

Technology

Randy Miles

A Facility Fitness Tracker?

Using technology to monitor the health of your building

Today, many of us wear health and fitness tracking devices to monitor data on what it means to be healthy. These often track heart rate, steps, calories burned and sleeping statistics to give a general baseline of some key health and wellness indicators. Thanks to the advent of low-power, wireless and internet-connected sensors, we can now get key data points for commercial building health in a similar fashion.

While a fitness tracker won't replace a full physical and bloodwork from your physician, these sensors are not meant to take full control of your building as a building management system (BMS) would. Rather, they monitor key building health indicators that can point to mechanical system issues before they become a major problem. Four key building mechanical health indicators are building pressure, temperature, relative humidity and carbon dioxide levels. Here, we'll explore the importance of each.

Building Pressure

Overall building pressure should be kept at a slightly positive level— that is, more supply than exhaust air—to mitigate a host of comfort, health and energy issues. Negative building pressure can lead to hot and cold spots, hard-to-open doors, condensation on diffusers and floors, poor smoke capture in commercial kitchens and increased energy usage by the mechanical systems. Building pressure is also a common root cause of overall humidity and moisture issues.

As Darren Witter, P.E., LEED AP, NEBB CP, says, "After more than 30 years of testing, balancing and commissioning thousands of buildings, we've found that pressure, temperature, humidity and carbon dioxide are key indicators of a building's overall health."

Temperature and Humidity

Temperature and relative humidity can impact the customer experience and employee productivity and, in extreme cases, can lead to condensation collecting and causing water damage and much-dreaded organic growth. Building finishes and architectural details, such as wood floors and walls, can be greatly impacted by large swings in daily temperature and humidity levels in the building, causing severe damage and potential hazardous conditions.

As an example, BOMI International demonstrated that a cubic foot of wood at 60-percent relative humidity weighs 30 pounds and can hold 3 pints of water. That same wood at 10-percent humidity holds only 1 pint of water and is lighter. These changes can impact building joists, studs and plaster finishes, causing significant cracks and longterm damage. In extreme cases, wood floors and architectural fixtures need to be replaced as a result of temperature and humidity fluctuations.

CO2 Levels

Carbon dioxide levels are a major driver of indoor air quality (IAQ), which correlates directly to worker productivity and absentee rates. Cognitive performance scores average 101 percent higher in buildings with lower CO2 levels and increased fresh air, according to the COGfx Study, based on research by Harvard University and SUNY Upstate Medical. Additional research by the team at ForHealth.org has identified nine foundations of healthy buildings that also includes ventilation, air quality, thermal health and moisture.

Embracing Automation

There are countless building automation systems on the market comprised of a seemingly endless array of sensors and monitoring points. The monitoring points available in today's RTUs and mechanical equipment are vast; however, the primary focus is on the equipment itself and not the overall building health. These systems are often expensive to implement in existing buildings and require dedication to one vendors' system architecture, driving up costs and requiring service by authorized providers.

With the internet of things (IoT), sensors have become more intelligent and offer additional connectivity options for monitoring. This allows for more widespread adoption and aggregation of pertinent building health information. This information can be brought directly to the cloud via dedicated cellular modems and delivered on a dashboard for the facility owners and managers. These dashboards offer an independent view to identify key trends in the health of the building and quickly identify problem locations in need of further investigation.

With the data aggregation comes the opportunity for the marriage of artificial intelligence (AI) and IoT sensors in the building space. The combination of these worlds leads to predictive analysis, rather than the reactive nature of today's facility management professional, especially in scaled environments. Facility managers in one-off, stand-alone buildings are often close to the heartbeat of every critical system at that facility and more likely to be aided by complex BMS systems. However, the management of chain retail and restaurant concepts presents a larger challenge due to the extensive scale. These scaled building networks need an easily deployed sensor network with a centralized dashboard for monitoring and proactive alerts for AI-identified trends, which are becoming increasingly available today.

Another benefit to these scaled systems is the relatively low cost of deployment on a per-building basis, as opposed to large capital expense projects. In some cases, subscription service models are available to shift the expense into the operating budget and provide a valuable resource to building managers. If viewed from a staff augmentation mindset, rather than as a pure expense, these sensor networks can provide valuable data to a consolidated view. This allows managers to triage trouble locations and begin proactive maintenance without hiring additional team members to diagnose building health issues.

Similar to when you monitor your health through a fitness tracker, you get alerts when the building health starts to dip, but you have to take action to get it back on track. A suggested first course of action is contacting an independent HVAC testing and balancing agent or qualified maintenance contractor to review the building pressure and root cause of any deficiencies. Buildings gradually get off balance due to lapsed maintenance or equipment failure, and these issues can be quickly corrected by the contractor.

Randy Miles is the General Manager of the Intelli-Hood demand control kitchen ventilation division at Melink Corp. He has a background in project management and business development, working with building operators around the world to implement kitchen energy efficiency projects.