Digital transformation of the water industry: new technologies for efficient operations

In a world of constant change and increasing demands on the water industry, digital transformation is an increasingly critical factor in ensuring the efficiency and reliability of water treatment plant operations. It focuses primarily on intelligent monitoring systems, digital modeling and simulation built on Siemens' Insights Hub and COMOS platforms.

The latest addition to the family of water applications is the recently completed innovative scientific research project called TWIN SKIN, which was created in cooperation between VDT Technology a.s. and leading institutions and partners - the *University of Chemical Technology in Prague, the Institute of Hydrodynamics of the Czech Academy of Sciences, the International Safety Institute, z. ú. and the town of Železná Ruda* - and introduces a new digital twin technology that can significantly improve the operation of water treatment plants and infrastructure and, hand in hand, efficiency, transparency and cost savings.

TWIN SKIN, the digital twin of the water treatment plant, is an application developed on the Insights Hub platform that uses neural networks and mathematical models to predictively analyse and simulate the operation of the water treatment plant in a virtual environment. This is a revolutionary step in the water industry, allowing the input parameters of raw water to be dynamically changed and the filtration cycles of drinking water production to be simulated depending on the quality of the source water. With a digital twin, water treatment plant operators can run simulations and test the behaviour of the plant in different situations, bringing increased flexibility and the ability to anticipate problems. The predictive algorithm of this application allows predicting the time to the next filtration cycle and optimizing operations in situations of significant increases in potable water consumption.

The digital twin of the water treatment plant also includes the COMOS system, which stores complete technical documentation using an object-based architecture, allowing information about each plant to be handled individually. Each device is captured here as an object with specific specifications, documentation and links to other elements in the system. The system automatically checks the correctness of connections, flow directions and device locations on the diagrams. Based on the data entered, the system generates supporting technical documentation such as equipment lists or technical specifications for individual machines. It also allows for complete maintenance of the water treatment plant: regular, preventive and predictive, thanks to the connection with monitoring instruments and the automatic transmission of measured values.

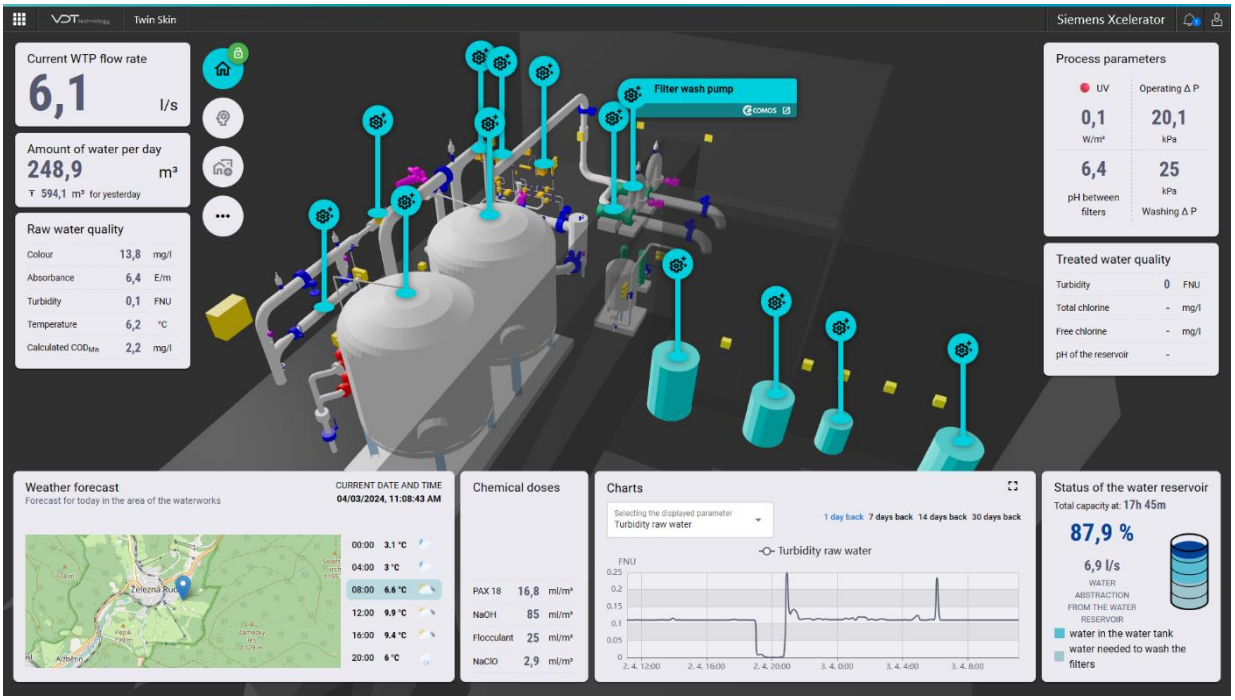
After two years of development, the water treatment plant in Železná Ruda is the first water treatment plant in the Czech Republic to have its own digital twin. This pilot project was supported by the Ministry

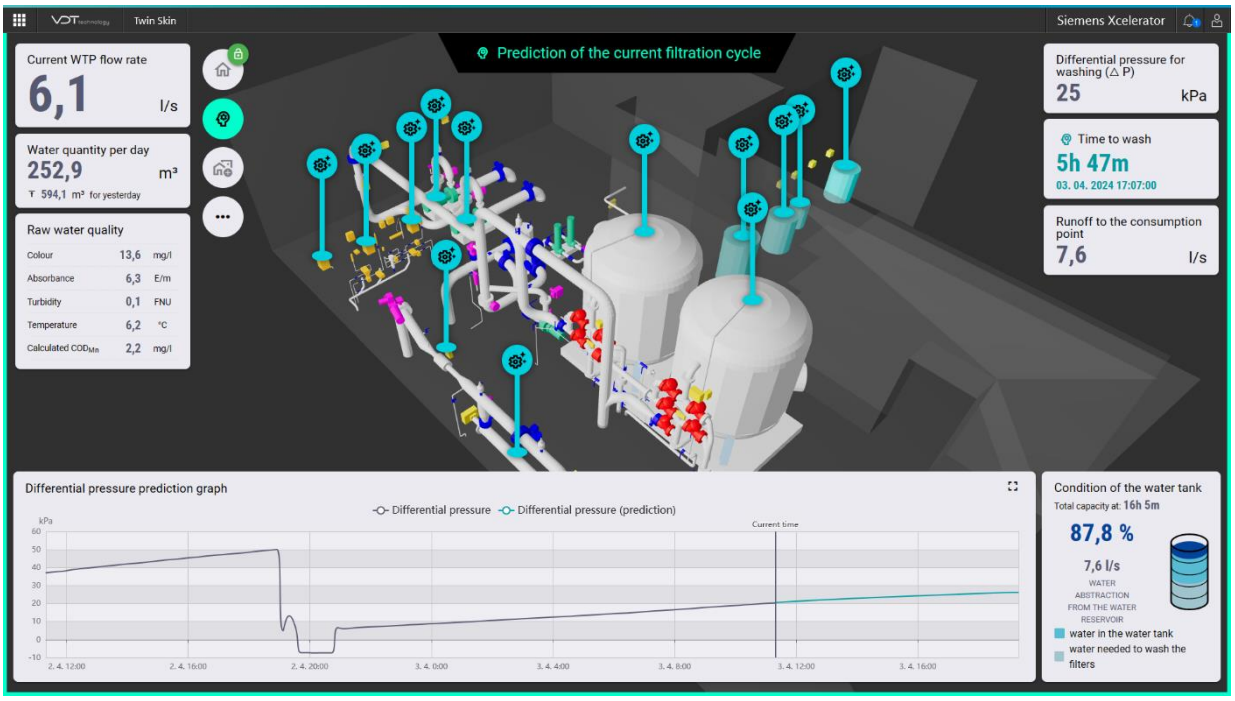
of the Interior of the Czech Republic under the Czech Security Research Programme 2021-2026, focused on the development, testing and evaluation of new security technologies (SECTECH).

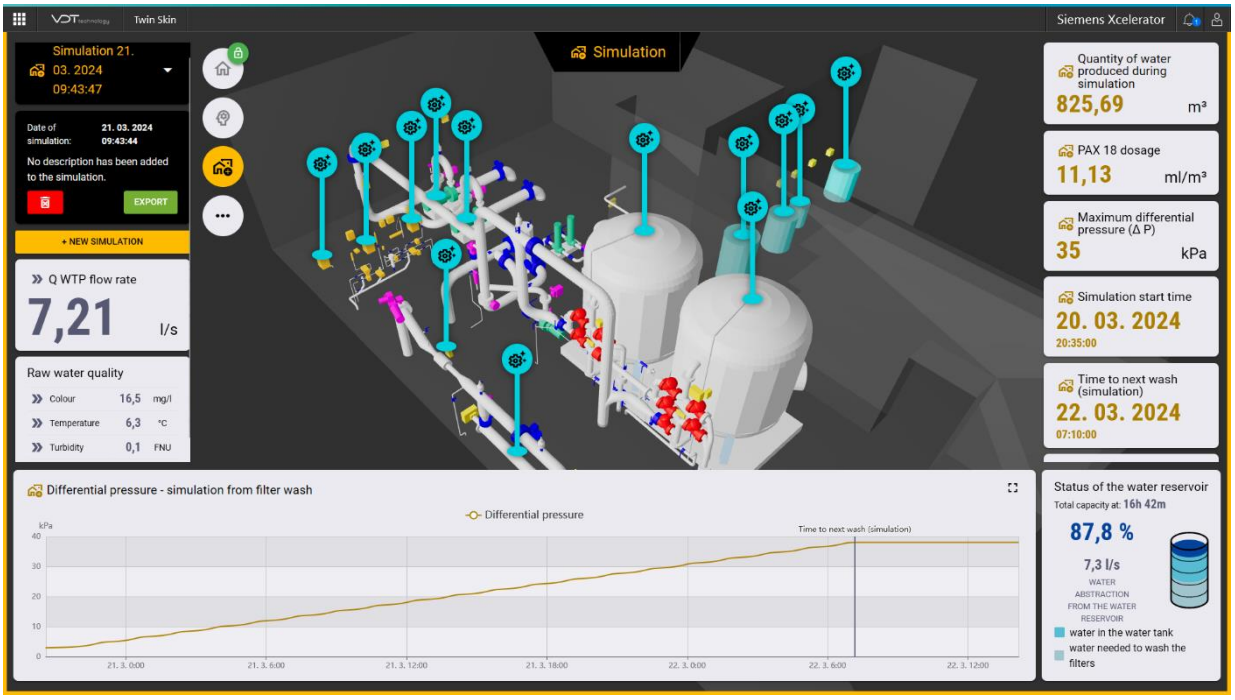
In addition to the innovative TWIN SKIN mentioned above, VDT Technology offers other useful ancillary applications such as Water Infrastructure Maintenance (WIM), aimed at monitoring and predictive maintenance of water infrastructure, Water Scan Toolbox (WST), an intelligent tool for wastewater quality prediction, and En-Key Energy Manager, an energy management application for water utilities, which provides the basis for energy audits, among others. These technologies provide a comprehensive solution for efficient management of water resources and infrastructure, optimizing operational tasks and improving energy efficiency. Comosintegration facilitates the transfer of data from the Insights Hub platform to COMOS, ensuring that the data in COMOS is up-to-date. Custom Notifier is a notification management tool on the Insights Hub platform that makes it easy to create customizable notification templates for emails and SMS messages, and allows notifications to be tailored to users' current needs.

The digital transformation of the water industry, facilitated by new technologies and applications, represents a key shift in the operation of water treatment plants and infrastructure. VDT Technology, in collaboration with major institutions and partners, is coming up with innovative solutions that not only increase the efficiency, reliability and sustainability of the water industry, but also contribute to protecting the environment and ensuring an adequate source of drinking water for future generations. These measures are in line with national and EU directives, underlining their key importance in the wider context of environmental protection and sustainable development.

VDT Technology will be presenting its latest applications for the water and wastewater industry at the upcoming 22nd edition of IFAT in Munich, one of the leading trade fairs for water, wastewater, wastewater and raw materials management.




Twin Skin
Siemens Xcelerator
Prediction of the current filtration cycle
Current WTP flow rate
6,1
l/s
Water quantity per day
252,9
m³
T 594,1 m³ for yesterday
Raw water quality
Colour 13,6 mg/l
Absorbance 6,3 E/m
Turbidity 0,1 FNU
Temperature 6,2 °C
Calculated COD Mn 2,2 mg/l
Differential pressure for washing (Δ P)
25
kPa
Time to wash
5h 47m
03. 04. 2024 17:07:00
Runoff to the consumption point
7,6
l/s
Differential pressure prediction graph
Differential pressure
Differential pressure (prediction)
kPa
Current time
2. 4. 12:00
2. 4. 16:00
2. 4. 20:00
3. 4. 0:00
3. 4. 4:00
3. 4. 8:00
3. 4. 12:00
3. 4. 16:00
Condition of the water tank
Total capacity at: 16h 5m
87,8 %
7,6 l/s
WATER ABSTRACTION FROM THE WATER RESERVOIR
water in the water tank
water needed to wash the filters


Twin Skin
Siemens Xcelerator
Simulation
Simulation 21. 03. 2024 09:43:47
Date of simulation: 21. 03. 2024 09:43:44
No description has been added to the simulation.
EXPORT
+ NEW SIMULATION
Q WTP flow rate
7,21
l/s
Raw water quality
Colour 16,5 mg/l
Temperature 6,3 °C
Turbidity 0,1 FNU
Quantity of water produced during simulation
825,69
m³
PAX 18 dosage
11,13
ml/m³
Maximum differential pressure (Δ P)
35
kPa
Simulation start time
20. 03. 2024
20:35:00
Time to next wash (simulation)
22. 03. 2024
07:10:00
Differential pressure - simulation from filter wash
Differential pressure
kPa
Time to next wash (simulation)
21. 3. 0:00
21. 3. 6:00
21. 3. 12:00
21. 3. 18:00
22. 3. 0:00
22. 3. 6:00
22. 3. 12:00
Status of the water reservoir
Total capacity at: 16h 42m
87,8 %
7,3 l/s
WATER ABSTRACTION FROM THE WATER RESERVOIR
water in the water tank
water needed to wash the filters