



# Off-Road's Move Toward R-1234yf Refrigerant

With the passage of the EPA's SNAP Ruling #24 in 2022, R1234yf was approved as an acceptable replacement for R-134a in several heavy-duty vehicle categories. Are you ready for the changes upcoming?

Since the summer of 2022, the off-road (non-road) segment has begun preparing for the HFC phasedown.

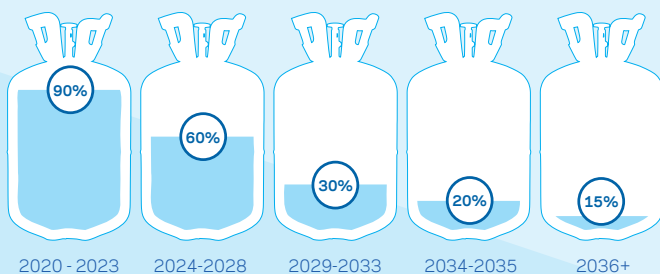
Chemours, inventors of Freon™ and next-generation Opteon™ solutions, supplies refrigerants for applications in stationary air conditioning, industrial cooling, commercial refrigeration, as well as automotive air conditioning. Learn more about R-1234yf, the ongoing HFC phasedown, the impacts to the industry, and how Opteon™ YF (R-1234yf) is an optimal refrigerant solution for off-road (non-road) equipment needs.



## How is the motor vehicle air conditioning (MVAC) landscape changing for the truck and off-road (non-road) industry?

The industry is experiencing the most significant refrigerant transition since the 1990s, when segments ranging from light-duty passenger to heavy-duty on-road and off-road converged on R-134a as a replacement for R-12, a chlorofluorocarbon (CFC), to comply with regulations. However, while R-134a is a non-ozone depleting hydrofluorocarbon (HFC), it still has a relatively high GWP and was included in several global phasedowns. In 2006, Europe introduced the Mobile Air Conditioning (MAC) Directive to enforce the use of refrigerants with a GWP of less than 150. This raised the importance of companies like Chemours developing a portfolio of refrigerant solutions with minimal ODP and a low GWP, such as Opteon™ YF (R-1234yf). The 2020 American Innovation and Manufacturing (AIM) Act's aggressive HFC phasedown schedule (85% baseline reduction by 2036) underscores the importance of developing systems around this refrigerant.

The AIM Act scheduled an initial 10% reduction in HFC consumption and production from Jan. 1, 2022 through 2023, with an additional 30% reduction to start in 2024. Between March 2011 and May 2022, the EPA's Significant New Alternatives Policy (SNAP) program listed R1234yf as "acceptable subject to use conditions" for new passenger cars, light-duty trucks, medium-duty passenger vehicles, heavy-duty pickup trucks, complete heavy-duty vans, and certain heavy-duty nonroad vehicles.



**HFC Phasedown Schedule**  
Consumption & Production  
Allowance Caps as a  
Percentage of Baseline



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## What are the key differences and similarities between R-134a and R-1234yf?

R-1234yf is a hydrofluoroolefin (HFO), which has a very short atmospheric life and offers a zero ODP plus a GWP of <4 (AR4) compared with R-134a's GWP of 1,430. With its low-GWP performance, R-1234yf is comparable to R-134a in terms of performance, operating range, low toxicity, energy efficiency, and thermal capacity. R1234yf also has a higher vapor density, enabling a smaller compressor that reduces the system's energy consumption. The major difference between these refrigerants is that R-134a is nonflammable (ASHRAE Class A1), where R-1234yf is mildly flammable, designated as an A2L. R-1234yf is difficult to ignite but prevents it from being a direct drop-in replacement for existing systems. New system components must be rated for R-1234yf prior to use. While there are no new types of components re-quired, an internal heat exchanger should be included to deliver the desired cooling load under all operating conditions.

## What market influences and trends are fueling the transition to R-1234yf?

R-1234yf is the preferred R-134a replacement for new equipment in heavy-duty off-highway vehicles following the recent SNAP listing. With the reduction of R-134a production and availability under the AIM Act, OEMs are staying ahead by designing equipment for R-1234yf. To meet the demand, Chemours recently announced a 40% production capacity expansion at our largest Opteon™ YF facility in Corpus Christi, TX. Lastly, YF helps businesses achieve sustainability goals for customers and end users to support their own growth while remaining compliant to the regulations.

## How much experience does the MVAC industry have with R-1234yf?

Successful use of R-1234yf in light-duty vehicles paved the way for the truck and off-highway segments. Nearly 30 manufacturers produce passenger vehicles charged with R-1234yf, representing 90% of R-1234yf cars sold in the U.S. and nearly 90 million vehicles on U.S. roads.

The transition in the truck and off-highway industry is well underway, with increases in R-1234yf use from semi-cabin cooling to heavy-equipment cabs. In the aftermarket, R-1234yf components and service have been tested and refined in passenger vehicles, providing a smooth transition when the need arises for truck and off-highway.

## What's next in cabin cooling for truck and off-highway vehicles?

New original equipment charged with R-1234yf and the need for maintenance will continue to increase. Light-duty vehicles offer a strong indication of exponential growth driven by the environmental benefits, regulatory compliance, and sector controls. Continued HFC phasedowns and increases in the manufacture of heavy-duty equipment for R-1234yf will impact market pricing for both R-134a and R-1234yf. And the move to EVs in this industry is already well underway. R1234yf is dominating the growing hybrid and EV market as the preferred refrigerant for heat pumps. Moreover, as the industry demands longer driving range and battery life, R-1234yf based technology will be increasingly

Need support? Contact our Tech-2-Tech hotline  
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If you would like more information about Opteon™ YF, the Opteon family of refrigerants, or other refrigerant products, please visit [opteon.com](http://opteon.com) or call 800-235-7882.

