

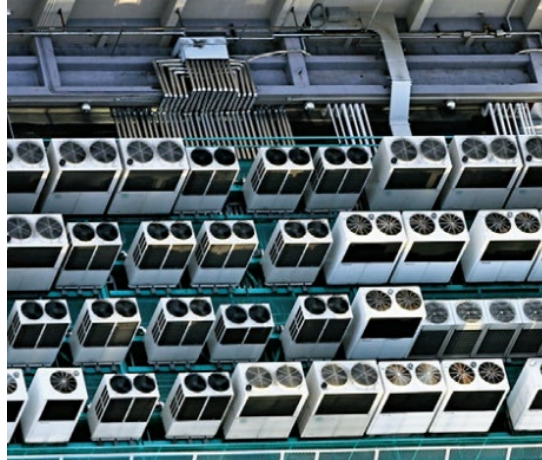
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HVAC Systems Must Adapt as Climate Agreements Take Hold

Phasing out HFCs means new requirements for electrical components.

By Michael Alba, May 27, 2022

TTI Inc. has sponsored this post.



(Image courtesy of Honeywell.)

The Montreal Protocol is a shining example of international cooperation. Signed in 1987 and ratified by every member of the United Nations, it called for many ozone-depleting substances to be phased out. Thanks to this agreement, Earth's damaged ozone layer is on a slow path to recovery.

But there is more work to be done. In 2016, the Kigali Amendment updated the Montreal protocol with a strategy to phase out hydrofluorocarbons (HFCs), another ozone-depleting substance. The first stage of that initiative began in January 2019, and by 2028, if all goes to plan, HFC use will be discontinued worldwide.

As admirable as these international agreements are, they pose a challenge for designers of heating, ventilation, air conditioning and refrigeration systems (HVAC/R). It's not as easy as swapping one refrigerant for another; the entire system must adapt, down to the level of electrical components.

Kigali Compatible Components

Two of the most common substances set to replace HFC refrigerants are R290 (propane) and R600a (isobutane). While much friendlier to the ozone layer than conventional refrigerants, these substances have a drawback: they are highly flammable. HVAC/R systems that utilize propane and isobutane must account for this hazard, and the electrical components used in these systems, such as switches and sensors, must also be designed appropriately.

Because propane and isobutane create the possibility of flammable gas throughout an HVAC/R system, switches used in these systems have the potential to be ignition switches. To prevent the risk of fire and explosion, these switches should be designed to contain any sparks fully inside the switch casing. So-called enclosed break switches are made to withstand internal explosions and to isolate them from the external environment.

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Ensuring Safety Certifications

It is not enough to choose components that are designed for hazardous conditions; these components must also be certified as such. There are a variety of international and region-specific standards with which components must comply, and HVAC/R designers must ensure their systems achieve all requisite safety certifications (such as ATEX certification in Europe and IEC Ex certification globally).

In HVAC/R systems employing propane or isobutane, electrical components must conform to specific safety requirements for locations designated as Zone 2 (ATEX and IEC Ex) or Class II, Division 2 (North America). These designations describe gaseous locations in which explosive conditions are not normal, but may occur for short periods of time.

The [Honeywell MICRO SWITCH V15W2 Series Switch](#), for example, is an enclosed break switch compliant with world-wide Zone 2 certifications. As such, this switch is suitable for use with R290, R600a and other flammable refrigerants.



The Honeywell V15W2 miniature basic switch. (Image courtesy of Honeywell.)

Drop-In Compatibility

An additional advantage of the V15W2 is that it employs a standard miniature switch footprint, meaning it can serve as a drop-in replacement for non-enclosed break basic switches.

This is a crucial feature, according to Darryl Ballard, Global Application Engineer at Honeywell. With the Kigali Amendment still in early days, the standard-size switch gives HVAC/R system designers the flexibility to retrofit existing designs as well as develop new systems.

“A lot of potential customers out there don’t know which direction they’re going—if they’re going to go with a complete redesign or if they’re going to continue to retrofit. And that’s why the standard footprint of a miniature switch was very important to achieve,” Ballard says.

Sensors Under Pressure

Adhering to the Kigali Amendment is just one burden on HVAC/R systems, which by nature present many challenges to designers. Electrical components used in these systems must be ruggedized to withstand extreme temperatures and corrosive media. They must also help HVAC/R systems operate efficiently, reducing energy usage and costs and minimizing impact on the climate.

Pressure sensors, for instance, continuously monitor fluids in pumps, compressors, chillers, evaporator coils and other HVAC/R subsystems. This continuous monitoring comes with continuous exposure to refrigerants and other fluids. Pressure sensors must be protected against corrosion from these fluids, as well as any chemical changes that may occur in the fluids over time.

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The [Honeywell MIP Series](#) of heavy duty pressure transducers addresses this challenge with a hermetically-welded design and stainless steel housing. This design makes the sensors compatible with most HVAC/R refrigerants, including the Kigali-compatible propane and isobutane.

“Stainless steel can accommodate a majority of refrigerants with no issues,” explained Derek Chung, Global Applications Engineer for heavy duty pressure sensing at Honeywell. “And the cabling is flame retardant, so it can be used for flammable surroundings.”



The Honeywell MIP Series of heavy duty, media-isolated pressure transducers. (Image courtesy of Honeywell.)

Keep It Configurable

For designers of HVAC/R systems, it is important to have options. Electrical components for these systems must be configurable for a variety of design requirements. Pressure sensors, for example, can vary in port connections, cable sizing, pressure sensing range and whether they provide voltage or current output.

“Configurability really comes into play with our electrical connections, as well as our pressure ranges,” says Chung. The MIP Series pressure sensors are currently available with six different port connectors, with six more coming soon, according to Chung. The sensors can be calibrated for pressures from 15 to 870 psi. They are available with both voltage and current outputs as well as a range of cable options.

While the MIP sensors are hermetically sealed, the connection points are a potential unwanted entryway for fluids or particles. While proper filtering helps prevent exposure to particulate matter, it is important that pressure sensors are protected against potential damage. The MIP sensors have an ingress protection rating from IP67 to IP69, depending on the connection type.

Early Adapters

As indispensable as HVAC/R systems are in the modern world, it is important to ensure they are not causing irreversible harm to our environment. The international community has pledged support for this goal many times, most recently committing to reduce hydrofluorocarbons with the Kigali Amendment. HVAC/R system designers are left to adapt.

For some, that means starting from scratch, designing new systems that can accommodate new refrigerants. Others are retrofitting existing designs by replacing components and subsystems one-by-one. With the Kigali Amendment still in its early stages, designers have some freedom to choose the best approach for them.

But ultimately, Ballard emphasizes, the HVAC/R industry is on a deadline.

“Whether we’re talking a condenser, an ice maker on a refrigerator or anything in between, everyone has to fall into compliancy at some point in time.”

To learn more, visit [TTI’s Honeywell Industrial Sensors and Switches](#).