Innovation flows through the city: water supply with zenon

Fresh ideas and modern standards power Novi Sad's water supply

The second largest city in Serbia, Novi Sad, has been the cultural and economic heart of the region for centuries. Founded in the 17th century on the banks of the Danube, this city has been a crossroads for different cultures and civilizations throughout its rich history, shaping its unique identity. As a modern city that is constantly growing and developing, Novi Sad must adapt to meet the challenges and needs of contemporary urban life.

One of the key elements of the infrastructure of any city is its water supply system. The development of the water and sewage system in Novi Sad began at the end of the 19th century when the need for the reliable supply of clean water became a priority for the rapidly growing urban population. Over the years, this system has gone through numerous phases of development and modernization to meet the needs of an increasing number of residents and industrial consumers.

One of the more significant steps in this modernization is the implementation of the zenon software platform. zenon is a revolutionary solution for managing and monitoring the complex network of the water supply system. The implementation of the system was carried out by Indas Automation, a silver partner in the COPA-DATA partner community. Indas Automation continues to support and maintain it.

Using the zenon software platform to manage the water supply in Novi Sad is not only a technological venture; it's a story of innovation, progress, and dedication to the city and its residents. With this sophisticated tool, Novi Sad is setting new standards in water resource management, proving its ability to adapt to the challenges of the 21st century and to continue to provide essential services to ensure an excellent quality life for its residents.

Štrand pumping station: system parameters and measurement of current, pressure and flow.

Water factory: filtering system with sensors

THE STRUCTURE OF A MODERN SYSTEM

The implemented system based on zenon is a sophisticated technical solution that enables advanced management and monitoring of the complex infrastructure. The central part of the system consists of a redundant server pair, designed to ensure continuous operation and high system availability in all situations. The server redundancy means that in case of a failure in one server, the other can take over its functions without interrupting the system operation, thus minimizing the risk of disruption to the water supply.

The system contains over 100 PLC devices, collecting and processing information from more than 10,000 data points. Communication with different parts of the system is established via numerous native zenon drivers, including Omron, Siemens, Beckhoff, Festo, and OPC.

One of the most striking elements of the system is the graphical workstation, equipped with a video wall consisting of eight screens and two engineering workstations, each with two monitors. This configuration provides operators with an extended visual representation of the system, enabling them to simultaneously monitor multiple parameters and conditions. The display is of particular benefit when there is a need to respond quickly to changes in the system. It supports efficient decision making. Another important aspect of the system is its regular maintenance, which includes updates to the latest software versions. This ensures that the system remains in step with the latest technological standards and improvements, thereby strengthening efficiency, safety, cyber security, and reliability.

THE SIMPLICITY IN MANAGING A COMPLEX SYSTEM

The water supply system in Novi Sad includes a complex infrastructure with multiple freshwater sources. There are 38 wells sourcing water from the three main sources, which have 15 wells, 17 wells, and six wells respectively. Each well is equipped with its own PLC device for automated control. Local control centers running zenon enable the local management and monitoring of each source.

Communication between the wells and the local control centers is achieved via a redundant connection, which includes optical cables and Wi-Fi technology. Communication with the main dispatch center is redundant, realized via radio (450 MHz duplex) and Wi-Fi connection (Ethernet). This infrastructure enables very reliable communication for efficient and reliable management.

The flow rate of water from the three sources varies between 1,000 and 1,300 liters per second. The supervisory control and data acquisition (SCADA) system monitors flows, pressures in pipelines, water levels in wells, and the condition of groundwater. This enables precise monitoring and optimization of operations across the entire water supply system.

PRECISE WATER TREATMENT FROM AERATION TO CHLORINATION

The water treatment process in Novi Sad includes several essential technical phases. Once untreated water is brought from the sources, it is directed for treatment.

Treatment begins with aeration, which oxygenates the water, eliminates harmful gases, and initiates the removal of iron and manganese. Sophisticated sand and carbon filters follow, removing particles, organic matter, odors, tastes, and specific chemicals. The next phase is ozonation and chlorination, providing a final disinfection to guarantee the water's safety for consumption before it is distributed to consumers.

In the main dispatch center, a zenon application runs as a subproject for each of these technical processes. zenon enables

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JANKO HRĆAN, HEAD OF ELECTRONIC MAINTENANCE, PUBLIC UTILITY COMPANY WATERWORKS AND SEWERAGE NOVI SAD

the monitoring and control of various parameters during the treatment process, including water levels in the filters, filter contamination levels, and filter operation time. The application also alerts dispatchers to any anomalies, such dangerously high or low water levels in the filters. These alerts enable a quick and efficient response.

After the filtration and disinfection process, the water is stored in reservoirs before it is made available to consumers as drinking water. This ensures that sufficient quantities of water are always available.

DISTRIBUTION OF DRINKING WATER

Water distribution in Novi Sad is characterized by a complex system that includes 15 pumping stations, 35 telemetry stations, and 10 auxiliary reservoirs. This system plays a key role in supplying remote settlements and municipalities, as well as in maintaining pressure within the water network. "The safety and precision of our water supply system are at the highest possible level. We efficiently monitor and respond to all anomalies in the system," says Janko Hrćan, Head of Electronic Maintenance. Telemetry stations send data to zenon via GPRS, optical cables or radio links, at least once a minute. This information enables the monitoring of vital system parameters, such as pressure and water levels.

The auxiliary reservoirs are crucial for supplying remote parts of the city and are key to establishing balance in the system, especially during periods of increased consumption or in case of malfunction.

A complete visual representation of the distribution system is available in the zenon software platform, including schematic and mapped views. Dispatchers primarily use the schematic view due to its clarity and efficiency in monitoring the system. zenon also displays alarms if the pressure drops. A drop in pressure can indicate potential problems in the water supply. Alarms are also displayed if there are pump failures or water levels are recorded outside minimum or maximum levels in auxiliary reservoirs.

STABILITY OF THE ENERGY SYSTEM

Because a reliable electricity supply is crucial for the operation of the water supply network, another key component of the water supply system infrastructure in Novi Sad are the 20/0.4 and 10/0.4 kV substations. zenon is also used to manage these resources and to monitor the consumption of electrical energy via network analyzers. Data collected in this way is transmitted via the Modbus protocol and sent to zenon via GPRS. Important parameters which are monitored include the temperature of the transformer oil and transformer protection. An alarm system has also been implemented here for the early detection of and rapid response to problems or anomalies in substation operation. This enables the appropriate intervention to maintain continuous operation of the system.

HIGHLIGHTS:

- zenon software platform used for advanced management and monitoring of all aspects of Novi Sad's complex water supply system
- Real-time data collection, analysis, and control incorporating more than 10,000 data points
- Communication with over 100 diverse PLC devices
- Redundant server pair ensures system availability and minimizes risk of disruption
- Regular maintenance and updates ensure system remains in step with latest technological standards and improvements
- More efficient water distribution management
- Monitoring of energy consumption and improvement of the system's energy efficiency.