

Nautilus™ Solves Large Diameter Water Loss Challenges in Colorado

CASE STUDY



Characteristics of the sections inspected:



Location
Longmont, CO



Pipeline Diameters
20-Inch, 22-Inch



Lengths
4 Miles



Material
Steel

OVERVIEW

With measured water loss exceeding 80,000 gallons per day and an annual revenue loss of approximately \$100,000, the City of Longmont had a significant problem that needed to be addressed quickly. Faced with a non-surfacing leak on two pieces of critical infrastructure, the City enlisted the support of Dewberry Engineers to research and identify appropriate solutions to assess the parallel pipelines. While initially slated for a competing technology, Dewberry and the City ultimately decided to utilize Hydromax USA and the Nautilus System based on its unmatched value, ease of deployment and proven results.

PROJECT DETAILS

Dewberry Engineers partnered with Hydromax USA to inspect the Price Park transmission pipelines. The parallel 20-inch and 22-inch steel pipes were constructed in 1924 and 1932 respectively and have a normal operating pressure of 60-80psi. For this project, three taps were installed to accommodate the Nautilus insertion and extraction systems.

PROJECT CHALLENGES

To reduce construction costs prior to the inspection, all parties agreed to use just one insertion point for the inspection of both pipelines. One 4-inch tap was installed upstream of the bifurcation point for the parallel transmission mains. To inspect the 22-inch main, the 20-inch main needed to be valved off. Nautilus would then have to avoid a blind tee created by this closed valve and make a 90-degree turn. By maintaining a constant flow during the inspection and due to the advanced engineering that allows Nautilus to

stay in the center of the flow, the device was able to make the turn with ease and fully complete the run.

CONCLUSION

Nautilus navigated both pipelines with ease. Results from the Nautilus audio recording indicated the transmission pipelines were predominantly intact, apart from a significant leak where the 20-inch main intersected a major roadway. HUSA staff confirmed the leak location with a geophone and by the presence of chlorinated water in a nearby storm manhole. This finding gave Dewberry the critical information they needed to provide the best guidance to the City. Excavation revealed the leak was located at the top of the pipe at a joint, so The City and Dewberry removed the bell/spigot and welded over the joint, resulting in a relatively simple solution to an expensive problem. Nautilus was able to pinpoint the source of the \$100k per year water loss within three feet of the marked-leak location and saved the City the cost of slip lining both pipes.



"A non-intrusive and cost-effective method for leak detection on large diameter pipelines."

– Alexander Doksa
Civil Engineer, City of Longmont

THE TECHNOLOGY

Originally developed in Spain in 2015 by Aganova, the Nautilus System has recently been introduced in the US market by Hydromax USA. The Nautilus System consists of a small, neutrally buoyant sphere that is inserted into the network where it travels freely, driven by the flow of water in the pipe. Sounds generated by a leak, gas pocket or anomaly have unique characteristics. The device captures the sound of these from inside the pipeline. Once the device is extracted, software processes the compiled information using a mathematical algorithm to determine the location of leaks, gas pockets and anomalies encountered.

PRE-LAUNCH ASSEMBLY

Encompassing the full internal diameter of the pipeline, the Nautilus System catch net is installed prior to any insertion. The proper placement and alignment of the net is verified using a built-in camera system allowing real-time verification for field crews.



INSERTION AND NAVIGATION

Hydromax USA team launches Nautilus, typically via insertion at a vertical valve, and the sphere is released into the flow of the water. Nautilus creates an audio recording as it moves with the flow of water.

Neutral buoyancy provides Nautilus the most optimal means of traversing the pipeline. Traveling in the center of the pipe allows Nautilus to avoid many obstacles including sediment build up and more easily navigate butterfly valves. Additionally, traveling in the center of the pipe allows Nautilus to utilize the most efficient velocity provided by the pipeline.

Prior to inserting the Nautilus System, the Hydromax USA team places synchronizers at intermediate locations along the pipeline using existing accessible features such as hydrants, valves, etc. The synchronizer devices serve as reference points for the Nautilus sphere as it traverses the pipeline and help to optimize the accuracy of the results.

NAVIGATION

Once Nautilus has reached the end of the test, the team is alerted via camera and an alert system. It is captured in the net and safely removed from the pipeline.



MEASURABLE RESULTS

Once the sphere is extracted, the recorded sounds are processed and analyzed using the Nautilus Systems' proprietary algorithms. (The data contains different spurious noises that are filtered by several processing techniques.) The final inspection report provides for each identified leak, gas pocket, and anomaly a range of observations, including but not limited to:

- Acoustic recording supported by visual plot (Colorimetry) of the identified discrepancy.
- Prioritization level for each identified leak.
- GPS /GIS deliverable of all findings and all project appurtenances in ESRI compliant format.

