

Chlorine Monitors Save Yorkshire Water Over £300,000 a Year

Yorkshire Water is one of the UK's largest water and wastewater companies, supplying around 1.24 billion litres of drinking water each day. At the same time they also collect, treat and dispose of around one billion litres of waste water safely back into the environment. To do this they operate more than 700 water and sewage treatment works and 120 reservoirs, looking after 62,000 miles of water and sewerage mains.

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In order to ensure the quality of its drinking water, Yorkshire Water continually monitors water from its 59 treatment plants with samples taken from 363 reservoirs, where treated water is stored. In a typical year, more than 500,000 tests are carried out on water samples to ensure it meets exacting standards.

Regulatory Requirements

Like all UK water companies, Yorkshire Water is regulated by a number of agencies, including the Drinking Water Inspectorate (DWI), the Water Services Regulation Authority (OFWAT) and the Environment Agency. In order to comply with these regulations, it is vital that Yorkshire Water employs the best equipment and technology to ensure that they comply with all the relevant regulations and provide water that has a pleasant taste and colour, and most importantly is safe to drink.

Background to Chlorine Monitoring

Chlorine is the most widely used disinfectant in domestic settings. However, it is also used in industrial settings for the purification of water. Chlorine is used to destroy agents that can cause disease, such as viruses or bacteria, and therefore pose a risk to human health. It also leaves a residual that can be controlled and measured to monitor chlorine levels. Despite its main function as an effective water purifying agent, chlorine is also useful for other purposes in water treatment plants. These include the removal of iron and manganese, bleaching of certain organic compounds and prevention of algae growth.

Chlorine monitoring is of great significance to water management and supply services as chlorine also has its associated drawbacks. Excessive levels of chlorine in drinking water or water used for washing can have an effect on the respiratory system and can also cause taste and odour problems. Chlorine has a long history of safe use for hygiene purposes; however, the World Health Organisation (WHO) has provided a health based guideline that no more than 5mg of chlorine should be present in every litre of water.

Challenge

In July 2011, Analytical Technology was awarded a prestigious framework agreement to supply and install 450 chlorine monitors to Yorkshire water as part of a new bufferless chlorine monitoring system – the first complete company-wide asset replacement programme of its kind.

In order to provide their 4.8 million customers with high quality drinking water, whilst also ensuring better savings during a tough economic climate, Yorkshire Water decided to replace their outdated and inefficient buffered amperometric systems, which they had previously spent around £250K a year on in reagents alone.

Yorkshire Water made a requirement of supply that, wherever possible, the new system be free from the use of chemical buffering, traditionally associated with such measurements.

The Yorkshire Water view is that acetate and phosphate buffers are expensive, present health and safety issues and are environmentally unfriendly. Buffer delivery systems are also maintenance-intensive and reagents are costly. By avoiding the use of reagents wherever possible, Yorkshire Water sites could achieve huge operating cost savings and reduce their environmental impact.

The company identified measurement accuracy, reliability and cost-effectiveness as the principle benefits it wanted to achieve from a new framework. With these requirements in mind, the research and development team ran an extensive trial testing 24 analysers from 12 different manufactures on several water treatment works against the company's existing analysers. The results demonstrated that Analytical Technology's Q46H Residual Chlorine Monitor offered the most accurate, efficient, reliable and cost effective system, ATi was therefore awarded the framework.

Selecting the Best Solution

Following the initial extensive trial there was a further evaluation period of nine months to assess the most appropriate solutions for the varying water types. Analytical Technology's bufferless chlorine monitors were tested using a wide variety of water types at four water treatment works in Elvington, Embsay, Keldgate and Langsett. During this time, Analytical Technology's monitors required very little maintenance and calibration, reinforcing the selection decision and further highlighting the company's vast experience with membrane sensor technology.

This trial also established that the monitor's membranes would not need replacing for at least six months in most applications, and in some cases 24 months. The exceptions were a small minority of Yorkshire water sites that had very high manganese levels. ATi, working closely, with Yorkshire Water's water quality scientists and project managers did identify a few sites would need to be buffered. A combination of unusually high pH, large pH swings and high iron and manganese concentration issues were the contributory factors in the selection process. Around 10% of the installations run with buffer. The ATi monitors, however uses a very small amount of reagents, 25l/year compared to 25l/month with the incumbent systems, due to the unique low volume flow cell in the new technology.

Analytical Technology supplied and installed 450 Q46H62 free chlorine monitors, which have been engineered to overcome the traditional issues associated with buffered amperometric monitors. The monitor features a variable water quality pH correction algorithm which allows the monitors to be deployed in processes that derive their raw water from all types of sources, rivers, boreholes, surface water etc. The standard ATi pH sensor is designed to work over a very wide range of conductivities reducing any pH errors. Around 50 Q45H79 Total Chlorine monitors were also supplied to the sites with high and varying pH and high iron and manganese levels. These monitors provide the same accuracy and reproducibility as the free chlorine monitors.

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In order to provide Yorkshire Water with the most efficient and effective system, ATi designed bespoke single and triple-validated chlorine monitoring boards which were installed on every sample point throughout the process, to ensure full disinfection control in accordance with their best water quality practice. All signal marshalling, power supplies and the entire “wet end” were custom designed to allow quick and easy replacement of existing monitors with minimum disruption to operations. The investment in design time up front dramatically reduced the time needed on site and reduced the installation cost for the scheme.

All the instrumentation was installed in 3 phases over a two and a half-year period, allowing for the plants to continue operating while adapting to changes in requirements. Following installation, ATi then provided full operational training to Yorkshire Water employees.

The final phase of Analytical Technology's framework agreement was successfully completed in May 2013, with 103 chlorine monitors installed throughout sites in the South area. This included a mixture of buffered, bufferless and pH corrected units, which were deployed depending on water quality and expected pH range. These monitors were installed into a total of 52 water treatment plants and nine secondary chlorination sites throughout Yorkshire Water.

The Benefits of Leading Instrumentation

In specifying monitoring instrumentation from Analytical Technology, Yorkshire Water has replaced their region-wide chlorine monitoring system with monitors that are more efficient, reliable and cost effective. The intuitive interface of the monitors enables operators at Yorkshire Water to easily calibrate and operate the instruments. In the vast majority of installations there is also no longer any need to manhandle 25 litre containers of buffer around sites. In addition, the chlorine

monitors supplied help to achieve compliance with EU directives, as well as the stringent internal guidelines set out by Yorkshire Water. Analytical Technology's monitors work within the parameters required by these directives.

Customer Feedback

Yorkshire Water found the service from Analytical Technology exceptional, including technical backup, support with spare parts and help and advice often involving site attendance. Alan Henson, Project Manager at Yorkshire Water said: “Analytical Technology came out comfortably the best performer in our rigorous selection process, and the company's vast experience with membrane technology places them ahead of most of their competitors, who were one step behind them in adopting the new technology. Now that the roll-out is complete, the scheme has realised around £336K of OPEX savings per annum, and operators will no longer have to manhandle 25 litre containers of buffer around our sites. ATi has provided an excellent service and it is a pleasure working with a company who are very customer focused. The high level of technical support that Analytical Technology provides really differentiates the company, and all staff have extensive knowledge of their products. The monitors also run without reagent in the majority of installations, resulting in cost savings and Analytical Technology has tailor-made a solution to fit our needs rather than just supplying a monitor.”

“The criteria we used to trial the monitors focused on reliability, accuracy and cost effectiveness. Analytical Technology was able to supply us with instruments that have met these criteria and also offered us additional benefits. This is why we selected the Analytical Technology Q46H Residual Chlorine Monitor as our preferred analyser. The customer service provided by Analytical Technology throughout the initial development of the monitor to ensure it best suited our needs, as well as during the installation process, has been excellent and we look forward to working

with the company going forward.”

The final customer of the scheme was Yorkshire Water's production sites. At the project wrap up meeting Rod Black Production Manager of one of the areas involved in the asset replacement commented “ The asset replacements were well managed on site, and everyone worked together to minimize risk to water production and any other site issues.” He added “ATi working closely with Yorkshire Water also resolved the SCADA issues on each site, sorting out RTS alarms and left every site clean and tidy, something which is not always the case. This extra “added value” has helped Operations in their day to day jobs”.

Conclusion

ATi's Q46H monitors are extremely easy to maintain and operate and provide reagent-less operation in the majority of applications resulting in an extremely economical solution, allowing Yorkshire Water to realise operational expenditure savings of up to £336k a year and whole life cost savings of up to £5.37M.

Analytical Technology was able to provide Yorkshire Water with bespoke instrumentation solutions that fitted their individual requirements.

However, the major harder to quantify added benefit has been Analytical Technology's award winning customer service, providing Yorkshire Water with industry-leading levels of responsiveness and backup support if issues should arise. Additionally, Analytical Technology has provided Yorkshire Water with personalised training as required by the staff.

Both the quality of the chlorine monitors and customer service provided by Analytical Technology have surpassed the high expectations of Yorkshire Water.

For more information about ATi's Q46H Chlorine Monitors, or any other ATi products, please call 0800 804 6062, e-mail sales@atiuk.com or visit: www.atiuk.com