

Five Facts To Consider Before Switching To CO₂

Global regulations are phasing down the use of refrigerants with high global warming potential (GWP). These changes are prompting HVAC&R operators using high-GWP HFCs to rethink their refrigerant selection. The good news is lower-GWP alternatives exist. These include lower-GWP HFCs, HFOs, and HFC/HFO blends—collectively known as advanced climate technologies, or ACTs—as well as refrigerant-grade CO₂, which has been touted for its minimal carbon footprint. But for all the hype surrounding CO₂, operators are wise to weigh the decision to switch carefully.

When it comes to CO₂ and your business, here are five important facts to consider:

1. CO₂ in many cases is inefficient

Don't be fooled: GWP is not the dominating factor of a refrigerant impacting the environment. The "indirect effect," which is directly related to the energy consumption of the refrigeration equipment, represents 60% - 90% of total emissions. Efficient systems require less energy to operate the equipment, reducing its overall carbon footprint. **One retailer's study** showed their store with a CO₂ system consumed 20% more energy than a store using a conventional HFC system in the same moderate climate, while stores using an HFO blend experienced a reduction in energy consumption. Efficiency matters for the environment and your bottom line—factor it into your decision making.

2. CO₂ systems are expensive

Transcritical CO₂ systems function much differently than conventional systems. Because they operate at **substantially higher pressures**, CO₂ systems require expensive, high-durability components. Not only are the components more expensive, there are also more of them. Because of their complex designs, CO₂ systems require more equipment than conventional systems: transcritical components, pressure relief valves, and extra controls. This equipment is not cheap and can impact your bottom line significantly.

3. CO₂ system leaks can quickly halt your operations

Leaks are a challenge for all operators regardless of their system. But for operators of CO₂ systems, the stakes are much higher. CO₂ systems operate at extremely high pressures and so when they leak, they leak rapidly. If the leak is not quickly identified and fixed, the system will experience a significant loss of cooling and may even break down. A 2018 study of ~200 transcritical systems found them to have a **very high leak rate (~48.3%)**, which means each store is losing the equivalent of their entire charge every other year. If you are considering a CO₂ system for your business, be prepared to manage outages and downtime.

4. CO₂ systems must be serviced by harder-to-find technicians

Unlike conventional systems, CO₂ systems require multiple circuit designs and complex controls. Because of the complexity, there is a lot that can go wrong. And unfortunately, many technicians are trained to service conventional systems, not intricate CO₂ systems. An unqualified technician servicing a CO₂ system can cause significant damage—in some cases resulting in a system shutdown due to complete charge loss. The challenge of finding qualified technicians for CO₂ systems is an important reality and something to keep in mind when making your refrigerant selection.

5. R-744 (Refrigerant grade CO₂) isn't as abundant as you think it is

Manufacturers sell CO₂ as a so-called “natural,” abundant solution. It's effective marketing, but it's far from the truth. For example, in Europe, the major CO₂ source is as a byproduct from ammonia plants. The downside to that? Most ammonia is produced for the seasonal fertiliser production business, and those plants often shut down for a quarter of the year. In other words, it's not a matter of if there will be a shortage—it's a matter of when. For operators of CO₂ systems, these shortages spark **panic buying** and halt businesses, like we saw during the UK CO₂ shortage in 2018.

Transitioning to lower-GWP refrigerants is an important shift for our industry and our environment. Fortunately, there are many solutions that can help you meet your goals. To make the decision that's best for your business, do your research—and consider all the facts.

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