TECH TIPS FROM NASSCO

Tech Tips by NASSCO is a bi-monthly article on trends, best practices and industry advice from NASSCO's trenchless technology membership professionals.

INSPECTION TECHNOLOGY FOR OUTFALLS, SIPHONS, AND FORCE MAINS

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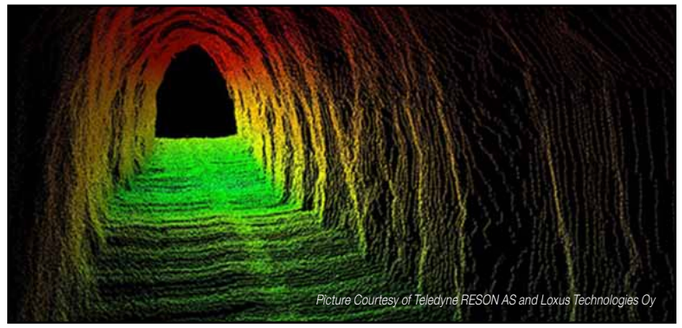
Robotic cameras utilizing Closed Circuit Television (CCTV) have been used since the 1960s to inspect sewer main lines, but CCTV cameras can only clearly inspect the pipe interior above the water line. Submerged assets such as outfalls, siphons, and force mains have historically been much more difficult to inspect due to the inability to remove these assets from 24/7 service, and due to the technology limitations that hinder a detailed inspection while in service. Consequently, these assets have mostly operated without any inspection, and with very little maintenance, since they were first constructed. However, there are more sophisticated technologies that can provide valuable information about these important submerged assets.



Picture Courtesy of Teledyne RESON AS and Loxus Technologies Oy

New 2D and 3D Sonar technology provides much greater detail under water by using multi-beam imaging technology that corrects for motion and position changes of the deployment platform to create high definition images.

Sonar Profiling
Sonar is an acoustic testing method that provides a scan of the submerged portion of an asset. Sonar can profile the interior of a siphon or outfall, providing information on the level of debris inside of an asset, and also the structural integrity of that asset. However, as sonar will only report on what the acoustic wave hits, anything hiding underneath piles of debris or grease will not be discovered. Typically, sonar is first deployed to determine if a submerged asset needs cleaning. If there is debris in the asset, cleaning should follow so that an unobstructed sonar scan can be obtained, then the asset is re-inspected with sonar.

Sonar can be deployed on a floating raft, tractor platform, Remotely Operated Vehicle (ROV), or in a sonar cage. Sonar Profiling provides a circumferential profile scan, or 'slice', of the pipe interior, but results cannot be PACP coded as it is difficult to clearly identify the exact nature of a defect because of the one-dimensional view. Sonar does provide one of the best evaluations of wastewater assets that cannot be removed from service, and where lack of water clarity would prohibit an underwater inspection with a CCTV camera. If an asset can be cleaned, bypassed, and dewatered, CCTV inspection is still the best method to assess the condition of a submerged asset through visual identification and PACP coding of all defects. Sonar profiling can be completed in sewers and chambers that are 8" and larger.

2D and 3D Sonar
New 2D and 3D Sonar technology provides much greater detail under water by using multi-beam imaging technology that corrects for motion and position changes of the deployment platform to create high definition 2D and 3D sonar images under water. Multi-beam sonar operates in a very similar way to laser scanning. In fact, the sonar point cloud can be exported and joined with LiDAR data (3D Laser that measures the pipe above the water line) to create above and below surface models. The technology uses thousands of overlapping narrow beams to create a continuous 360° profile to create a dense 3D point cloud. This technology was designed to be mounted on a lightweight ROV to provide mobility and control to the sonar unit, and was invented for the inspection of dams and deep underwater structures, but can be used for large diameter outfall inspections, tunnels, and sewer lines. The minimum range for the 2250KHz sonar system is approximately 1.6 feet from the sonar transducer, which equates to a pipeline that is at least 4 feet in diameter.

Where water turbidity is low, and the water is essentially clear, ROVs have been a successful technology to deploy CCTV and sonar to inspect large diameter assets. Powerful lighting on the ROV can typically illuminate a pipe interior sufficiently to perform a CCTV Inspection and PACP coding of defects. Sonar can also be added to the ROV to simultaneously obtain sonar data. ROVs are either controlled via a fiber optic cable or can be free-swimming.

Live View CCTV, Leak Detection and Pipe Wall Scanning
Several newer technologies provide live CCTV, leak detection via a hydrophone, sonde for locating, and pipe wall thickness scanning. These tools can be vital for small diameter force mains, siphon inspections, and water mains that cannot be removed from service, although CCTV results are limited by water turbidity. One such technology only needs a 2-inch insertion point, and the asset can remain live and in service with up to 230 psi operating pressure. Inspection range is for pipelines from 3 inches, up to 45 inches in diameter.