HEVASURE
INTELLIGENT CORROSION CONTROL

Case Study: Tees Valley Hospital, Acklam, Middlesbrough

The building: Tees Valley Hospital in Middlesbrough is part of Ramsay Health Care's UK network of private hospital services. Previously known as the Tees Valley Treatment Centre, the hospital has now moved to a purpose-built facility in Acklam, close to Middlesbrough town centre.

The water system: Two closed-circuit water systems provide heating and chilled water for the three-storey building, piped using thin-walled carbon steel supplied by Peglar Yorkshire. Carbon steel is popular in hospitals and large buildings in general as it is lightweight, easy to install and cost effective - as long as dissolved oxygen (DO) is kept out of the system.

Hevasure was contracted to monitor both systems during the critical commissioning phase, which started in late 2017. During this phase, Hevasure's monitoring technology identified an aeration issue which could have led to corrosion damage if left un-checked. After hand-over, the hospital was keen to continue with monitoring in order to ensure critical assets were properly looked after throughout their lifetime.

By flagging up small issues before they cause major problems, corrosion can be prevented and major repairs/ breakdown avoided.

Water treatment services were delivered by Primary Water.

Commissioning phase

A multitude of critical system and water parameters were continually and remotely monitored during this phase, these included:

1. Dissolved oxygen
2. Conductivity
3. pH
4. Pressure
5. Temperature
6. Corrosion rates (on open steel surfaces and within crevices)

Early on during the pre-commissioning cleaning of the chilled water system, following flushing and filling activities, it became clear that DO was taking too long to return to acceptable levels **(figure 1)**. With excessive oxygen in the pipework, corrosion risk was exacerbated, a particular concern in thin-walled carbon steel systems.

Following the identification of this issue, Hevasure advised the installation of a vacuum degasser; a solution which had an immediate and dramatic effect.

Within days, the dissolved oxygen was consumed and levels stabilised below 0.2 mg/L, minimising the risk of damage to the pipework and preventing expensive remedial action at a later date. If sampling had been the sole method of checking system condition during pre-commissioning cleaning, the oxygen issue would not have been picked up in time, meaning the water system would have started life in a compromised position, potentially leading to problems further down the line.

As well as identifying adverse conditions which can lead to corrosion, the monitoring system was also used to record when key events in the pre-commissioning cleaning process took place **(see figures 2 & 3)**.

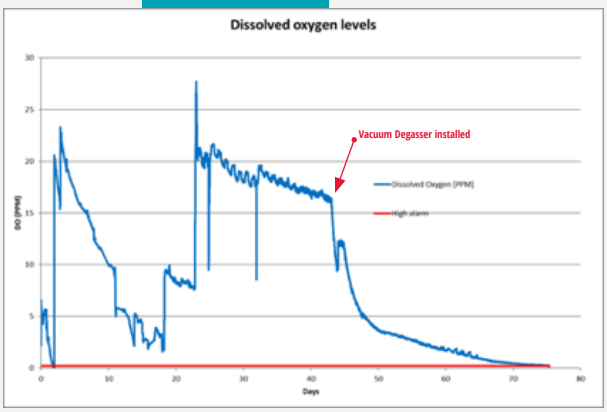

Figure 1. Dissolved Oxygen in the Chilled water system during PCC and commissioning

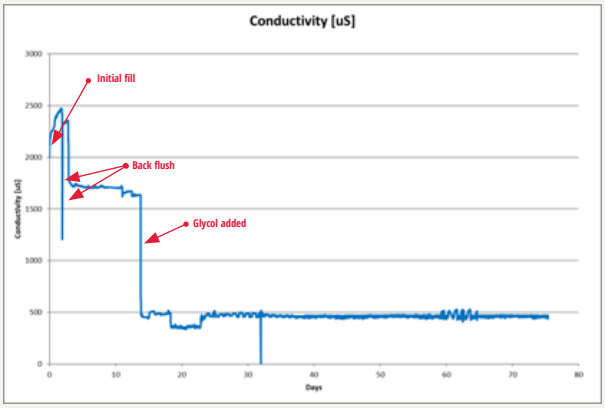

Figure 2. Variation in conductivity during PCC and commissioning

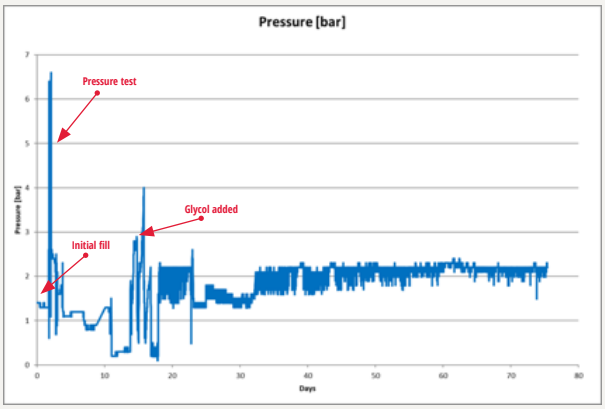

Figure 3. Variation in pressure during PCC and commissioning

Handover and beyond

Monitoring of both the CHW and LTHW systems continued after hand-over in order to ensure that corrosion is continually kept at bay.

By measuring conductivity (and compensating for temperature) it is possible to determine inhibitor dosing levels. **Figure 4** shows that conductivity was decreasing over the first 70 days. The Hevasure monitoring unit issued an alert before conductivity fell below the bottom threshold and in response to this, Primary Water added more inhibitor which increased the conductivity to within guide levels.

Although conductivity has continued to decrease over time, there is no evidence of corrosion (as measured by our galvanic current sensor) despite the fact that DO levels are slightly elevated. This indicates that the inhibitor is performing as intended and/or DO levels are insufficient to cause corrosion.

The charts below show some of the key data from the first 100 days for the LTHW system following Practical Completion and hand-over.

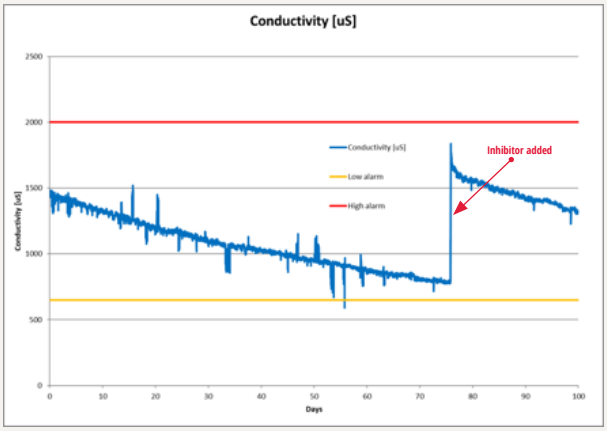

Figure 4. Variation in conductivity following hand-over

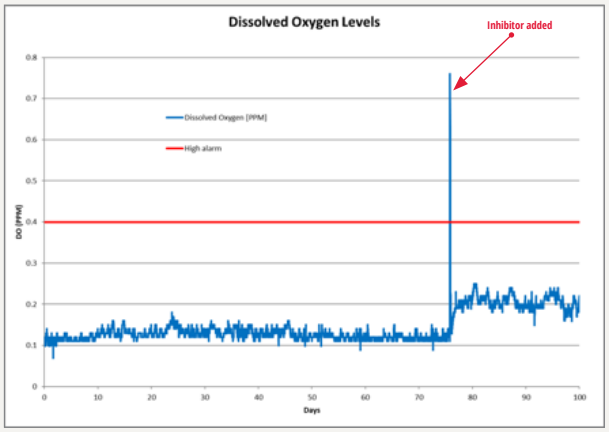

Figure 5. Variation in dissolved oxygen levels following hand-over

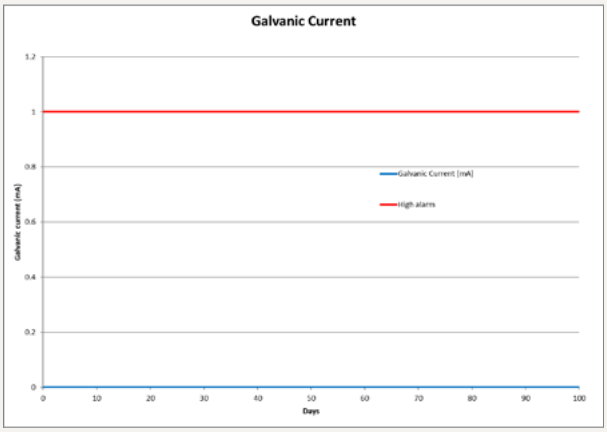

Figure 6. Galvanic currents at zero throughout the monitoring period proving that there is negligible steel corrosion

Conclusion

The Hevasure monitoring system detected several important changes to system conditions during the pre-commissioning cleaning period and after hand-over. Early intervention was possible averting significant and potentially catastrophic corrosion of steel pipework in this state-of-the-art medical facility. Continued monitoring is providing the hospital trust with reassurance that all systems are now being looked after and should meet their life-expectancy.

- **Fast, effective diagnosis of DO compared with sampling**
- **Catastrophic corrosion of steel pipework avoided**
- **On-going monitoring for peace of mind**
- **Safeguard for thin-walled carbon steel pipe**
- **Breakdown prevention in critical healthcare building**

"The Hevasure technology has undoubtedly prevented serious problems occurring in the heating and chilled water systems at Tees Valley hospital by the early identification of adverse issues such as gross aeration and loss of inhibitor."

Martin Williams, Director of WW Medical facilities

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