

servicing low-global-warming mobile air conditioning systems

HFO-1234yf: the better choice

	HFO-1234yf	CO ₂
Ease of leak detection	Easy; use same equipment and techniques as today ¹	More difficult to find leaks; CO ₂ is present in background air ²
Service equipment and practices	Similar to HFC-134a ³	Higher pressures require different equipment and practices ⁴
Impact of very small leaks	Minor; lower pressure minimizes leak rates ⁵	High pressure of CO ₂ makes even small leaks a problem ⁶
Impact of charge loss	Low leak rates and ability to hold reserve charge reduce impact on performance ⁷	Higher leak rates and limit on total charge due to pressure concerns increases impact of charge loss ⁸
Ease of Service	Flexible hoses make it easy to replace hoses and components ⁹	Stiffer hoses more difficult to work with in crowded engine compartments ¹⁰
Cost of repair parts	Similar to HFC-134a ¹¹	CO ₂ system components are generally more expensive than those used for 134a ¹²
Safety	Can be used safely with proper practices and training ¹³	Can be used safely with proper practices and training ¹⁴
Other	HFO-1234yf is odorless ¹⁵	CO ₂ likely to require odorant ¹⁶

1 Since HFO-1234yf is a fluorocarbon, the existing fluorocarbon leak detection equipment and techniques can be used to easily detect HFO-1234yf leaks.

2 Since CO₂ is present in air, it is very difficult to detect small CO₂ leaks in an air conditioning system. Different equipment and techniques are required to detect CO₂ leaks in air conditioning systems.

3 The properties of HFC-134a and HFO-1234yf are very similar. That's why the air conditioning systems for each are nearly identical. The service equipment and service practices will also be very similar.

4 The very high pressure of CO₂ requires completely new air conditioning system designs, new service practices and specially designed service equipment to handle the high pressures of CO₂ safely.

5 Similar to HFC-134a, the relatively low pressure of HFO-1234yf minimizes the effect of very small leaks on an air conditioning system. Also, small leaks can be more easily located due to the ease of leak detection of fluorocarbons.

6 The high pressure of CO₂ systems allows more refrigerant to escape out of a small leak than lower pressure refrigerants. In addition, detecting small CO₂ leaks is more difficult than detecting fluorocarbon leaks.

7 The relatively low pressure of HFO-1234yf allows manufacturers to put a small excess charge of refrigerant into the air conditioning systems. This allows the systems to continue to function well even after a portion of the charge is lost.

8 The high pressure of CO₂ system limits the ability to overcharge the air conditioning system. Even a small amount of charge loss due to leaks begins to impact the cooling performance of the air conditioning system, leading to more frequent a/c service visits.

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- 9 The current system designs for both HFC-134a and HFO-1234yf use flexible hoses to connect the components. This makes systems repair and assembly easier.
- 10 The high pressure of CO₂ requires the use of stiffer, more rigid hoses to connect the system components. This may make servicing CO₂ systems more difficult, particularly in crowded engine compartments.
- 11 The parts and components used in HFO-1234yf systems are similar or identical to those used in today's HFC-134a systems. The parts are mass produced in high volumes globally and are widely available at reasonable prices.
- 12 Most components of CO₂ air conditioning systems are entirely new designs that require special construction to handle the high pressures. These components are not currently mass-produced and therefore will likely be very expensive. Furthermore, safety standards for CO₂ may prohibit the use of repaired or remanufactured parts during service repair.
- 13 Although the properties of HFO-1234yf are very similar to HFC-134a, some education and training will be required to properly and safely service HFO-1234yf systems to address the mild flammability of HFO-1234yf. Consult your local regulations for any additional requirements.
- 14 New service practices and training will be required to properly and safely service CO₂ systems due to the higher pressures and potential harmful effects of excessive CO₂ levels. Consult your local regulations for any additional requirements.
- 15 HFO-1234yf is odorless and leaves no lingering odor after leaks or releases.
- 16 OEMs are considering adding an odorant or stenching agent to CO₂ to assist in detecting leaks. The odor may be unpleasant and may be difficult to remove if it leaks into the passenger compartment of a vehicle.