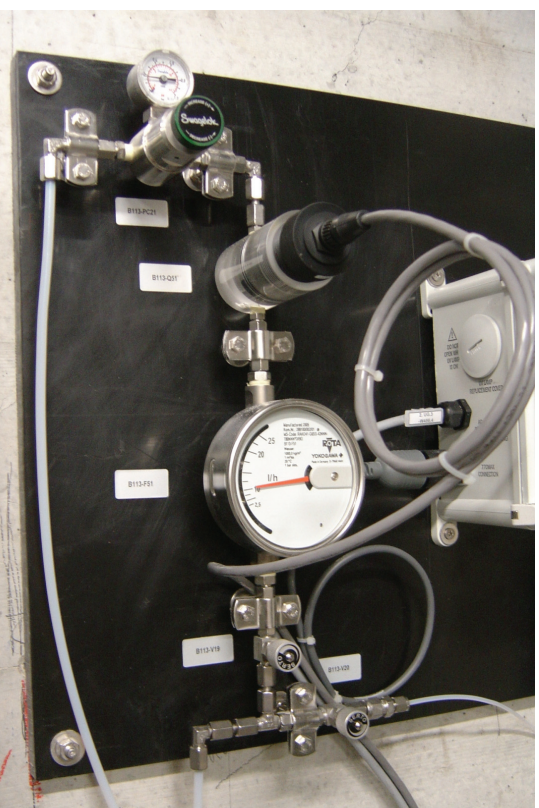
Bristol Water uses innovative techniques to improve Water Quality

"Lack of access to clean water is a leading cause of death and disease in developing countries, killing about 5 million people annually and causing 3.3 billion illnesses'', says the World Wide Water Foundation.

Water purification is the removal of contaminants from raw water to produce drinking water that is pure enough for human consumption or for industrial use. The treatment of water to make it suitable for drinking is one of the foundations for a prosperous and healthy nation.

Bristol Water has a long and distinguished history in the supply of fresh, clean drinking water to its customers. Founded in 1846, it supplies 300 million litres of clean potable water to 1,066,000. Water quality is the prime concern for everyone working in the UK water industry which has to meet some of the highest quality standards in the world. The regulatory framework currently governing the UK water industry is overseen by the Economic Regulator, OFWAT, and is remarkably stringent. In addition, water companies must abide by the Drinking Water Inspectorate, who publishes findings and recommendations for the water industry. In recognition of this, Bristol Water needs to have sufficient resources to ensure that the quality of water it provides is of the highest possible standard.

Thanks to the efforts of Bristol Water, water quality in the Bristol area is currently among the best in the world. Reaching and maintaining this exemplary level demands that Bristol Water invests heavily and constantly in new technology to ensure water quality standards are preserved and to increase efficiency and cost savings. The company is constantly upgrading its water treatment processes and is always on the lookout for new ideas and equipment to improve its water quality. In order to do this, Bristol Water only works with reliable third party suppliers.



Ensuring Water Quality

Local geography has played an important part in Bristol's water supply and the Mendip hills have traditionally supplied the majority of Bristol's water requirements. Blagdon Reservoir and Chew Lake, the company's largest collection reservoirs, can hold nearly 30,000 million litres of Mendip water between them. However, by the late 1950s it was clear that those traditional resources needed to be augmented to cope with growing populations, the growth of local industries and greater demands on water supplies. In all, Bristol Water can take water from over 60 different sources - reservoirs, rivers, springs, well and boreholes - linked by an increasingly flexible integrated distribution system enabling the Company to make the most economical use of them in terms of cost, energy and conservation.

Today the Gloucester and The Sharpness Canal is the Company's largest single source, capable of supplying more than half the area's daily needs. With such a range of sources, there are also a wide variety of treatment processes in use with each plant designed to tackle the problems encountered or likely to be encountered from its sources. Water from the Mendip sources, including the reservoirs, is generally of a good original quality and requires less treatment than water from the The Sharpness Canal.

Water Treatment

Treatment of the water from The Sharpness Canal has overtaken treatment of water from other sources. In 1973 the rated capacity was 120 mega litres a day with an average daily output of 93 mega litres per day from the canal. Today, following major refurbishment of Bristol Water's plant in 1995 at a cost of £23 million and the instalment of state of the art treatment processes, capacity has increased to 165 mega litres a day.

Water from The Sharpness Canal contains a mixture of debris and living organisms, bacteria, pesticides and chemical residues. Bristol Water has developed a number of strategies to clean this water involving a long and complicated water treatment process.

Treatment of water from The Sharpness Canal follows three broad stages;

1. Initial collection and storage,
2. Removal of fine solids and larger debris by coagulation, flocculation and filtration, and
3. Disinfection to ensure the water is microbiologically safe to drink.

Disinfection is normally the last step in purifying drinking water. Water is disinfected to destroy any pathogens, which have passed through the filters. In most developed countries, public water supplies are required to maintain a residual disinfecting agent throughout the distribution system, in which water may remain for days before reaching the consumer.

Within the water industry a number of chemicals or gases are added to the water to achieve disinfection and to protect the water in the distribution network following treatment. Bristol Water's nearest reservoir for treated water is 33km away from the nearest plant, which necessitates adding chlorine to protect the clean water as it travels along the route.

The most common and widely used disinfectant is chlorine. Chlorine is a strong oxidant that kills many micro-organisms. Because chlorine is a toxic gas, there is a danger of a release associated with its use. Chlorine has a number of drawbacks, however, not least of which is the familiar taste and smell associated with it and the large storage facilities required to hold it before use.

OZONE

Bristol Water currently uses ozone for potable water treatment. Ozone is regarded as a highly effective disinfectant due to its powerful oxidizing properties. It is a very strong, broad spectrum disinfectant that is widely used in Europe. Bristol Water is at the forefront of water treatment technology and was among the first UK companies to use ozone for this purpose. The advantages of using dissolved ozone are numerous; Ozone is made on site, there are no dangerous chemicals to transport, store or handle and it is a highly efficient disinfectant and kills micro organisms with a process known as cellular lysis. Its high reactivity, penetrability, and natural decomposition to a harmless product (Oxygen) make ozone a practical disinfectant for ensuring microbiological safety.

Ozone is the strongest stand-alone oxidiser currently available for water treatment and is 152% stronger than chlorine. It destroys the ecoli bacteria 3.125 times faster than chlorine and leaves no taste or odour. It breaks down pesticides and removes unwanted colour. In the oxidisation process, ozone ruptures the cellular membrane of micro organisms and disperses the bacterial cytoplasm into solution which makes reactivation impossible. It is exceptionally quick-working, with the oxidisation process taking a staggering 2 seconds.

Ozone is used in conjunction with other treatment processes and is the key element in Bristol Water's current success.

First discovered in 1840, ozone is a form of oxygen which contains 3 oxygen atoms instead of 2. Its chemical formula is O_3 and it is produced when oxygen molecules are split into 2 oxygen atoms whilst in the presence of other oxygen molecules which combine to form ozone. It is deep blue and strongly magnetic. Ozone is formed when an electric spark is passed through oxygen, and causes a detectable odour near electrical machinery. The commercial method of preparation consists of passing cold, dry oxygen through a silent electrical discharge. In the potable water industry it is manufactured from oxygen gas, requiring large amounts of oxygen production, storage and consumption, making it extremely expensive if managed incorrectly.

Traditionally ozone production has been

monitored and controlled using redox analysers, spectrophotometers, amperometric monitors and colorimeters, all of which demonstrate shortcomings. Lack of sensitivity, expense and inefficiency are just some of the criticisms levelled at them.

Q45H/64 Dissolved Ozone Analyser

Analytical Technology Inc. (ATi) developed its innovative Q45H/64 Dissolved Ozone Analyser which has largely superseded other monitoring systems and is used extensively by Bristol Water. The flexibility of ATi's dissolved ozone monitor combined with its ease of use first interested Bristol Water. However, the company has since also benefited from the accurate monitoring afforded by the Q45H/64 monitor, providing better and more accurate data to feedback, reducing the amount of energy required for the ozone disinfection process.

The ATi Q45H/64 dissolved ozone monitor has been engineered to give accurate reliable ozone measurement down to PPB levels. Accurate calibration using a PPB traceable titration method ensures the monitor's accuracy. The monitor requires minimal operator attention and has the lowest cost of ownership of any dissolved ozone monitor on the market. Bristol Water's intelligent use of the monitor with the assistance and expert input of ATi and good working practices, alongside modifications made to the ozone diffuser system on site, means Bristol Water has been able to reduce the oxygen consumption required significantly.

Oxygen consumption has reduced from 6 tonnes daily to between 3 and 4 tonnes whilst maintaining the improvement in the water treatment process.

A spokesperson at Bristol Water comments: "Reaching and maintaining an exemplary level of drinking water quality demands that we invest heavily and constantly in new technology to ensure standards are preserved and to increase efficiency and cost savings. The reduction in ozone usage from six down to four tonnes per day is down to several factors:- A new diffusion system and dosing controls which disperse the ozone in a more uniform pattern. The result is a more stable residual which is accurately measured by the ATi instrument. The ATi Q45H/64 dissolved ozone monitor has proven an intelligent, dependable tool capable of providing accurate data easily and efficiently."

Through its partnership with ATi, Bristol Water has not only been able to minimise the cost of using ozone in the disinfection process, but has also been able to improve the quality of its drinking water.

For more information on the new Q45H/64 Dissolved Ozone Analyser, please contact ATi at: info@analyticaltechnology.com, call 01457 832800, or visit www.analyticaltechnology.com

AUTHOR DETAILS

By Garry Tabor, European Sales Manager, ATi, and Paul Moorhead, Senior Works Controller, Bristol Water

Simultaneous Parameter Monitor

Tethys Instruments (France) announces the launch of its new generation of on-line water analyser UV400. Up to 12 parameters can be monitored simultaneously in one instrument. The new design gives an easy access to the flow cell(s) and to any part of the analyser. A USB port enables the download of the measurements and parameters with any USB key. The user-friendly colour touch screen interface gives an easy way to check and calibrate each parameter.

Based on UV spectroscopy for the main parameters (ammonia, COD, hydrocarbons and nitrate) it offers an unparalleled reliability and stability with an extremely low operating cost. Thanks to large bore tubing and optical compensations, the measurements can be done directly on wastewater without filtering (even with activated sludge). A new flow cell design enables very high values of suspended solid (like paper mill wastewater) without risk of clogging. Phosphate is measured by standard colorimetric methods while pH, conductivity and dissolved oxygen are using standard external probes. A low range turbidity cylinder enables measurements down to very low values for drinking water applications. Different interfaces are available: RS485/MODBUS, RS232, GSM modem as well as analogue 4-20 mA outputs.

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EPA Vials

Testing of water supplies for the presence of potentially harmful chemicals such as pesticides, herbicides and polycyclic aromatic hydrocarbons requires controlled sample collection and processing. **Chromacol** (UK) produces a range of vials for environmental water analysis with Environmental Protection Agency (EPA) certification. This is defined by cleanliness and sampling volume.

Chromacol EPA vials are available in two sizes of 20mL and 40mL capacities with a standard 28mm outer diameter. They are available in clear or amber glass that meets ASTM Type I Class A and USP Type I standards. To reduce possible contamination, the vials come pre-assembled with caps and septa manufactured from high purity polypropylene lined with silicone/PTFE injection septa. Cleaning conforms to EPA standards with three levels of certification class - 100, 200 and 300; with Class 300 comprising batch certification for analysis of VOA components to less than 0.5ppm.

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