies, to customers that were arguing over bills. Historically, where the utility may have had to make adjustments or estimates with the customer, utilities are now able to highlight specific usage data and refer the customer to specific events that may result in higher-than-expected bills. This includes overnight consumption, which can signify a leak, and specific peaks that may be when homeowners have houseguests or fill up a swimming pool, for example. Importantly, this ensures Bismarck collects full revenues where appropriate and ensures customers trust their water utility to accurately bill them.

One specific event delivered a dramatic advancement in the water utility's ability to communicate in a crisis and deliver actionable insights to help sustainably manage the Bismarck's water resources. A 1 million gallon city water tower drained six times in one day and was unable to fully refill, resulting in poor water pressure for an entire part of the city because the system is gravity-fed. Itron Analytics was able to identify the problem——a section of the city was undergoing significant development and was using excess water reserves. The rural water provider for the section also draws upon the city water supplies, contributing to a level of water consumption that the system was not designed for. Bismarck was able to enact water conservation measures that reduced system strain, improved pressure performance, and delivered more sustainable services.

Enabling Behavioral Change for Reducing Waste Through Customer Engagement and Technology Driven Programs

Both events described in the previous criterion relied heavily on customer engagement with water consumption reduction, and achieving those reductions relied on an advanced metering infrastructure and analytics system that captured actionable intelligence. Bismarck residents and the broader community became much more aware of their water consumption profile, why usage levels were unsustainable, and what actions could be undertaken to address overconsumption.

Underpinning these changes in the community was a new online portal where customer accounts could be accessed and relevant data could be provided to each account holder. Current estimates place 10%of the Bismarck customer base opening up Web portal accounts to receive data and information within a 2.5 year period.

Yielding Impressive Waste Reduction Results That Benefit the Overall Community

Bismarck has obtained impressive water reduction results from the implementation of the advanced metering infrastructure and analytics solution. Before the program started, the city experience water losses of 22%. After the successful implementation, it lowered these losses to just 2% in 2017. This has saved the city over 474 million gallons of water each year, which delivers both an environmental benefit and results in monetary savings from less pumping and treatment of abstracted water. The city has undoubtedly seen significant cost savings as a result of this project.

Business Impact

Drafting a Clear Vision to Address Excessive Waste Through Technology Implementation

Bismarck's clear vision to deploy smart meters and advanced analytics has delivered expected waste reduction through its ability to change consumer consumption habits and raise awareness of good water management. However, it has also delivered unanticipated waste reduction through better managed water supplies in the storage tower and has improved system efficiencies through lower levels of water abstraction and treatment.

Achieving Operational Efficiency as a Result of Successful Strategy for Sustainability

Operational effectiveness within the Bismarck water utility has also been greatly enhanced. The utility understands accurate and up-to-date customer consumption data and can clearly talk customers through their problems, identify the causes, and discuss the steps that can be taken to address overconsumption. Internal utility operations can accurately assess where, when, and how water is being consumed or leaked to better manage supplies; this puts them in an advantageous position for ongoing improvement and empowers them to take a leadership role in emergency situations to bring the community together with facts and action.

The public utility has also delivered efficiencies for itself and for the local electricity and gas utility, Montana-Dakota Utilities (MDU), by collaborating on the network infrastructure. The water utility gained access to an established network and an operator/host while allowing MDU to install network infrastructure on water utility and city property. This includes high points in the city because water reserves are kept at high points in the city to improve the effectiveness of a gravity-fed system. This strong local public-private partnership improved the sustainability for city stakeholders and the wider community.

Strengthen Utility's Brand Image as a Leader for Sustainability

The actions taken by the city of Bismarck's water utility as described above all contribute to its position as an engaged local partner and leader in sustainability efforts. The utility's focus on resourcefulness has positioned it as a bridge between an essential city service and managing the needs of a growing city. The advanced metering infrastructure and analytics solution also proactively positions the utility to better handle unknown and unforeseen events that, unfortunately, are bound to arise from time to time. This ability will ensure that the utility is a proactive and responsible partner of Bismarck, which will further its image as a leader in sustainability.

Conclusion

The city of Bismarck has delivered exceptional results through its strategic investments in advanced solutions that resourcefully manage its water supplies. With its strong overall performance, the Bismarck has earned Frost & Sullivan's Excellence in Resourcefulness Award for Water.

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