REFERENCE PROJECT

A Digital Twin of a Pumping Station

Using a Digital Twin to Achieve Water 4.0

German Water Partnership
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Technische Universität Berlin

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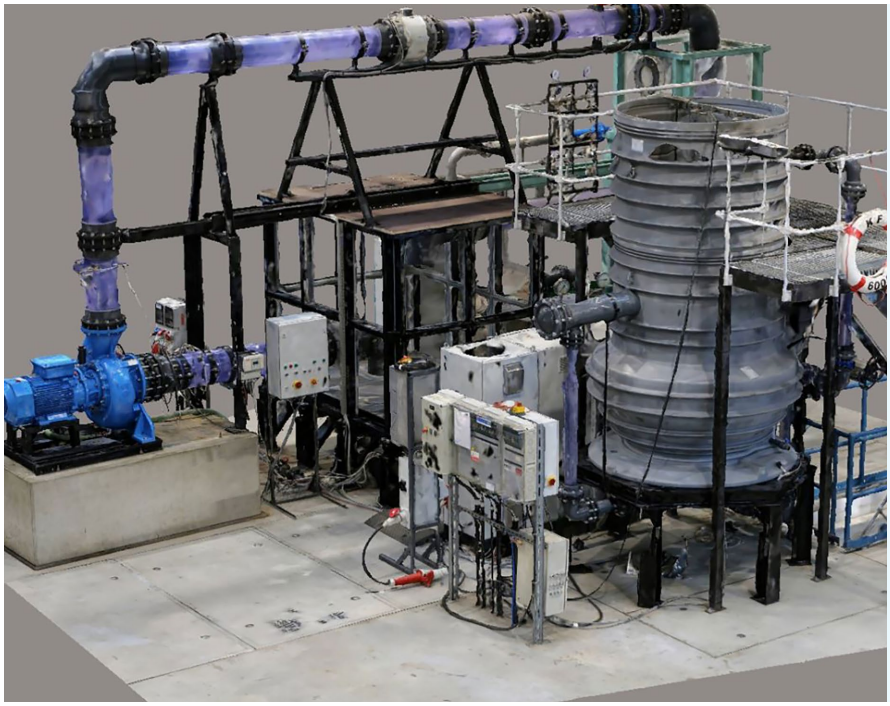

KEY DATA

A Digital Twin of a Pumping Station at TU Berlin

Background: Developing a „digital twin" of a pumping station to improve understanding of wastewater infrastructures and make them easier to manage. Digital solutions are being explored for the operation, maintenance, data analysis and networking of wastewater infrastructures.

Objective: Making optimal use of the plant and infrastructure through digitalization by interlinking the real and virtual worlds.

Result: All information is accessible in a single, digital environment. Implemented since 2019.

THE INITIAL SITUATION

Using a Digital Twin to Achieve Water 4.0

High population growth and increasingly frequent, extreme weather events—such as heavy rainfall or dry spells—pose great challenges for sustainable water resource management. This is leading to a range of issues, such as unpleasant odors from the wastewater network, severe corrosion of installation parts during dry spells, or systems overflowing due to heavy rainfall and releasing polluted wastewater. The department of Fluid System Dynamics within the Institute of Fluid Dynamics and Technical Acoustics at TU Berlin is conducting research into this area to find intelligent and interlinked solutions to tackle these existing issues. By using a digital twin of a pumping station, innovative concepts can be examined in a realistic environment, developed and used in training and further education.

IMPLEMENTED MEASURES

Making Digitalization Accessible—Specific Applications to Illustrate the Benefits

The plant was equipped with a comprehensive digitalization and automation solution provided by Siemens, which was then integrated into the pumping station test bed at TU by the company PWT. The solution covers everything from asset inventory and digitalization, process instrumentation, power supply, industrial communication and security, motor and pump management, and the process control system right the way through to systems for the engineering and simulating the plant's status.

The end result is a single digital environment for all information from the pumping station test bed, from planning to operation and maintenance data, and including partially autonomous systems for detecting faults and troubleshooting. Thanks to the bidirectional data exchange between process

engineering with Comos and the Simatic PCS 7 process control system, information is always up to date throughout the entire operating phase.

During the first phase of the project, all of the physical plant components were captured in Bentley's ContextCapture software using photogrammetry and laser scanning, before being digitalized into a 3D model. This model was then used as the base for the twin and was imported into the PlantSight software, where it was integrated with additional data to create a digital twin of the pumping station test bed, illustrating how it can be used in existing plants as well. The model data was linked to the process automation to create a complete digital twin of the plant, combining all planning and operating data throughout the entire plant life cycle.

Integrating intelligent tools into the pumping station test bed has allowed for the first innovative concepts to be implemented. This means that current and voltage profiles of the pump drive can be evaluated using the motor management system, either locally or in the cloud. Optimization potential can also be derived from the plant data using the model in PlantSight and cloud-based algorithms. This allows frequently occurring faults in pumping stations (e.g. blockages) to be detected and avoided in advance.

CONCLUSION

A Milestone on the Way to Achieving Water 4.0

The test bed—which includes a complete, genuine plant with a process control system, drive technology, sensors and actuators—is equipped with industrial components that are also used in many wastewater plants, meaning new solutions can be quickly put into practice. The entire system demonstrates how specific solutions can be integrated into a real-life plant environment and the demonstrator can be used to show real-time results. This makes the complex topic of digitalization simple and accessible, and the benefits are clear to see—e.g. for apprentices, students, planners, and employees who work on-site and on-call.

German Water Partnership

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German Water Partnership e.V. (GWP) drives innovation and gathers information using its large network of companies, trade associations and institutions within science and research. This commitment shows how efficiency can be increased and obstacles can be overcome within the sector through collaboration and an integrated approach supported by state-of-the-art digital concepts.

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