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Top Tips
Ensure Quality Air Conditioning Service

Heating, ventilation, and air conditioning (HVAC) systems have been a standard feature in vehicles for almost 100 years. More recently, manufacturers have been evolving these systems to achieve higher fuel efficiency and create a more climate-friendly approach. While the use of R1234yf refrigerant in new model vehicles is relatively well-known, there have been many other advancements in A/C systems, like variable displacement compressors (VDC). VDCs, also called clutches compressors, increase efficiency by adjusting the amount of work the compressor performs based on demand.

Here are some tips about the unique features of R134a and R1234yf, VDC operation and diagnostics, and external factors that could affect the A/C system operation.

1

Identify the similarities and differences between R134a and R1234yf systems.

On a surface level, R134a and R1234yf systems may seem almost identical. There are quite a few similarities between the two refrigerant variants. In some instances, a R134a A/C compressor can be used on a R1234yf system. If the compressor is shipped pre-filled, the oil must be drained and then filled with R1234yf-compatible oil prior to installation. The oil used in a R134a system does not contain the same amount of acid-reducing additives that are required in R1234yf oils. If the proper oil is not used, premature wear to the compressor can occur.

Only a few differences stand out between the two refrigerants. R1234yf is much more environmentally friendly compared to R134a. R1234yf is a non-ozone-depleting chemical and has a significantly lower global warming potential (GWP), depleting from the atmosphere in 11 days or less. The pressures between the two systems differ slightly as well. You will also be required to use specific equipment based on the system you are working on. R134a service fittings will not connect to a R1234yf machine and vice versa.

2

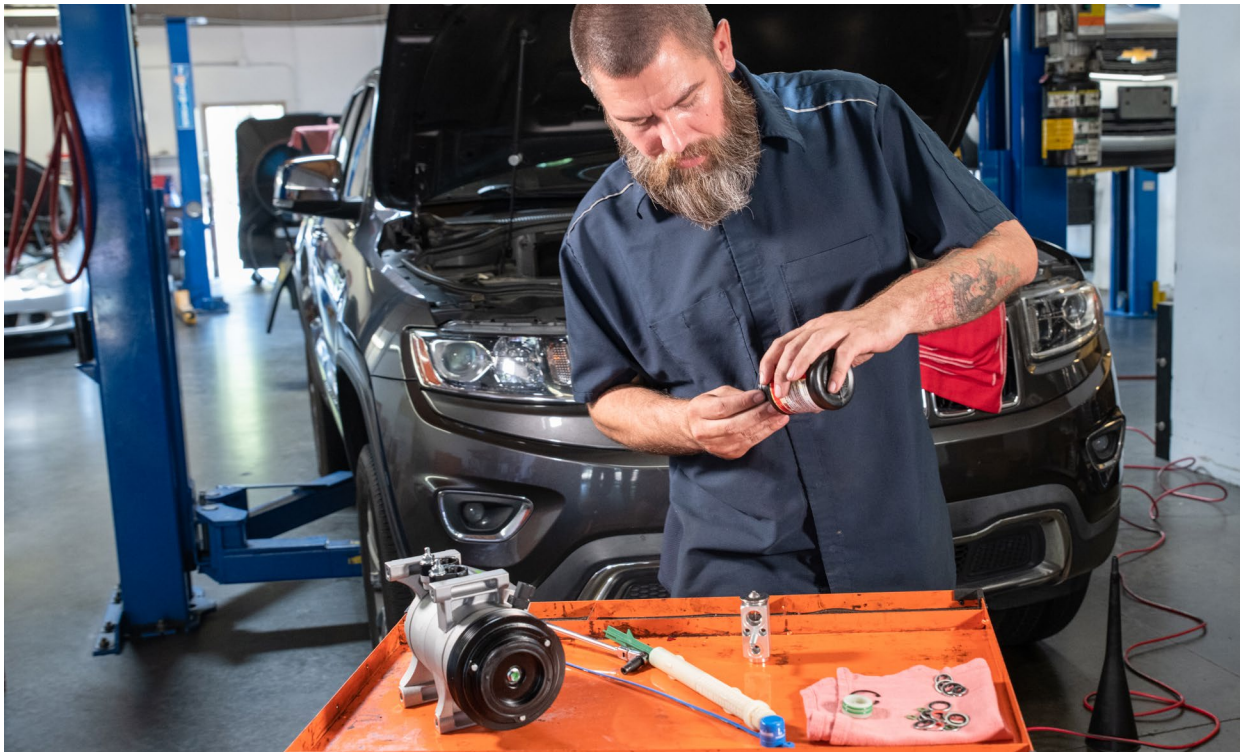
Understand variable displacement compressor (VDC) operation.

Traditionally, A/C systems have used clutch-controlled A/C compressors. Recent developments in the industry have led to the introduction of the VDC, or clutchless compressor. VDCs do not contain a clutch and are always considered to be in operation. The electronic control module (ECM) can control VDCs to increase or decrease the output level. This is achieved by adjusting an internal swash plate, which alters the displacement or distance traveled by the internal pistons. The changes in displacement help create more flow in high-demand scenarios, while staying efficient in normal operation. Since the compressor is always spinning, any lack of refrigerant or oil can cause compressor damage almost immediately.

3

Know when to flush the A/C system.

A common misconception is that if a part in the A/C system fails, no further action beyond replacement is needed. However, there are several steps a technician can take to avoid a complete system replacement. Whenever debris is suspected or found in the HVAC system, a proper flushing procedure must be performed. Additionally, whenever an A/C compressor is replaced, it's crucial to flush out or replace any part of the refrigerant path that may be contaminated. When replacing an A/C compressor, replace the receiver drier or accumulator to ensure all debris is removed from the system. Some components, such as the A/C condenser, may be more difficult to flush due to the small passages within the condenser. After a compressor fails, it's best to replace the discharge hose, condenser, expansion device (thermal expansion valve or orifice tube), and the accumulator or receiver/drier. Any remaining components should be flushed. Failing to properly flush the system and replace all necessary parts can cause further damage to the A/C system.



4

Ensure HVAC system airflow.

When diagnosing HVAC-related customer complaints, the first step is typically to hook up an A/C recovery machine or gauges and view the pressures. While this is not a bad test, many technicians overlook air distribution issues. If an A/C system does not have proper airflow, both across the condenser and the evaporator core, the customer will notice a lack of cooling in the cabin. It's almost impossible to know if the issue is with the refrigerant system or the air distribution system without properly diagnosing the system.

The cooling fans are a good first place to check if there is a suspected airflow issue. If a cooling fan is inoperative, A/C performance will suffer. Normally, the cooling fan will help draw heat away from the A/C condenser. Without the airflow of the cooling fan, the stagnant heat has nowhere to travel, resulting in the A/C system overworking. The blower motor is also another potential failure point. The A/C system can turn on and work properly, but if the blower motor is inoperable or restricted, then air can't move inside the cabin. Sometimes, more intricate failures involving blend or mode doors can cause the system to become stuck in a specific setting or at a particular temperature.

5

Service and repair the A/C for hybrid and electric vehicles properly.

HVAC service on hybrid and battery-electric vehicles (EVs) follows most of the same general principles, with some unique requirements. EVs are equipped with high-voltage electric compressors. Electric A/C compressors do not need to be driven by a belt and can have their speeds varied infinitely by the ECM. When servicing an A/C compressor on an EV, all high-voltage safety protocols and procedures must be followed. The high-voltage system must be powered down before removing anything related to the A/C compressor. Ensure that you follow all manufacturer-recommended procedures to maintain a safe work environment.

For more information on A/C and climate control service, visit **www.autozonepro.com/ac**.

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