Showcase

Title: **Drinking Water in Remote Areas**

Sector: Drinking Water:

☒ drinking water sources
☒ drinking water treatment
☐ drinking water distribution
☐ wastewater collection / influent
☐ wastewater treatment
☐ wastewater effluent / receiving water
☐ other

Utility: **Water Corporation, Western Australia**

Date: 2012

Introduction & Background Information

In Western Australia about 100,000 people are located in remote areas and approximately 200 water treatment schemes supply the potable water. The regional, south-western sector and northwest of the state has a more equal share of surface water and groundwater. Mid-west, agricultural and goldfields regions are dominated by bore water. The capacity of the treatment plants is 0.5 ML per day on the average.

The use of sensors in remote areas is completely different from their application in metropolitan or industrial areas where skilled resources are available easily. Furthermore, robust online industrial instruments within management, engineer support and in a stable environment have much more chance of working accurately and provide trustful data.

In remote areas, the environment can be aggressive, and the temperature can affect the performance of the instruments. In addition, the access to maintenance can be problematic and expensive. In this manner, one of the influence factors that must be considered when choosing instrumentation to process control is the business landscape. Additional factors are the size of the facility (large or small) and the risks associated to the control parameter.

Water Quality Challenges

Most of the groundwater has very high salinity content, which represents a big issue for treatment. Additionally, the main problems are related to the presence of calcium, iron, magnesium, nitrates and arsenic. When the groundwater source is connected to some fresh water system, the risk of pathogens is also associated.

The main chemicals utilised in these schemes are chlorine, fluoride as NaF of FSA and Calgon, a water softener. pH-correction chemicals (caustic, soda ash, sulphuric acid) are also common. Around 25 plants consist of membrane filtration systems and some of them are fully automated and contain high technology instrumentation. However, the automation does not prevent the need for weekly basis visits and in 70% of failures, it was necessary for an on-site technician to start up the system.

Approach and Implementation

In case of the potable water supply, the real need for online monitoring is to control the water quality supplied to the population. It must ensure that it complies with Drinking Water Guidelines. The parameters of continuous monitoring are chlorine, pH and turbidity.

Systems, methods, and monitoring instruments

Sensors for chlorine, pH and turbidity. Conductivity is also common. Nitrate analysers have been trialled with little success.

Costs and Maintenance

In terms of maintenance-associated costs, to calibrate one chlorine sensor in a remote area costs around $1,500 considering the trip and technical expenditure. Since they are calibrated once a week, the maintenance of each chlorine sensor costs around $6,000 per month.

Data Collection, Storage and Handling

All parameters are collected, stored and controlled by a SCADA system. Access to communication does not take place in all sites. There are no land cables and some sites are accessed by satellite.

Controlled water treatment plants can generate an alarm if the control parameters are outside the acceptable range. In some cases, the adjustment in the treatment plant can be performed remotely from the central control; in other cases the operator can make some adjustment remotely, and on some occasions, it is necessary for on-site intervention.

Quality Assurance / Quality Control

Besides online monitoring, samples are collected once a week and analysis results are compared to recorded values to ensure instruments are performing well. Chlorine sensors are calibrated on a weekly basis and turbidity sensors are calibrated from weekly basis to monthly basis, depending on local water scale properties and instrument drift.

Turbidity sensors are the most sensible. If frequent cleaning is not executed, the reading values can be non-trustworthy. To assure data quality and to guarantee turbidimeters have good performance, Water Corporation developed guidelines to the operators to handle these instruments. Best cleaning and calibration practices were also established.

Evaluation of Successes and Limitations

One of the limitations observed at the moment refers to the integration of the online monitoring in the company organization. There are two versions of SCADA system in use and the data controlled by one version cannot be transferred or compared to the data controlled by the other version.

However, this is only a minor issue across a few sites. Generally, the SCADA integration is rather good.

Benefits include: significant reduction in risk due to better knowledge of water quality being delivered, quicker response to out-of-spec conditions and therefore a reduction in incident costs, Critical Control Point monitoring and reporting is now more achievable.

Additional Comments

The performance of an online chlorine sensor differs significantly according to manufacturer and reagent type; sensors can be affected by higher temperatures. The Water Corporation team recommends the use of non-reagent type sensors in remote areas due to temperature fluctuations.

The importance of frequent chlorine sensor calibration, as executed by Water Corporation, was proved in a research study (Shin et al, 2008). The online free chlorine sensors are affected by combined chlorine and pH and non-reagent type sensors calibrated for pH are not affected by pH while sensors not calibrated were significantly affected by pH fluctuation.

Reference

Shin, P., Choi, Y., and Jeng, B. (2008) *Study on Evaluation of On-Line Free Chlorine Sensors in Water Supply Facilities*. Water Distribution Systems Analysis Symposium 2006: pp. 1-9.