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IWTM, VDI2035 GUIDELINES & CORROSION CONTROL IN OLDER SYSTEMS

GUIDE V3 APR 23

The background of the lower half of the cover is a dark blue, semi-transparent image. It shows a close-up of a water tap on the left and a sign with the word 'ROTECT' in large, light blue letters on the right. A single water droplet is visible on the sign.

**IWTM-UK
GUIDES**

INTRODUCTION

Founded in 1992, IWTM have partnered with Elysator working with chemical free water treatment using electrochemistry for corrosion control in heating and cooling systems for over 30 years, with worldwide recognition, offices in Norway, UK, Finland, Sweden, Canada, USA and a global presence in the Marine sector.

The Chartered institute of Building Service Engineers CIBSE encourage the industry to seek advice from specialist suppliers of this equipment when following VDI 2035, and with our experience we are ideally suited to provide this.

VDI 2035 Part 1 is a German guide used widely throughout the world and is now recognised by CIBSE in CPI 2020 and CIBSE Heat Network Design Guide 2021. We often refer to VDI 2035, primarily because HVAC equipment manufacturers typically require this for warranty validation. However, our methodology predates this standard by more than 35 years.

Other national standards which reflect IWTM & VDI methodology include SWKI BT 102-01 Switzerland guideline and the Norm H 5195-1 Austrian guideline. IWTM can ensure compliance with VDI 2035 (as well as the above guidelines) but, more relevant to the UK market, provide adherence to CIBSE guidelines.

All these guidelines, & our methodology, achieve corrosion control by altering the condition of the system water:

- Lowering the electrical conductivity
- Removing dissolved oxygen
- Maintaining the pH between 8.2 & 10

COMMISSIONING NEW SYSTEMS

When filling new systems via our resin devices & following the correct filling and cleaning methods you will be able to achieve the standards set out above for electrical conductivity & pH and be compliant with CIBSE from the outset.

The installed IWTM device will subsequently remove any dissolved oxygen and, together with a simple maintenance program, maintain these 3 key parameters for the lifetime of the system.



RETRO-FITTING UNITS TO EXISTING SYSTEMS

Historically, UK systems have typically used chemical additives in an attempt to control corrosion. Despite this, many continue to experience significant issues with corrosion leading to efficiency losses, increased operating costs & lower equipment lifetimes.

It is possible to address these issues, switching these systems to chemical free operation, by retro fitting IWTM products.

This process broadly consists of 2 phases:

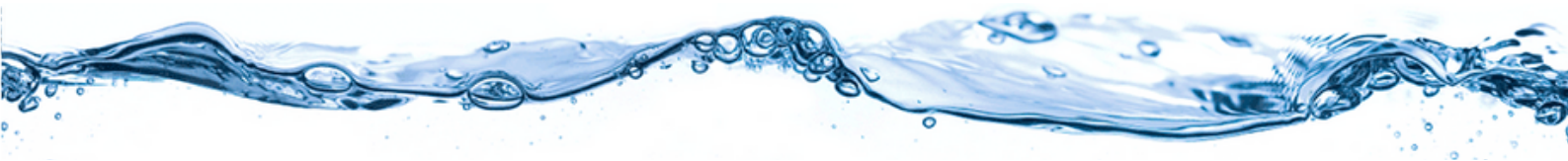
- Cleaning up the existing system: removal of dissolved oxygen, control of pH & reduction in electrical conductivity to inhibit on-going corrosion together with systematic removal of pre-existing corrosion debris & sludge.
- On-going control of the water quality to ensure dissolved oxygen is removed, pH and electrical conductivity are controlled.

The duration of the cleaning phase is highly dependent upon the initial system state:

- Levels of corrosion & bacteria present
- Chemical composition of system water
- Levels of chemical present (inhibitors, biocides etc) present
- System operation (operating hours, temperatures)
- System “tightness” – levels of top-up &/or air ingress

Consequently, whilst we are confident that the system clean-up will always be achieved, it is difficult to accurately predict how long this will take.

Rinsing of the system through an ion exchange resin bed (ProFill & Purotap products) and/or additional filtering (Protector Skid product) are often used during the cleaning phase to accelerate electrical conductivity reduction & debris removal.



RETRO-FITTING UNITS TO EXISTING SYSTEMS

However, it is important to appreciate that, depending upon the initial chemical composition of the system water, it may be impractical to reduce the electrical conductivity to below 100uS/cm.

Whilst this is not strictly in line with VDI, our extensive experience has shown that effective corrosion control is still possible. The key to success is removing dissolved oxygen & maintaining pH. Our products do this & independent 3rd party documented results (see charts on following page) show corrosion effectively controlled in systems where electrical conductivity exceeds 100uS/cm.

It is informative to sample & analyse water regularly, particularly during the cleaning phase. We also recommend corrosion rates are monitored (using, for example, a product such as Resus Risycor).

These will, in our experience, typically show key parameters moving towards VDI 2035 standards, and the corrosion rate declining within the first 90 days of installation.

Clients often report network reliability improvements are apparent early in the cleaning phase even before old debris within the system has been completely removed. This is due to process of corrosion being halted by the lack of dissolved oxygen.

Records show that this change in corrosive state can happen anywhere between 36 hours and 14 days depending on the existing water quality and historic chemical make-up of the system.

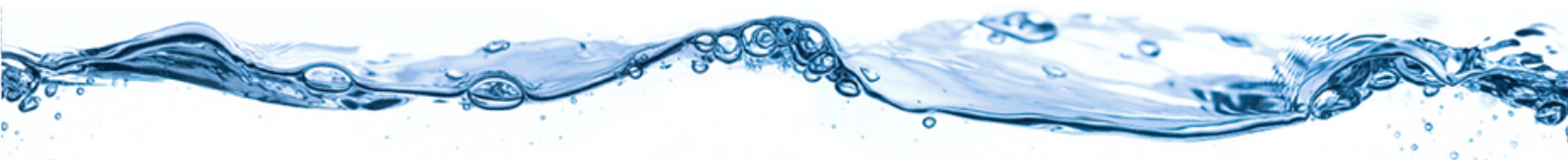
Throughout the remainder of the cleaning phase, it is important to continue to clean away historic corrosion debris from any system strainers and the Protector / industrial unit (by blowing down via the drain valve).

The Resus data in figure 1 demonstrates this rapid change in the corrosive state from an initial very high corrosion rate (indicated by the red line) to an acceptable rate (indicated by green) in <7 days.

The figure 2 shows that within 36 hours of our unit being turned on the dramatic effect we have on the system.

It is this reduction in dissolved oxygen, caused by the electro-chemical reaction of our pure magnesium anodes, which achieves the rapid system improvements seen when our unit is installed & enables it to effectively control corrosion even if electrical conductivity values exceed VDI recommendations.

clean | protect | prevent

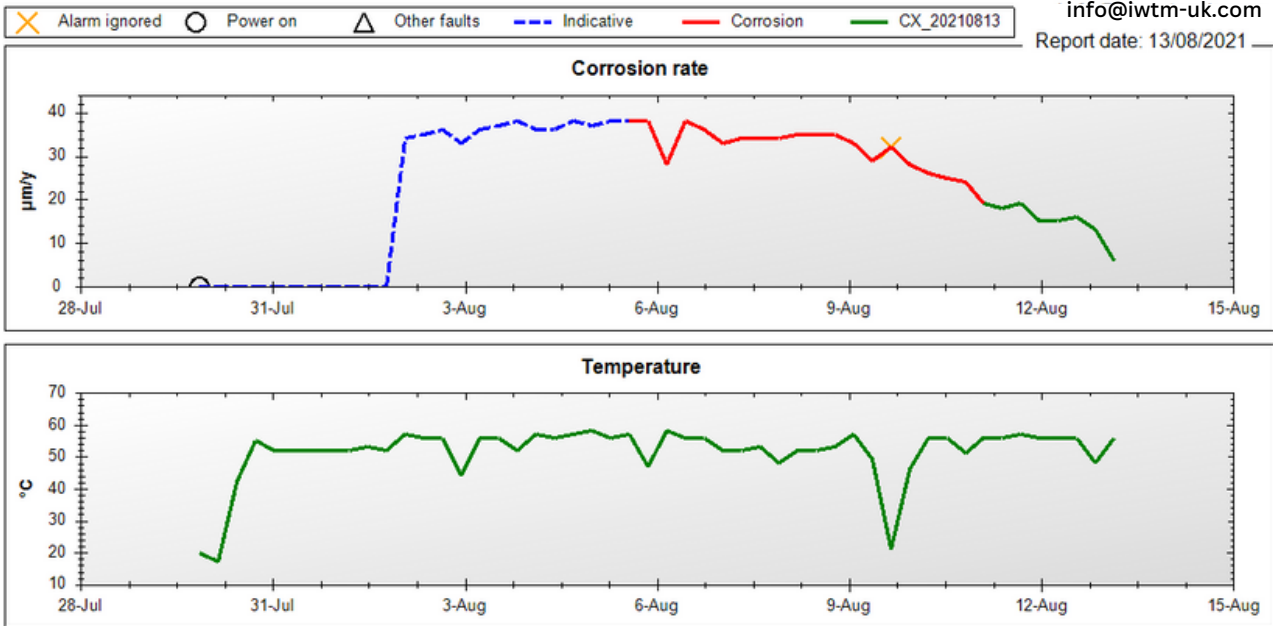


RETRO-FITTING UNITS TO EXISTING SYSTEMS



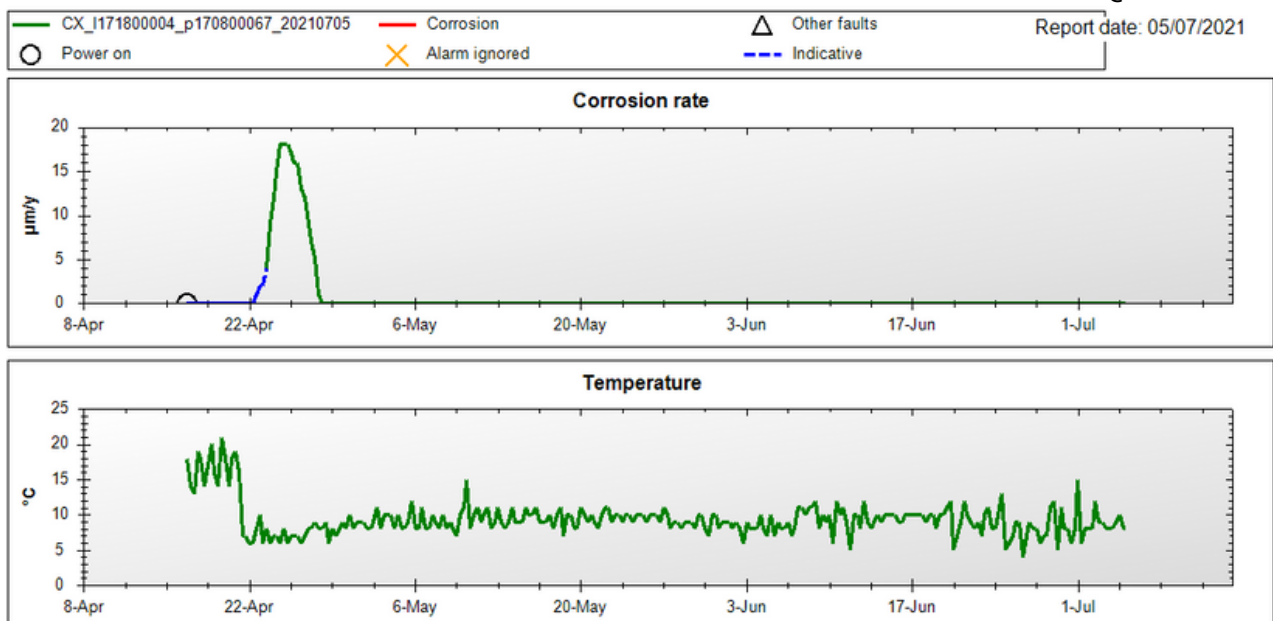
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FIGURE 1



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FIGURE 2



IWTM-UK TARGET LIMITS

		Target limits after installation (Retrofit)	Target VDI limits (New Systems)
Chemistry Analysis (Unit)	pH (pH Unit)	8.2 - 10 <i>(Without Aluminium alloys)</i>	8.2 - 10 <i>(Without Aluminium alloys)</i>
		8.2-9 <i>(With Aluminium alloys, but can be higher when used with magnesium anode technology)</i>	8.2-9 <i>(With Aluminium alloys, but can be higher when used with magnesium anode technology)</i>
	Electrical Conductivity (uS/cm)	<1000 <i>(Decreasing trend towards 100 uS/cm is to be observed)</i>	0-100 <i>(Low-salt Operation)</i>
			100-1500 <i>(Salt Operation)</i>
	Hardness, Total as CaCO3 (mg/l)	10-200 <i>(Depends on system volume and boiler outputs)</i>	10-200 <i>(Depends on system volume and boiler outputs)</i>
	Chloride (mg/l)	<= 30 <i>(Decreasing trend towards 10 mg/l to be observed)</i>	< 10
	Iron, Dissolved (mg/l)	<=0.5 <i>(Decreasing trend towards 0.1 mg/l is to be observed)</i>	<0.1
	Iron, Total (mg/l)	<i>Decreasing trend towards 0.1 mg/l is to be observed</i>	<i>Decreasing trend if any</i>
	Copper, Dissolved (mg/l)	<=0.1 <i>(Decreasing trend towards 0.02 mg/l to be observed)</i>	<0.02
	Copper, Total (mg/l)	<i>Decreasing trend towards 0.1 mg/l is to be observed</i>	<i>Decreasing trend, if any</i>
Aluminium, Dissolved (mg/l)	<=0.5 <i>(Decreasing trend towards 0.1 mg/l is to be observed)</i>	<i>Decreasing trend, if any</i>	
Aluminium, Total (mg/l)	<i>Decreasing trend towards 0.1 mg/l is to be observed</i>	<i>Decreasing trend, if any</i>	
Bacterial Analysis (Unit)	Presumptive Pseudomonas (cfu/ml)	<=1000 <i>(Decreasing trend towards 0 cfu/ml is to be observed)</i>	Absent
	TVC at 22°C (3 day) (cfu/ml)	<10,000 <i>(Decreasing trend towards 10 cfu/ml is to be observed)</i>	Absent
	TVC at 37°C (2 day) (cfu/ml)	<10,000 <i>(Decreasing trend towards 10 cfu/ml is to be observed)</i>	Absent
	Nitrite Reducing Bacteria (NRB) (in 2ml)	<i>Not Detected</i>	<i>Not Detected</i>
	Sulphate Reducing Bacteria (SRB) (in 1ml)	<i>Not Detected</i>	<i>Not Detected</i>



Founded in 1992, IWTM have partnered with Elysator working with chemical free water treatment using electrochemistry for over 30 years and have offices in Norway, UK, Finland, Sweden, Canada, USA and a worldwide presence in the Marine sector.

We have developed models specifically suited to the higher demands of the marine industry operating at higher pressures and higher temperatures.

The marine products are provided worldwide on the world's largest cruise ships working with the leading operators in this sector.

Having secured DNV approval in 2003, we are still the only chemical free water treatment manufacturer to have this certification and approval. DNV is a globally leading quality assurance and risk management company operating in more than 100 countries.

The IWTM Protector™ is our most recently developed product. The Protector range is now available to our land-based customers.

We're greatly encouraged to encounter a genuine industry appetite for culture change with many seeking alternative options for effective, pre-emptive water treatment.

We are looking to help accelerate that positive shift, with all of its associated benefits, seeking to tackle the cause of corrosion rather than the symptoms, and offer ongoing protection thereafter.

By adopting a chemical free approach as part of your environmental policy you are at the forefront of significant and positive change for water treatment in the UK.



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In line with continued product development we reserve the right to make any changes to this document without any given notice.

