



SENSING CHANGE: SIX HVACR TRENDS MOVING THE INDUSTRY FORWARD

The biggest trends in commercial HVACR right now are tied to building systems becoming more connected, efficient and responsive.

And it's not just because of tightening regulatory constraints.

While the Department of Energy (DOE) and other agencies have set their sights on reducing the impact commercial buildings have on the environment, building owners have their own reasons to demand more innovation and efficiency from their HVACR systems. Namely, this: commercial buildings use more than \$190 billion in energy every year.

Inside this report, we'll examine these two sources of pressure and the trends that have emerged as a result. They include:

- Evolving Regulations
- Getting Smart
- Human Comfort
- Integrations and Connections
- Open Systems
- Industrial Internet of Things

As front-line components in HVACR systems, sensors are playing an ever-expanding role in helping drive many of these trends forward. Read on to learn more about how that's happening.

Trend 1: Evolving Regulations

Over the last several years, there's been pressure to cut commercial energy consumption. The pressure's been so steady, in fact, that by 2023, HVACR efficiencies will be required to have improved by 50% over 20 years ago.

This may read as old news to some, but many of the newer regulations are just now going into effect. And with that, new solutions will be needed to expand upon existing efficiency efforts. Sensors are often at the core of those solutions.

Take, for example, the DOE's [Direct Final Rule 79 FR 17725](#) which went into effect in March 2017. The rule requires maximum daily energy consumption for certain commercial refrigeration products to be reduced by 30-60%.



In the rule, the DOE called for greater efficiency to defrost mechanisms. There was debate as to whether the rulemaking committee's compliance date was achievable, because some thought there'd be too much research and development needed to improve defrost sensors to meet the DOE's goal. The DOE, meanwhile, responded by outlining a solution that would use an optical sensor or temperature sensor to detect the temperature differential across the evaporator coil.

While the two sides disagreed on what technology was needed, the debate underscored a fine point: sensors were core to [solving the problem](#).

Trend 2: Integration and Connections

The ability to tie together multiple building components—along with other systems—is certainly not a new trend. And for good reason: Enabling heating, cooling, and lighting systems to work together can mean big gains in efficiencies for commercial buildings.

Much attention is being paid to the role occupancy sensors can play in helping better control the systems (and the energy savings that comes along with it). But there's also a lot of room for better interoperability even within HVACR: combining temperature sensors, pressure sensors, and humidity sensors to create more efficient heating and cooling solutions that are also more comfortable for those who work in the spaces.

Of the three, humidity sensors have been the biggest change to the equation, as they directly correspond to human comfort while allowing systems to put less stress on temperature control.

Another under-discussed piece of the puzzle: wireless sensors for future flexibility.

Systems-wide integrations often require more sensors in more places. If those sensors are analog, they can require more effort and hardware for the sensor interface, with limited flexibility for future modifications and improvements.

Digital sensors, on the other hand, have improved the resolution they can offer in recent years and are approaching the levels of resolution offered by analog sensors. They also offer more flexibility in terms of the amount and type of information they can provide to the control system. This helps create systems that can be more easily adjusted and upgraded throughout their lifecycles.

Trend 3: Getting Smart

Similar to the industry's move toward greater integration is its move toward smarter systems and increased smart communication with energy grids.

Smart systems allow for better monitoring of usage based on a variety of factors—such as time of day, occupancy, and external conditions. That data can be used to automatically deliver heating, cooling and ventilation (among other things) only when needed.



A popular approach to smart systems among building owners is to add a level of automation to zoned commercial HVACR. In these set-ups, commercial HVACR systems rely on a variety of sensors placed throughout the building to heat, cool or circulate air in those specific zones.

Because HVACR systems in these setups only run under certain conditions (when, say, people are in a room or the temperature rises above a certain temperature), they operate with increased efficiency and building owners realize improved energy savings.

Smart HVACR systems go one step further than the “on/off” zoned approach: They learn how much heating, cooling, and ventilation is needed by collecting data and automate that functionality so manual tweaking of thermostats is no longer needed.

Sensors offer advantages to maintaining smart systems.

Pressure sensors, for example, can monitor maintenance needs in real-time for things like airflow, blocked filters and the like. In a commercial building with hundreds of zones (or even room-specific zones), this ability to closely monitor maintenance needs helps systems meet their promised levels of efficiency.

For zoned systems to be efficient and effective, they require accurate and reliable sensors to control each zone. When paired with smart grid systems, this allows key usage data to be sent back to the utility companies

Trend 4: Open Systems

As the industry continues to focus on improving integrations and developing smarter systems, another trend is developing as a result: increased open systems.

Open systems rely on industry-standard protocols that allow for simpler integration and connections throughout HVACR systems and commercial buildings, in general—without the need to worry about manufacturers’ proprietary technology.

These advantages are leading to a substantial increase in market share for open systems.

In 2014, **according to IHS**, 14% of controllers still used proprietary protocols. That number was expected to drop to 12.6% in 2015, the latest year data was available.

While HVACR cross-system integrations may still be possible with proprietary protocols, there’s still a risk for building owners to inadvertently handicap themselves in these efforts under certain circumstances.

These limitations can quickly become apparent when trying to connect HVACR systems to other systems within buildings, like lighting. And as more and more building owners look to those types of integrations, there will be more pressure to provide more open protocols.

Trend 5: Human Comfort

Throughout this report, we’ve been discussing the role of sensors in HVACR system efficiency.

But saving money isn’t the only reason building owners are upping their sensor game. Sensors can also deliver an enhanced level of human comfort that’s quickly gaining in recognition.

Green-building rating systems, such as LEED, are increasingly emphasizing human-centric factors, like thermal comfort and enhanced HVACR controllability.

In this sense, **humidity, temperature and pressure sensors** play a significant role in delivering energy savings and improved comfort for building occupants.

Though comfort is relative to each person, there is guidance for building owners on how they are most likely to provide comfortable working conditions for many people. OSHA recommends temperatures between 68-76° F and humidity between 20-60%. ASHRAE also offers guidance, and the University of Connecticut’s Division of Environmental Health and Safety provides a **helpful chart** that shows the ideal combinations of humidity and temperature.

And it’s no wonder so many sources aim to provide building owners with this type of help: Studies have also shown that optimizing human comfort in the workspace can **increase productivity by up to 3%**, while improved ventilation systems can help create healthier workspaces.

Trend 6: Industrial Internet of Things

Much of the attention being paid to the “Internet of Things” (IoT) is its relationship with consumer’s household appliances. But there’s significant potential within commercial buildings and HVACR systems, as well.

Internet-connected HVACR systems offer several advantages, including better performance monitoring, more timely maintenance, and better integrations with other systems. To deliver on their potential, though, these systems **require sensors** that can collect the necessary data and share it not just with controls, but with systems managers and technicians.

In addition, these systems can tie into a single infrastructure to handle building management solutions and require far less in the way of manual operations.

The trend around developing and implementing HVACR systems that are IoT-connected are more like a confluence of many of the trends outlined above.

Conclusion

Improvements and innovations in sensors—especially newer sensor types, newer uses or how and where to use them, and newer capabilities to pass data in a variety of ways—are driving the HVACR industry forward.

These improvements in sensors allow for more efficient, more intelligent HVACR systems and deliver a host of benefits, including cost savings, energy savings and improved comfort for building occupants.

Across the industry, sensors are a driving force behind making the trends explored in this report part of the mainstream.

For information about TE Connectivity’s HVACR sensor solutions, [visit us here](#).

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