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WIRELESS TEMPERATURE MONITORING: CONNECTIVITY, COST & CARBON FOOTPRINTS

A CASE STUDY

EMBRACING THE TECHNOLOGY

Generally speaking, the facilities management industry has been slow at - and dubious of - new technology adoption when it comes to water quality control. In recent months, however, there is growing awareness that wireless sensors and remote monitoring will become increasingly prominent as the data produced begins to advance control schemes and working practices that organisations can implement.

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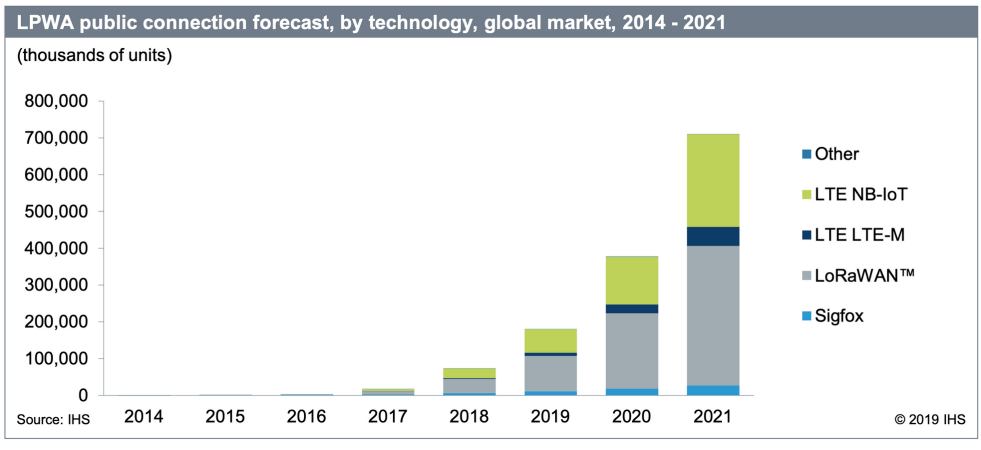
IS THE SIGNAL STRENGTH CAPABLE OF PENETRATING LARGE BUILDINGS?

One main area of scepticism often attributed to wireless technology is the proficiency of signal connectivity through large, complicated building fabric. Often, this scepticism is due to existing difficulties with cellular signals for mobile phones that occupants experience in some areas of an organisation's buildings.

LoRa is a non-cellular modulation technology and is used as a wide area network. It is, in essence, a very good way to achieve strong receiver sensitivity meaning low-data rate applications, such as periodic temperature monitoring, can attain much longer range by using LoRa rather than other comparably-priced radio technologies (Link Labs, 2018).

By utilising the capability of LoRa network technology, Citritek have successfully achieved stable signal scalability through numerous buildings of enormous footprint and prohibitive construction without changes to the building fabric or compromising on the monitoring point locations. Some of these buildings comprise walls that are in excess of 2 meters deep and floor levels that extend to 3 stories below ground level. Even in these potentially problematic areas, the water systems are being successfully monitored by tactical installation of gateways and antenna placement.

Due to the demonstrated capability and growing applications of this technology, it is widely forecast that the rollout of LPWA (Low Power Wide Area [Networks]) is set to increase hugely in the next 2 years. This is illustrated in the below graph based on the IHS connection forecast cited by the Lora Alliance (2019).



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HOW DOES THE COST OF WIRELESS TECHNOLOGY COMPARE TO THE COST OF MANUAL MONITORING?

Dubiousness regarding the economic viability of remote monitoring for Legionella has also been a frequent topic of discussion during Citritek's initial launch.

Understandably, the perception of new technology is that it will be prohibitively expensive, at least for the foreseeable future.

In response to this, Citritek have undertaken a basic cost analysis using its experience and understanding of the water treatment and hygiene market and therefore the average cost of manual temperature monitoring contracts. This was included in a direct comparison of existing deployments of the *tangeritin* system and the costs associated with it.

One of Citritek's larger deployments involving 80 devices assembled with between 2 - 4 sensors each is across a very large building with over 10 floors based within Greater London. The monitoring locations covered hot and cold sentinel points from principal and subordinate loops, hot return temperatures where there were known existing issues as well as key assets such as hot water calorifiers.

The scale of the building itself as well as the difficulty of access to some of these monitoring points meant that a modest estimate for a manual temperature monitoring contract would be priced at 3 working days per month. An average price of a water treatment contract deploying a water hygiene technician for this amount of time can comfortably cost over £10,000 per year. In the same scenario, *tangeritin* had an operating annual cost of less than £4,500 following an initial CapEx of roughly £12,000.

The ROI associated with the OpEx costs was under 2 years. The subsequent savings totalled over 55% per annum notwithstanding the additional cost savings associated with managing and escorting contractors and undertaking fixed, unnecessary flushing regimes.

THE CARBON FOOTPRINT ASSOCIATED WITH MANUAL MONITORING

Large buildings inherently have large carbon footprints associated with them. Not just in the energy they use and waste they produce but with the CO2 emissions corresponding to contractors travelling to and from site.

It is estimated that, on average, every full-time multi-site contractor creates in excess of 5.5 tonnes of CO2 emissions every year in the UK. Across large sites with dozens of contractors visiting their buildings every day, it is easy to extrapolate this number to appreciate the scale of emissions associated with visiting contractors.

According to Forbes (2020); "the proliferation of long-range, ultra-low-power IoT sensors and networks...is potentially the most important technology innovation in generations that will help preserve our future natural resources."

Gas and electric reduction is often cited as the obvious example of technology minimising carbon cost however the amount of contractor time associated with water system maintenance plus the energy wasted heating unnecessary water is often overlooked.