

Xylem Delivers Actionable Data Within a Tight Time Frame to Enhance the Safety and Resilience of a Nuclear Power Plant

DEWATERING AND PCCP INSPECTION PROVIDE COMPREHENSIVE INSIGHT INTO PIPELINE CONDITION

Nuclear power plants operating in the United States are accountable to high safety standards set by the Nuclear Regulatory Commission. Operators of a plant located in the southern U.S. region commissioned Xylem to conduct a condition assessment of the plant's 120-inch diameter prestressed concrete cylinder pipe (PCCP), which carries water to and from the turbine building and the cooling tower. The goal was to evaluate the state of the pipelines and ascertain any repair work required.

A condition assessment helps to understand the state of the prestressing wire which provides the pipe's strength. PCCP manufactured during the 1970s is prone to low ductility in the wire and susceptibility to hydrogen embrittlement, both of which increase the risk of failure. Worn PCCP can rupture with no warning, potentially shutting down the entire facility. This condition assessment was planned to preempt any such shutdown. The purpose of the project was to identify distressed pipes that needed rehabilitation within two intake lines and two discharge lines totaling approximately 2,900 linear feet.

Challenge

A key challenge of this pipeline condition assessment was the limited time frame within which the Xylem team had to operate. The assessment was scheduled to take place during one of the plant's planned outages, which enable inspections or maintenance work to take place while the reactor is refueled. Since power is not generated during an outage, all work needs to be completed as quickly as possible, so that the reactor can resume generating revenue for the utility owner.

One of the reasons Xylem was selected for the project was the team's ability to manage all aspects of the task - including both the dewatering and the pipeline condition assessment.

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Solution

First, the pipelines first had to be dewatered. The Xylem team managed this using twelve Godwin diesel CD150MV pumps with 1,500 feet of suction hose. Xylem's Godwin MV Series pump features a vacuum pump priming system, making it perfect for the long lengths of suction lines needed for this project. Despite restricted entry points and the large volume of water to be pumped, the team completed the task within two days - a very short time frame for this task - allowing the inspection team to begin on schedule.



Twelve Godwin CD150MV pumps and 1,500 feet of suction hose were used to dewater the pipelines, to allow the condition assessment to take place. Xylem selected this pumping solution to handle the volume of water that needed to be removed in the short time frame available.

PROJECT HIGHLIGHTS:

- The plant worked with a single expert team capable of managing all aspects of the project, including both dewatering and pipeline condition assessment.
- The Xylem team carried out all necessary tasks within the tight time frame of the scheduled plant outage.
- Actionable data helped the customer to make informed decisions and prioritize repair work.
- The inspection and subsequent targeted repair work will enhance the plant's safety profile, supporting license renewal and the ability to carry out future work.

SOLUTIONS:

- Twelve Godwin CD150MV pumps and 1,500 feet of suction hose
- Xylem's PipeWalker electromagnetic technology, and visual and sounding services for pipeline condition assessment

Dave Donahue, Power Generation National Sales Representative for Xylem, said, "Working across the entire water spectrum enables us to provide customers with a complete solution. Xylem's water and fluid management expertise extends across the entire power generation operation, from sourcing to dewatering to treatment and reuse. Combining pumps and mixers with smart and analytical technologies, our team can engineer solutions that increase productivity, reduce costs and turn water management from an expense to a strategic advantage. We draw on our broad portfolio and extensive experience to provide customized solutions for each customer's unique challenge. One aspect of this project was a finite time frame available to us; we had to complete the job during the outage and provide actionable data to the client within 48 hours after the inspection's completion, before the plant went back into operation."

Xylem's PipeWalker electromagnetic inspection tool provides a non-destructive method of evaluating the condition of the wire. It is capable of detecting broken prestressing wires and estimating the quantity and location of wire breaks for each pipe section. The Xylem team performed a manned electromagnetic inspection, combined with an internal inspection of the pipelines involving visual and sounding techniques.

Jeremiah Fagan, Assessment Services Business Development Manager for Xylem, said, "These inspection techniques are complementary and, when combined, offer the best baseline assessment of a PCCP pipeline. Manned visual and sounding inspections are carried out in dewatered pipelines to identify and document visual distress indicators such as cracks or spawls, and to listen for hollow areas that typically indicate that core compression in PCCP has been lost."

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Result

Xylem conducted a complete dewatering and pipeline condition assessment that provided actionable data within a tight, agreed time frame. A number of the 204 pipes inspected were determined to have broken wire wraps. Out of those, ten pipes showed signs of visual distress, in addition to more significant prestressing wire damage. This information helped the customer to make knowledgeable decisions and prioritize repair work, which is planned for the next scheduled plant outage. Without the insight provided by the inspection, plant operators could have been faced with extensive pipeline replacement, difficult construction and extended downtime, all of which would cost several millions of dollars in repairs, as well as the potential for fines if the pipelines were to rupture. This inspection and the subsequent targeted repair work will enhance the plant's safety profile and support license renewal.

Fagan continued, "Nuclear industry operating costs need to be minimized, to make the price of generated power as competitive as possible. Our inspection and the resulting data delivered within a limited time frame provided our customer with the ability to plan and budget for strategic and surgical repairs, and generated confidence in the plant's safety and system integrity."



The Xylem team is pictured performing a visual and sounding inspection of the pipelines. This provides an additional data set to compare with information collected during an electromagnetic examination, and increases confidence in the location and presence of wire breaks and significant pipe wall deterioration.



The Xylem team is seen here performing a manned PipeWalker electromagnetic inspection of the pipelines. This provides high resolution condition data about the pipe wall and prestressing wires.