

DON'T TAKE A CHANCE ON CORROSION

Gordon Pringle of HASL makes the case for a sustainable and environmentally friendly heating system.

The implementation of an alternative approach to water treatment and the use of continuous monitoring in the prevention of corrosion in closed systems is not always obvious. The approach used by James Culbertson of the Keenan Consultancy at Harvesters Way, Edinburgh explains the operation of such systems, the minimal initial cost and sustainable savings associated with this enhanced process.

Control of corrosion of any closed-circuit heating or cooling system is critical as it imposes a considerable energy load on the system if fouling and debris accumulates. Premature component failure or pipework penetrations can cause catastrophic financial and reputational damage to manufacturers, contractors, designers, and owners alike.

Greater knowledge of the fundamentals of pressurisation and alternative methods to controlling oxygen corrosion can result in substantially lowering of the environmental impact of systems. CIBSE CPI 2020 on Heat Networks has recently recognised the approach of alternative standards such as the German VDI 2035 Part 1* in this regard.

The introduction of the Northern European guidance leads to better sustainable outcomes based on minimizing oxygen entry and water conditioning such as demineralisation as opposed to the use of chemical inhibition. This approach has been used very successfully in Germany, Switzerland, Austria, the Benelux, Scandinavia etc. for decades. In many parts of the UK the mains water quality is good enough to fill systems without any further treatment or conditioning.

The key to controlling corrosion in closed systems is to control the level of oxygen entry. The case of Harvesters Way and many others show that correct pressure control, limiting water make up and the use of steel pipework lead to corrosion levels below 5µm/y. This is well below the level where damage due to corrosion or corrosion products could occur.

Continuous corrosion monitoring will monitor the system condition and alert the building operator if events occur that will cause an increase in corrosion. Real-time corrosion monitors are low cost and will pay for themselves within 2-4 years thus CAPEX neutral and truly OPEX beneficial.

Traditional Water Treatment vs Water Conditioning

What is the difference? Water treatment is adding chemicals to the water to change its properties, in water conditioning the properties of the water are altered by processes such as demineralisation or softening. No chemicals are added.

The traditional UK method of protecting heating systems from corrosion is through the use of chemical inhibitors. Standards such as BS7593:2019 or BSRIA BG29:2021 / BG 50:2013 leave very little option for an alternative approach. The problem is that many people think that because the system has been inhibited it is fully protected regardless of all other parameters. But nothing could be further from the truth. It is the amount of oxygen that enters the system that determines the amount of corrosion that takes place. Even the best inhibitors cannot cope with large amounts of oxygen entering the system.

Therefore, most continental standards are based on minimising the oxygen entry and using water with a conductivity below 100µS/cm (VDI2035 Part1). In some parts of the UK mains water would meet these requirements without any further conditioning. The low conductivity slows down corrosion and microbiological processes. Any corrosion that may occur would not be damaging and can easily be monitored.

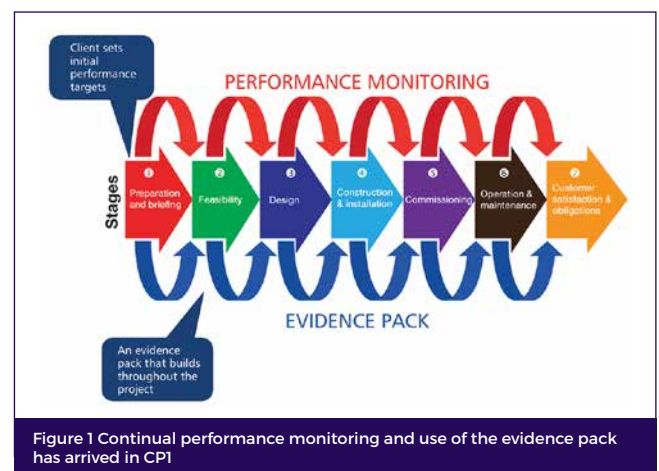


Figure 1 Continual performance monitoring and use of the evidence pack has arrived in CPI

A non-chemical approach is not only better for our environment but also offers more sustainable results and a lower overall cost. The CIBSE Heat Networks Code of Practice in the UK (CPI) should be commended in its adoption of alternative approaches such as VDI 2035Part1. >>

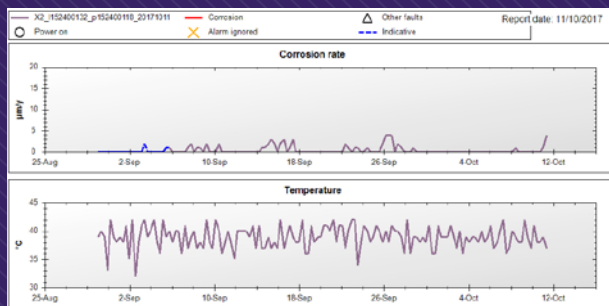
Case Study

The heat network at **Harvesters Way in Edinburgh** used the approach in CIBSE document CPI. It consists of 183 maisonettes, flats and town houses with HIUs and no hydraulic break.

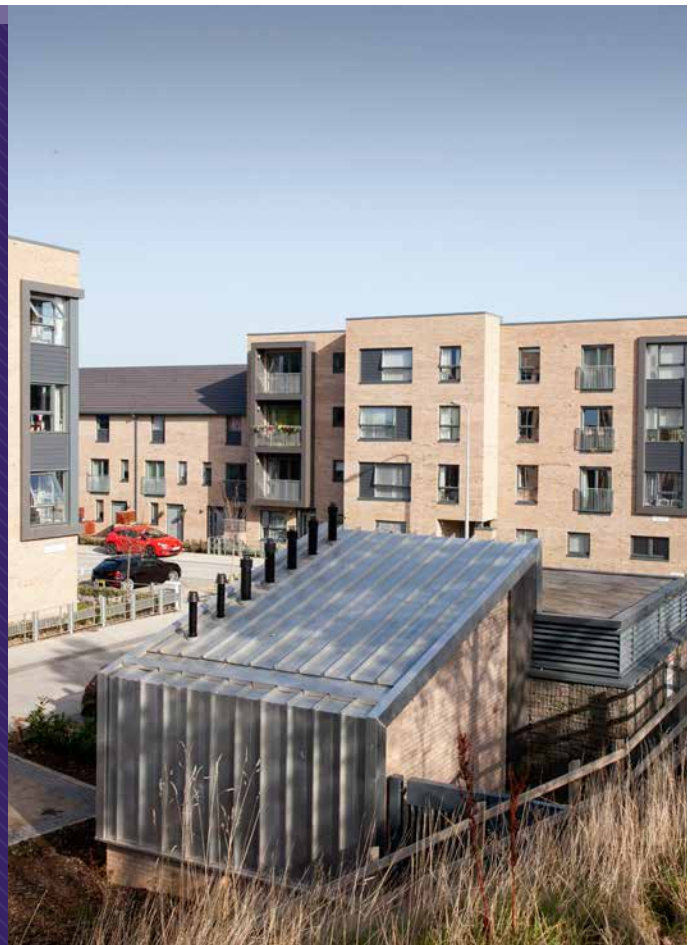
By using a central boiler plant of only 400kW the efficiency of the system in comparison to decentralised boilers is around 15% better.

The inclusion of a Risycor electronic corrosion coupon monitor allows systematic performance monitoring and to provide data for the evidence pack at hand over. The Risycor electronic corrosion monitor alarmed twice in 3 years when maintenance on system was being carried out.

The corrosion data recorded by the monitor shows otherwise very low levels of corrosion meaning the system runs efficiently and reliably.



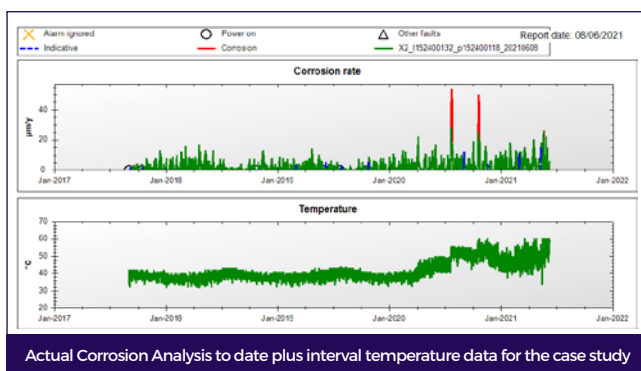
Post Practical Completion introduction of Electronic Coupon Corrosion Monitoring initial 6 weeks forming evidence of a stable system in the handover pack



Conclusion

The case identifies the benefits of adopting a considered design approach to water conditioning opposed to water treatment combined with performance monitoring where quality & quantity of incoming water, enhanced design of system pressurisation and commissioning offers substantial economic justification in terms of ROI.

“Corrosion tends to be the greatest mystery and astonishment of both stakeholders and FM contractors, who historically just rely on inhibitor levels as their standard bearer whether a system is going to be okay.



Actual Corrosion Analysis to date plus interval temperature data for the case study

An online corrosion monitor such as Risycor provides transparent real time and proactive assistance to the process to allow better financial, educated and long term planning for any system.” **James Culbertson of The Keenan Consultancy**

This new technology has been widely used in other systems for a few years now, particularly where clients and manufacturers have sought greater transparency on system performance at commissioning and beyond. The benefits of the monitoring technology can be applied in all such systems regardless if the water comes straight from the tap, has been conditioned or chemically inhibited with minimal capital expenditure. ■

On-Demand access to: *The case for sustainable, environmentally friendly heating and cooling systems*
<https://www.youtube.com/watch?v=cqfF3fx6jPw>



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