



Silo AI Develops Intelligent Digital Optimization Service for Finland's Water and District Heating System Operators

Using the Bentley iTwin[®] Platform Results in Record Project Delivery Times and Improves Energy Efficiency

OPTIMIZING AGING CITY PIPELINE NETWORKS

Finland maintains over 16,000 kilometers of district heating pipelines and, approximately 3,000 kilometers of water and sewerage lines in the Helsinki metropolitan area alone. A significant portion of these networks are aging and expiring, resulting in water leaks, higher costs, and unreliable service for pipeline network customers. The inefficient network performance and leakages increase fuel consumption and wasted water, which is not only detrimental from a business perspective, but also environmentally. To improve performance, reliability, and energy efficiency of Finland's water and district heating networks, Silo AI initiated a project to develop a smart, data-driven asset optimization service for city pipeline operators.

As the largest private artificial intelligence (AI) lab in the Nordics, Silo AI develops customizable, AI-driven solutions and products to enable intelligent monitoring and forecasting in city infrastructure, energy, and logistics. The company set out to pilot their digital pipeline optimization solution in cooperation with Helsinki Environmental Services Authority HSY and Suur-Savon Sähkö Oy, one of the largest grid operators in Finland. The goal was to enable these system operators to offer more sustainable energy services, optimizing performance of district heating assets and eliminating pipeline leakages. Known as Silo Flow the system optimization service will help predict network failures and prioritize proactive asset maintenance to avoid costly repairs and potential network shutdowns, ensuring efficient and reliable service while minimizing environmental impact. "Silo AI's service will increase energy efficiency, performance, and productivity of [our] customers' network systems by several percentages," said Harri Kaukovalta, business development executive at Silo AI.

DISPERSED DATA SOURCES AND MANUAL WORKFLOWS

System operators have been trying to localize leakages by different methods. However, these methods take place only after the leaks have occurred, requiring extensive repair and often resulting in service interruption. Silo AI sought a proactive solution to optimize pipeline operations, using AI and data analytics to pinpoint areas prone to leakage and prioritize pipeline maintenance renovations. They wanted to develop a digital twin model to identify and predict network failures before leakages occur. However, previous workflows required a combination of numerous data sources in various data formats, resulting in partial and inaccurate representations of the network. "Today, scattered data sources make it difficult to have a holistic overview of the pipeline network health, and manually driven investment planning takes only a very limited amount of data sources into account," said Kaukovalta.

The multisourced, disparate data and manual workflows prevented operators from accurately identifying potential risks and proactively addressing them before they become costly, environmentally damaging problems, leading to shutdowns and interrupted service. Operators had to aggregate the data and visualize their network in its entirety to predict and prioritize pipeline maintenance. "This is where Silo Flow can provide an answer where you can optimize your network assets by investing in the right locations, at the right time while guaranteeing a high level of services for your customers," said Kaukovalta. However, to execute their solution, Silo AI needed a user-friendly, web-based interface. They sought to integrate the multiple pipeline data sources and perform advanced data analysis

PROJECT SUMMARY

ORGANIZATION

Silo AI

SOLUTION

Water and Wastewater

LOCATION

Helsinki, Uusimaa, Finland

PROJECT OBJECTIVES

- ◆ To combine a digital twin with AI, creating a prediction model for proactive network maintenance.
- ◆ To ensure efficient, reliable, and sustainable network water and district heating services throughout Finland.

PROJECT PLAYBOOK

iTwin

FAST FACTS

- ◆ Silo AI developed a smart, data-driven asset optimization solution for city pipeline operators.
- ◆ Known as Silo Flow, the service predicts pipeline leakages and identifies the potential cooling upside of district heating systems.
- ◆ Leveraging iTwin facilitated data integration and provides a holistic visualization of the pipeline network.

ROI

- ◆ Bentley's flexible and user-friendly application cut visualization efforts by 50%.
- ◆ Silo AI decreased their customer's district heating network supply temperature by 3 degrees, improving energy efficiency and fuel consumption.

“Silo AI developed the whole system, including several other data sources, AI models, and a visual analytics user interface utilizing the iTwin Platform.”

– Harri Kaukovalta, Business Development Executive, Silo AI

in a digital platform, providing operators a visual, comprehensive overview of asset health, systematically identifying and addressing leakages before they occur.

DEVELOPING A DIGITAL PREDICTION MODEL

To predict pipeline maintenance needs and optimize network management, Silo AI developed its smart Silo Flow prediction model based on the Bentley iTwin Platform. The solution combines Silo AI's advanced data analytics with Bentley's digital, cloud-based interface for easy, accessible visualization of the pipeline data and assets. “Bentley's iTwin framework offered a simple and straightforward way to visualize data and data analysis results,” said Kaukovalta. Combining advanced data science with cutting-edge visualizations, district heating and water network operators can pinpoint assets in need of maintenance prior to leakages or asset failure. They can optimize their network to timely invest in the right locations, ensuring safe and reliable service while promoting energy efficiency and carbon neutrality.

As the foundation for Silo Flow, Silo AI used the Bentley iTwin Platform to integrate the multisourced data into a living digital twin and aligned it with reality data, sensors, and AI without any additional equipment needed by the network operators. The combined solution can consolidate and analyze data into an understandable, valuable format facilitating data-driven decisions. “We built a solution for city pipeline infrastructure owners to predict pipeline failures and increase operation efficiency of district heating by several percent,” said Ville Hulkko, cofounder of Silo AI.

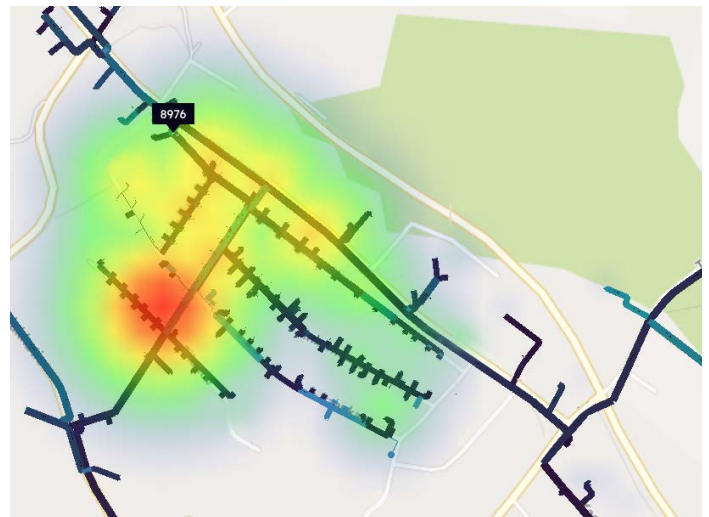
Working within a fully accessible visual interface, operators can achieve comprehensive insight into asset health, and analyze and predict where better cooling can bring savings and more efficient productivity, optimizing heat balance in district heating as well as water flows throughout the network.

SMART SOLUTIONS DRIVE SAVINGS AND SUSTAINABILITY

The Bentley iTwin Platform was easy for Silo AI to use. It allowed them to integrate data and visualize the new data analysis capabilities that they implemented. The flexibility and interoperability of Bentley's application shortened the project time, and any needed additions were easy to make to the digital platform. Using iTwin reduced visualization efforts by 50% and significantly reduced delivery time for the digital AI leakage prediction and flow optimization solution. “The project was delivered in a record time just because [the Bentley iTwin Platform] was so easy to use and make great visualizations real,” said Kaukovalta.

Having easy accessibility to the data and visually analyzed results, network operators can improve pipeline operations. The iTwin-based smart solution offers a holistic view of pipeline network health, where maintenance needs and potential risk areas are clearly identified and visualized. It predicts and prioritizes pipeline maintenance to ensure customer satisfaction and sustainability, avoiding unwanted shutdowns of the grid, environmental damage, and waste from leakages. The successful project decreased the client's district heating network supply temperature by 3 degrees, improving energy efficiency while decreasing fuel consumption. “Silo Flow adds predictability and restores control over your system. It also helps you to optimize energy production,” said Kaukovalta.

With one degree cooling improvement providing a 1% to 1.5% increase in the network energy performance, system operators can deliver more sustainable service and increase ROI through pipeline system optimization, preventing leakages, eliminating lost resources, and budgeting future maintenance and network investments. By combining progressive data science with advanced visualizations in a digital twin platform, Silo AI is simplifying decision-making for network operators, enabling straightforward conclusions to support reliable heating and water access crucial to quality of life. “The solution is currently being scaled up for multiple customers and pipeline types,” said Hulkko.



Silo AI developed a smart, data-driven asset optimization solution for city pipeline operators.