

Smart Sewers In Kansas City

The city of Kansas City, Missouri, expects to spend more than \$350 million to maintain clean and reliable water services over the next fiscal year – an investment driven in large part by a 25-year, \$4.5 billion-dollar federal consent decree that began in 2010. Since the onset of Kansas City’s Smart Sewer program to meet the requirements of the consent decree, the City calculates that customer wastewater rates have risen more than 290 percent while annual median household incomes have only increased a mere 1% per year.

“The financial burden placed on our customers does not go unnoticed,” says City Manager Troy Schulte. “Kansas City is actively searching for cost-effective solutions that we hope will significantly reduce future rate increases and meet federal clean water requirements.”

Leading the City’s charge to find cost-saving infrastructure solutions is Special Assistant City Manager Andy Shively, a 25-year water industry professional with a reputation for bold perspectives and industry-altering solutions.

In 2016, Shively issued a Billion Dollar Smart Infrastructure Challenge to the local contracting community, asking local stakeholders to join him in finding \$1 billion in water and wastewater infrastructure savings. The intent of Kansas City’s Billion Dollar Smart Infrastructure Challenge, however, was not a mere reduction in capital expenditure, it was a mission to leverage data and technology in order to deliver more sustainable and cost-effective solutions that would eventually help ease the burden on rate payers.

“Each of us has a responsibility to our rate-payers, and to future generations,” says Shively. “I refuse to leave a legacy of debt and disintegrating infrastructure for our children and grandchildren.”

At the time, the City’s Billion-Dollar Challenge was



unheard of. The challenge was received with both awe and skepticism.

“When Andy issued the Billion Dollar Smart Infrastructure Challenge, I asked him point-blank if he really thought he could find \$1 billion in cost-efficiencies,” remarked Schulte. “Andy promised me that he would not only meet that challenge, he would crush it.”

Part of Shively’s strategic plan to find Kansas City \$1 billion in infrastructure cost-efficiencies lies within the City’s existing infrastructure, much of which is more than 100 years old.

According to Shively, the City’s existing sewer system has tremendous potential for capacity and longevity, if the City spends the time and the investment to learn.

“The infrastructure we have in place today is capable of much more than we realize,” states Shively. “By understanding and rehabilitating the system that already exists, we can adapt best management practices and begin to utilize existing assets to the maximum extent possible (UEA-MEP).”

So far, the City’s investment has proven to be very beneficial. Through the process of system characterization, the City found significant discrepancies in its existing mapping system. For example, the City discovered 650 manholes and 1,000 connecting pipes the City did not previously realize existed. Thousands of additional asset attribute updates were made including corrections to pipe size, material, flow direction and system usage.

However, system characterization is only one part of the City’s plan to realize the potential of its existing sewer system. To find solutions for the Billion Dollar Smart Infrastructure Challenge, Kansas City would need to look deeper – approximately eight feet deep. In fact, one of Kansas City’s smartest assets now lives within in its 100-year-old sewer infrastructure.



Left: Kansas City’s smart sewer network consists of sensors attached to manhole covers. The sensors measure water flows and levels at critical points throughout the City’s wastewater system.
Right: Special Assistant City Manager Andy Shively.

This smart asset comes from Xylem’s intelligent urban watershed brand EmNet. The company’s product, a smart sewer sensor and data analytics, is designed upon the premise that the same technology used to track terrorist activity in war zones could potentially provide critical insight and savings for utilities facing costly aging infrastructure concerns.

The system was first tested in South Bend, Indiana, and the proprietary IoT technology-based solution has since been brought to 25 additional water and wastewater systems, including the city of Kansas City, Missouri.

Kansas City’s smart sewer network consists of sensors attached to manhole covers. The sensors measure water flows and levels at critical points throughout the City’s wastewater system. Sensor data is used to train an artificial intelligence (AI) system that then acts as the “brain” of the 100-year-old sewer system to predict how the Kansas City’s sewer system will perform during various storm conditions. The system then uses the predictions to decide how to best route flows during storm events.

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“Kansas City is a leader in overflow control solutions and is currently home to the world’s largest smart sewer system” states Luis Montestruque, president and chief technology officer of EmNet. “In an industry that is often reluctant to adopt technology-based solutions, Kansas City is proving that smart technology solutions have the potential to unlock the potential of what already exists within our nation’s infrastructure.”

Kansas City has successfully used the artificial intelligence technology to better understand and improve its hydraulic model – improving the model in some cases from 50% accuracy to 90% accuracy in four short months. Kansas City’s improved hydraulic model is anticipated to help the City achieve overflow capture and cost savings like those achieved in the original pilot city of South Bend, where 70% of the City’s overflow capture was achieved with one tenth of the City’s planned budget for controlling combined sewer overflows.

“Like many cities across the nation, Kansas City has a 100-year-old sewer asset that must be reconfigured to meet 21st-century challenges,” says Shively. “Rather than building a new sewer system, Kansas City is learning how to optimize the existing infrastructure to meet our needs. What we are

learning is that the infrastructure we have can be used to help address the issues at hand.”

The AI technology in the City’s smart sewer sensor network uses National Oceanic and Atmospheric Administration (NOAA) forecasts to decide the most optimal place to store or direct wastewater in Kansas City’s sewer system. Once real-time controls are in place, this information will be electronically relayed to pump stations and in-line gates so that the sewer system can align itself, in real-time, to optimize the conveyance, storage and treatment of incoming storm and waste water.

To learn more about Kansas City’s Smart Sewer program, visit www.kcmo.gov/smartsewer.

Information about EmNet can be found online at www.emnet.net.

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