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From Experience

Cooling with Caution: Meeting EPA's GWP Limits in Industrial Refrigeration

The American Innovation and Manufacturing (AIM) Act, passed in 2020, mandates an 85% reduction in the production and consumption of high-Global Warming Potential (GWP) hydrofluorocarbons (HFCs) by 2036, supporting the global climate goals of the Kigali Amendment to the Montreal Protocol. In support of the AIM Act's objectives, the U.S. Environmental Protection Agency's (EPA's) Technology Transitions Program is enforcing stricter GWP limits on refrigerants used in new industrial refrigeration systems (see chart, below). However, the new GWP limits do not restrict the continued use of refrigerants in existing systems.

GWP Limits for Manufacturing & Import of Products Containing HFCs

Sectors	GWP Limit	Compliance Date
Industrial Process Refrigeration Systems <200lb charge with refrigerant entering evaporator ≥ -22°F	300	1/1/2026
Industrial Process Refrigeration Systems ≥200lb charge (excluding cascade high side) with refrigerant entering evaporator ≥ -22°F	150	1/1/2026
Cold Storage Warehouses ≥200lbs	150	1/1/2026
Cold Storage Warehouses <200lbs	300	1/1/2026
Chillers - Industrial Process Refrigeration with exiting fluid at or above -22°F	700	1/1/2026

The EPA's GWP limits are pushing the industrial refrigeration industry towards A2L refrigerants, such as R-454C and R-455A, or natural refrigerants, such as ammonia and carbon dioxide. ASHRAE classifies refrigerants by toxicity (A=lower toxicity and B=higher toxicity) and flammability (1=non-flammable, 2=lower flammability, and 3=higher flammability). A2L is classified as a lower flammability risk with a low burning velocity.

GWP of Common Refrigerants for Industrial Application (values from EPA website)

Refrigerant Number	GWP 100	Class
R-410A	2088	A1
R-448A	1386	A1
R-454C	146	A2L
R-455A	146	A2L
R-717, Ammonia (Natural)	0	B2L
R-744, Carbon Dioxide (Natural)	1	A1

Some A2L refrigerants offer significantly reduced GWP compared to the HFCs they replace. However, their use introduces additional safety considerations due to their flammability. When A2L refrigerants are used in Industrial Occupancies, ASHRAE 15-2024 has different requirements based on the releasable refrigerant charge (m_rel) of each independent circuit and the safety systems applied.

If the releasable refrigerant charge does not exceed the Effective Dispersal Volume Calculation (EDVC - See formula in *Experience in Brief* below), no additional safeties are required for industrial occupancies.

If the refrigerant charge exceeds the EDVC limit, the m_rel value can be lowered by implementing release mitigation controls as spelled out in ASHRAE 15-2024. If mitigation controls are not applied or do not reduce the m_rel below the EDVC, ASHRAE 15-2024 provides an alternate path to compliance with additional safety requirements such as installing refrigerant detection and eliminating open flames.

When designing and installing new industrial refrigeration equipment and systems, it is important for end users to understand the impacts of the AIM Act and the EPA refrigerant restrictions. If applying an A2L refrigerant to meet the new GWP limitations, there are some additional safety requirements that may need to be implemented due to the refrigerant flammability, which may not have been a factor in the past when dealing with the commonly used A1 refrigerants. Consulting with a qualified refrigeration engineer can help determine the best refrigerant for the application and compliance with all associated safety requirements.

EXPERIENCE IN BRIEF

EDVC can be calculated as follows:

$$EDVC = RCL \times V\_eff \times F\_occ$$

Where:

RCL = Refrigerant Concentration Limit (published in ASHRAE 34-2024)
V_eff = Effective Dispersal Volume
F_occ = Occupancy Adjustment Factor

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