

optiqua

Operational Water Quality Event at Vitens

- EventLab Case Study -

Background

Vitens is the biggest drinking water supply company in the Netherlands, supplying high quality water to almost a third of the total population. Vitens is a technological front-runner in the water sector which is investing in smart water grid solutions to monitor the water quality during production as well as distribution.

As part of the smart water grid, Vitens has installed a network of 44 Optiqua EventLab systems to monitor water composition and detect quality events. This network is installed in the Dutch province of Friesland and has been operational since 2013.



EventLab

Optiqua EventLab is a generic online sensor concept for deployment in distribution networks. The major components are an optical sensor, data transmission infrastructure and software for data analysis and event detection. The optical sensor probe measures minute refractive index changes in water. Refractive Index (RI) is a useful generic indicator of water quality as any substance, when dissolved in water, will change the refractive index of the water matrix. EventLab can detect changes in the composition of the water down to concentrations in the upper $\mu\text{g/L}$ range. These characteristics make it possible for EventLab to monitor any change in (chemical) composition of drinking water using a single sensor.

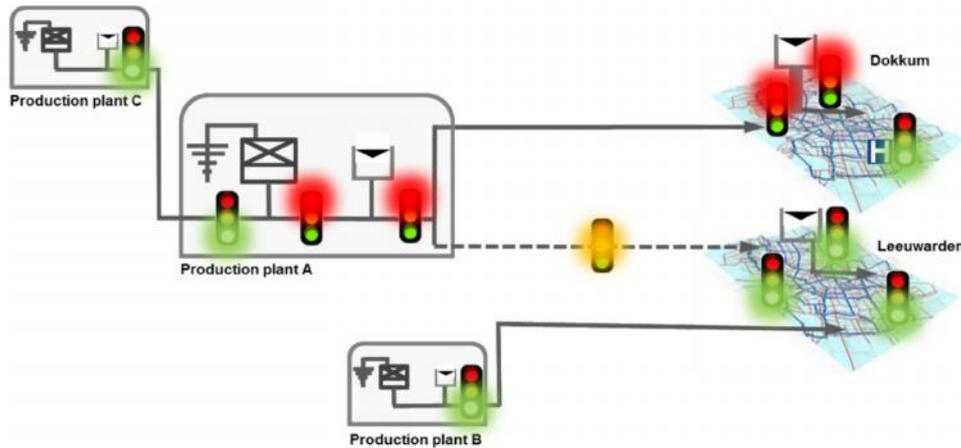


EventLab is based on a stable and robust optical technology. The optical method ensures low maintenance, no calibration, and consumable free operation.

EventLab Online is Optiqua's event detection software. This web-based application allows EventLab users to monitor the water quality throughout their network in real time. It provides detailed information for each sensor unit and detects events using Optiqua's proprietary algorithms. EventLab Online facilitates (i) early detection and rapid response time, (ii) accurate location and real-time monitoring of the spread of a contamination within the network, and (iii) decision making and adequate actions to minimize damages.

Plant maintenance triggers WQ event

On the 4th of October 2013 Vitens performed regular maintenance at one of their treatment plants. This necessitated the halt of production and a temporary reliance on storage reservoirs to keep up the water supply. Although production was planned to be offline for several hours, recurring software issues resulted in disrupted water production during 36 hours. In order to keep up the supply, input from a secondary plant was increased and production was restarted temporarily to top up the reservoirs. During these restarts, the process was run under manual control, resulting in significant fluctuations in water quality. Furthermore, on the 5th of October the treatment was accidentally operated without softening and water containing substantially higher levels of calcium was distributed. As the hardness exceeded consent limits, notification of critical customers, including health care centers and dialysis patients, became necessary.



EventLab systems installed in the affected area monitored the water quality fluctuations. They also traced the water throughout the affected supply zone, providing information on the extent of the network affected. Finally, the return to normal quality could be determined based on RI values. In March 2014 Vitens, under controlled conditions, reproduced the event. Again, EventLab responded the water quality variation and traced it through the distribution network. This confirmed that EventLab reliably detects to this nature of event.

During both events, other sensors installed at the treatment plant, including pH, conductivity and turbidity sensors, did not detect the changes in water quality (Fig. 1).

EventLab also determined hydraulic residence time of the water in the network under the changeable flow conditions during the operational changes (Fig. 2). These experimentally measured travel times between monitoring locations provided input for the fine-tuning of Vitens' hydraulic network model.

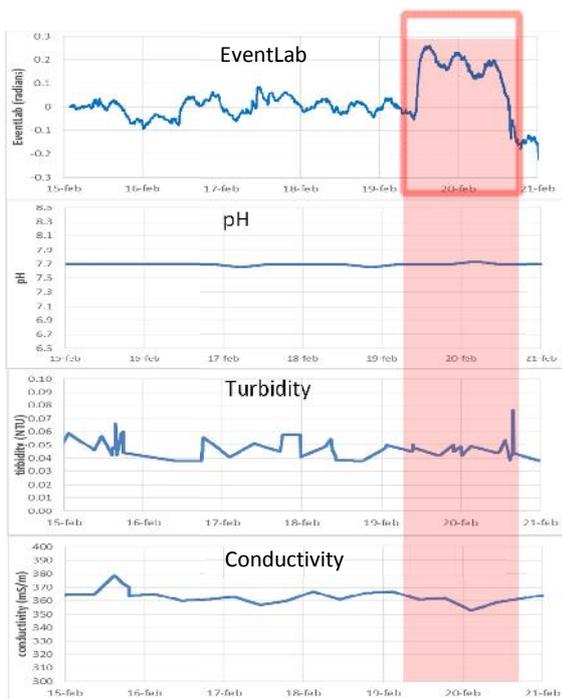


Figure 1: Only EventLab detects WQ event (duration of operational issues indicated in red).

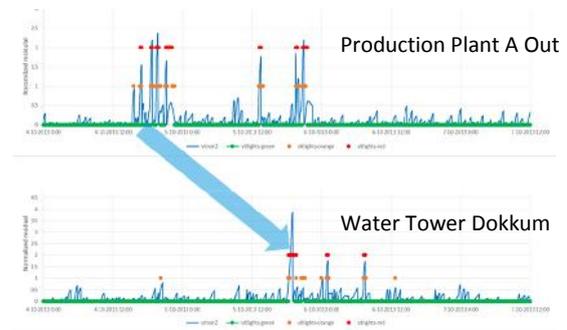


Figure 2: Alarms from Plant A arrive at Water Tower Dokkum with a delay that corresponds to the retention time in the network as predicted by Vitens hydraulic model.

The bottom line

With EventLab Vitens has realised a monitoring network that is capable of detecting water quality anomalies in its distribution network. Where in the past water quality issues in the network were nearly impossible to detect and trace, it now has the capability to follow such events in real time. Monitoring the issues resulting from plant maintenance, something conventional sensors were unable to pick up, are a first example of what this network is capable of.

Optiqua Technologies

Optiqua Technologies is a provider of innovative tools for both online and sample based water quality monitoring. Optiqua develops and produces innovative optical biosensor technology for the real-time detection of contaminants in water. Optiqua

serves water utilities around the globe with its ground-breaking solutions. All Optiqua products leverage our award winning and patented lab-on-chip sensor technology. Optiqua has won several industry awards, including the 2009 Frost & Sullivan Asia Pacific New Product Innovation Award.



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