Remote Temperature Monitoring of Water Systems in Healthcare

A STUDY

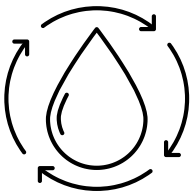
Introduction

Remote monitoring systems can be used for a myriad of building and environmental control. In this document, we will discuss the use of remote monitoring for the control of Legionella, Pseudomonas and other opportunistic pathogens.

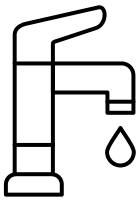
Maintaining the appropriate temperature of the circulatory waters systems and ensuring adequate usage are the primary control measures for the management of bacteria in domestic water systems. This is especially important in healthcare premises where infection prevention and control is essential and vulnerable occupants are numerous.

Remote monitoring can be utilised for investigative projects or routine analysis of water systems. Site requirements will differ but in general terms, the advantages of remote monitoring can be summarised into these five key areas:

Hot water system circulation



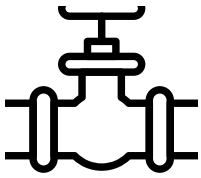
Outlet usage profiles



Routine manual monitoring replacement

Commissioning of new systems

Thermostatic mixing valve operation and scald risk reduction



Hot Water System Circulation

The key to. the prevention of bacterial proliferation within circulating systems is ensuring that the system is properly balanced and circulation pumps operate effectively resulting in all return loops flowing continuously. Remote monitoring installations over several years have categorically demonstrated that this is often not the case.

A common factor during routine manual monitoring programmes is that the recording of temperatures of the primary, subordinate and tertiary loops within a system is rare. Generally, this is due to pipe access proving problematic for contractors. Attributable to time-consuming and/or invasive works.

Manual monitoring of sentinel outlets is therefore common practice as an alternative to return loop monitoring. However, this undertaking does not provide a true representation of overall system operation. In addition, outlets are often chosen that are easy to access (non-patient areas) and do not include TMVs (eg. Dirty Utility rooms). Furthermore, hot supply temperatures - in isolation - do not determine the temperature or flow performance of return loops which may or may not be circulating. Acting as a dead leg if failing to circulate (see Citritek's white paper). Rectifying defaulting tertiary loops may be as simple as opening a closed valve that has accidentally been left open (see figure 1).

Remote monitoring of the principle, subordinate and tertiary loops gives clear and constant data showing what is reaching temperature and, by inference, flowing.

The devices also have the capability to incorporate any 4-20 milliamp input therefore the potential to incorporate flow meters and sensors to understand flow volumes to optimise distribution will soon be possible through additional software development.

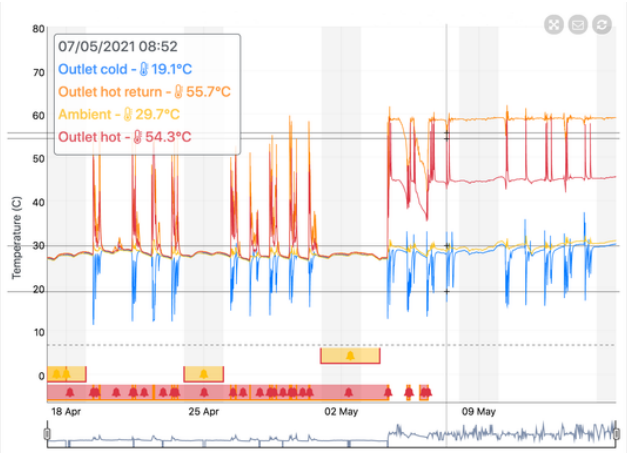


Figure 1

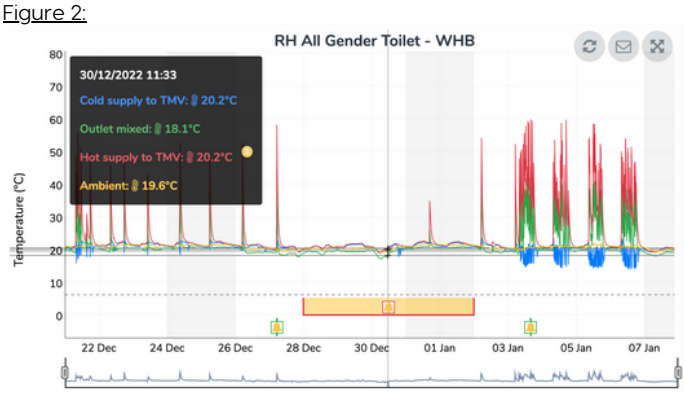
Outlet Usage Profiles

Ensuring sufficient turnover of water in a system helps prevent bacterial proliferation within pipework.

Remote monitoring of the hot and cold supply pipework to outlets will provide accurate intelligence as to whether an outlet has been used and whether the system temperature is compliant.

Hot feed temperatures are monitored after the tertiary loop and, as can be seen from Figure 1, a spike when the outlet is used is clearly visible. Figure 2 shows when the system has alarmed if the temperature hasn't achieved the appropriate temperature during the usage event.

Figure 2:



Routine manual monitoring replacement

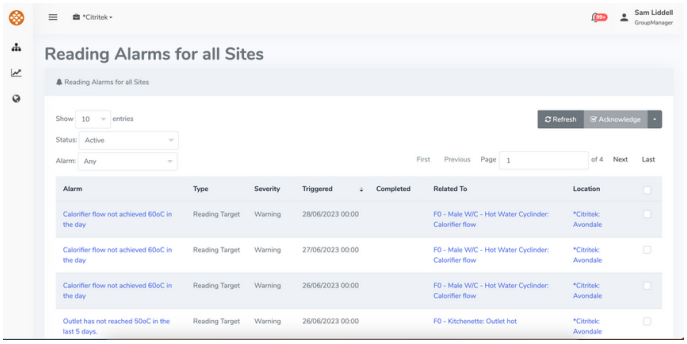
Employing remote monitoring to replace manual monthly monitoring of water systems is a good mechanism for offsetting the cost of implementing the system. Traditional monitoring of sentinel outlets is not required if the primary and subordinate loop temperatures (or the sentinel outlets) are remotely monitored.

Devices can also be added proportionately to outlets for each subordinate loop to assess the usage of the outlets and the balance of the system through tertiary loop monitoring which provides a much clearer indication of risk.

Alarm rulesets and alert notifications that are built into the system interface enable users to proactively manage defects across the system and rectify non-conforming areas in a prioritised and more robust manner.

Summary reports for users responsible for large scale systems and estates can provide insight and clarity into the worst performing areas of the water system and key factors to prioritise. Complete data interrogation and summaries are also provided via the online dashboard enabling users to assess the granular data if there is a fault highlighted on the dashboard see Figure 3.

Figure 3:



Commissioning of new systems

Refurbishments of departments within healthcare premises is often an ongoing process. This will invariably have an impact on the existing water systems that it is connected to. In particular, the balance of the system in the area being refurbished and potentially adjacent systems that are fed from the same subordinate loop.

Using remote monitoring systems can ensure that, during the commissioning process, contractors are undertaking the appropriate frequency of flushing to prevent bacterial proliferation during the build phase. Critically, remote monitoring can also provide evidence to ensure that the system is properly balanced before the system is signed off and handed back to the Estates team.

Thermostatic mixing valve operation and temperature control

Each device has up to four temperature sensor channels (2 additional channels for 4-20ma inputs) ensuring a standard outlet incorporating an external TMV can be monitored completely (temperatures of hot and cold supply, tertiary return and post-TMV). This enables alarms to trigger in the event that a TMV has failed or begins to fail reducing the risk of scalding (an NHS "Never Event"), see figure 5. This can be utilised to reduce the potential for scalding in parts of the hospital with particularly vulnerable patients.

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