

"The Standard of the Industry"



This report was written by
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America's Failing Pipeline Infrastructure

How to Rapidly Perform Condition Assessment with Digital Side-Scanning Technology

EXECUTIVE SUMMARY

Portions of America's wastewater systems are failing at a concerning rate.

Following World War II, America grew quickly, recovering from an economic depression and fresh from military triumph. The pipeline infrastructure for our water and sewer networks was expanded to the far reaching corners of our country.

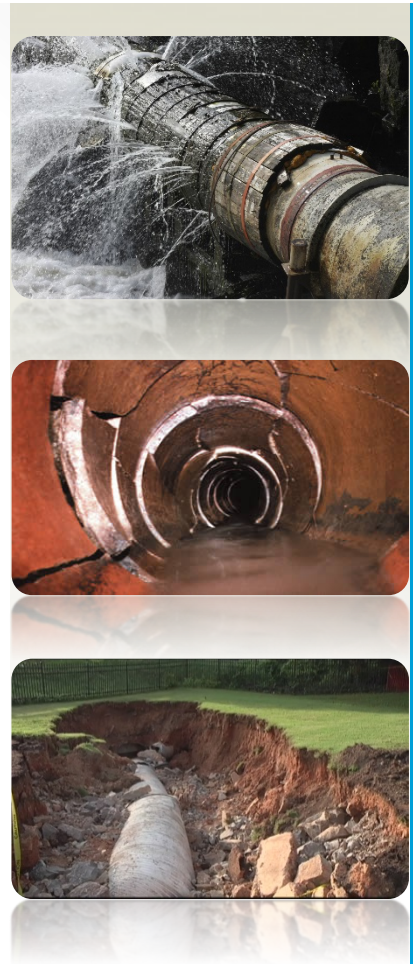
The result of that rapid expansion and investment provided us with somewhere between 700,000 and 800,000 miles of public sewer running below are homes, businesses, parks, and playgrounds – much of it largely brittle if not broken. The massive costs required to update this aging pipeline infrastructure is difficult to comprehend.

Before we can improve our pipeline infrastructure, a thorough visual inspection and condition assessment of every pipeline asset must occur to properly catalog, document, quantify and prioritize the repair or replacement of each asset.

Considering the quantity of assets and how swiftly the pipeline infrastructure is deteriorating, it will be difficult to meet the inspection challenges most municipal entities are facing utilizing traditional CCTV inspection.

To meet the demand, municipalities should consider embracing new technologies that enable rapid assessment of pipelines while providing the highest quality of data to efficiently quantify repair and replacement needs.

Digital Side-Scanning technology offers the solution for municipal entities to meet the ever increasing challenges and demands of America's failing Sanitary Sewer and Stormwater systems.



INTRODUCTION TO THE PROBLEM

The failing infrastructure has become a hot button topic in political campaigning. At Faneuil Hall, presidential candidate Hillary Clinton unveiled her \$250 billion infrastructure plan and went on to state... “I don’t have to tell you what a sorry state we’re in,” she said in Boston. “...Beneath our cities, our pipeline infrastructure — our water, our sewer, you name it — is up to a century or more old...”

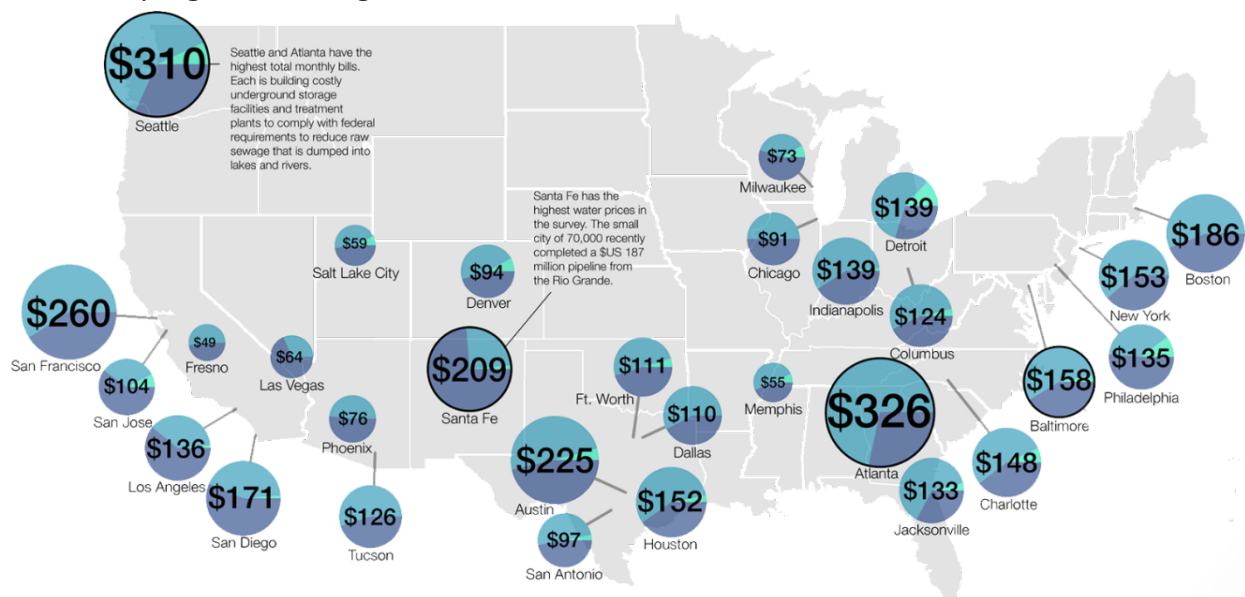
Many experts feel \$250 billion is just a down payment on what is really needed to revitalize and rebuild America’s infrastructure. The American Society of Civil Engineer’s estimate the need for \$300 billion in the next twenty years for just wastewater infrastructure, with 75% slated towards the rebuilding and rehabbing of pipelines alone.

As a whole, the United States ranks 11th in the Infrastructure pillar as part of the World Economic Competitiveness Report for 2015-2016, behind Spain, France, United Arab Emirates, and Singapore to name a few.

The vast majority of Americans served by municipal sewer systems are in for a rude awakening when it comes to annual water & sewer cost increases and by the future major construction projects to repair and replace the dilapidated sewers under their feet.

The price for residential Water & Sewer Services in 30 major U.S. cities, over the past year rose faster than the cost of nearly every other household staple according to Circle of Blue’s annual water pricing survey.

These rates have risen 41% since 2010 and will continue to rise. The increases will still not offset the need for additional major funds that will be required to rehabilitate and replace our failing pipelines, and it will continue to concern Americans being subjected to ever increasing rates with little to no progress on fixing what’s broken.



THE PRICE OF WATER: 2015

Combined Water, Sewer, and Stormwater Prices in 30 Major U.S. Cities

Water prices pay for treating, pumping, and delivering water, while sewer prices cover the cost of cleansing the water that goes down the drain.

Sewer prices are often higher than water prices because more energy and chemicals are required for treatment. Following the Clean Water Act, the federal government gave grants for new treatment plants during the 1970s and 1980s. Over the past three decades, however, new spending has been cut for local sewer infrastructure.

Stormwater fees are not included in every city's monthly bill. Some cities use general tax revenues to pay for projects to reduce polluted runoff from streets and parking lots. However, these projects must then compete for funds with other departments like police and schools.

So what is the real problem here? Lack of funds or lack of information? The answer is... both.

Of course, more funding is needed to correct the problems at hand but what if there was considerably more accurate and pertinent data available for your pipeline assets so that available funding could be spent more appropriately?

With less staff, limited resources, little or no federal funding, and the inability to turn back time, most municipalities face a harsh reality as to how to address these failing pipelines. An even harsher reality is that most municipalities lack the proper inspection equipment to perform thorough condition assessments of all of their pipeline assets within an appropriate amount of time.

Having an active pipeline inspection program with traditional CCTV equipment in some cases is no longer sufficient to meet the demands most municipalities face. Every dollar must be spent as wisely as possible.

By utilizing digital side-scanning technology, a thorough 360-degree visual assessment is accomplished in a fraction of the time it takes for a traditional CCTV inspection. The advantages of digital side-scanning inspection are quantifiable and enable the Operations and Engineering Teams to work together collectively to rapidly perform condition assessments of an entire pipeline system, but most importantly, to collect high quality usable data to make appropriate repair and replacement calls to ensure defensible, efficient, and wise spending.

WASTEWATER INFRASTRUCTURE PROBLEMS & RESULTANT CHALLENGES

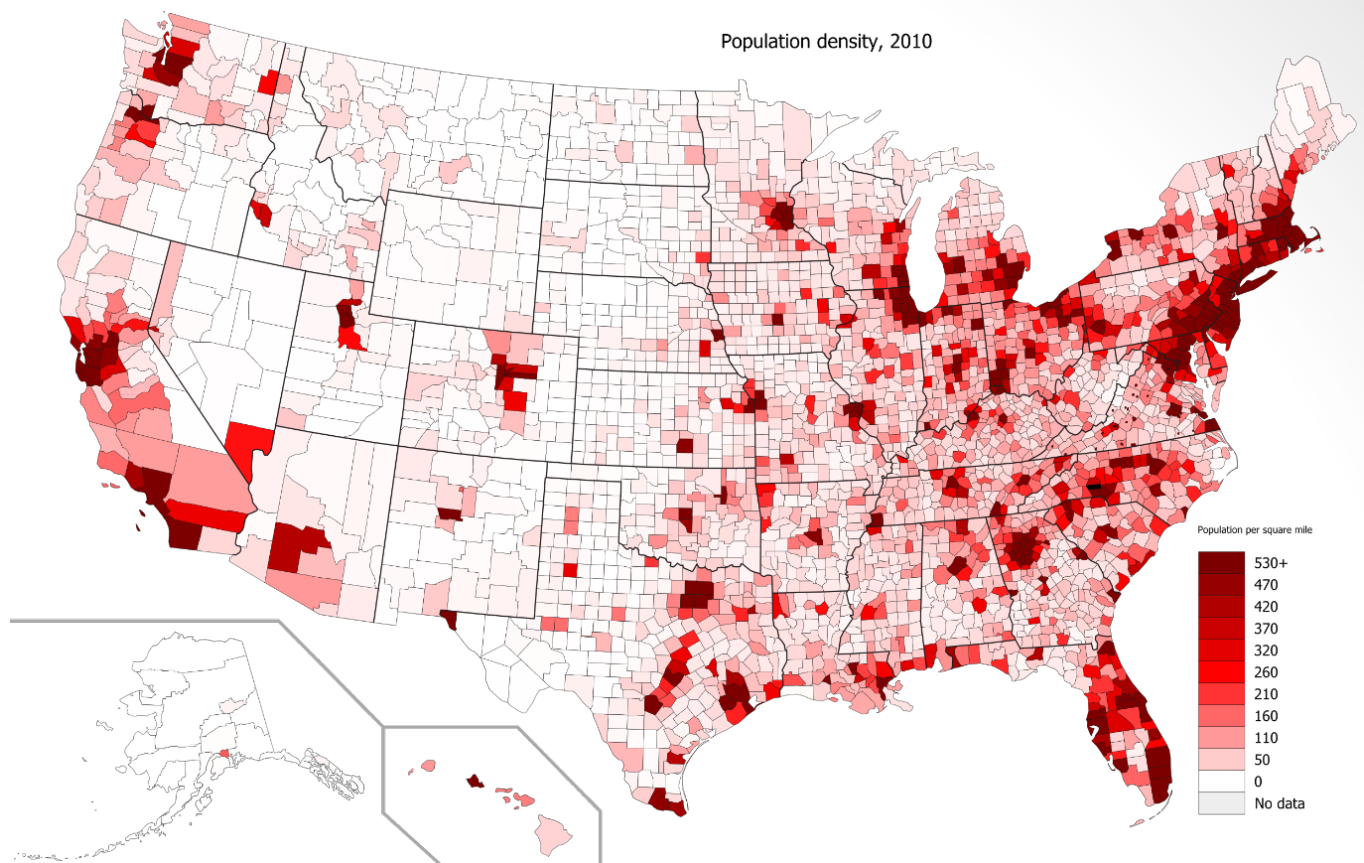
America's Wastewater Infrastructure is rated a D by the American Society of Civil Engineers (ASCE) in their 2013 Report Card for America's Infrastructure.

While fixing pipes will correct overflows and other pipe-related issues, the difficulty in that process begins far before making the necessary repairs or replacement. With over 700,000 miles of public sewers in the United States, these pipes must initially have a condition assessment performed via a visual assessment in order to determine whether they are in good standing, need of repair, or complete replacement. This proves to be troublesome for most municipal entities in the United States that are under equipped to properly inspect the current state of their sanitary and storm water systems.

From the smaller town of Framingham, MA with 68,000 residents that were facing \$200 million for repairs to the cautionary tale of Atlanta's \$2 billion overhaul of their system, the stories continue to repeat over and over again from communities across the United States having major sewer issues with few reported on a national level. Sanitary sewer back-ups are not just an inconvenience but a major public health concern.

Having raw sewage in the streets, yards, and sidewalks of American cities is not acceptable, yet not nearly enough is being done. Municipalities can avoid the majority of these situations by having an effective and efficient pipeline condition assessment program and utilizing the latest technologies available to rapidly inspect an entire city system.

Continuing with traditional pipeline inspection methods in today's climate will not allow municipal entities to get ahead of the problems at hand or to make informed decisions at a rapid rate to help avoid more sewer system problems.



While population density is a good indicator to areas with the most repair and replacement needs, every municipality, regardless of size should have a thorough condition assessment program in place for their pipeline assets.

While analog pan/tilt camera technology has been the standard for pipeline assessment for over 20 years, this technology has never been known to save time or rapidly expedite the assessment process. Given the current state of the pipeline assets in this country, a more thorough and rapid approach had to be developed to meet the true needs of municipal entities and the challenges they face.

Any municipality that does not have an active inspection program is doing a disservice to the residents and the city. They are essentially spending capital funds blindly for repairs and replacements on pipes they may never have been assessed or have not been assessed for a long time.

Serious pipeline problems will continue to develop unnoticed due to the lack of a pipeline assessment program. These problems include:

- Infiltration into the system causing great costs at the processing plant not being addressed
- Continued hydrogen sulfide pipe wall corrosion not being addressed
- Poor construction and workmanship not being exposed
- Protruding lateral services causing reduced line capacity and contributing to blockages
- Excessive settling of solids in pipelines, which can lead to obstruction or blockages
- Excessive build-up of grease, slime, and other viscous materials leading to blockages

All of the above detrimental factors could be mitigated along with a directly related substantial reduction of capital expenditures via a regularly scheduled pipeline condition assessment program.

Most cities lack any level of visual data of their pipelines and have no data for comparison purposes when additional assessments are performed. This lack of data leads to further indecision or wrong decisions being made for pipeline repairs.

SOLUTION TO THE PROBLEM

Early adopters of digital side-scanning technology have been more than pleased with the results of digital side-scanning technology. One of those early adopters, McKim & Creed, an Engineering Firm with numerous locations through the United States has been using the technology since May of 2014.

Greg Anderson, Vice President for McKim and Creed feels that their pipeline condition assessment programs for various entities have increased production at least 2x that of traditional analog surveys.

When asked whether the quality of the digital side-scanning data enables his end clients to make better informed decisions for repair & replacement over that of traditional CCTV surveys his response was “without a doubt. The quality of the video stream is substantially more defined and the evaluation process much easier to complete.”

Digital Side-Scanning inspection technology enables rapid assessment of the pipeline structure with the highest quality scan of the pipe possible without the need to stop during inspection.

It's important to understand the differences between the previous technologies available and that of the newest technology, digital side scanning cameras.

While several systems are available in the marketplace for digital side-scanning, very few are true digital systems and even fewer offer all the features and benefits of side scanning in one comprehensive system with the highest quality workmanship and American made quality.

Digital Side-Scanning Camera Systems are designed to provide the highest quality video/photos for review along with significantly increasing footage while augmenting the quality of data available for condition assessment.



FLAT IMAGE FROM CUES DUC SYSTEM

8" VCP with Multiple Cracks Around Lateral Connection

The CUES Digital Universal Camera (DUC) in particular has 8 times the pixel count of standard analog cameras providing uncompromised clarity and detail. A wide angle lens is used producing 360-degree video capture, meaning you miss nothing!

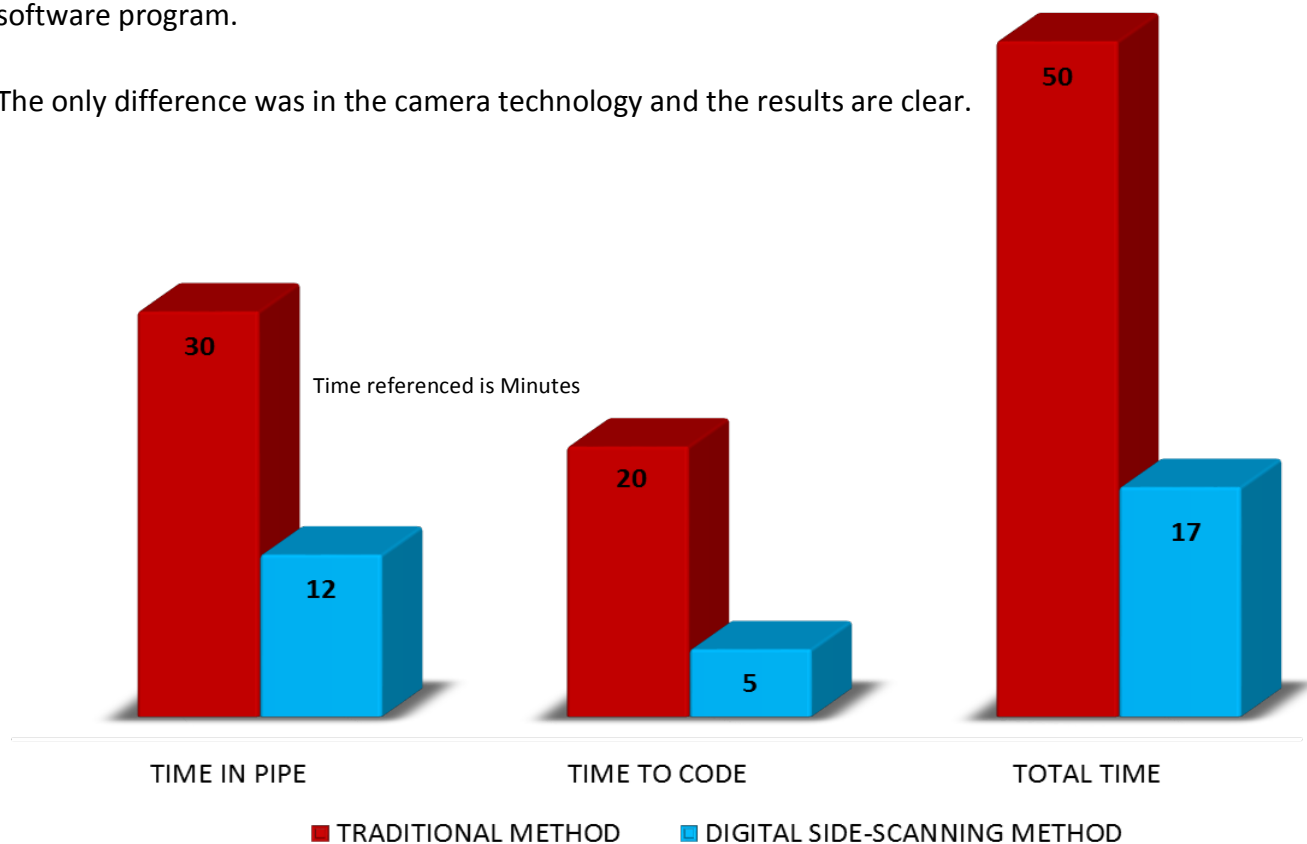
The technology works by capturing several images per second which are then stitched together, producing three deliverables; high resolution video that is a permanent and accurate record with the ability to virtually pan, tilt, and zoom to any area of interest; a flat unfolded view of the pipe from manhole to manhole (multi-flat view), and an expanded flat unfolded view of the pipe for close up views of defects and to perform measurements.

The flat view provides the ability to quickly inspect and review thousands of feet of pipe in a matter of hours instead of days allowing you to make the best use of the one resource that is not replaceable...time.

The digital side-scanning method saves you that most valuable resource of time. In fact, when compared to traditional analog camera surveys, the time savings is significant.

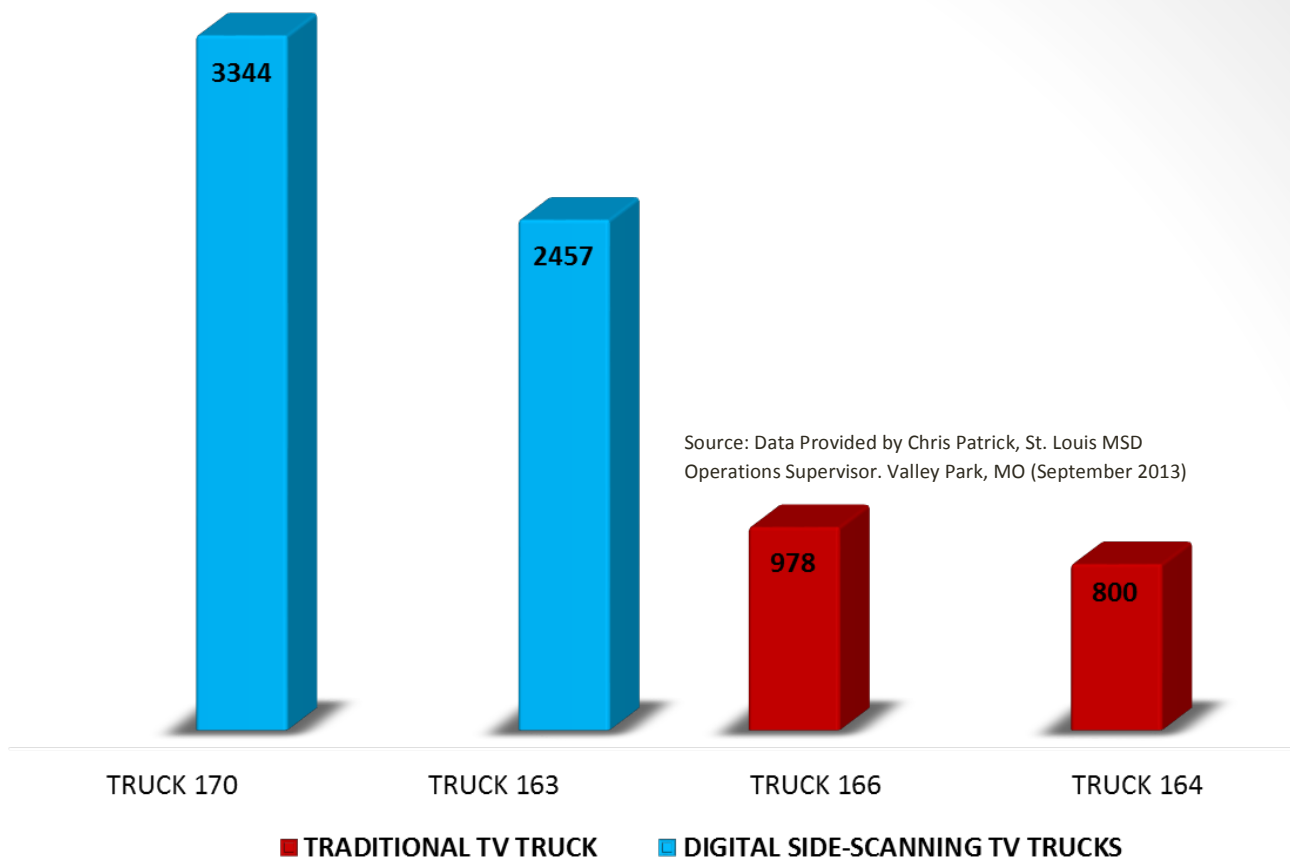
The chart below was based on using the same camera transporter, in the identical 400-foot pipe segment and documenting of the same 20 observations. There is a significant time savings when collecting the video and documenting all 20 observations in the same condition assessment software program.

The only difference was in the camera technology and the results are clear.



The positive results of digital side-scanning technology are echoed from numerous municipalities from across the U.S. that embraced the technology in its early stages and have significantly improved their position for the future, while making better informed decisions on repair and replacement calls, enabling wise and efficient spending of public funds.

St. Louis MSD was one of the early pioneers in embracing the technology and results are clear. On Page 7 is a footage report provided to CUES by St. Louis MSD from September of 2013 that showcases the type of production increases they are experiencing with the digital side-scanning systems over their remaining traditional CCTV systems.



The two digital side-scanning trucks outperformed the traditional CCTV systems by 4,023 feet. Essentially, the digital side-scanning trucks were 3x more productive in the same working day than that of their traditional counterparts.

Beyond the potential increase in data collection, more importantly is the increase of quality sustained with the digital side-scanning technology over traditional systems.

The digital side-scanning technology advancement most notably enables us to view the interior of a pipe like never before, not missing a single detail.

By removing the need to pan and tilt while traversing the structure, the time savings and production instantly increase. Because the camera captures the entire 360 degrees of the pipe, this means fewer errors, elimination of repeat inspections, and high resolution images to ensure the condition assessment of the pipe will be accurate and properly coded, resulting in the correct rehabilitation or repair call being scheduled.

Digital side-scanning technology is a comprehensive data collection platform that offers high quality video inspections at a rapid rate that meets accelerated time frames for inspections, especially in regards to fulfilling consent decree requirements and EPA expectations, enabling the end user to do more with less. Additionally, the system improves accuracy and consistency even though inspections are completed within a compressed time frame.

The CUES **DUC** Digital Universal Camera Side-Scanning System can meet the need of every municipality regardless of size.

CONCLUSION

There are vast challenges ahead pertaining to wastewater infrastructure maintenance and rehabilitation. It is essential to adapt new condition assessment processes and systems such as Digital Side Scanning in order to meet these requirements. Traditional pipeline inspection has worked well for years in municipalities, but most are faced with a new set of objectives and problems.

Not every new technology that enters the market is worth adapting. It is important to perform due diligence to verify that the new wastewater inspection systems now available will meet your long term requirements, be cost effective, and produce a positive return on investment.

Digital side-scanning technology will provide a comprehensive, 360-degree view of the pipeline while allowing rapid condition assessment to make intelligent, informed decisions on where to spend repair and replacement dollars.

Pipeline condition assessment and maintaining a fleet of inspection vehicle is expensive. However, the expenses of not having an inspection program that utilizes the best available technologies on the market can be even greater.

Digital side-scanning technology can help you identify costly infiltration and thus save funds related to pumping, treatment, and disposal.

Digital side-scanning can help you rapidly identify problem areas and major pipeline issues thus allowing you to react before there is a back-up and possible fines due to an overflow.

By maintaining an inspection program that includes digital side-scanning technology there is less risk of regulatory action and an enhanced reputation for proper operation and management of the public sewer system.

Ensure you are investing your budgetary dollars wisely into technologies and programs that can provide benefits on several levels to offer the best possible return on investment. Digital side-scanning technology is proven, reliable, and will surely accelerate your municipality in the direction of success.

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ABOUT CUES

About CUES, a Subsidiary of SPX Corporation - As the world's leading manufacturer of water, wastewater, and stormwater inspection equipment, CUES provides the necessary tools for both pipeline inspection and repair. For 50+ years, CUES has manufactured the most rugged and reliable pipeline inspection equipment in the industry. CUES also offers a range of advanced systems, such as SONAR, LIDAR, and LASER PROFILING, for those requiring more detailed inspection data. For more information, visit www.cuesinc.com.

CUES is fully dedicated to providing the finest after-sales service in the industry! This is guaranteed by our investment to provide the largest field engineering and technical service department, the largest inventory of replacement parts, and a dedicated staff of service and repair personnel for our industry.

Customer Service is our top priority at CUES. The process of customer service precedes the sale of equipment, continues upon delivery, and extends for the duration of equipment use and thereafter. Additional independent sales and service representatives are located in more than 20 states and around the world to serve our customer's needs. CUES will be there to support you!

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