

January 20, 2022

Future Refrigerants

Refrigerants in the HVAC industry are changing. Historically, the focus has been to reduce Ozone Depletion Potential (ODP) by eliminating refrigerants that have Chlorine. In the last 10 years, the focus has shifted to lowering Global Warming Potential (GWP).

The current refrigerants used today are Hydro Fluoro Carbons – or HFC's. These are primarily R-410a, R-134a and R-407C. All refrigerants are a blend of other refrigerants.

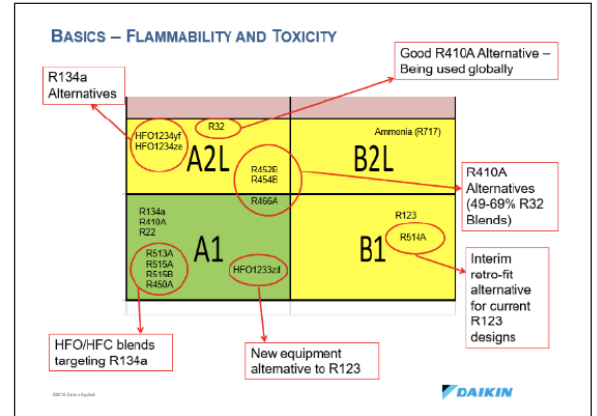
		Safety Group	
Increasing Flammability	Higher Flammability	A3	B3
	Lower Flammability	A2	B2
		A2L	B2L
No Flame Propagation	A1	B1	
		Increasing Toxicity	

No refrigerant is perfect. The refrigerant manufacturers must balance multiple factors – toxicity, flammability, stability of the refrigerant blend, cost, efficiency, capacity and now GWP. The baseline for GWP is CO2 which has a GWP =1.

The tables on the right shown the ASHRAE classifications for flammability and toxicity. The majority of the future refrigerants have an A2L classification, which means slightly flammable. Note that the flammability is a measurement of flame propagation. Class 2L refrigerants have slow flame propagation (burning velocity < 10 cm/sec).

Current building codes do not have a means to address Class 2L refrigerants. The building codes are expected to accommodate these refrigerants prior to 2024. Class 2L refrigerants are used widely in Europe and around the world.

None of the future refrigerants are “drop in” replacements. The future refrigerants have different efficiency and capacity characteristics vs the current refrigerants. These are some of the reasons that the transition presents challenges to manufacturers.



Air Reps Offerings:

Aermec and Daikin Applied have R-32 machines operating in other countries. As soon as the building codes allow R-32, these products will be available in the US market. Daikin is currently offering R-513A for the WMC and WME. AWV is expected to have R-513A in 2022.

Daikin AC has released an R-32 ductless split in the US. The VRV products will use R-32 once codes allow.

R-410a Replacements (High Pressure)					Future Refrigerants
Refrigerant	ASHRAE Class	GWP	% R-32	Available in US?	
R-32	A2L	677	100%	Limited	
R-466A	A1	575	49%	?	
R-454B	A2L	466	68.90%	?	
R-452B, branded Opteon XP44 is targeted to replace R-404a & R-507 for low temp refrigeration.					
R-134a Replacements (Medium Pressure)					
Refrigerant	ASHRAE Class	GWP	Available in US?		
R-513a	A1	579	Yes		
R-1234ze	A2L	1	Yes		
R-1234yf	A2L	1	Yes		
R-123 Replacements (Low Pressure)					
Refrigerant	ASHRAE Class	GWP	Available in US?		
R-1233zd	A1	1	Yes		
R-514A	B1	1	Yes		

High Pressure – Scroll Compressors

- Smaller footprint and lower cost than other compressor technologies
- Unitary Equipment, VRV, Scroll chillers under 250T, HP/HR chillers
- Industry doesn't have a clear direction on replacement refrigerant as of early 2022.

Medium pressure—Centrifugal Compressors, Screw /Rotary Compressors

- Medium pressure machines are physically smaller than low pressure.
- Slightly higher leakage rates since refrigerant pressure is higher.
- Daikin, York, Smardt all use R-134a.

Low pressure—Centrifugal Compressors

- Low pressure machines are physically larger than medium and high pressure machines
- Low pressure compressors typically run at lower speeds.
- Lower leakage rates since refrigerant pressure is much lower.
- [Trane CTV](#) uses R-1233ZD and R-514a depending on tonnage.
- [Carrier 19DV](#) uses R-1233ZD
- [York YZ](#) uses R-1233ZD, MagLev chiller

Legislation:

- Washington State passed legislation in 2019 banning the use of R-410a and R-134a in new chillers starting 1/1/2024. Similar to other phase outs, these refrigerants will still be produced for servicing existing equipment, as well as reuse/recycle. Availability of these refrigerants should not be an issue.
- California passed legislation in 2020 banning the use of refrigerants with GWP >750 for air conditioning by 1/1/2025. VRV will have until 1/1/2026. This allows time for building codes to accommodate A2L refrigerants.

The slide below shows the A2L standards/codes that have been updated or will be updated prior to the phase outs of R-410a and R-134a. This is from AHRI from 2019.

