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Implementing Acoustic Inspection for Prioritizing Sewer Cleaning in New Castle, Delaware

By Alex Churchill

EACH DAY, billions of gallons of wastewater flow through an extensive underground network of sewer pipes to reach one of thousands of treatment plants. Regularly inspecting this great network of pipes is necessary to ensure proper collection, treatment and disposal of wastewater.

To achieve this, wastewater collection system managers must correctly determine where and how to deploy their inspection and maintenance resources. This can be challenging since blocked pipes can be difficult to spot before serious consequences, such as sanitary sewer overflows, occur. Current maintenance strategies are commonly time-based, meaning that pipe segments are cleaned on a time interval basis. However, since most pipes in the average utility are clean and functioning properly, time-based cleaning can result in wasted resources through "cleaning clean pipe."

To address this dilemma, an acoustic inspection technology was developed through a multi-year partnership between a utility and academia. The patented product, manufactured by InfoSense Inc., is called the Sewer Line Rapid Assessment Tool, or SL-RAT. The technology uses transmissive acoustics – or in other words, yelling and listening – to screen 6- to 12-in. gravity-sewer lines for blockage conditions. The SL-RAT has been gaining traction with utilities since 2012, as it enables conditioned-based maintenance of a collection system – line by line.

New Castle County, located in northern Delaware, is one utility that recognized the potential for its department to operate more efficiently through integrating acoustic technology. The county's wastewater division oversees a network of 1,760 miles of sewer pipe serving a population of more than 500,000. The collection system is comprised of 169 pump stations and 45,000 manholes and manages more than 50 MGD of wastewater.

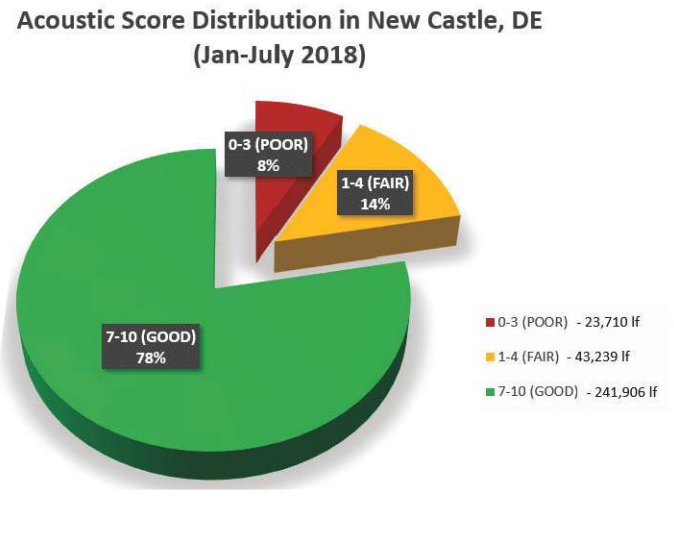
"In 2008, we had to make a CMOM program where we are required to clean 500 miles of our system a year, unless we can show why we can clean less," explains New Castle operations services manager Robert Roff.

The mandate by Delaware's Department of Natural Resources and Environmental Control, led the county to fund a $1.7 million per year increase for collection system maintenance resources to expand and enhance CCTV, root control and truck cleaning operations. Recognizing that the additional funding would likely not be supplemented in subsequent years, the County has sought ways to stretch this funding to get long-term results and sustainable benefits.

The Problem – Addressing Limitations of Time-Based Preventative Maintenance

Prior to integrating acoustic inspection, New Castle County relied on a time-based preventative mainte-

nance approach that address each of its 400-sewer sheds based on an assigned frequency between one to five years. "That was the big problem with the way our PM program was set up. We clean every foot of the sewer shed – whether it needs to be cleaned or not. As you can imagine, we're cleaning a lot of places that don't need to be cleaned," Roff says. "Our operators were coming back, some of them frustrated that every pipe they cleaned was running clear water. It's frustrating when you know your resources are limited and you know you're cleaning pipes that don't need to be cleaned."



Testing RATs – Validating Acoustic Inspection Technology

To see if acoustic inspection may be the appropriate tool for prioritizing cleaning assets, New Castle County implemented a pilot program in 2016. The SL-RAT provides an acoustic assessment score on a scale of zero to ten – zero indicating a completely obstructed pipe, and a ten indicating a completely unobstructed pipe. A score of 7 or above categorizes a pipe as "GOOD," a score of 4 to 6 "FAIR," and a score of 3 or below "POOR" or "BLOCK." The score is generated in less than three minutes, allowing a typical two-person crew to inspect more than 10,000 ft per day.

The pilot study took less than 50 hours spread over 13 days to inspect 56,000 lf of sewer lines. The acoustic inspections showed that only 10 percent of pipes required immediate action. 51,083 ft (90 percent) good, 4,581 ft (8 percent) fair and 1,140 ft (2 percent) poor. Based on the pilot study evaluations, the county determined that all sewer sheds assigned cleaning frequencies of four to five years would be evaluated, and those with acoustic scores of 6 or less would be cleaned. New Castle teamed up with two independent contractors to accomplish their acoustic evaluations on all 4 and 5 frequency sewer segments.

Sound Implementation – Acoustic Inspection for Prioritizing Cleaning Assets

Implementing acoustic technology has resulted in large time and cost savings for New Castle. As of July 2018, the County has already inspected more than 300,000 ft this year. Seventy eight percent of inspected pipes (241,906 ft) scored 7 or above. Importantly, this means that rather than cleaning the entire 300,000 ft based on a segment's assigned time frequency, the County can concentrate its cleaning efforts on the 22 percent, or less than 70,000 ft, pre-determined to need the cleaning. Importantly, the reduction in cleaning has not compromised the quality of maintenance. New Castle anticipates a continuing downward trend of sanitary sewer overflow occurrences in 2018, indicating that acoustic inspection can be a highly effective tool for prioritizing resources to regions where they will be most effective.

In addition to saving the County time and money, the inspection results help New Castle meet their compliance efforts of assessing 500 miles annually. Through integrating acoustic technology with cleaning, repairing and asset management, New Castle County ensures optimization of existing infrastructure and establishes a continuous improvement program.

"We're using acoustic inspection technology to show that the pipe is clear and does not need cleaning at this time. We saved a lot of cleaning and a lot of money because we didn't have to clean everything," Roff says. "We're always trying to continually improve, and right now, we're doing that within an existing budget."

Alex Churchill is CEO at InfoSense.