KEEP IT COOL

REFRIGERATION ENGINEERING NEWS *from* **emanuelson-podas** | Q3.25

Heat Reclamation:

How Refrigeration Couples with HVAC

Grocery stores operate refrigeration systems 24/7, making them a prime source of waste heat. By reclaiming this heat and integrating it with the HVAC system, store owners can achieve significant energy savings and lower operating costs. As the industry shifts toward CO2-based refrigeration systems — which produce more heat — here are five ways heat reclamation can complement HVAC systems.

1 Higher-Quality Heat for Reuse

Transcritical CO2 refrigeration systems generate heat at higher temperatures (188°F) than traditional HFC systems (150°F). This is especially true in higher ambient transcritical operation. This makes the reclaimed heat more useful for space heating, domestic hot water, and other high-temperature applications. The elevated output allows for more efficient integration with HVAC systems, often eliminating the need for auxiliary heating altogether during cooler seasons.

2 Enhanced Hot Water Production

The switch to CO_2 significantly improves the ability to use waste heat for domestic hot water (DHW) needs. CO2 systems can recover heat at temperatures exceeding 150°F, which is ideal for meeting sanitation and food safety requirements in deli, bakery, and meat departments. With proper heat exchangers, CO2 heat recovery systems can meet most or all DHW demand, reducing or even eliminating the need for separate gas or electric water heaters.

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3 Simplified System Design

CO2 systems can include built-in heat recovery modules, making integration with HVAC systems more straightforward than with older HFC-based setups. In many cases, these systems are designed with heat reclaim in mind, allowing store owners to implement energy-saving strategies without complex retrofits. The design flexibility means stores can fine-tune how much heat is directed to space heating, water heating, or rejected based on seasonal needs.

CO2 refrigeration systems generate waste heat that may be reclaimed and used for domestic hot water, space heating, and other high-temperature applications.

4 Increased Energy Efficiency and Reduced Carbon Footprint

CO2 refrigeration not only avoids the use of high-GWP refrigerants but also enhances the overall energy efficiency of grocery store operations when heat reclamation is utilized. By harnessing the high-grade waste heat produced by CO2 compressors, stores can reduce their reliance on fossil fuel-based heating systems. This results in lower operational emissions and can help retailers meet aggressive sustainability targets or regulatory mandates tied to carbon reduction.

5 Future-Proofing Against Regulations and Utility Incentives

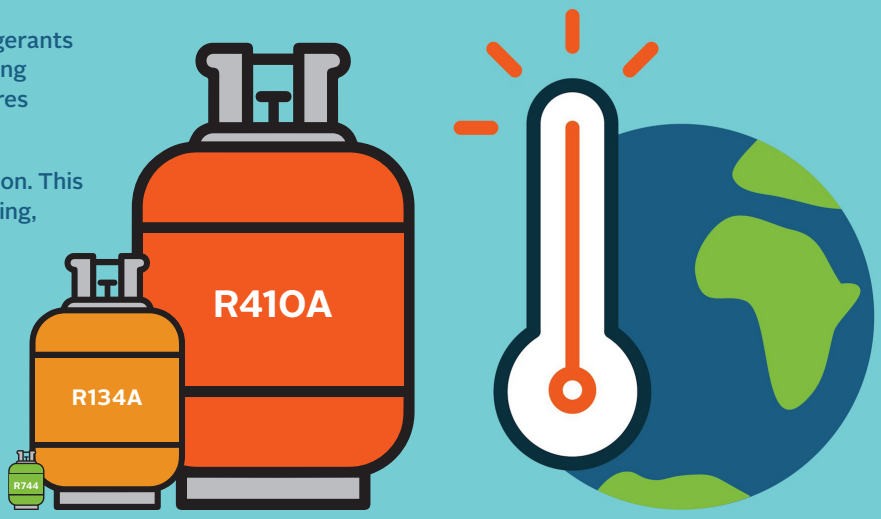
As environmental regulations tighten and utilities begin offering incentives for decarbonization and efficiency improvements, investing in CO2 refrigeration with heat recovery puts store owners ahead of the curve. Some utilities now recognize the dual benefits of CO2-based systems and offer rebates or incentives for integrated heat reclaim systems. This not only accelerates ROI but also ensures long-term compliance with evolving energy codes and refrigerant phase-downs.

Refrigerant Global Warming Potential (GWP)

R744, or CO2, stands out among refrigerants due to its extremely low Global Warming Potential (GWP). Here's how it compares to other common refrigerants:

R744 (CO2) has a GWP of 1, by definition. This means its contribution to global warming, over a 100-year timeframe, is the same as that of the equivalent mass of carbon dioxide itself.

Traditional hydrofluorocarbon (HFC) refrigerants have vastly higher GWPs than R744. For example, R134A has a GWP of 1,430, and R410A has a GWP of 2,088.



Staying Cool During Power Outages

Power outages pose a serious threat to grocery stores, particularly when it comes to preserving perishable inventory. Even a brief disruption can lead to significant product loss, food safety issues, and financial damage. How can you take a proactive approach to emergency power planning? Start with these four steps:

1 Prioritize Essential Refrigeration Loads

Not every electrical system in the store needs to be powered during an outage. Store owners should work with a qualified engineer to determine which refrigeration units are essential to keep running. This typically includes walk-in freezers, coolers for meat and dairy, and any units containing high-value or highly perishable items.

2 Invest in a Properly Sized Generator

A standby generator is the backbone of any emergency power system. It must be sized to support critical refrigeration loads, with room for startup surges and sustained operation over multiple hours—or even days. Undersized generators can fail under load, while oversized systems can be unnecessarily costly.

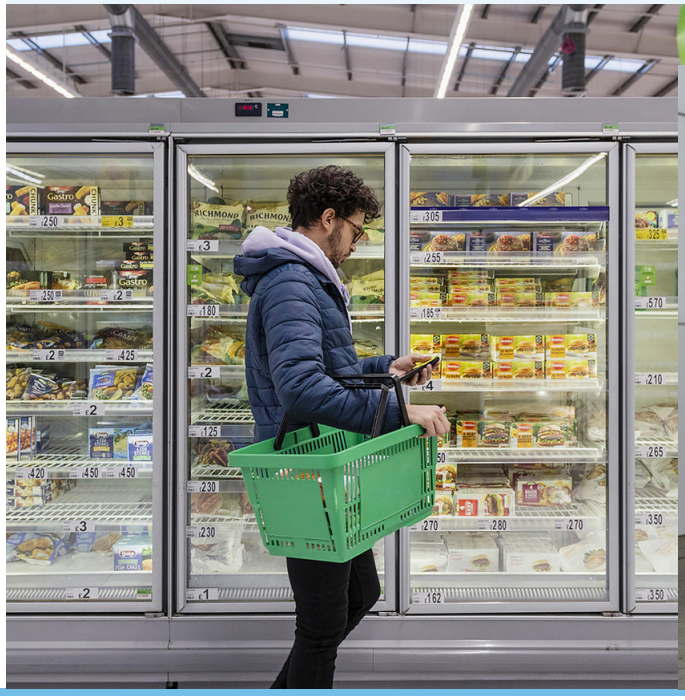
3 Include Backup Power for Control Systems and Alarms

Refrigeration isn't just compressors and fans — controls, sensors, and monitoring systems also need power. These systems alert staff to temperature deviations and equipment failures, and in modern facilities, they may be tied to remote monitoring software. Emergency power planning should include these components to ensure full situational awareness and timely response during a power loss.

4 Plan for Maintenance, Testing, and Staff Training

Having emergency power equipment installed is not enough—it must be regularly tested and maintained. Generators should undergo routine load testing, fuel quality should be checked, and transfer switches should be inspected to ensure reliable performance. In addition, staff should be trained on startup procedures, refrigerated product handling during outages, and emergency protocols.

Power outages are inevitable, but food loss doesn't have to be. With thoughtful planning, the right equipment, and regular testing, grocery store owners can ensure their refrigeration systems stay online — and their products stay safe — no matter what happens to the grid. ❄



Retrofitting Refrigeration with Zero Downtime:
SMART STRATEGIES FOR SMOOTH TRANSITIONS

In the world of commercial refrigeration, system upgrades aren't optional—they're inevitable. But for grocery stores, distribution centers, and other facilities where refrigeration is mission-critical, even short-term downtime can be costly. The good news? Retrofitting a refrigeration system doesn't have to mean shuttering operations. Here's how:

1 Start with Phasing and Planning

A well-phased retrofit begins with early collaboration between engineers, contractors, and facility managers. You need to understand existing loads, equipment conditions, and scheduling constraints—and build your retrofit around them. Phased implementation ensures that one system comes online before another goes offline.

2 Temporary Cooling Systems Work — If You Plan Ahead

Some facilities with existing secondary glycol fixtures, including national retailers, temporarily leverage chilled water systems during a retrofit to maintain cooling loads. These systems can be piped in temporarily and scaled to meet demand while new equipment is installed and commissioned

- ***Tip:*** *Confirm that your power infrastructure can handle both systems running concurrently during switchover.*
- ***Reality Check:*** *Renting and staging chilled water systems isn't cheap, but it's often far less expensive than a shutdown. Renting self-contained fixtures is also an option.*

3 Know When CO2 Isn't Enough

Converting to CO2 usually requires full system replacement; existing refrigerated cases and evaporators must be replaced. However, a refrigeration compressor system can be kept in place and a CO2 or glycol pump system inserted as a secondary subcritical system. With planning, existing cases and evaporators can be strategically moved to the new system, while existing cases and evaporators remain.

4 Build for Structural Flexibility

Think beyond the mechanical. Large system retrofits may require new or expanded support structures — especially if new condensing units or compressors are located on the roof. Some owners even pre-plan for future phases by installing secondary supports now.

- ***Tradeoff:*** *Roof-mounted systems are discreet. On-grade systems are easier to access. Choose wisely.*
- ***Future-Proofing:*** *In some cases, it makes sense to build both primary and backup support structures during the initial install.*

Final Thoughts

Downtime doesn't have to be the price of progress. With early coordination, flexible design, and the right temporary strategies, refrigeration retrofits can happen in real time — without disrupting operations or compromising performance. ❄

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