CiTRiTEK

Subordinate & Tertiary Loops - The Hidden Legionella Risk?

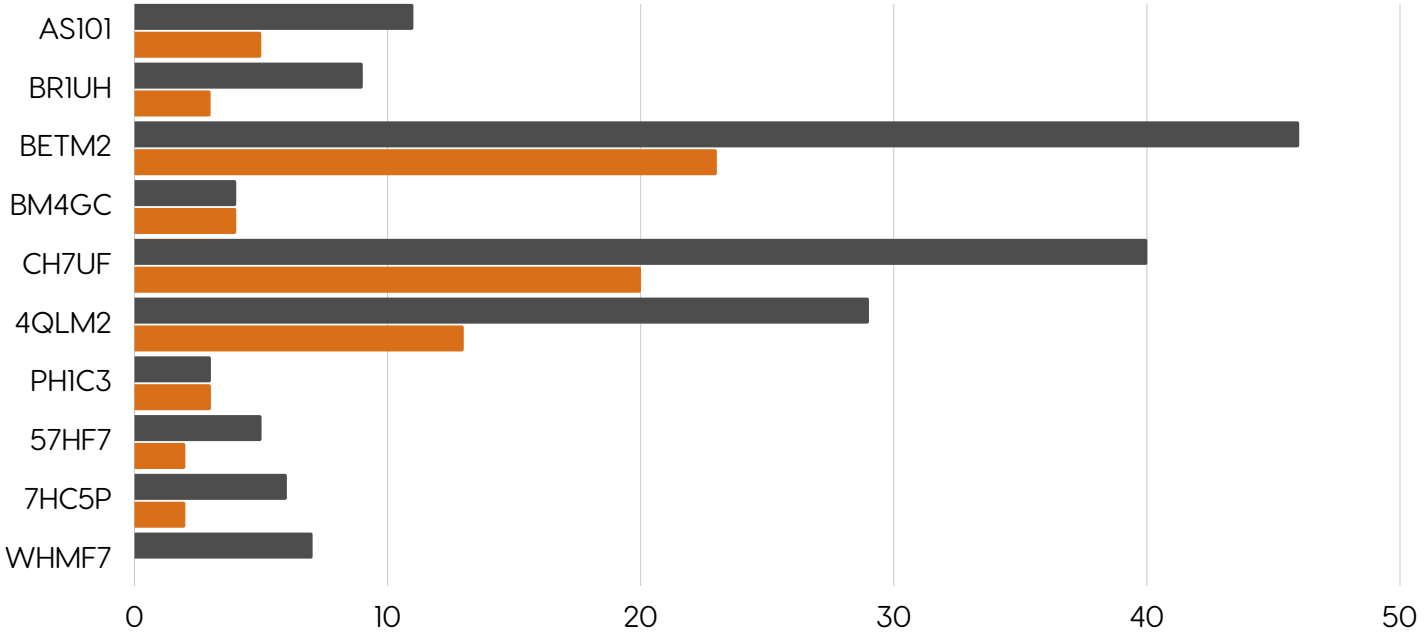
A WHITE PAPER

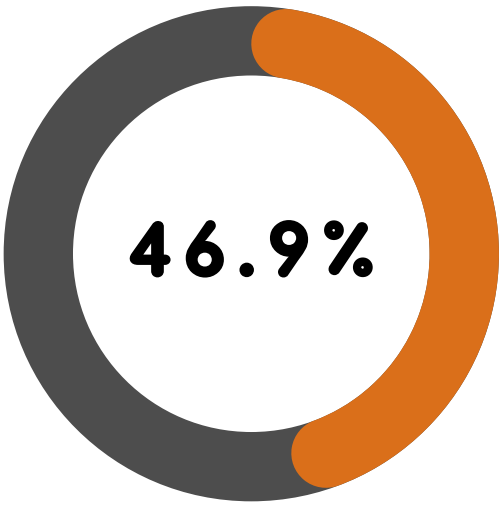
Abstract

The study outlined in this report shows that on average 46.9% of subordinate and/or tertiary hot return loops were found to be faulty at the ten sites tested. The faulty returns are highly likely to create the conditions for biofilm growth and the proliferation of Legionella bacteria. The solution for remediating these issues can often be as simple as tracing the pipework to the localised valves that have been inadvertently left closed and reopening them.

Introduction

Citritek has been installing remote monitoring systems for over two years and has done so across many sites. This study has been designed to investigate the prevalence of faulty hot return pipework within subordinate and tertiary loops. 10 sites were selected from a variety of industries and building type. From these buildings, wireless devices incorporating a minimum of three sensors were selected that monitor, as a minimum, the hot and cold feed to an outlet as well as the hot return.





Hot return temperatures on subordinate and tertiary loops should consistently maintain a minimum of 50˚C (55˚C in Healthcare premises) to ensure that Legionella bacteria is controlled within the circulating portions of the system. The remote monitoring sensors clearly identify when there is an issue with the hot return loops whereby the consistent data exhibits how the temperature will increase with the hot flow when the faucet is opened but fail to retain the temperature after the flushing event. Often declining completely to the original ambient temperature until the outlet is used again.

Following the study of subordinate and tertiary hot returns, site CH7UF was used to investigate possible causes of this issue and successful remedial actions.

Results

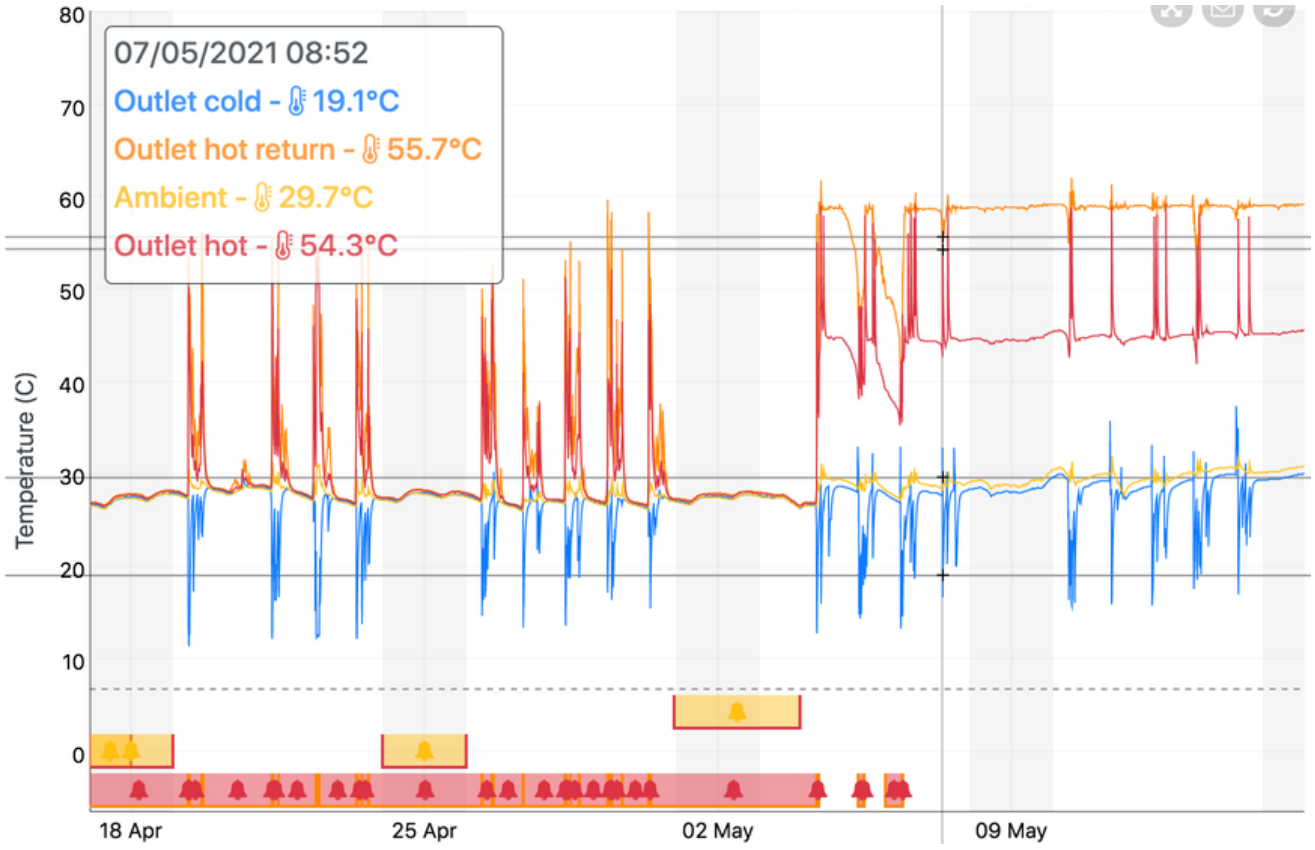
The results show that of the ten sites evaluated, 90% had multiple outlets operating with hot return temperatures that did not retain temperature. The proportion of outlets from the sites that exhibited this type of failure was, on average, 46.9%.

The results of the investigation at site CH7UF specifically, showed that of the three devices analysed (monitoring pipework for six outlets), none retained temperature. An on-site audit to trace the hot return pipework for this section of the site was undertaken and two valves were found to be closed. Once opened, all three of the areas began to circulate effectively and the remote monitoring system now demonstrates that each of the three sets of outlets' hot return pipework has consistently been in-specification since the valves were reopened. This is shown in the screenshot below where the orange temperature line becomes consistent.

Discussion

The high proportion of faulty hot return pipework from subordinate loops is of extreme concern. The temperature of the hot return rises in parallel with the hot supply as the outlet is activated however, the temperature then quickly decreases back to an ambient level indicating that there is minimal flow and a lack of circulation. The water in this leg of pipework effectively acts as a dead-leg by not being returned to the HWS, therefore, creating conditions that will be ideal for biofilm formation and Legionella proliferation. This contamination will potentially seed other areas of the system.

This problem has largely gone unnoticed prior to the advent of this remote monitoring system due to traditional manual monitoring – in almost all cases – only recording the hot and cold feed temperatures of outlets for the subordinate and tertiary loops.



The reason behind the problems of circulation on this type of return is frequently one of four variables: blockage of the pipework (an unlikely occurrence); balancing of the system; under-specified circulation pumps; or, in the case of CH7UF, isolation valves that have inadvertently been left closed.

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