



SMART WATER CITIES: IN BEIJING THE PIPE::SCAN ENABLES REAL-TIME MONITORING OF THE DRINKING WATER

To measure turbidity, color, free/total chlorine, pH, conductivity and other conventional and key indicators at the same time, the Beijing Waterworks Group Co., Ltd. installed a pipe::scan in the drinking water network. The Group has been relying on s::can products since 2017. At that time 50 i::scans were installed for turbidity real-time monitoring.

Background

Beijing Waterworks Group Co., Ltd. is one of the most influential urban water supply enterprises in China. The group is responsible for the water supply of central Beijing, Tongzhou, Huairou, Miyun, Yanqing, Fangshan, Daxin, Mentougou and other new suburban areas. By the end of 2019 they supplied 4.85 million m³ every day. The total length of the pipe network is more than 14,000km and the service area includes nearly 1,180 km² with more than 5.3 million households.

Challenge

Beijing's water supply sources include local and external sources. More than 20 water sources are used, which is very rare. This represents the complexity and diversity of the water quality in Beijing. The aging urban network threatens the water quality and is therefore a potential source of danger. An automatic water quality monitoring equipment has to be installed in the pipe network, to ensure water supply safety in the capital. The installation space of the test site is small and the pipeline, made of cast iron, is aging, which might affect the reading of turbidity. The duration of the maintenance intervals and certain settings of the pipe::scan needed fine tuning. In addition, laboratory validation is required to determine whether the pipe::scan transfers the water quality data correctly to the SCADA.

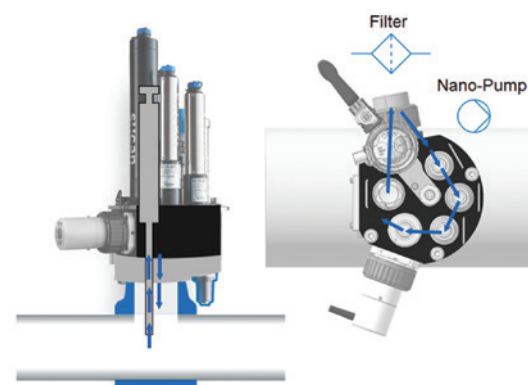
s::can's solution

For the parameters like turbidity, free/total chlorine, pH and conductivity, the system was equipped with s::can sensors, automatic brush cleaning and the con::cube terminal. For the aged pipe, a double layer filter was added, to make sure that iron particles do not interfere with measurement results. SCADA get the data via the RS485/Modbus protocol from the terminal con::cube.

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.



The functional principle of the pipe::scan

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,



pipe::scan installation in a suburb of Beijing

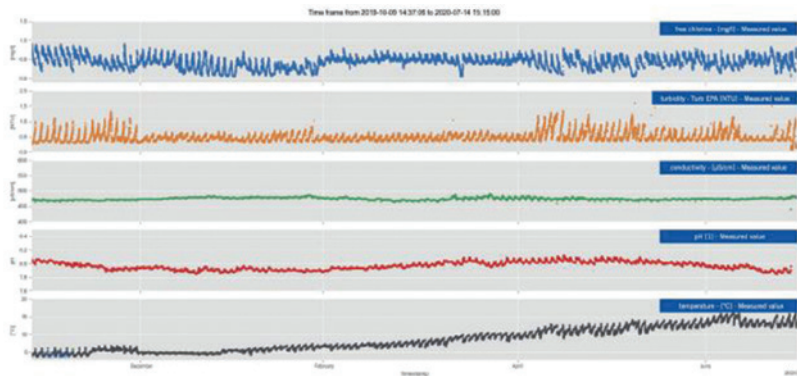
which is accredited by the French Ministry of Health to evaluate, test and certify materials and products which are in contact with water intended for human consumption. The Attestation de Conformité Sanitaire (ACS) is the Certificate of Sanitary Conformity that ensures all materials used in a product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



Water is sent continuously for 24 hours in the pipe network, the turbidity value changes according to the regular fluctuation of water consumption.

Water is sent continuously for 24 hours in the pipe network, the turbidity value changes according to the regular fluctuation of water consumption.

Benefits at a glance:

- Real-time monitoring of different parameters—so that changes in water quality can be detected timely, speed up the maintenance response time and improve network reliability.
- Understanding of the water quality changes of the entire water supply network, based on historical and actual readings.
- Total chlorine monitoring in the pipe network not only determines the multiplication activities of microorganisms in water quality, but also controls the process operation of water systems, effectively controls the amount of added chlorine and reduces the formation of disinfection by-products.
- Manual maintenance is extremely low, except regular manual sampling comparison and calibration.
- Achievement of continuous monitoring with insertion installation, no discharge and pollution, which leads to water savings.



The pipe::scan is a sensor system for monitoring drinking water quality in pipes under pressure

Yanyang Hou, Manager at Beijing Clean water Co., Ltd., states: "The pipe::scan measures total chlorine/free chlorine, color, turbidity, pH, conductivity and temperature in one system. Other organic pollution parameters like TOC, DOC, UV254 can be added. After more than 6 months of testing, the equipment is running stable, the measurement is reliable and there is a super long maintenance cycle. These new devices increase the possibility of large-scale monitoring networks in the supply system."



This project will be extended to many pipe::scan locations.

Author Contact Details: s::can GmbH • Address: Brigittagasse 22-24, 1200 Vienna, Austria • Tel: +43 1219 73930 • Email: marketing@s-can.at • Web: www.s-can.at