

VDT Technology presents digital twin of the Železná Ruda Water Treatment Plant: innovative monitoring and simulation of operations

Prague, 26 February 2024 - VDT Technology, a leading developer of digital applications for the water industry, has, in collaboration with partners, successfully concluded an innovative scientific and research project aimed at simulating and optimizing the operation of water treatment plants. The primary objective of the project was to create a virtual twin of a water treatment plant and evaluate its practical utility. Partner organizations included the University of Chemical Technology, the Institute of Hydrodynamics of the Czech Academy of Sciences, the International Safety Institute, and the municipality of Železná Ruda.

The project consortium approached the Železná Ruda authorities for participation as a testing authority. The municipality's role involved the provision of access to water treatment plant technologies, sharing operational data with researchers, and actively engaging in project discussions. Following the signing of a Memorandum of Cooperation, the unique two-year research initiative commenced on January 12, 2022, and has now been successfully completed.

The digital twin of the water treatment plant is an application deployed on Siemens' Insights Hub platform, utilizing neural networks and mathematical models for predictive analysis. It simulates the operation of the water treatment plant in a virtual environment, enabling operators to adjust raw water input parameters and simulate filter cycles for drinking water production based on variations in water source quality, which can fluctuate significantly throughout the year due to meteorological conditions. This is the case in Železná Ruda, for which the primary water source is the Grádelský Brook.

"The digital twin is a computer model that perfectly replicates the entire water treatment plant. We can run simulations on this model to test how the water treatment plant behaves in different situations. In addition, the model automatically warns of adverse conditions, reducing the risk of machine downtime and interruptions in the supply of drinking water to the population," explained Petr Dolejš from the Institute of Water and Environmental Technology at the University of Science and Technology in Prague.

The predictive algorithm used in the digital twin enables prediction of the timing for the next filtration cycle. This knowledge empowers operators to adjust operations in response to significant increases in drinking water demand, such as during weekends or peak tourist seasons, optimizing filtration cycle lengths while suggesting necessary adjustments to plant setups and maintenance schedules.

Furthermore, the digital twin incorporates Siemens' COMOS system for comprehensive technical documentation through object-based architecture. This system ensures the management of individual devices as objects with unique specifications, associated documentation, and interconnections, facilitating automatic generation of required technical documentation and comprehensive plant maintenance.

"Our digital twin water treatment plant brings many advantages for monitoring and controlling operations. Operators can leverage real-time data collected from sensors and equipment to simulate different operating scenarios, optimize plant performance, and predict filtration cycles, ultimately improving plant efficiency," said Lukáš Chalupa of VDT Technology.

Tomáš Koniček, from the International Security Institute (MBI), who contributed to the project by assessing operational security and proposing relevant methodologies, stated: "Our primary task was to address issues of cyber and physical security which are often overlooked. We are pleased that our efforts have resulted in recommendations for the planned update of the State Health Authority's methodology for assessing risks associated with water supply systems. These changes will significantly strengthen the security of water supply systems in the Czech Republic, both in terms of cyber and physical security."

After two years of development, the Železná Ruda water treatment plant is now the nation's first facility with its own digital twin. This pioneering project received support from the Ministry of the Interior of the Czech Republic within the Czech Security Research Programme 2021-2026, which is focused on developing security technologies (SECTECH).

The utilization of digital twins in water treatment plants is a major step forward in water management. VDT Technology's innovative approach demonstrates the potential for enhanced efficiency, decision-making, and resource utilization in the water sector, offering promising prospects for water treatment worldwide.

For more information, please contact:

Lukáš Chalupa, VDT Technology
lukas.chalupa@vdttechnology.com, Tel: 725265465

Kateřina Fričová, Best Communications
Kateria.fricova@bestcg.com, Tel.: 602515093