

The use of several Risycor corrosion monitors can help to quickly localise the causes of corrosion – e.g. at the inlet and outlet of a combined pressurisation system to prove oxygen ingress

Source: Resus

New System Gives Early Warning of Corrosion in a Heat Network

For a heating or district heating system, there is nothing worse than creeping corrosion, which attacks systems and pipes over time and thus significantly reduces the performance of the entire system. To prevent impending damage, the Belgian company Resus has developed an early warning system that can detect early signs of corrosion accurately and reliably.

Homeowners know this problem: The pressure of the heating system water gradually drops. The solution is often easy – the system is topped-up with fresh water. The pressure increases and initially remains stable. Until the next drop in pressure. Then the procedure repeats itself. „It is often misunderstood,“ says Karl Willemen, Managing Director of the Belgian sensor manufacturer Resus (figure 1), „that the causes of a problem are not resolved, but only the symptoms.“

District and local heating networks are usually filled and topped-up with demineralised water. Nevertheless,

corrosion can still take place. Willemen: „Although fully demineralised water significantly reduces the rate of corrosion, it can never completely prevent it, because it is not the salt content but the ingress of oxygen that causes oxidation to occur.“

For the managing director, the main cause of the problem is in 95% of cases inadequate pressure maintenance in a heating, local or district heating system. However, defective seals or materials that are open to diffusion can also lead to a higher oxygen content in the water – which can be shown to be responsible for a higher rate of corro-

sion. In order to counter this problem early on, the Belgian company has concentrated on a tried and tested process, but at the same time has taken it to a new level applying modern technology.

The coupon method for corrosion detection is the oldest, best known, and simplest measurement method that has been around for centuries. A small metal plate, the coupon, is placed in the water of a system. After a certain time, the coupon can be removed from the system and examined. Based on the condition and weight loss, it can be determined to what extent corrosion has taken



Figure 1. Karl Willemen, Managing Director of Resus Source: Resus

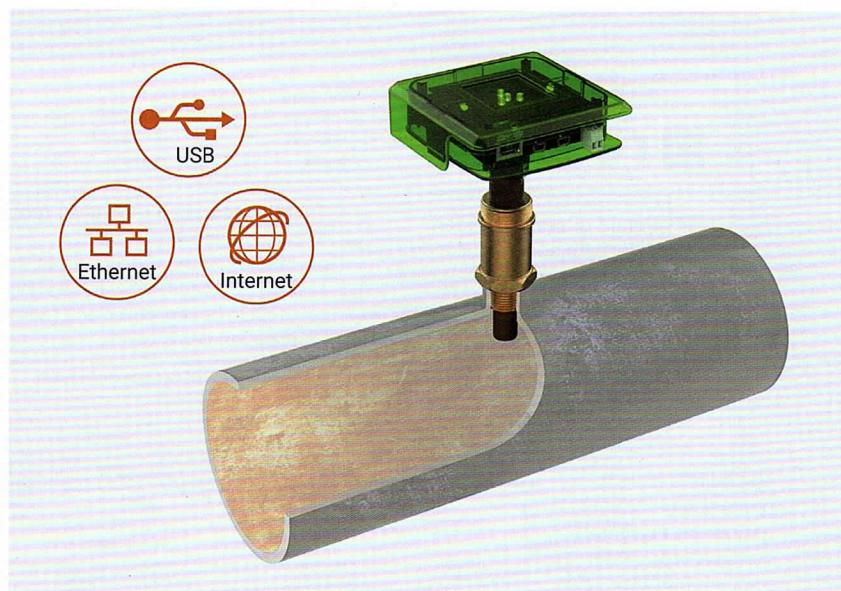


Figure 2. The Risycor devices can be read out via USB cable Source: Resus

place in the system. The disadvantage: The coupon is in the system water for a long time (usually at least three months). In this way, damage can only be recognised and remedied after it has occurred. This makes it very difficult to diagnose the cause, says Willemen: „One does not know whether the rate of corrosion during this period was initially very intense and then decreased considerably after a very short time, or whether it was slow but constant. You never know what exactly happened and when.“

With the Risycor corrosion monitors (figure 2), Resus has greatly improved this reliable method, because weight mass loss is now measured more or less permanently. Thus, the corrosion rate can be placed on a time axis. Risycor corrosion monitors were developed for use in closed

cooling and heating systems but are also being used in district and local heating networks. This shows that they can also detect corrosion in large systems at an early stage and warn the operator.

The Risycor consists of a probe and a logger. At the end of the probe is the coupon, a small piece of iron with a thickness of 50 μm . Depending on the nature and oxygen content of the system water, this coupon will corrode more or less quickly. As it corrodes, the coupon loses mass. This loss of mass is measured contact-free at regular intervals by the electronics in the probe. The mass difference between two measurements gives the corrosion rate in μm per year. The logger saves this value every seven hours.

What is special about the devices is their compact design and the

ability to read the coupon without water loss while the system is in operation. Changing the probe is also possible without further intervention in the system. Based on the electromagnetic principle of a proximity switch, the Risycor measures the weight loss of the coupon with very high accuracy. Each corrosion monitor contains a probe with such an iron coupon that can corrode in the water stream. The oxidation (corrosion) of this coupon is representative of the uniform corrosion in the system. The corrosion rate is constantly measured and stored in the Risycor. The data recorded – corrosion intensity and time of the corrosion – can be evaluated with the company's own software „Resus Dashboard“. An alarm function warns of inadmissible values or a defect. This alarm function can be

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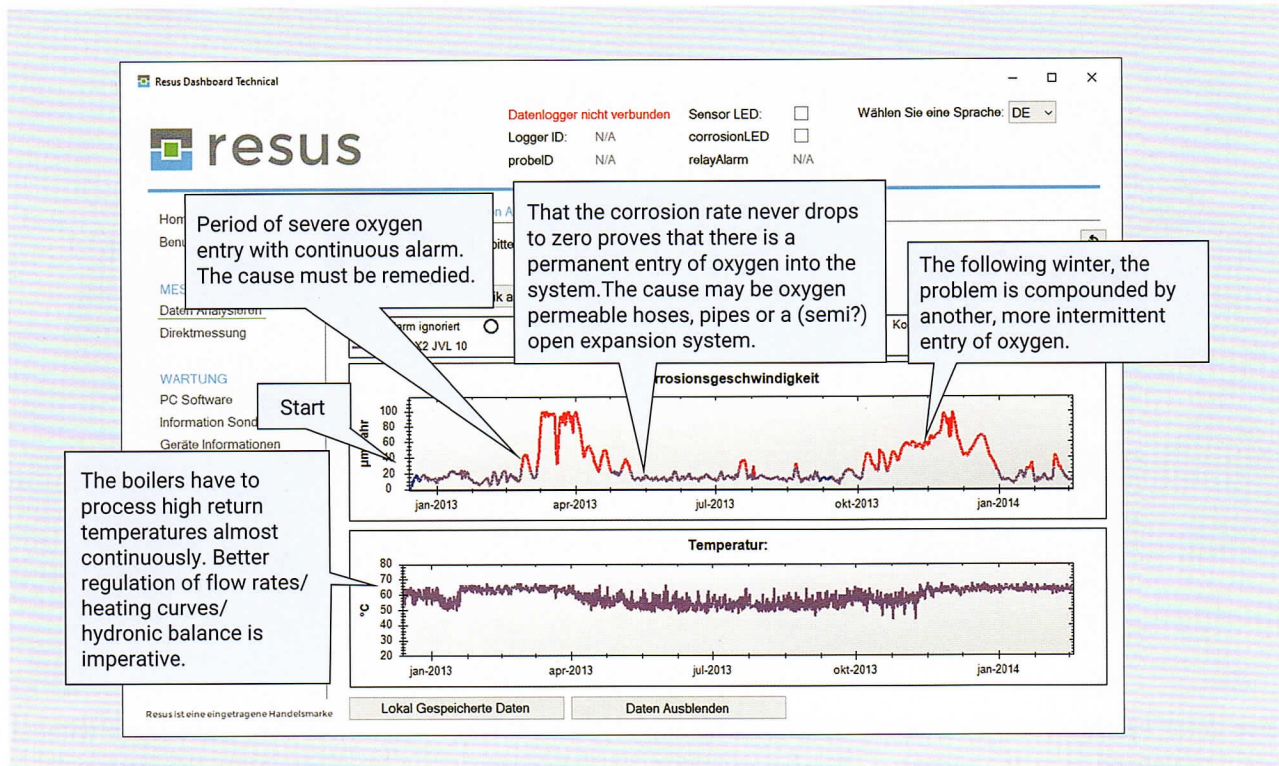


Figure 3. Corrosion profile of a system over a period of just over a year with two periods of a greatly increased corrosion rate and high base corrosion

Source: Resus

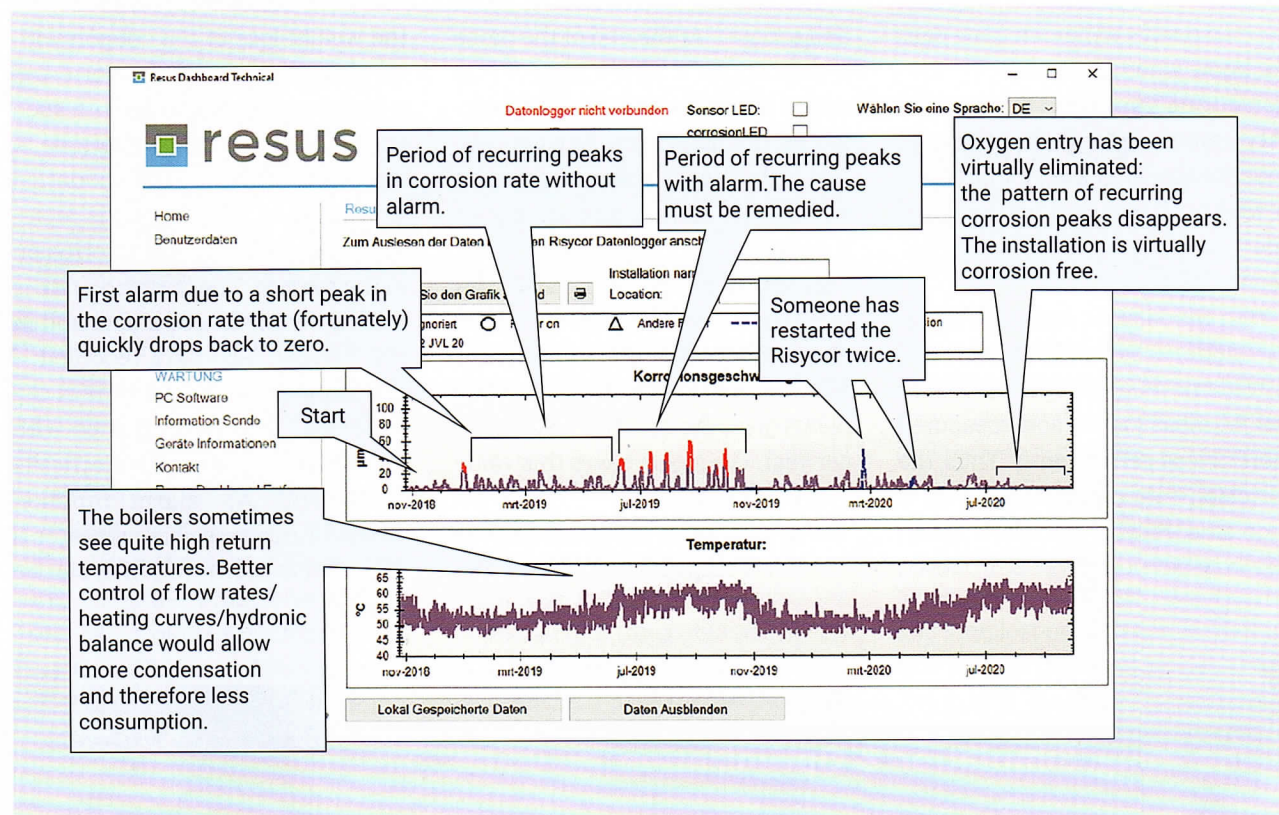


Figure 4. Corrosion profile of a system over a period of approximately two years: After corrosion peaks were identified in the summer of 2019, the causes of the corrosion could be remedied so that the system has been in good condition since summer 2020

Source: Resus

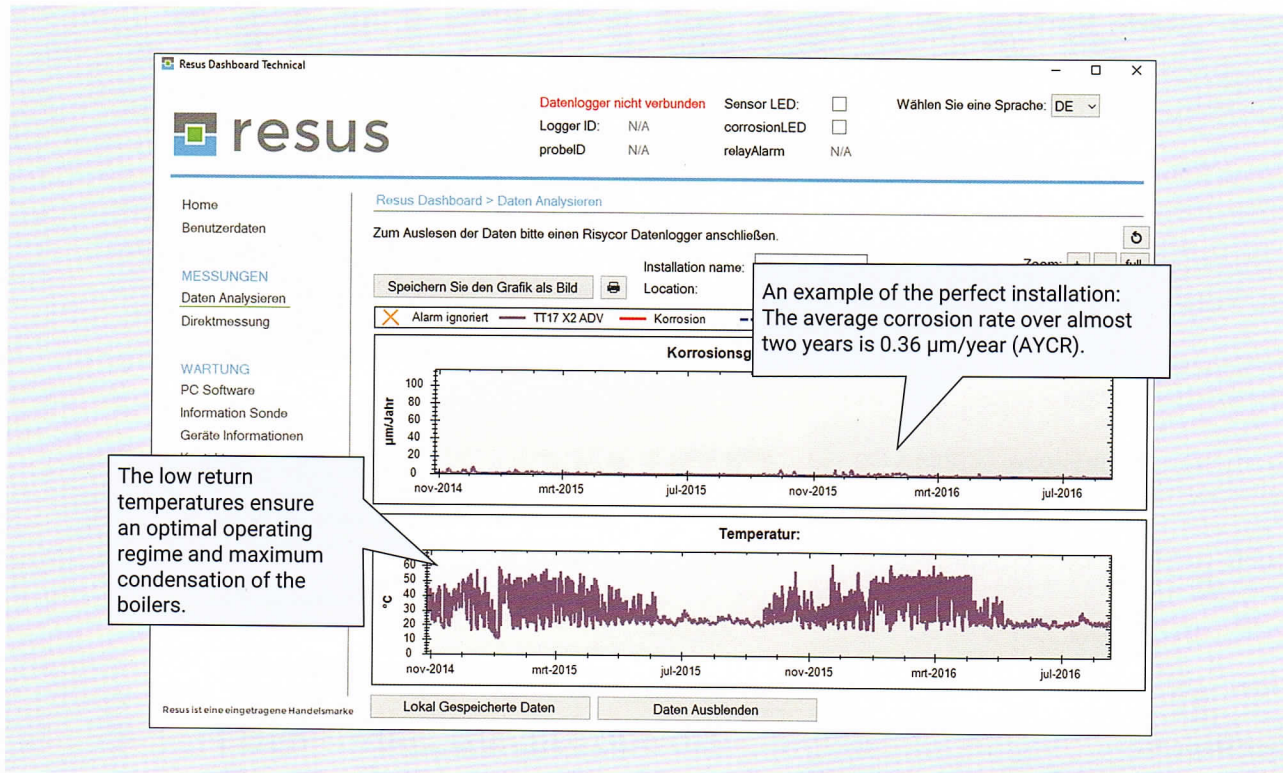


Figure 5. Perfectly working system

Source: Resus

connected to the building management system via a volt-free contact.

However, the Risycor devices not only measure the corrosion rate (YCR = Yearly Corrosion Rate) in μm per year. Equipped with the appropriate sensors, they also provide information about the temperature of the system water or even the pressure in a system. In this way, different values can be related to each other and a possible weak point in a system can be quickly localised. Figure 3 shows the corrosion profile of a system over a period of just over a year. It shows two periods with a greatly increased corrosion rate (i.e. excessive oxygen ingress) and a high level of base corrosion.

Figure 4 shows the corrosion profile of a system over a period of approximately two years. Despite a „worrying“ summer in 2019, the installation has been in good condition since summer 2020. Due to the permanent monitoring, various causes of corrosion could be detected and remedied.

A perfectly working system is shown in figure 5. It manages without any corrosion peaks. No oxygen enters, and due to the low conductivity of the system water, any remaining corrosion progresses very slowly.

Willemen is convinced of his patented system: „The Risycor is a highly sensitive measuring instrument that can even measure small amounts of oxygen ingress. This makes it an early warning system that warns of corrosion in good time before corrosion products such as magnetite sludge can cause damage.“

Oxygen is highly reactive and in systems that use a lot of steel, it is consumed very quickly by the corrosion process itself. In smaller systems it is often sufficient to position a Risycor in the return to monitor the entire system. According to the managing director, it is advisable to position several Risycor monitors in risk circuits or close to risk components in large, extensive piped systems. These can be,

for example, pressure maintenance stations, expansion vessels, automatic air vents or vacuum degasers. „This makes it possible to narrow down very quickly,“ says Willemen, „where the causes of the corrosion actually lie.“

Depending on the size of the system and the number of Risycor devices used for monitoring, the costs, which are in the upper three-digit or low four-digit range per device, are amortised after just a few weeks. „Measured against the potential damage that corrosion can cause within a heating or district heating system, our devices significantly extend the service life of a system and substantially reduce maintenance costs,“ emphasises Willemen the advantages.

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