

Fortum Power and Heat Polska – Wrocław, Poland

SMARTBALL® TECHNOLOGY USED TO SUCCESSFULLY IDENTIFY LEAKS ON VACUUM-INSULATED HOT WATER PIPELINE, GUIDING REPAIR DECISIONS AND IMPROVING SERVICE RELIABILITY

Fortum's core business in Poland is high-efficiency combined heat and power production and heat distribution. The company aims to develop sustainable solutions for cleaner cities, meeting the needs of local communities.

District heating pipelines make sense from an environmental perspective. Throughout Northern Europe, many municipalities operate closed-loop systems of vacuum-insulated pipelines that circulate hot water for heating businesses, homes, roads, sidewalks, and more. A central heat source, commonly a power plant, heats the water. Insulated supply pipelines transport this outbound hot water to customers. Without water ever leaving the system, inbound cool water is recirculated through a return line. This efficient method of heating structures boasts a 98 percent heat retention rate during transmission.

Challenge

Fortum wanted to understand the true condition of a suspect section of its district heating pipeline in Wrocław, a historic city of 630,000. District heating pipelines typically consist of an outer jacket pipe, a heat insulation layer, and an inner pipe. Fortum suspected a section of its return pipeline had a leak, as water was observed in the annular space between the jacket and the inner pipe.

District heating pipelines incorporate numerous 90-degree bends and u-shapes to allow for expansion and contraction as the product temperature changes. A pipeline with these challenging configurations precludes the deployment of many traditional condition assessment solutions.

Additionally, district heating pipelines carry very hot water, which limits the use of inline inspection tools that may succumb to such high temperatures. The same insulation that prevents heat loss also makes the pipeline well insulated against sound transfer. This makes it difficult or impossible to hear acoustic leaks from the pipe exterior. Additionally, Fortum was understandably averse to compromising the integrity of the line's vacuum seal, and therefore, did not wish to expose the inner pipe to mount sensors.



PROGRAM HIGHLIGHTS

- SmartBall inline leak detection inspection identified six leaks over 11 kilometers
- Inspection identified 90-degree bends and u-shapes in pipeline
- Inspection results guided repair decisions to improve service reliability and Wrocław's resilience to water-related failures

SERVICES PROVIDED

- SmartBall® leak and gas pocket detection

PIPE MATERIAL: Steel

INSPECTION LENGTH: 11 kilometers

DIAMETER: 900-millimeter and
1000-millimeter pipe

Solution

In 2018, Heat Polska, at the request of Fortum, retained Pure Technologies, a Xylem brand to provide a pilot inspection of an older section of the Wroclaw district heating line. To meet the challenges outlined above, Pure Technologies deployed its **SmartBall® platform**, an inline, free-swimming technology that detects acoustic anomalies associated with leaks and gas pockets in pressurized pipelines.

Because the SmartBall platform could not be tracked externally in this case, other reference points in the data were critical for accurately locating anomalies within the pipeline. SmartBall technology contains gyroscopes that can display directional changes as the tool traverses the pipeline. The many 90-degree bends in the district heating line were identifiable in the data, providing great geospatial reference points that enabled Pure Technologies to locate anomalies with confidence.

As this was a pilot inspection – the first of its kind in Poland – Fortum intentionally simulated two leaks to verify the SmartBall platform's performance.

"This was the first time in the country using the innovative SmartBall tool to inspect for leaks, and the electronic device passed the exam perfectly, detecting weak points at risk in the network..."

Thomas Adamiok, Supervising Manager, Fortum Power and Heat Polska

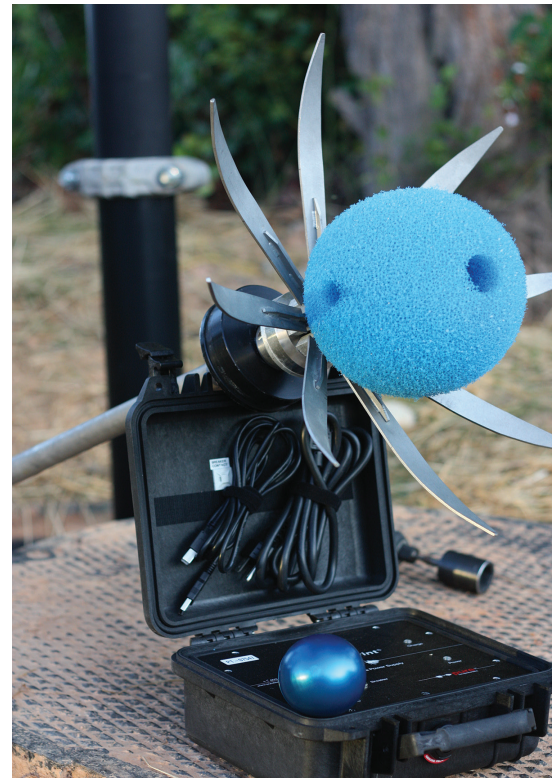
Outcome

The pilot inspection took place over two days – one day for the supply line and another for the return line – without any negative impact on operations. Pure Technologies inspected just over 11 kilometers of the district heating system's supply and return pipelines, including 9.2 kilometers of 1000-millimeter internal diameter steel pipe and 2.2 kilometers of 900-millimeter internal diameter steel pipe. In the end, Xylem's analysis team provided Fortum with the actionable information they needed to proactively manage their district heating line and improve Wroclaw's resilience to water-related failures.

Acoustic data recorded by the SmartBall platform was analyzed and cross-referenced with position data to precisely locate the detected anomalies.

The SmartBall pilot inspection identified six leaks clearly visible in the data, including two on the supply line (one simulated) and four on the return line (one simulated). No gas pockets were detected.

Fortum now has rich and valuable data on the overall condition of this high-priority pipeline. With the data and recommendations provided by Pure Technologies, the utility is now better equipped to make the best possible remediation decisions to aid in future capital planning.



District heating pipelines carry very hot water, so they pose challenges for leak detection technologies that can succumb to such high temperatures. The SmartBall platform has been tested in district heating pipelines with temperatures up to 105 °C.

"Thanks to our leak detection inspection and the innovative SmartBall device, the citizens of Wroclaw can look forward to the heating season in peace..."

Włodzimierz Popielewski, Manager of Investment and Purchasing, Fortum Power and Heat Polska