

## **Artificial intelligence helps optimise the operation of wastewater treatment plants**

Prague, 19 May 2023: A consortium of experts including technology integrators and academia is presenting a new innovative solution for wastewater treatment plants (WWTPs): an intelligent algorithm called WaterScan Toolbox. This software is used to predict the influent to the WWTP, where a neural network calculates the quality of the wastewater and suggests operational measures to the operator based on the calculated values.

Wastewater treatment plants are currently facing a number of challenges, such as increasing capacity and stricter limits that lead to significant increases in operating costs. In addition, the infrastructure of WWTPs is ageing; this also brings with it a demand for new, reliable technologies to ensure stable effluent quality from WWTPs.

The project team collaborating on the solution using artificial intelligence to predict wastewater flows and related operational measures consists of VDT Technology a.s., the University of Chemical Technology in Prague (VŠCHT Praha), the Czech Technical University (ČVUT), the Technology Agency of the Czech Republic (TA ČR) and the operator of the Prague water infrastructure PVK a.s.

The solution uses cloud computing and machine learning technologies based on in-depth analysis of wastewater data, qualitative and quantitative data, recurring events, precipitation forecasts and urban behaviour (days of the week, hours of the day). The neural network is able to predict, for several hours, the level of incoming pollution and the load on WWTPs, taking into account recurring and non-recurring factors. Processing the vast amount of data and generating accurate information will allow for better decision making and planning, ultimately leading to improved effluent quality from WWTPs. This brings with it significant operational cost savings, both in material and energy terms. Until recently, pollution risk has often been addressed by oversizing technological elements, causing unnecessary costs compared to the real need.

The WaterScan Toolbox predicts the chemical oxygen demand concentration of the water (COD), the flow rate, and therefore the mass flow rate. This is one of the most important criteria for water pollution, providing information mainly on the concentration of all organic substances. COD is defined as the amount of oxygen equivalent to the consumption of the oxidising agent used. The application then generates alerts for different types of exceedances based on these predictions and provides a database of event scenarios based on predicted loads.

These reports allow operators to take effective measures that prepare the WWTP for the expected conditions and lead to increased efficiency of the treatment plant. The application allows users to view data for either a single WWTP or dozens of individual sites at a time, and provides access to historical data on events that occurred over the past 360 days. Everything is accessible through an intuitive and user-friendly interface.

"Cloud computing and machine learning technologies in wastewater treatment have huge potential for improving the environment," emphasises Lukáš Chalupa of VDT Technology. "Our new Water Scan Toolbox software tool enables wastewater treatment plants to make preventive interventions and improve the efficiency of the treatment process based on unique knowledge of the quality and quantity of wastewater according to predefined operational scenarios."

"Thanks to modern analytical methods, we can monitor the quality and quantity of wastewater, which can be processed into valuable information. By monitoring long-term data sets, we can obtain valuable information on the development of key indicators of inflow and outflow from wastewater treatment plants," said Petr Sýkora of PVK a.s., adding: "The pressure to comply with strict emission limits is increasing, and with this comes the demand for new reliable technologies that ensure stable effluent quality from WWTPs, even during adverse operational events such as heavy rains or extreme drought."

This new solution, based on the principle of advanced IoT network data processing on the cloud-based MindSphere platform, was chosen mainly because of its high security standards, as water infrastructure is classified as "critical". In addition, MindSphere brings the latest information technology findings to the relatively conservative field of municipal water infrastructure management.

More information on the project can be found [here](#).

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***Presentation of project partners to journalists:***

**VDT Technology a.s.** as a system integrator offers complex solutions for intelligent monitoring, control and data management systems. In the environment of IoT platforms, it prepares advanced expert functionalities such as simulation, prediction and digital modelling. For more information, visit [www.vdttechnology.com](http://www.vdttechnology.com).

**Pražské vodovody a kanalizace a.s.** operates the water management infrastructure of the capital city of Prague. Prague's water supply and sewerage services. They deal with the production and distribution of drinking water and wastewater disposal and treatment. They provide water production for 1.3 million inhabitants of the capital city of Prague and another 208 thousand inhabitants. Central Bohemia Region. They operate the Káraný and Podolí water treatment plants and purchase water from the Želivka water treatment plant. More at [www.pvk.cz](http://www.pvk.cz)

**The University of Chemical Technology** in Prague offers education and research in the fields of chemistry and food science. It is one of the largest domestic institutions focused on technical chemistry, chemical and biochemical technologies, materials and chemical engineering, food and nutrition, environment, and now also economics and management. More at [www.vscht.cz](http://www.vscht.cz)

**Czech Technical University** in Prague is one of the largest and oldest technical universities in Europe. According to the 2017+ Methodology, it is the best Czech technical college in the group of ranked technical colleges. Currently, the CTU has eight faculties (civil, mechanical, electrical, nuclear and physical engineering, architecture, transport, biomedical engineering, information technology). It has over 19,000 students. For the academic year 2022/23, CTU offers its students over 250 accredited study programmes and over 100 of them in foreign languages. CTU educates technical experts, scientists and managers with knowledge of foreign languages who are dynamic, flexible and able to adapt quickly to market demands. More at [www.cvut.cz](http://www.cvut.cz)