


Decision Intelligence: Manage the Urban Watershed

REDUCE THE COST OF SAFELY RECLAIMING WASTEWATER.

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Let's Solve Water



The key imperatives of wastewater and storm water management include ensuring compliance with environmental regulations at the lowest total cost. This task is becoming more difficult with stronger and more variable wet weather incidents, deteriorating infrastructure, intensifying inflow and infiltration issues, and more complex constituents in wastewater (e.g. wet wipes, microbeads) requiring new mitigation measures. At the same time, the wastewater treatment process remains extremely energy intensive and vulnerable to shifting volumes and concentration of wastewater influent.

In an effort to deal with these dynamic issues in an affordable way, utility managers are challenging traditional mitigation strategies that rely only on building expensive new infrastructure, and instead leveraging the power of decision intelligence to optimize the use of existing assets.

Current State

Wastewater management has improved over the years but continues to rely on incremental improvements in technologies that are decades old and often highly inefficient. Key approaches to addressing emerging challenges include:

- ▶ Combined sewer separation or the construction of tanks and deep tunnels to manage wet weather flows
- ▶ Scheduled sewer cleaning; gravity sewer CCTV inspection to assess sources of inflow and infiltration and identify blockages
- ▶ Regular maintenance schedules for wastewater pumps at lift stations
- ▶ Aeration to saturation in secondary wastewater treatment to ensure proper digestion or control logic based on dissolved oxygen set points

This approach has serious limitations. Sewer separation and deep tunnel construction are massive capital investments that have a very low return on investment, with only episodic benefit during peak flow events. Routine sewer inspection and cleaning can help reduce infiltration and blockages, but current methods are labor intensive and result in crews spending most of their time cleaning sewers that do not require attention while neglecting hotspots – both known and unknown. Regular maintenance of lift station pumps can help reduce overflows and outages caused by lift station challenges, but pump clogging, power failures and other malfunctions still lead to periodic violations. Finally, most secondary treatment approaches leave money on the table with respect to energy savings, with Xylem research indicating that 50% of electricity consumption could be eliminated with effectively zero or negative costs incurred.¹

< 1. *Powering the Wastewater Renaissance, Energy Efficiency and Emissions Reduction in Wastewater Management*, Xylem Inc. 2015 >

THE POWER OF DECISION INTELLIGENCE

New standards of best practice leverage assessment technologies, real-time monitoring, data analytics, and system modeling to minimize the cost of maintaining compliance, both through capital optimization and energy efficiency:

A real-time digital twin of the wastewater collection system enables real-time management of wastewater from toilet to treatment plant. By optimizing capacity utilization of the network using coordinated real-time control of gates, valves, pumps, and tanks, the total effective capacity of the system can be increased with little or no construction of additional infrastructure (e.g. eliminating tanks, tunnels and/or sewer separation). Digital twins can also identify, locate, and characterize I&I to prioritize mitigation efforts, and can optimize sewer cleaning schedules to address blockages in order of importance.

Critical force main assessment and ongoing monitoring can identify defects and risks of failure in these essential assets, lowering the risk of leakage and compliance violations in this part of the collection system.

Risk-based asset prioritization reduces the risk of failure by leveraging condition assessment data and machine

learning tools to evaluate each asset's probability of failure, while also incorporating multi-disciplinary socioeconomic data to estimate the consequence of failure. This approach ensures that dollars can be targeted at the right assets to minimize the community's total risk exposure.

Intelligent pumping systems provide real-time visibility into current conditions, enable proactive maintenance programs that ensure uptime, and dramatically reduce the risk of clogging and backups at the lift station.

Digital twins of the treatment plant enable process optimization, decreasing energy consumption and increasing process stability, throughput rate and effluent water quality. Coupled with real-time control of sewer networks, these twins can stabilize flows into the plant, generating even greater performance improvement.

Taken together, these approaches significantly reduce the capital and operating costs of collecting and treating wastewater in compliance with environmental regulations.





Benefits of Decision Intelligence for Managing the Urban Watershed

OPERATIONAL BENEFITS

Rapid response and proactive mitigation facilitated by advanced warning of real-time network capacity issues

Reduced numbers of call-outs to address infrastructure failures or overflows

Optimization of operator efforts during critical procedures using predictive decision support systems

Minimization of surcharge conditions, basement backups, street flooding and overflows

Expanded operational agency over legacy infrastructure and treatment facilities

FINANCIAL BENEFITS

Reduction or avoidance of new capital investment in the sewer network and optimization of renewal and rehabilitation programs

Reduction in energy costs from substantial efficiencies

Avoidance of significant fines associated with non-compliance

COMMUNITY BENEFITS

Reduction in risk of dangerous sewage overflows into environmentally sensitive waterways

Avoidance of large capital investments that would require rate increases or new debt

Increased support for economic development and expansion

Driving Impact

■ The City of South Bend, Indiana, faced a billion-dollar consent decree for combined sewer overflows. The city implemented Xylem's BLU-X™ intelligent sewer solution, utilizing a combination of sensors and artificial intelligence to provide real-time decision support and coordinated real time system control. As a result, the City has reduced combined sewer overflow volumes by over 70%, reduced E. coli concentrations in the St. Joseph River by 50% and is expected to reduce capital required to comply with the consent decree by more than \$500 million.

■ Baltimore County, Maryland, was looking to use data to manage their critical force mains. Working with Xylem, they implemented a comprehensive force main assessment program using a combination of SmartBall®, PipeDiver®, and PureRobotics™ inspection technologies. These assessments determined that 3.5% of pipes showed signs of deterioration, with only 0.5% requiring repair. The program has empowered the County to safely and cost effectively manage its system while avoiding unnecessary replacements.

■ A large municipal WWTP in Cuxhaven, Germany, wanted to optimize their energy consumption. Using Xylem's BLU-X™ Treatment solution, an optimization strategy based on artificial neural networks was developed to predict the best setpoints to operate the aerators of five parallel biological treatment tanks. Following system commissioning, results showed a 26% reduction in aeration energy usage, corresponding to ~1.1 million kWh annually. In addition, all plant effluent concentrations continue to maintain regulatory compliance.

■ Genesee County, Michigan, sought to employ smart technologies to address operational issues at their lift stations. Following the deployment of Xylem's Flygt Concertor® system, an artificial intelligence-powered wastewater pumping system, the County was able to significantly reduce energy consumption, eliminate the need for scheduled de-ragging and lift station cleaning, and ultimately reduce maintenance call-outs to zero.

■ The City of Muncie, Indiana, wanted to reduce energy consumption and improve the process stability at its wastewater treatment plant. By installing Xylem's aeration control technologies, which optimize the treatment process with real-time sensors and controls, the City was able to reduce energy usage in the plant by over 20%, ensure more stable effluent quality, and increase operator efficiency.





It would be our distinct pleasure to partner with you in capturing the opportunity of a lifetime to serve your community even more effectively through the power of decision intelligence. Please do not hesitate to contact decisionintelligence@xylem.com with any questions. We will respond within 24 hours. For More information on how Xylem can help you, go to www.xylem.com

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