

Get to know your AYCR

Gordon Pringle, Managing Director of HASL, highlights why understanding average yearly corrosion rates matters and how it helped one client make the right specification choices.



Durable, proven over many years and more cost-effective than stainless steel and copper (subject to copper prices), carbon steel offers a viable solution for closed water systems if monitored and protected properly.

In addition, the press-fit system is quicker to install than traditional jointing methods because it requires no hot works, no soldering, and no threading. It is designed so that any connections not pressed during installation can be visibly detected during testing as it would purposefully leak. The pressing indicator consists of a thin plastic foil encasing the pressing shoulder, which gives a visible indication of a pressed joint when the foil is removed during the pressing operation.

Klondyke Garden Centre in Polmont, Falkirk, reopened its doors in 2021 after a major refurbishment which included a large extension, additional retail space and a new 300-seater restaurant with separate coffee bar.

The owners were keen to include an environmentally friendly and reliable heating system in this multi-million-pound refurbishment. This included avoiding the use of chemical inhibitors for the new heating system.

Inhibitors are generally used to prevent rust and internal corrosion from occurring inside heating systems but are damaging to the environment. So, the project M&E contractors VWG Mechanical helped the client achieve their environmental aims by opting for untreated water protected by innovative corrosion monitoring technology focused on average yearly corrosion rates (AYCR) to achieve a long-lasting, reliable, and efficient system.

VWG Mechanical designed a system which is both automatically vacuum degassed and pressurised, taking advantage of soft local water to minimise oxygen content and corrosion build up. This made the specification of precision carbon steel pipework (Mapress press-fit from Geberit) the ideal solution.

HASL was recently asked about the initial passivation of steel in the initial fill process. We believe that, provided minimum over pressure above 0.3 bar at the head of the system is achieved and permanently maintained in the system hot or cold in accordance with EN12828, then the rate is proportional to the amount of ferrous material available to consume the dissolved oxygen or remediation process adopted.

A micrometer (μm) also known as a micron is 1×10^{-6} meters = 1 millionth of a meter = 1000th of a millimeter. The Risycor sends an alarm when an annualised corrosion rate of $24 \mu\text{m}/\text{year}$ occurs, which our algorithm creates every 7 hours. Approximately $50 \mu\text{m}$ is the average thickness of a human hair and the same as the Risycor probe. Aluminium foil is about 25 microns thick and commercial steel radiators are traditionally 1.6mm ($1600 \mu\text{m}$) thick. >>

What do standards and guidelines say?

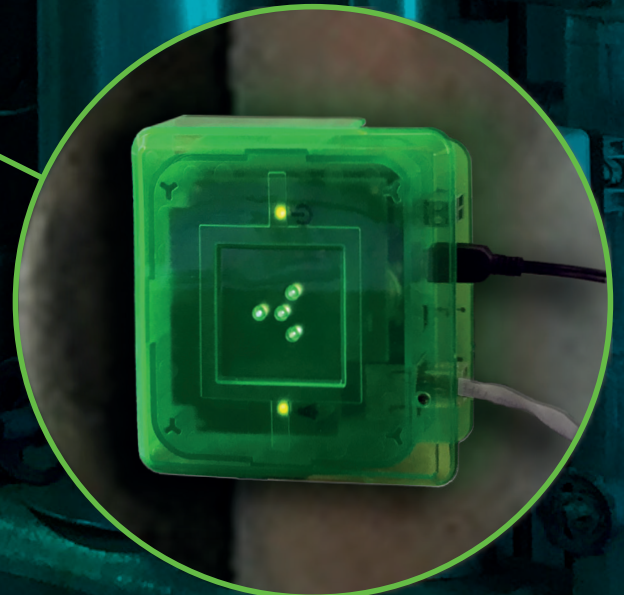
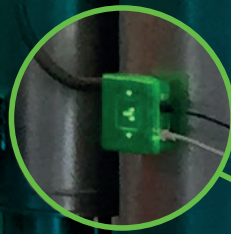
As also explained in the Risycor Application Guideline, occasional spikes in corrosion rate (YCR) are usually not a problem. As far as we know, very little research has been done on corrosion rates in closed heating systems. This is possibly due to the fact that until now there has never been a practical, economical and accurate measuring method. Based on the extensive experience gained with thousands of Risycors in real installations, RESUS currently use:

Average Yearly Corrosion Rate (AYCR)		
< 7 $\mu\text{m}/\text{yr}$	7 - 21 $\mu\text{m}/\text{yr}$	> 21 $\mu\text{m}/\text{yr}$
Risk of Corrosion Damage		
Low	Medium	High
Result in the long term		
little chance of corrosion damage	corrosion damage probable	serious chance of corrosion failure

 **risycor**[®]

Smart sensor technology that warns you
if corrosion is threatening your heating or
cooling system

The smallest component with
the biggest savings potential.





The new heating system with monitoring provides Klondyke with an environmentally-friendly and reliable heating system. As a client, they can be safe in the knowledge that manufacturers and contractor have worked together to complete an effective solution to overcome the corrosion challenge. Early monitored evidence from the project demonstrates the success of the installation.

Chris Dooling, managing director of VWG Mechanical, says: "We're aware of recent negative press surrounding carbon steel yet we've never lost confidence in the material or doubted its reliability. We chose Geberit Mapress

The carbon steel used on this project is 1.2mm (1200µm) thick and the initial fill passivation we noted earlier, on a well-designed system may average around 0.005mm (5µm) per year. This may not remain constant (uniform corrosion) depending upon numerous factors but suffice it to say if AYCR isn't measured, then it will never be possible to improve outcomes.

The updated system also therefore includes the innovative Risycor electronic coupon method (ECM) for monitoring of corrosion (the AYCR) and pressure for ongoing protection. When maintained with minimal system water loss and vacuum degassed make up, it is expected to have an average yearly corrosion rate (AYCR) below 7µm/y lasting for at least 25 years.

System hydraulics and water loss play such an important factor in operational activity and the Risycor logs these events and their impact on corrosion rates regardless of if inhibitors are present or not.

carbon steel along with electronic coupon method (ECM) monitoring for this project because of the cost benefits, as well as the technical expertise and support provided by Geberit and HASL. It has enabled us to proactively respond to any maintenance requirements, ensuring smooth operation and longevity of the system."

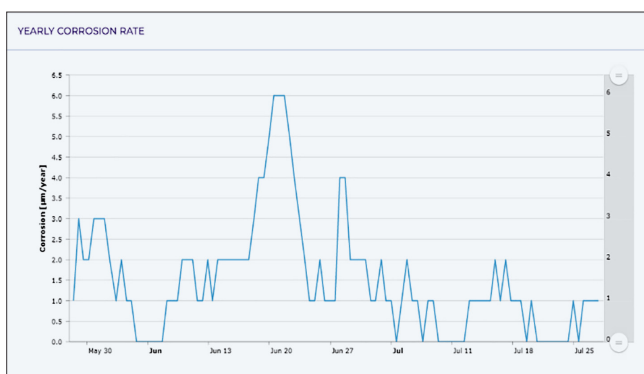
By adopting correct installation and mechanical procedures alongside cost-effective monitoring to alert those responsible when things go awry, they can respond in a timely way to provide proactive maintenance as and when required. This is condition-based maintenance as it should be.

The importance of understanding AYCR figures is becoming more widely recognised. Recently a head of asset management for a global FM business commented: "I like the metric (AYCR). More accurately understanding the rate of degradation to inform life cycle planning and maintenance interventions would be really beneficial."

Today's asset management professionals need notification when events occur that require condition-based maintenance and FM will evolve to adopt technologies that help to improve their efficiencies - and lead to improved system performance and better outcomes for all.

Klondyke now knows their ongoing closed system average yearly corrosion rate with alarms to the BMS when settings go awry. Do you know your system's AYCR? ■

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PCXI output

The corrosion coupon at the end of the probe is very thin but it is important to note that it is not so much the loss of material but the rate of material mass loss which is a crucial factor. Which is why measuring and monitoring the average yearly corrosion rate is vital to keep the system optimized.



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