



Chiller Refrigerants: A Time to Stay the Course

Sometimes the more things change, the more they stay the same.

Last year, regulators around the world began proposing reductions and limits on several established refrigerants, including the widely used HFC-134a (also called R-134a). This caused a flurry of questions in our industry, specifically: What's the best refrigerant choice for high-capacity chillers and other HVAC equipment?

For now and the foreseeable future, an excellent answer is: R-134a.

Why? Because R-134a strongly combines key attributes of a responsible refrigerant choice: low environmental impact, safe, efficient, reliable and cost-effective.



Taking the long view

Hydrofluorocarbon (HFC) refrigerants have started to face scrutiny as governments look to combat climate change. In July 2014, the U.S. EPA proposed reductions and limitations in certain non-stationary air-conditioning applications for several refrigerants, including R-134a. And Canada gave notice of the intent to follow suit. Meanwhile, the European Union's fluorinated greenhouse gas (F-gas) regulation calls for a two-thirds reduction in emissions of F-gases by 2030.

HFCs do have higher global warming potential, and in the long run they likely will be replaced. Reductions over time are going to happen, and forward-thinking manufacturers and industry leaders support them. Experts from the public and private sectors have come together to establish a useful dialog around the topic of reducing emissions. But HFC replacement won't happen next year. Or ten years from now.

Some industry players misinterpreted the recent government proposals to mean R-134a, and even chiller equipment that uses it, was on the fast track to obsolescence. In reality, for the building sector of the HVAC industry in most parts of the world,

there is no proposal on the table to phase out R-134a. Most units that Johnson Controls and other suppliers design, manufacture, sell and maintain are simply not affected – for sound scientific, economic and practical reasons.

Big sources first

First, the U.S. EPA, quite logically, is focusing on industries with the highest greenhouse gas emissions: foam, automotive and commercial refrigeration. Chillers – centrifugal, screw and scroll – are on the other end of the spectrum and projected to represent less than 2 percent of global HFC emissions in 2020, with an even lower percentage of greenhouse gas emissions.¹

Regulators are also targeting applications that involve a high risk of refrigerant leakage. In cars and trucks, for example, air conditioners face constant movement and jostling and are often serviced by untrained do-it-yourselfers. On the other hand, commercial and industrial chillers and residential HVAC units are made of welded steel; sit stationary in basements, on rooftops or on concrete slabs; and are serviced by professionals, making the risk of leakage minimal.

Refrigerant Guiding Principles

At Johnson Controls, our refrigerant choices – past, present and future – are governed by a stewardship model that has guided us through previous transitions and will serve us and our customers well in changing times ahead.



THE JOHNSON CONTROLS REFRIGERANT STEWARDSHIP MODEL

Safe and Reliable

Toxicity and flammability must be addressed for all refrigerant options. Systems must be designed for new refrigerants and undergo long-term testing.

Efficient and Sustainable

Future refrigerant choices must present equal or better overall performance values than current refrigerants. Energy efficiency is the ultimate priority to reduce the carbon footprint of HVAC products.

Available and Affordable

Local availability at a reasonable cost is critical for building owners' bottom line.



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Absence of alternatives

The U.S. EPA has said it will move forward with scheduling phase-outs only when viable alternatives are commercially available. At present, they are not. The consensus among industry experts is that even for those inclined to consider hydrofluoroolefins (HFOs) and other new refrigerants, it is simply too soon and too risky to make a change. R-134a remains a fully responsible choice, for users and for the environment. Here is why:

R-134a is safe. Alternative refrigerants that are mildly flammable could drive higher installation costs to mitigate safety and ventilation concerns. The use of flammable refrigerants in most commercial applications would require a significant change for which typical end users, such as office buildings and K-12 schools, are not prepared. Mitigation of higher flammability risks will cost more, likely increase insurance premiums, and require additional precautions. In addition to flammability, the potential toxicity of alternative refrigerants is a hurdle that must be overcome. Prevailing practices for handling current refrigerants in commercial

applications in most of the world are not adequate to account for potentially higher toxicity or flammability in new refrigerants. Refrigerants with either or both of these characteristics can be handled safely but require special precautions and training and, most likely, changes in consensus-based codes and standards to mitigate the increased risks.

Units with R-134a are efficient and thus environmentally sound.

Efficiency is essential to a chiller's environmental impact. Equipment running less efficiently on alternative refrigerants takes more electric power to deliver the same cooling. In turn, more electricity from fossil-fueled power plants means more carbon dioxide emissions to the atmosphere. About 95 percent of a chiller's lifetime carbon footprint comes from these indirect emissions.

R-134a is economical. Today's refrigerant alternatives are more complex to manufacture and come at a high price. They are being quoted at several times the cost of R-134a and are forecast to remain more expensive than R-134a is today, even at full-volume production. In addition,

because the alternatives are not widely used, equipment owners will pay a premium for maintenance until service technicians with necessary tools and skills are plentiful.

Chillers have been optimized for R-134a. It takes time and experience to optimize chiller equipment for a given refrigerant and maximize capacity and efficiency. Chillers that use new alternative refrigerants but are not yet optimized for them will likely exhibit lower efficiency and higher operating and maintenance costs.

The way forward

The indications show that R-134a remains a solid choice for refrigerants in building HVAC equipment until the industry has settled on truly worthwhile alternatives. Johnson Controls is committed to helping chart the course toward efficient, affordable and safe alternatives.

¹United States Environmental Protection Agency, Global Mitigation of Non-CO₂ Greenhouse Gases: 2010-2030, September 2013, p.161. http://www.epa.gov/climatechange/Downloads/EPAactivities/MAC_Report_2013.pdf



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