



# A digital twin for the plant

*Digital twin is a new integration platform that connects technology and operators in a unique way as it provides a holistic view of a utility's water system and enables data-driven decision-making.*

We have all dreamt at some point of having a twin who could replace us during class or do our job in our place. A twin who would be more efficient and would succeed in achieving all the goals we struggle with. But what if this twin was in fact a digital double, exactly like us, able to try out and test all the things we cannot?

The concept was developed at NASA: full-scale models of early space capsules, used on the ground to reproduce and diagnose problems in orbit, eventually gave way to fully-digital simulations during its Apollo missions. Today digital twins are used in all industries, with analysts MarketsAndMarkets indicating that the market is expected to grow from \$3.8 billion in 2019 to \$35.8 billion by 2025.

Digital twins have already started to play a role in managing wastewater infrastructure. Simply put, they are a digital representation of physical infrastructure and its inner workings, providing a description of the current state of the system as well as predictive analysis of its future evolution from data acquired in real time.

The idea is to let us see what might happen if we were to make certain adjustments in real life. These adjustments can be trialed on the digital twin without having to test potentially expensive or risky changes on the real-world counterpart.

If implemented properly, digital twins can influence the design, build and operation of the system throughout its life cycle.

**Given its vast expertise as both operator and technology provider, Veolia is uniquely positioned to propose the most powerful digital tool to optimize operation** — through informed insights — according to the objectives of savings, performance or capacity that were set at its implementation.

The Plant module of Hubgrade Performance is an online digital twin of the wastewater treatment plant. It creates a digital representation of the customers' assets which uses predictive analytics in real time to provide optimized setpoints to the PLC control and deliver insight to the operators, process engineers, and management.

The robust algorithms used help address challenges such as handling increases in load, meeting compliance requirements and reducing operating costs. The concept is simple: do more with less.

## Everything starts with data

Digital twins are continuously updated with historical as well as current data from SCADA systems, sensors, meters and other measured sources to create an up-to-date representation as soon as new information becomes available. This enables utilities to better understand the past and current performance of their wastewater treatment



plant while helping them predict future performance and simulate the impact of potential changes in the virtual world before taking actions or committing funds. Historical data basically allows forecasting the future.

Hubgrade Performance's Plant module is rendered truly unique thanks to the robustness of its algorithms, which rely on data from more than 100 plants in operation, some for more than 25 years, for a total aggregated number of years with operational experience exceeding 800.

Through the system, the operator can decide to retrieve instructions from the Cloud, set Hubgrade Performance Plant to optimize or use existing PLC setpoints. Benefits include increased machine availability and reduced maintenance costs, with priority set on optimizing either savings, capacity increase or performance guarantees.

When the digital twin is used to predict the future — and the predictions are used to optimize and find the best control actions — it is known as Model Predictive Control (MPC). The idea is simply to imagine all the possible outcomes and then choose the best one. MPC explores the consequence of changes to processes without disrupting customer

operations. It also allows more robust control, because if data is missing for a period of time, the digital twin uses its virtual representation to reconstruct the process. Finally, MPC can have a positive impact on the environment by identifying the “best” control, therefore reducing greenhouse gas emissions.

### Digital twin in action

The digital twin can be made available to operation teams to test stress scenarios or specific settings before actually implementing them. Another useful application is for planning teams to test new work to be carried out, or test temporary situations (during the work phase on certain parts of the network, for instance).

Automated data quality check and associated fall-back strategies secure the best achievable optimization at all times, taking into account the fixed boundaries of the existing PLC so that the whole operation of the plant can never be below or beyond what the operator has defined, and the outlet performances can never be lower than what the PLC allows for, even in case of failure of the digital system, should that happen.

Hubgrade is inspired by the Sustainable Development Goals and assists municipalities and industries in improving their environmental footprint and reducing their carbon emissions.