HEVASURE
INTELLIGENT CORROSION CONTROL

Case Study:
Monitoring vs sampling - the benefits of instant results

Project overview

Building no. 6 is a large, prestigious office in central London which had a heavily contaminated Chilled Water (CHW) system, with high levels of dissolved iron (108mg/l) and suspended solids (138mg/l), which, if left unchecked would lead to inefficiencies in the system, shortened lifespan and potential breakdown.

In an occupied building of this size, implementing a full flushing or re-cleaning programme was deemed impractical as there are over 500 Fan Coil Units and only limited out of hours' access would be available. Any works carried out ran the risk of destabilising the system.

The Hevasure 24/7 monitoring system was utilised alongside partner company, Guardian Water Treatment's industry-leading water solutions, to firstly bring the site back to a stable condition, and then provide a period of monitoring. Over two weeks in July/August 2017 the system was continually checked to ensure corrosion was kept at bay, as well as identifying and rectifying additional issues.

Working alongside traditional corrosion coupons and sampling, the Hevasure unit proved itself to be a far more responsive and thorough solution, allowing problems to be immediately flagged up and therefore dealt with, while giving peace of mind that Guardian's water treatment programme had been successful.

The solution

A Hevasure unit, which provides real-time, 24/7 monitoring of key system parameters, was installed in order to provide an accurate picture of the system over a period of time. At the request of independent consultants, a sampling programme and corrosion coupons were also employed.

The works carried out by Guardian included a balanced flush via the main plant, with as many valves on the system open as possible in order to leave it in a clean and stable condition. The majority of the debris was removed to slow the spread of corrosion.

One of the concerns raised was how to ensure the system was stable after the flushing and passivation, as the introduction of fresh water can sometimes lead to oxygenation and further damage. Hevasure was key in showing a real picture of system conditions following this treatment, providing more instantaneous and accurate results compared with corrosion coupons and sampling.

The findings

Initial data
Following the flushing works, water quality was shown to be within BG29 guideline limits. The laboratory sampling confirmed these results, but took one week to come back.
Hevasure provided information straight away, including the fact that system had slightly higher than desired levels of Dissolved Oxygen (DO), at 0.33ppm. Despite this, the output of all corrosion sensors indicated that the system was not adversely affected, demonstrating that inhibitors were working as they should.

Hevasure data
Within the first two weeks of installation the Hevasure system tracked pressure spikes and the actions and system conditions that had caused them. At the time, the site engineers noticed noise and possible air in the system – an indication that a previously non-circulating area had been re-opened and was introducing air.

Once the pressure spike issue had been resolved, DO returned to 0.3ppm and the galvanic and crevice corrosion sensors indicated negligible corrosion rates.

Conductivity showing as stable after the pressure surge incident.
Following the pressure surge, around 400 litres of water had to be introduced to the system, causing a sudden drop in conductivity (28th August). The engineers responded by re-dosing the system with inhibitor until the conductivity reached an acceptable level.

Corrosion data:
Providing readings every 15 minutes, all the indications from the Hevasure unit demonstrated that the conditions in the system were not corrosive, with the three different sensors showing low outputs following the flushing works.

On the 29th August, two weeks after the Hevasure installation and four weeks after the flushing works were completed, independent laboratory sampling was carried out for a second time. The results showed very low dissolved and total iron levels, with the consultant commenting, "iron levels and copper levels are remaining at low levels which is encouraging."

Corrosion coupon data
Corrosion coupons were installed alongside the Hevasure system at the request of the consultants. The results from both the copper and mild steel corrosion coupons confirmed that the data from the Hevasure unit was correct, and the metals in the system were indeed stable – well below the recommended 'good' levels.

- Mild steel corrosion coupon - 0.012 mpy – recommended levels for good control 0.2mpy.
- Copper corrosion coupon – 0.0159 mpy – recommended levels for good control 0.1 mpy

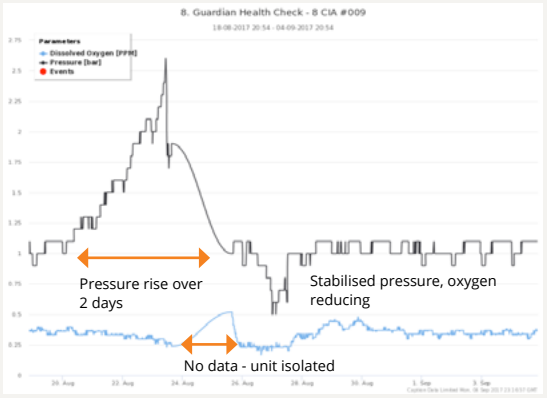
Identifying additional issues
Despite the fact that the Hevasure unit showed the system to be in reasonably healthy condition, free from corrosion and water losses, it did detect a consistent level of DO at around 0.3ppm. Recommended levels for a healthy "aeration free" system is less than 0.2ppm. The pressure, which was being measured close to the top of the system, was also lower than it should be, occasionally dropping further.

After some investigation into the layout of the system, including an additional section of pipework which was added to the roof area, very low pressures were noticed. Sections of the systems were also noisy with what sounded like air in one or two areas.

The site engineer team checked this and when the original drawings were compared they discovered around 20 Air Auto Valves (AAVs) missing from the top of the system.

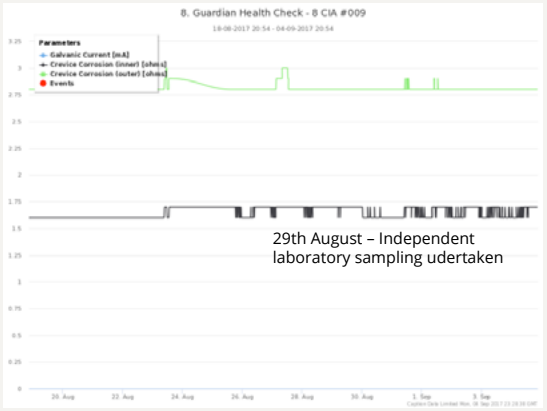
Eight new AAVs were subsequently installed and the aeration noises have now disappeared.

Data before and after pressure spike



Conductivity data

Corrosion data



Conclusion

Independent laboratory testing – conclusion corrosion under control
In the six weeks following the flushing works, independent sampling of the system at an estimated cost of £2,400, provided 12 sets of chemistry readings that showed stable iron and copper levels, as well as a consistent conductivity. There was also one reading of dissolved oxygen taken. A leading independent consultant who took these samples concluded that the "iron and copper were remaining at low levels."

Corrosion Coupons – conclusion corrosion under control
Corrosion coupons were installed on 17/8/2017 and taken away for analyses on 10/10/2017. These showed that iron and copper corrosion was very low during this period.

Hevasure Monitoring – conclusion corrosion under control
Within one day of installation the Hevasure unit was reporting slightly low pressures and slightly high DO readings but, most importantly, controlled and low corrosion rates. Despite the pressure changes, and the continued DO presence the corrosion sensors informed us that the system was stable, demonstrating the effectiveness of inhibitors.

The anomalies in pressure and DO lead to the rectification of other issues in the system, issues that may not have been identified from sampling alone.

Negating the need for sampling and corrosion coupons
At the end of the period the Hevasure unit had collected over 35,000 data points and helped to identify an installation issue with missing AAVs – as well as confirming the system metals were indeed stable after the flushing and passivation works were carried out.

Providing, real-time, 24/7 data, covering a range of parameters, the Hevasure monitoring system negates the need for corrosion coupons and also reduces the amount of chemical sampling required. By providing virtually instant feedback, any issues can be addressed before corrosion ensues, saving maintenance teams and building manager's time and money long term.

- **Hevasure was key in showing a real picture of system conditions following Guardian's treatment, providing more instantaneous and accurate results**
- **Providing readings every 15 minutes, all the indications from the Hevasure unit demonstrated that the conditions in the system were not corrosive**
- **The Hevasure unit collected over 35,000 data points, helped to identify an installation issue and confirmed the system metals were stable after the flushing and passivation works were carried out**
- **By providing virtually instant feedback any issues can be addressed before corrosion ensues**

Hevasure Ltd
Stancliffe House
Whitworth Road
Darley Dale
Derbyshire
DE4 2HJ
United Kingdom

Tel: +44 (0)1629 735743
Email: info@hevasure.com
Web: www.hevasure.com