

mobile air conditioning refrigerants

HFO-1234yf: the better choice

	HFO-1234yf	CO ₂
Environmental Impact	Lower lifetime GHG emissions than 134a or CO ₂ ¹	20% more lifetime greenhouse gas emissions than 1234yf ²
Atmospheric Lifetime	11 days ³	>500 years
Compatibility with Current A/C Equipment	Yes, with minor change ⁴	No; new high-pressure system required ⁵
Cooling Efficiency	Comparable to 134a in all climates ⁶	Less efficient in hot climates where A/C is needed and used most ⁷
Ease of Adoption	High; minimal additional design changes or delay ⁴	Low; significant engineering and re-tooling required ⁸
Safety	Safe for use in automotive air conditioning applications ⁹	Safe for use in automotive air conditioning applications ¹⁰

1 HFO-1234yf has the lowest Life-Cycle Climate Performance compared to CO₂ and HFC-134a, regardless of region. Calculations were made based on model tests for climates in Phoenix, Arizona; Frankfurt, Germany; Tokyo, Japan; and Athens, Greece. Results were presented by the JAMA-JAPIA consortium at the 2008 SAE Alternative Refrigerant Systems Symposium in Phoenix, Arizona in June 2008.

2 CO₂ air conditioning systems have higher indirect greenhouse gas emissions than HFO-1234yf systems because they are less efficient. This lower efficiency results in higher fuel consumption for the vehicle which creates more GHG tail pipe emissions.

3 Unlike HFCs and CFCs which take generations to decompose, HFO-1234yf does not accumulate in the atmosphere creating long-term problems. A short atmospheric lifetime means less impact on the environment. HFO-1234yf is highly stable in the compressor system, and if it escapes, will not persist in the environment.

4 Current car designs use low-pressure air conditioning systems. HFO-1234yf is compatible with these low-pressure systems and can be used as a replacement for HFC-134a with minimal reengineering of automotive systems. Because HFO-1234yf is a near drop-in, car manufacturers can more quickly and cost-effectively comply with the new EU regulations.

5 CO₂ requires a re-designed high-pressure AC system. As with many new designs, there are questions about reliability in the field due to the unproven technology.

6 HFO-1234yf is as effective as HFC-134a, and offers comparable cooling performance in warm and hot climates.

7 Energy efficiency of CO₂ declines as temperatures increase which means greater fuel consumption to generate the power to operate the compressor, increasing tailpipe emissions and environmental impact. Therefore, CO₂ is not a global solution.

8 CO₂ requires a new high-pressure air conditioning system and cannot be used as a direct replacement for HFC-134a. In order to adopt CO₂ as a refrigerant, automakers would need to completely redesign their air conditioning systems.

9 Thorough independent tests, including documented tests performed by the Society of Automotive Engineers and automakers using real-world conditions, have demonstrated that 1234yf is safe to use in mobile air conditioning.

10 Due to the extremely high pressure and harmful health effects of CO₂, the air conditioning system must be carefully designed to minimize the risk to passengers and service people.