SMART WATER CITIES: MULTIPLE PIPE::SCANS MONITORING WATER QUALITY ALLOW A SMART WATER OPERATION OF THE DISTRIBUTION NETWORK IN VALENCIA, SPAIN

Smart Water Cities aim to continuously supply the city with fresh drinking water, the environmentally friendly drainage of dirty water and the safe drainage of rainwater. In order to be able to guarantee good water quality, be it drinking or waste water, more and more cities start to monitor their water networks.

In Valencia, real time monitoring of drinking water from source to tap is possible with s::can technology. Years of collaboration between EMIVASA and s::can enabled to gain valuable information to improve operation in the drinking water treatment plant and in the distribution network.

EMIVASA is a water company participated in 80% by Aguas de Valencia (Global Omnium) and in the remaining 20% by Valencia City Council. EMIVASA has more than a century of experience in drinking water supply and the objective to improve the service continuously. EMIVASA Global Omnium developed a corporate strategy to improve the drinking water quality in the area of Valencia. Different projects have been executed for many years now. With this objective, different improvements with new treatment processes have been carried out in the two drinking water treatment plants (DWTP) providing water to two million inhabitants. In addition, the drinking water network of Valencia is becoming highly sensorized with the aim to control water quality in real time from source to tap. Both in the drinking water treatment plants and within the distribution network , EMIVASA and s::can have been fully cooperating for the last few years. s::can has been chosen to provide real time water quality monitoring stations both at the two drinking water treatment plants of Valencia and also in the distribution network. Real time data robustness and maintenance free were key factors in choosing s::can.

s::can's solution

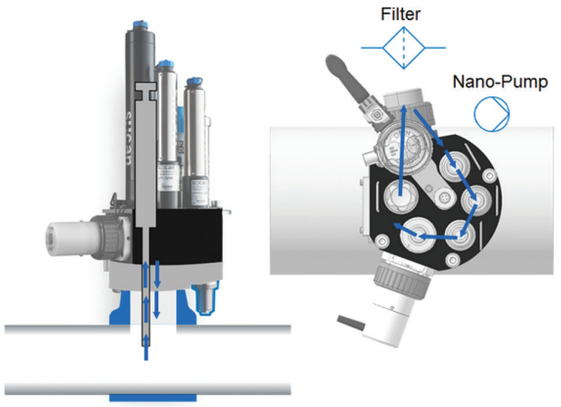
Raw and treated supplied water from the two DWTPs in Valencia are monitored with s::can monitoring stations. Moreover, many pipe::scan stations with solar panels have been installed directly at the pipe under pressure at different hydraulic sectors of the distribution network. The micro::station allows to monitor nitrates, nitrites, TOC, DOC, color, turbidity, UV254, temperature, free/total chlorine, dissolved oxygen, red-ox potential, conductivity and pH. UV-VIS spectrum is also collected.

The pipe::scan is an innovative, modular sensor system for monitoring drinking water quality in pipes under pressure. It is ACS drinking water certified and measures up to 10 key parameters in one device: TOC, DOC, UV254, Turbidity, Color, Chlorine, pH or Redox, Conductivity, Temperature and Pressure. The real-time data can be transmitted to any central database via almost any communication protocol using the revolutionary terminal con::cube. Therefore multiple pipe::scans are the ideal solution to monitor drinking water at any point in the distribution network.

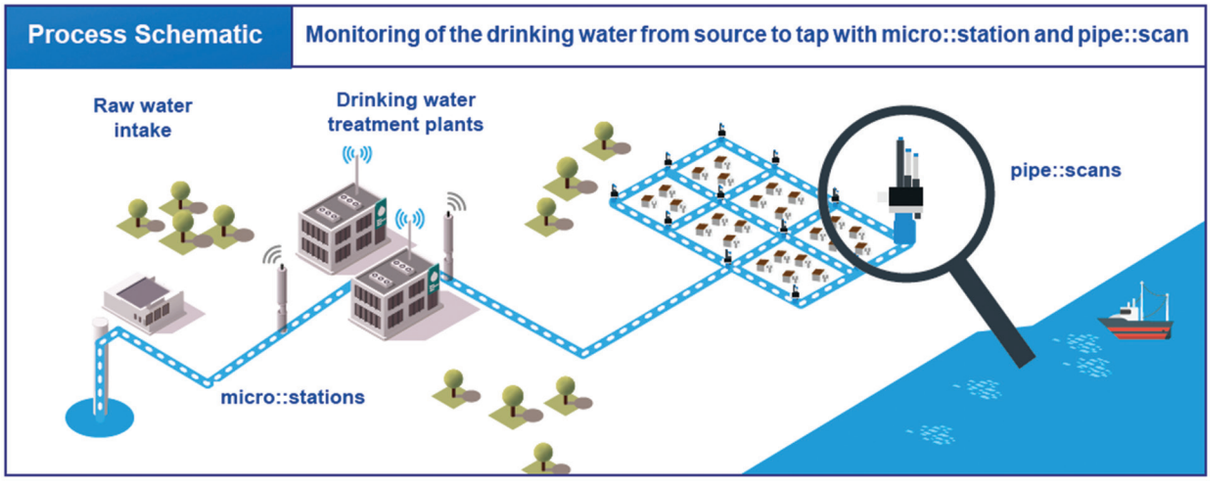
The pipe::scan provides unique benefits like a quick installation directly on the pipe, maintenance without interrupting the flow and for each sensor individually and accurate, reportable measurements in perfect agreement to standardized lab reference. The installation is performed on the pipe under pressure by utilizing Hawle pipe saddles (sizes from DN100 - DN600). Via a "straw", the water from the pressured pipe is pushed into the pipe::scan flow cell. A nano pump ensures that the water is pumped through the flow cell and back into the pipe without water loss and even during periods of stagnation.

A micro::station monitoring the drinking water quality

A pipe::scan installation in a manhole, on the left the pipe::scan, on the right the terminal con::cube



The functional principle of the pipe::scan



Process Schematic of monitoring drinking water with micro::stations and pipe::scans

A local contamination event detection software with real-time alarms, tested by US-EPA, allows a real-time detection of events, so that immediate countermeasures can be taken to prevent harmful events on the consumers.

The pipe::scan has been ACS drinking water certified by the independent French institute CARSO, which is accredited by the French Ministry of Health to evaluate, test and certify materials and products which are in contact with water intended for human consumption. The Attestation de Conformité Sanitaire (ACS) is the Certificate of Sanitary Conformity that ensures all materials used in a product and in contact with water are safe.

The sensors in the pipe::scan are well known, reliable s::can sensors which have been on the market for many years. What's unique about these sensors is that they are fully pressure-resistant: the i::scan - an optical miniature spectrophotometer with LED technology and automatic brush cleaning for the measurement of organics (TOC, DOC, UV254, UVT), turbidity and colour, the chlori::lyser – the only pressure-resistant amperometric sensor for detection of free chlorine on the market, the pH::lyser - a very robust pH sensor without salt bridge with a polymer reference electrode, the condu::lyser - a maintenance-free 4-electrode conductivity sensor with an integrated temperature sensor suitable for industrial use, and a miniature pressure sensor. All these sensors are optimized for the use in pressurized pipes, are characterized by extremely low maintenance requirements and have been used for years in drinking water applications all over the world.

A filter in the inlet ensures that no large particles penetrate into the flow cell and a ventilation valve ensures an air free measuring environment inside the cell. Optionally, the system can automatically clean this filter and automatically take samples in case of an alarm.

The water quality data can be sent to any central database via almost any protocol using the s::can terminal con::cube, and the stations can be reached at any time in real time via VPN connection and are 100% remote controllable. Due to its low power consumption, this terminal fits the requirements for operation in decentralized installation sites.

Benefits

Over the last few years, the micro::station in the DWTP has allowed to detect real time water quality changes that affected the DWTP performance and allowed operator reaction to study THMs formation potential by combining UV-VIS spectrum and single parameters and to identify a time offset of the coagulant dosing when high turbidity raw water reached the plant due to strong episodes of rain. In the distribution network the pipe::scan enables to assess the impact of maintenance operations carried out at the pipes through the water quality in order to control stability of water quality at different residence times of the network and to see the impact of the effect of operational changes in the distribution network.

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