

DEUS EX MACHINA

Smart HVAC controls can improve preventive maintenance and related service efforts, and increase system efficiencies and lifespans.

BY BEN WALLACE
Images courtesy of 75F.

HVAC systems have been getting a lot smarter as sensors, data capture and visualization, machine learning and cloud computing bring the Internet of Things (IoT) to reality in the mechanical world. But how can these technologies help HVAC contractors, technicians and facility managers and their customers from a service and performance perspective?

Changing building dynamics, aging equipment

Even as new technology advances, buildings continue to age, and their HVAC systems require care and feeding as they are challenged to meet the dynamic building loads every day. Everyone knows no two buildings are the same, so some expert inspection and care is also needed to keep it all running.

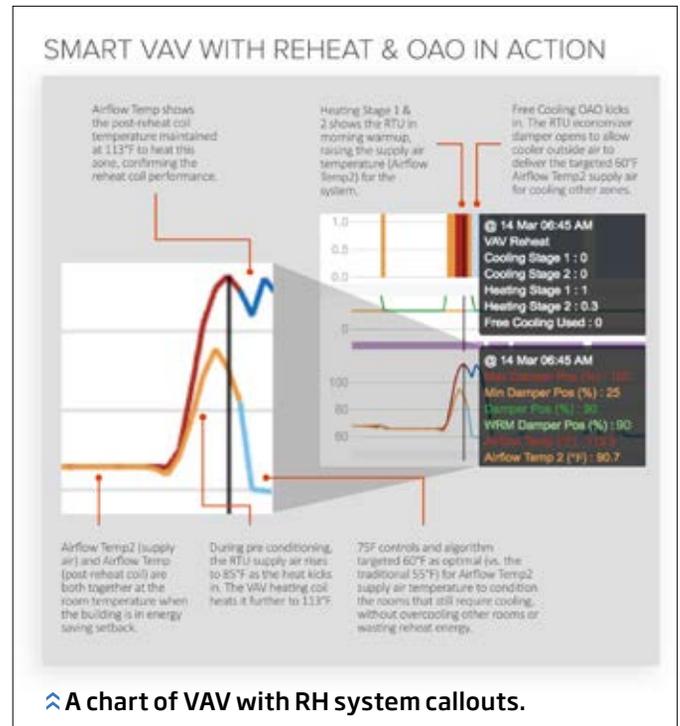
Most building owners and contractors would agree that preventive measures and early detection are much preferred and much less costly compared to emergency service calls. The small cost of prevention far outweighs the risks and disruption associated with equipment failures and downtime.

The typical preventive maintenance plans seek to establish a schedule for on-site delivery of routine care: equipment assessments and replacement of consumable parts (filters, belts), coil cleaning, electrical amperage draw confirmation, tune-ups and calibrations. While going on-site for in-person inspection is critical at times, new technologies are making it easier to get a sense for what is really happening, when things are running well and when attention is required. These technologies can help HVAC pros get a handle on their maintenance schedule. Maybe even get in front of it, or at least out of emergency-responder mode.

Smart HVAC a game changer

IoT-enabled control systems can improve preventive maintenance and related service opportunities by offering:

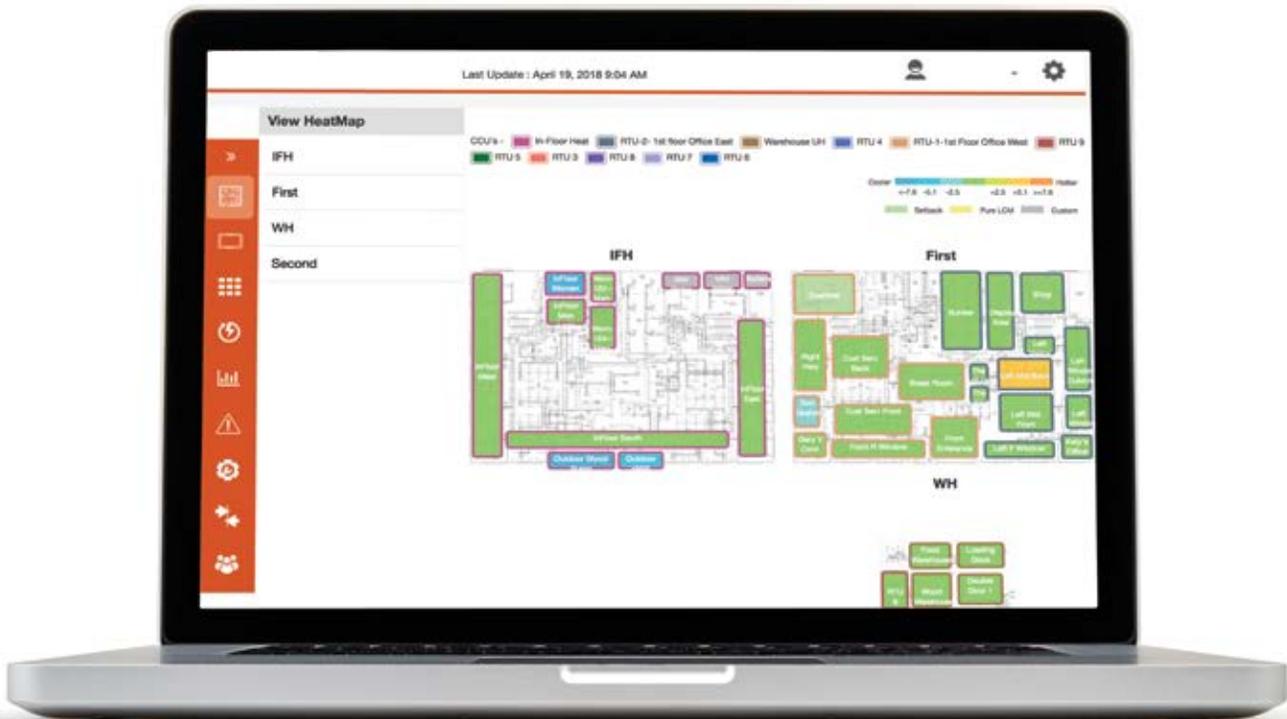
- Sensing, data and visualization on both air qualities and equipment status.
- Remote monitoring and data drill down.
- Remote adjustments.



⚡ A chart of VAV with RH system callouts.

- Alerts and early notifications.
- Better-informed truck rolls when onsite services are required.
- Increased energy efficiency and equipment life.
- Lower service costs with higher service value.

Visibility and data—With newer, affordable IoT-based systems, it is easier than ever to gain insights across a range of equipment brands and types, including rooftop air-handling units (RTU), air-handling units (AHU), make-up air units (MAU), variable air volume (VAV) with reheat systems, boilers, cooling towers, air- and water-cooled heat pumps and other systems.



⚡ Heat map zones software includes at-a-glance color-coded status for zone-by-zone reporting, with sensors delivering snapshots every 60 seconds.

Data can be interpreted for opportunities and inefficiencies by offsite professionals who are trained to notice them and take appropriate actions. Opportunities and inefficiencies that never would be noticed by a technician physically inspecting a system can be noticed in the data collected by IoT sensors.

Preventive maintenance can be made more precise and less frequent. Issues may be noticed between scheduled maintenance inspections and resolved before they become costly problems. It can also help prepare for a scheduled service call with the knowledge, proper parts and people to address the issues. It allows service professionals to provide services based on the needs of customers, not on a time schedule.

Remote monitoring

This helps identify HVAC equipment performance issues and provides visibility across facilities. With a smart HVAC controls system, one can get a visual status confirmation across buildings, and drill down to the specific building, floor, zone and equipment level to see if temperatures, air quality and energy use are all as desired and expected, and if not it can help identify issues or anomalies.

One of the most valuable insights is the ability to confirm that building tenants are comfortable, by viewing the current air temperatures and humidity levels. With smart HVAC controls systems, the comfort index can be monitored and controlled remotely. Examples of issue monitoring scenarios:

→ *Temperature Monitoring:*

- ↳ *Call for heat, but temp not improving.* This can check for stage one or two heating run times and whether supply air temperature is improving. This provides an alert capability to the mechanical contractor vs. a plain thermostat that just shows space temperature.

- ↳ *Disparity in zone temperatures.* Likely to be an air flow problem. For example, incorrect sizing of ducts for the space load it is serving, often following a remodel where HVAC wasn't updated.
- ↳ *In a VAV with reheat system,* pre- and post-reheat element sensors can confirm that the reheat element is properly conditioning air.
- ↳ *Refrigeration system thresholds* can provide early notice to determine if propped open or if refrigeration equipment issues.

→ *High CO₂ levels* could indicate issues with outside air economizer actuator or other make-up air system issues.

→ *High energy consumption* patterns might indicate improper scheduling, or other equipment efficiency issues. This helps identify and focus attention on high-energy usage at the equipment level.

→ *Wireless sensor battery life* readings can provide early notification when approaching low-battery levels and allows for planned change-out with other regular service calls, avoiding data outages.

Identify issues before they become problems

An HVACR professional can choose to receive notifications for thresholds in temperature or other factors, to learn of early indicators before they escalate and their customers experience or communicate symptoms. With newer systems, they can choose to receive email or text alerts when exceeding expected performance thresholds. This constant monitoring and reporting capability puts building automation to work, reducing the time spent going on-site and seeking out air quality and HVAC equipment status, since much of that information is at their fingertips. This way attention can be focused on the areas



^ A portfolio energy manager offers indexed comparisons across sites, with cost/sq ft factors and derived equipment energy without the expense of individual CT submeters.

that need it, determining root cause and assuring each facility is operating like a well-oiled machine.

Automated and remote adjustments

One of the best aspects of smart building automation systems is that they can do much of the adjusting and balancing work automatically, using the sensors, building load patterns, weather data and controls capabilities to manage to desired set points and energy consumption. However, even the smartest HVAC systems need a human to manage them.

Sometimes, a remote adjustment can be made to address a newly-identified issue, or to test the system performance across buildings, floors, zones and equipment. For example, with a cloud-based smart HVAC system, mobile apps or Web browser access can be used to make adjustments to schedules, holidays, seasonal modes, or temperature set points.

While building management systems (BMS) may offer cross-equipment high-level data, sophisticated deep-system integrations with equipment offer detailed maintenance log dashboards and diagnostic renderings. One example provides real time visibility to 150 data points on a rooftop unit or air-cooled chiller.

Be a cost savings hero

Well-maintained equipment operates at optimal energy efficiency, offering significant energy savings opportunities, especially when HVAC can be 40% or more of the electrical bill. In addition to the fact that well-maintained equipment enjoys extended lifespans, energy-efficient controls systems reduce run times, further extending the life of equipment and pushing out the need for new capital equipment. Smart automation systems open up opportunities for energy load balancing, and demand-response programs with the utility can be recognized easier.

Predictive insights and higher value roles

A smart HVAC control system can help HVAC pros to be a data-informed consultant to their clients, adding value in assuring a safe, efficient, comfortable and healthy indoor environment for their clients. Get out of emergency-response mode and into being a wellness coach for building HVAC systems.

New service opportunity

Armed with the capabilities of smart HVAC systems, contractors, techs and facility managers can create or enhance their maintenance programs to include a remote monitoring managed service for their customers, where they charge fees for proactive monitoring and check-ups remotely via Web and mobile tools. They can increase their value, while reducing costs and the need for physical site visits. Plus, they can inform their truck rolls to bring the right tools and parts focused on pre-identified issue areas.

Smart HVAC solutions have short payback, especially with reduced operating expenses. New HVAC monitoring systems are more and more affordable and easy to install and manage for new or existing buildings. Unlike overly complex HVAC controls systems, there is no need for controls specialists or programming skills to install and manage these newer systems designed around workflows. ☁

Ben Wallace is a multi-disciplined marketing strategist and executive leader, with extensive experience growing technology and professional services brands with go-to-market models leveraging emerging technologies (IoT, SaaS, Big Data, Machine Learning). He has led several technology companies in aligning business strategy and products with market opportunity and user experience (UX). He leads digital transformation to improve business value and efficiencies, driving demand and customer experiences which result in stronger marketplace relationships.

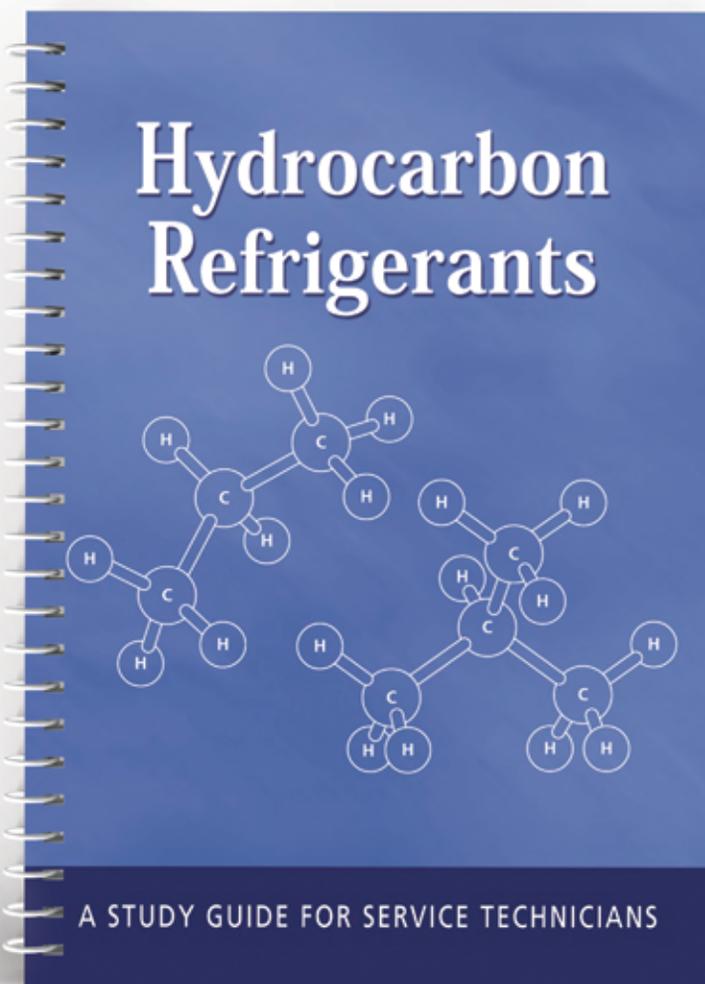
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