Getting Smarter: New Fixture Technology Boosts User Experience

Connected devices assist managers in monitoring restroom use, condition

By Karen Kroll,
Contributing Writer

Lighting, energy and other building systems have long been smart or connected. Institutional and commercial restrooms are joining the group. Smart devices can help facility managers more effectively maintain and operate restrooms, while also improving the user experience.

Smart restroom technologies incorporate networks of Bluetooth or Internet of Things connected devices, says Paul McLennan, manager of advanced engineering with Delta Commercial. Smart restrooms may also be connected to building management systems (BMS), so facility staff can quickly and remotely monitor their status, he adds.

For example, a smart restroom might incorporate a device that allows the facil- ity staff to remotely monitor a connected plumbing system, says Bob Carter, product manager, finished plumbing, with Zurn Elkay Water Solutions. By analyzing the real time data collected, such as the amount of battery life left in a device, managers can schedule its replacement rather than waiting until the battery dies, and the device doesn't work.

Benefits of going smart

A key benefit of smart restrooms is their ability to help managers achieve predictive maintenance. Smart systems can track usage to determine when to perform maintenance, as well as the kind of maintenance required.

"If a fixture has reached a certain allotment of flushes, you know that it may be time to proactively change the diaphragm," says Solay Alagappan, Sloan senior product line manager, IoT and programmed water technologies (PWT).

When preventive maintenance can be scheduled, restroom users are less likely to come across devices that don't work or empty soap or paper dispensers. In other words, the restrooms appear well-taken care of, says Orkun Onur, senior product manager, commercial faucets and IoT with Kohler. This can help a facility avoid hits to its reputation.

What's more, by scheduling maintenance work so it's efficiently handled, smart restrooms can help alleviate the labor issues many facilities teams face today. With traditional devices, a maintenance worker might receive an email or call about a malfunctioning faucet, but until stepping inside the room, he or she likely wouldn't know which faucet or model it was, nor which part was malfunctioning, Onur says. While many facilities initially install standard device models, they can wind up with a variety of models as malfunctioning ones are replaced.

Instead of a quick fix, a staff member might spend hours on a repair, Onur says. With smart systems, managers have much of the information he or she needs to fix a device before starting a repair job.

In addition, replacements can be more targeted. Rather than replacing, for instance, the diaphragm on all flush valves in a restroom because it seems like it's time, managers can identify those that have been used enough times that they need replacing.

"You're really pinpointing it. That

cuts down on the number of repair parts and the labor required," Carter says.

Safety and cleanliness

Smart restrooms enable technicians to automatically perform line flushes, which helps to prevent the formation of biofilms that can serve as a breeding ground for bacteria, Alagappan says. The spread of Legionella, which causes Legionnaires' disease and Pontiac fever, is a major concern in hospitals and facilities that house aging populations who are vulnerable to the bacteria. Automatic line flushes are also important for purging the water in faucet lines in facilities that may be closed for extended periods of time, like schools, he adds.

Similarly, if hot water cools because a system hasn't been used, it can become a breeding ground for bacteria, says Greg Hunt, product manager, commercial, with Chicago Faucets. This also can pose risks in healthcare settings. If a patient who is immune-compromised moves into a room in which the faucet hasn't been used for three or four days, a waterborne pathogen could potentially become active, he says.

In healthcare settings, occupancy lights in individual stalls can be set to issue an alert after a certain amount of time, Carter says. If a user remains in the stall for more than 20 minutes, an employee can check to ensure he or she didn't suffer a medical event.

At times, an occupancy light system might show that an individual walked into a stall and then walked out a second or two later. If this continues for several people, it's likely the stall requires servicing, Carter says.

It's important to note that smart devices capture information on the use of a restroom, but not personal information.

"You can only tell overall how many people used the restroom," Onur says.

Implementation challenges

While smart restrooms offer multiple benefits, equipping restrooms with smart components can prompt a few challenges. Devices using Bluetooth or Wi-Fi connectivity can require a great deal of electrical energy, McLennan says.

While these devices can be powered by alkaline or lithium batteries, the increased power consumption often means the batteries need to be replaced frequently. AC mains or low-voltage AC power can eliminate this concern, but installing a hardwire power source is often difficult or expensive. Energy harvesting faucets or flush valves that collect power from ambient light or water flow are common and can help extend battery life and reduce maintenance frequency.

When devices installed in smart restrooms are wirelessly connected, signal strength and connectivity need to be considered. One possible solution is to use long-range wireless communication methods, such as LoRa or LTE. LoRa is a wireless modulation technique that encodes information on radio waves using chirp pulses, similar to the way dolphins and bats communicate. LTE, sometimes referred to as 4G LTE, stands for Long Term Evolution and is a standard for wireless data transmission.

Wireless connectivity should be engineered to account for the number of devices connected to the network, the distance between devices, the location of wireless gateways, and how to integrate them with a BMS system, McLennan says.

Even with wireless devices, some degree of wiring is generally required, Hunt says. For example, when connecting a device to a BMS, numerous wires typically will run either from a central location to the BMS or individually from the products to the BMS.

"There's always some sort of wired element somewhere in the system, at least today," Hunt says.

When retrofitting smart devices, it's also critical to ensure compatibility with the existing infrastructure.

"Working to upgrade the existing infrastructure can be challenging," Alagappan says.

When commissioning products and connecting devices to a BMS, it's important to know the connections are accurate.

"That's a whole separate skillset," Hunt says. For example, Faucet 1 in Restroom A should line up with its location in the BMS schematic.

On the bright side, while connecting devices to a BMS requires some knowledge, it isn't a new concept, Hunt says. Many facilities and other teams have connected HVAC, lighting and other systems, and can apply their experience to restroom devices.

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Impact on budgets

Smart products tend to be somewhat more expensive than their equivalent manual versions, McClennan says. Smart restroom products that are cloud-connected also typically require a monthly or yearly subscription fee for storing and analyzing device data, he says.

With careful planning, at least some of the higher upfront costs can be offset by lower labor, maintenance, and operating expenses. In addition, products that detect and issue alerts for water leaks can often reduce insurance premiums for building owners, McLennan says.

The data a smart restroom system collects also can generate value in new ways. For example, because people tend to make beverage purchases after using the restroom, stadiums might consider restroom occupancy data when deciding where to place mobile beverage carts, Alagappan says.

Capturing earlier insight on maintenance issues can sometimes improve operations and boost revenue. For instance, a non-operational faucet could render a hospital room temporarily unusable, Hunt says. By speedily identifying and fixing the malfunctioning faucet, it may be possible to return the room to operation more quickly.

The data collected may also help facilities minimize wasted water due to leaks or other malfunctions.

"Though water is cheap, it is a resource that is becoming scarcer," Alagappan says.

Smart restrooms promise to provide added convenience and benefits for both users and facilities managers, Alagappan says. As with any rapidly changing technology, facilities professionals will want to check support, network security, changing communication protocols, and the risk of obsolescence. ∎

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