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Refrigerant Guiding Principles: A Guide for Navigating the Changing Refrigerant Landscape with Confidence

In the 130 years since its invention of the first thermostat, Johnson Controls has been guided by two key values: A commitment to continuous improvement and a dedication to delivering on its promises to customers. At no time in history have those tenets been more important than they are today, as the industry attempts to navigate the complex and ever-changing refrigerant landscape.

Where will the current patchwork of evolving codes and regulations lead? What refrigerants will eventually be adopted as the new global standard? And until those questions are answered, how will facility managers and business owners make well-informed decisions when buying or maintaining HVAC equipment?

Johnson Controls

Amid the uncertainty, one thing remains clear: Johnson Controls will continue to ensure that our refrigerant choices are practical, safe, efficient and environmentally friendly solutions.

For decades, the company's selections have been directed by our Refrigerant Stewardship Model. The guiding principles specify three sets of criteria that must be considered before Johnson Controls will agree to choose a particular refrigerant. The company's current refrigerants meet all the criteria, and its customers can be confident that when the time is right to make a change, future product transitions will be also be guided by the Stewardship Model.

Our Refrigerant Stewardship Model

Our Refrigerant Stewardship Model requires refrigerants to meet all three criteria:

Safe & Reliable

Many of the commercial refrigerants coming onto the market today are flammable. In response, standards and codes are being developed that establish rules for how equipment and building design must accommodate these fluids and how the flammable refrigerants can be used safely. Unfortunately, the emerging codes don't currently—or consistently—address requirements for each of the various levels of refrigerant flammability, which can lead to a great deal of confusion about what's required in any given application. Because the uncertainty can lead to unnecessary implementation costs or increased risk of fire, consensus-based safety standards should be developed before flammable refrigerants are considered.

New refrigerants must also be tested for reliability to ensure compatibility with HVAC system gaskets, elastomers, and materials of construction. They must prove long-term stability, as well; if a refrigerant begins to break down over time, it can impact system performance and operating costs or cause damage to the equipment. For those reasons, new technologies must be properly vetted before being introduced to the market. In keeping with our Stewardship Model, Johnson Controls works closely with refrigerant suppliers to ensure product reliability. In addition to the battery of tests typically conducted by the supplier, Johnson Controls requires suppliers to run specific tests, engages third-party independent labs to conduct testing and does its own endurance and accelerated life-cycle testing of refrigerants. And although such rigorous testing takes time, it's time well spent. Without a thorough pre-market vetting, customers may find themselves with a poor-quality or unsafe product, and manufacturers may find themselves with unrecoverable costs and damaged reputations.

Efficient & Sustainable

For any new refrigerant to be considered, its use should result in overall chiller performance that is equal to or better than conventional or existing refrigerants.

The alternative fluids coming onto the market have different chemical properties than existing refrigerants and, as such, cannot yet match their thermal and efficiency performance. So while it may be possible to replace existing fluid by 'dropping in' a newer alternative, the switch will likely result

in a change in performance with a trade-off between GWP (global warming potential) and capacity or efficiency.

If efficiency is lowered, more energy will be needed to provide the same level of cooling. The additional power will come from plants that burn fossil fuel and emit CO_2 into the atmosphere, which means the environmental damage caused by this indirect emission will be greater than the impact of venting the full charge of a chiller's refrigerant directly into the atmosphere. In fact, up to 95 percent of the total CO_2 equivalent emissions over the life of air conditioning equipment can be due to energy use alone. Our Stewardship Model calls for consideration of new refrigerants only if they help to reduce the net carbon footprint of the company's products. To meet this goal, energy efficiency cannot be sacrificed.

A new refrigerant that results in lower capacity poses a different challenge: Customers will see higher first costs because larger or additional equipment will be required to meet existing capacity.

For both these reasons, new refrigerants should result in overall chiller performance that is equal to or better than the fluids they replace.

Available & Affordable

Alternative refrigerants must be affordable. Many of the emerging refrigerants cost up to 50 times more than existing fluids. Where flammable refrigerants are being considered, there are the additional costs for the facility safety equipment, increased ventilation requirements, and potentially higher insurance premiums.

Refrigerants must also be available. Some of the recently introduced alternatives have been released only in limited quantities or, in some markets, not at all. The challenge is understandable; it takes time for new product production to ramp up and for supply chains to be established. But in the meantime, the lack of availability creates incalculable risk. Technicians can't be properly trained in the refrigerant's use. And for building owners who commit to a refrigerant that's not widely available at the outset, the long-term cost of ownership may turn out to be prohibitive if supply remains limited.

Under the Johnson Controls Stewardship Model, lack of availability must be considered when evaluating new refrigerants. This holds true for existing refrigerants, too. If a product currently in use is slated for future phase-out, or is otherwise expected to become limited in quantity, the projected lack of availability may cause Johnson Controls to make a refrigerant change.

Past, present and future confidence

For decades, Johnson Controls' refrigerant selections have been guided by our Stewardship Model. Today, all of the company's current refrigerants meet the three sets of criteria. Moving forward, our Stewardship Model will continue to serve as our guidepost. So, when the time is right to make a change, customers can be confident that the transition will be led by a company committed to continuous improvement and dedicated to delivering on its promises.

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