How borehole bacteria can impact on essential water supplies

Legislation demands that, under normal circumstances, fire and rescue services will secure water for firefighting purposes from the public water mains via hydrants maintained by water companies up and down the country. On occasion, however, the use of private borehole water supplies – or indeed other sources, such as ponds, lakes and rivers – may be required. Good reason then, to ensure regular testing programmes are carried out to avoid the potential failure of essential equipment just when you need it most.

Mike Deed

The importance of testing for bacteria in water pipes, pumps and sprinklers is often overlooked. I was reminded of this on a visit to a factory where iron oxide residue was causing problems in the factory's ceiling wet mains, affecting both the quality and the quantity of the water it was using in its production processes.

It is worth noting that these same pipes supplied water to the sprinklers, which would automatically be activated in the event of a fire. The factory had its own water supply from a borehole yet, as often happens, it had adopted a 'fit and forget' attitude – the borehole goes into the ground and the end user expects it to continue pumping good-quality water ad infinitum.

It is not that simple. Without regular maintenance and testing, bacteria in borehole water can lead to corrosion problems, including blockages within the borehole casing, the fouling or seizing up of the pumping mechanisms and contamination of the water itself.

Potentially, it could lead to a failure to provide essential on-site water supplies to the fire services because pipes may become damaged and/or impact on the effectiveness of fire-sprinkler systems.

The most likely culprit will be iron-related bacteria (IRB), which is found in many boreholes and can have a major effect on the efficiency of equipment, causing corrosion or blockages through the formation of residues and slime. Other types of bacteria will include manganese oxide and slime-forming bacteria. Found together or individually, these can all influence the flow and quality of the water and cause a decrease in performance.

▼ **A treatment solution, contained in the IBCs helps to clear iron-related bacteria in an industrial complex which relied on a borehole.**

Mike Deed is founder and managing director of Geoquip Water Solutions. He has a lifetime's experience in the water-treatment sector. Specialising in borehole management, he has a particular focus on helping organisations proactively tackle corrosion problems caused by bacteria.

Testing

As different bacteria strains require different treatment, the simplest way to check is to take and test water samples.

A simple Biological Activity Reaction Test (BART) kit can identify the growth of iron-related bacteria, sulphate-reducing bacteria or slime-forming bacteria, providing results in just a few days. These have the added benefit of being done on site, most likely by the facilities team, with no need to send a sample to a laboratory or undertake potentially more expensive downhole camera surveys or investigation work.

Over an eight-day period, a series of indicators will develop within the test vial, depending on the type of bacteria present:

- Iron-related bacteria will develop a foam and/or a brown ring inside the testing tube.
- A cloudy or gel-like growth will demonstrate the presence of slime-forming bacteria.
- If sulphate-reducing bacteria is found, foam will be produced and a black ring may develop around the interior vial of the testing tube.

Ideally these straightforward tests should be carried out as part of a six-monthly maintenance programme.

Treatment

Having established both the presence and type of bacteria, prompt treatment is required.

Approved for use in the UK market by the US National Science Foundation (NSF), which sets standards for many treatment chemicals including well drilling and rehabilitation aids, the BoreSaver range of borehole cleaning and well rehabilitation treatments is safe and easy to use.

The addition of a biodegradable marker into the formulation gives an instant all clear to demonstrate that any remaining chemical residue has been removed.

One treatment will usually be enough to remove the deposits that have built up and it can be applied while the equipment remains in the borehole, avoiding the expense of lifting out the pump, thereby ensuring that downtime is minimal.

The range includes the BoreSaver Ultra C, which will completely remove iron and manganese oxide deposits in as little as 24 hours; the Ultra C PRO for more severe

▲ **Photo shows the test vial (centre) once it has been removed from the outer dispenser.**

▶ **Photo shows how the colour of the water changes during the testing process.**

cases or iron oxide, manganese oxide and iron bacteria contamination; and the Ultra C ECO for more standard iron residues.

The MultiKleen is a general all-purpose cleaning treatment used when a wide range of residues are present or if the exact composition is unknown, which completely removes deposits and slime from boreholes, wells, pumps and equipment.

Taking a closer look

While the testing kits and treatment solutions are an important first step, if problems continue, it may be that a more serious issue exists within the borehole. For example, damage to the casing or a blockage caused by extraneous materials such as lost equipment (dip tubes, cable or sometimes even the pump!); or debris from the surface; or from breaks in the casing.

A downhole camera inspection will be the next point of action; look for one that ideally has a dual-view wide-angle colour camera to give you both a down view and a side view with adjustable lighting; and it's worth checking both its portability and its battery time and charger. If you're working out in the field with a remote borehole, you don't want the battery to constantly need recharging.

A camera will show if an old borehole needs relining or replacing or if there is any other damage, for example to the pump. This allows decisions to be made as to the next course of action.

Boreholes for today and tomorrow

If budget allows, the optimum way to manage a borehole for the best longevity is to install bespoke remote monitoring and telemetry systems. By enabling full remote access, complete with triggers and alarm points, which raise alerts when faults or particular combinations of problems arise, the chances of a borehole failure at a critical time will be greatly reduced.

If, however, you're watching the pennies and the pounds, then do just one thing: use that BART kit and regular treatments to stop bacteria and corrosion in their tracks. You can then be safe in the knowledge that if emergency water supplies are required, it won't be the fault of bacteria in your system that stops that water flowing.

For more information, go to www.geoquipwatersolutions.com