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A/C Failure Prevention

The challenges of eco-friendly refrigerants

During the winter months, it goes completely unnoticed, but during the stifling summer heat, the truck's air conditioning system is your driver's best friend.

Even though it's not working during the colder months, certain conditions could be setting you up for an A/C system failure in the middle of summer. The most common culprit is refrigerant leakage. Slowly, silently, refrigerant can be escaping from the system until it reaches critically low levels.

When you turn on an air conditioner with low refrigerant levels, the system's compressor and clutch must work a lot harder. If the level is low enough, the compressor will cycle frequently enough to overheat and eventually fail.

So why does the refrigerant leak in the first place? It's very difficult to completely seal a system and keep it sealed. Seals will deteriorate over time, particularly if the air conditioning hasn't been used for a number of months. If lubricant isn't contacting the seals, they can warp and start leaking.

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The switch to new refrigerants in recent years has not helped the situation. Prior to 1995, all A/C systems used R-12 refrigerant, also known as Freon. Today, all new vehicles use R-134a, which contains fewer chlorofluorocarbons (CFCs) and is more friendly to the environment.

The arrival of R-134a brought along its own set of challenges. Since R-134a boils at a higher temperature than R-12, it's a less efficient refrigerant. Air conditioning systems must run higher discharge (head) pressures with R-134a. This places extra stress on A/C compressors, which must work longer under full load.

R-134a refrigerant also has smaller molecules than R-12, so it's more difficult to prevent leaks. Hoses and seals must be high-quality and all connections must be tight.

Fleets also need to be cautioned about converting an R-12 system to R-134a. The lubricant used in R-134a systems is totally incompatible with the mineral-based lubricant used for R-12. If you choose to retrofit a pre-1995 vehicle with an R-134a system, you must make sure that all hoses are replaced and the old mineral oil used with R-12 is thoroughly flushed out of the system. If the ester-based oil contacts any mineral oil, there's a chemical reaction which forms an acid that attacks all of the aluminum components in the A/C system.

Without some type of monitoring system, refrigerant leaks are difficult to detect before it's too late. By the time you notice a drop in A/C performance, the damage may already have been done to the compressor and/or clutch.

How else can your A/C fail? Over-voltage damages an A/C system by creating excessive current and heat in the clutch oil, shortening clutch life. Under-voltage is even worse: it can cause the clutch to slip and burn out.

Finally, the vehicle's starter motor and batteries merit some consideration. If the A/C is on during a vehicle's ignition cycle, the starter motor has to work extra hard cranking the compressor as well as the engine.

An untimely failure of the A/C system impacts you in a couple of ways:

1. Higher maintenance costs associated with unscheduled repairs. Anything repaired in a hurry at unplanned locations will always cost more.

2. Unscheduled downtime and frustration.

By paying attention to your A/C systems now, you can avoid system failures—and unhappy drivers—later this summer. ●

Gary Wilson helped pioneer onboard A/C power in trucks and played a key role in developing the first cogeneration auxiliary power unit for trucks which included an A/C generator and stand-alone air conditioning system. Wilson is a member of the Technical Maintenance Conference and the National Society of Heating & Air Conditioning. He joined Index Sensors in 2002.