





**CASE
STUDY**

Putting Nautilus™ to the test in the Navajo Nation

Characteristics of the sections inspected:

-  **Location**
Navajo Nation, NM
-  **Pipeline Diameters**
24-inch
-  **Lengths**
16 miles
-  **Material**
Fiberglass

Overview

As a premier heavy, civil and utility contractor who focuses on core values of excellence, service and employee development, Navajo Engineering and Construction Authority (NECA) along with the Bureau of Reclamation (BOR) constructed and installed a 24-inch fiberglass raw water transmission main in New Mexico. The main stretches along miles of remote landscape within the 27,000 square miles that make up the Navajo Nation, spotted only periodically by oil derricks. The recently constructed pipeline often saw pressures reaching up to 200 psi in some regions and subsequent pressure isolation tests had identified possible issues along the buried pipeline. Estimated to only be a 3 gallon per minute leak, NECA and the BOR sought out to identify any trouble spots and remedy them prior to the pipeline being brought fully online for a newly under construction water treatment plant.

Project Details

Navajo Engineering and Construction Authority set out to identify a technology in the marketplace that could identify the locations of the pressure loss that was both efficient budgetarily as well as operationally. Comparing similar inline leak detection tools on the market, NECA ultimately chose Hydromax USA's Nautilus System as it surpassed the competition in both fields of price and effectiveness.

Project Challenges

For optimal results, the Nautilus System relies on continuous and consistent flow. Understandably, challenges can and will arise even with the best project planning. Fortunately, the Nautilus System is capable of adapting. During the assessment of the 24-inch fiberglass pipeline the pumps driving the raw water through the transmission main failed two separate times while the Nautilus sphere was traversing the pipeline. While this

created challenges in the analysis of the data, Hydromax USA was able to adapt to the field changes and successfully perform the analysis, identifying the locations of leakage.

Conclusion

Having successfully navigated the nearly 16 miles of 24-inch fiberglass pipeline, Hydromax USA delivered the findings to NECA. Nautilus's free flowing neutrally buoyant inline leak detection tool identified 4 leak locations along the 16 miles of remote pipeline. In the delivered report each leak location is provided as a distance between two known assets. A priority level based on various factors is also included and is meant to help prioritize which leaks should be mitigated first. NECA took the reported findings and successfully excavated, located, and remedied the identified water loss of all 4 leaks as identified by Nautilus.



"Pipeline leaks don't always surface. The Hydromax team and Nautilus technology quickly identified our problem areas enabling us to complete the repairs and finish the project."

— Frank Smith
Operations Manager, NECA

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 & 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.

EXTRACTION

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.

