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Refrigerant Planning Guide
Low Temperature Rooms

An essential guide for retrofitting existing or planning new science grade cold rooms and freezers.

Refrigerant Planning Guide
Low Temperature Rooms

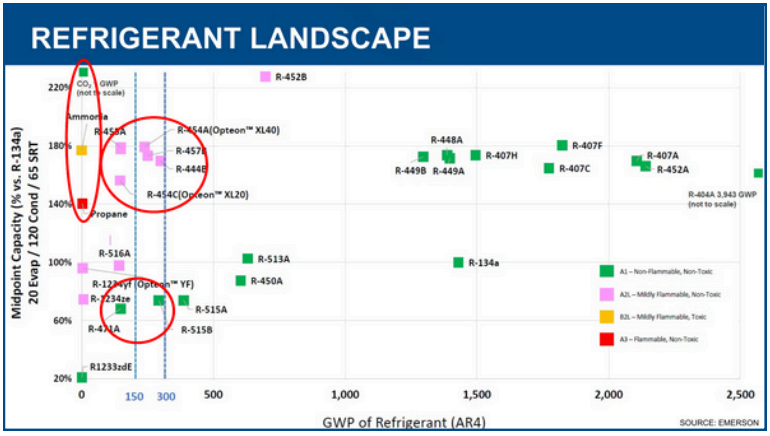
As environmental regulations evolve, particularly those concerning the Global Warming Potential (GWP) of refrigerants, it's crucial for businesses relying on cold storage to proactively adapt. This guide is designed to empower you with the knowledge and tools necessary to navigate the upcoming EPA regulations and make informed decisions about your refrigerant and system choices.

We understand the critical role these systems play in maintaining the integrity of your products and operations, and this guide aims to provide practical, actionable insights to ensure seamless compliance and optimal performance.

Inside, you'll find detailed information on the latest refrigerant alternatives, system design considerations, and best practices for transitioning to lower-GWP solutions. We'll explore the implications of the new EPA regulations, helping you understand the timelines and requirements for phasing out high-GWP refrigerants.

Labworks International is committed to supporting our customers in achieving sustainable and efficient cold storage solutions.

This guide will help you select the most suitable refrigerants and systems for your specific needs, minimize environmental impact, and maintain operational excellence in the face of changing regulatory landscapes.



Requirements

What are the GWP requirements for cold rooms and freezers?

The U.S. Environmental Protection Agency (EPA) is implementing regulations to significantly reduce the use of high Global Warming Potential (GWP) hydrofluorocarbons (HFCs), primarily through the American Innovation and Manufacturing (AIM) Act.

Key Regulatory Points:

- **AIM Act and EPA Rules:**
  - AIM Act directs the EPA to phase down HFC production and consumption.
  - EPA regulations set GWP limits for various refrigeration sectors.

- **GWP Limits for Cold Rooms:**
  - The EPA has established different GWP limits based on the refrigerant charge size:
    - *Systems with less than 200 lbs. of refrigerant:* The GWP limit is 300.
    - *Systems with 200 lbs or more of refrigerant:* The GWP limit is 150.
    - *High-temperature side of cascade systems:* The GWP limit is 300.

- **Compliance Timeline:**
  - These GWP limits are set to take effect starting January 1, 2026, with some variations depending on the type of application.

- **Impact on Refrigerant Choice:**
  - These regulations necessitate a shift away from high-GWP refrigerants like R-404A, R-448A and towards lower-GWP alternatives, including:
    - Hydrofluoroolefins (HFOs)
    - Natural refrigerants like CO2

- **State Regulations:**
  - It is important to note that some states have their own, sometimes stricter, regulations regarding refrigerant GWP. Therefore it is important to check both federal and state regulations.

Requirements

Practical Implications:

- Cold room operators must assess their existing systems and plan for transitions to compliant refrigerants.
- New cold room installations must utilize refrigerants that adhere to the GWP limits.
- Consideration of system design is crucial to optimize performance with lower-GWP refrigerants.

In essence, the EPA's regulations are driving a transition to more environmentally friendly refrigerants in cold room applications. Facility operators must be aware of the charge size of their systems to correctly adhere to the regulations.

Refrigerant Types

What refrigerant should I choose for coldrooms and freezers?

The industry has been working on testing refrigerants with compressors and systems to ensure compliance, optimal performance and to address limitations that may exist with potential systems.

Through this process two refrigerants have become the most widely supported for equipment and testing, R-454C and R-744 (CO_2).

Each of these refrigerants have advantages and disadvantages, and do require further examination.

R-454C

Manufactured by Honeywell as 'Solstice 454c' and Chemours as 'Opteon XL20,' **R-454C** is a non-toxic, semi-flammable (A2L) refrigerant. It offers a lower-GWP alternative for cold rooms and freezers, significantly reducing environmental impact and ensuring EPA compliance. R-454C also provides good energy efficiency, lowering operating costs.

However, as an A2L refrigerant, it requires specific safety measures, adding costs for specialized equipment and training. System modifications may be needed for optimal performance, potentially increasing upfront investment. While availability is improving, R-454C may not yet be as widely accessible as traditional refrigerants.

R-744

R-744, purified CO_2, is a natural refrigerant supplied by Messer, Linde, and National Refrigerants. It offers major environmental benefits, with an ultra-low GWP of 1 and zero ODP. CO_2 also has excellent thermodynamic properties, enhancing energy efficiency in cascade or transcritical systems, and is both non-flammable and low-toxicity.

However, R-744 systems require high operating pressures, necessitating specialized components and increasing initial costs—typically 20% to 80% higher than R-454C systems. Skilled technicians are essential for installation and maintenance. Efficiency can also be impacted by high ambient temperatures, requiring advanced system designs in warmer climates.

Upgrading your current Refrigeration System

Upgrading a cold room's mechanical systems to meet GWP guidelines is a complex decision with financial and operational impacts.

Factors Favoring Upgrading

- **Regulations**: The EPA's AIM Act is phasing down high-GWP HFCs like R-404A, impacting availability and cost. Federal and state rules may vary.
- **Replacement Refrigerant Costs & Availability**: As high-GWP refrigerants decline, prices rise. Lower-GWP alternatives like R-454C and R-744 are becoming more accessible.
- **Efficiency Gains**: Modern systems with variable-speed compressors and advanced controls offer better efficiency, lowering costs and environmental impact. ASHRAE sets efficiency standards.
- **Equipment Age:** Older systems are prone to leaks and inefficiency. If nearing end-of-life, upgrading is a smart investment.

Factors Against Upgrading

- **Initial Cost**: Upgrading requires significant capital for new equipment, installation, and potential infrastructure modifications.
- **Downtime**: System upgrades may disrupt operations, leading to lost revenue.
- **Existing Equipment Condition**: If the system is well-maintained and relatively new, continuing its use may be more cost-effective.
- **Refrigerant Retrofit**: Retrofitting to a lower-GWP refrigerant can be cheaper than replacement but must ensure system efficiency.

Upgrading your current Refrigeration System

Decision-Making Process:

- **Assess Current System:** Evaluate its condition, age, and efficiency.
- **Cost vs. Savings**: Compare upgrade costs with potential energy and refrigerant savings.
- **Regulatory and Refrigerant Impact**: Consider long-term compliance and availability.
- **Expert Consultation**: Engage a qualified technician for tailored recommendations.

In conclusion, while upgrading a cold room's mechanical systems to meet GWP guidelines can be a significant investment, it can also lead to long-term cost savings, improved efficiency, and reduced environmental impact. Careful planning and consideration of the factors outlined above are essential for making an informed decision

For expert guidance on selecting the right system and refrigerant for your cold room or freezer, contact a Labworks Sales Engineer. They can assess your current setup and provide tailored recommendations to meet your specific needs.

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