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COLD, HARD FACTS ON A/C REPAIR

Reacquaint your staff with the basics of air conditioning work. Although climate control systems have become significantly more advanced, restoring fresh, cold air conditioning to a vehicle can be manageable if you stay educated.

As a vehicle owner, there are few feelings worse on a hot summer day than turning on your air conditioning only to get a blast of warm air or barely any airflow at all. It could be your A/C system just needs recharged or has a small leak. Then again, you also could be looking at replacing an expensive compressor or evaporator.

As a repairer, there are few tasks potentially more aggravating than tracking down the source of an A/C problem. There's a good chance that source could be something obvious, like a damaged component, hose or O-ring. At the same time, you also could be looking at wiring damage or a complex diagnostic and repair issue with a vehicle's sophisticated climate control system that may require computer scanning.

Tangling with an inoperative A/C system entails many of the same challenges of any damaged mechanical/electronic automotive system. In most cases, you turn this work over to a certified A/C tech (mandated by law) at your shop or sublet it to a mechanical repair facility. That doesn't mean you should keep information on A/C repairs solely in the hands of those who perform the work.

Customers and insurance reps can have plenty of questions surrounding A/C repairs that estimators, customer service reps and managers will need to address. Additionally, air
conditioning maintenance can provide your business with a significant revenue stream these same employees could be upselling.

It's time to take another look at the cold, hard facts and repair information surrounding A/C work. Refer to the following steps to keep your employees educated.

Step1: Learn the system

A vehicle's air conditioning system works by creating a super-cold element and then circulating air over it and into the vehicle cabin to remove the hot air from the vehicle cabin. The circulation is the product of a fan. Creating the cooling element is the difficult part.

This is accomplished by transitioning an A/C refrigerant (typically R-134a) through a series of gaseous and liquid states that turn it ice cold.

The refrigerant is stored in the A/C system as a gas. When you flip the A/C on, this gas is compressed, causing it to liquefy. The liquefied refrigerant then flows through a high-pressure line to a radiator-like component that condenses it and removes any heat.

The cold liquid flows through a valve into an evaporation unit where it becomes a gas again. The cold gas turns this unit into a cooling element that air can be forced over to produce air conditioning.

The refrigerant warms as it is used here. To keep the cold air flowing, the refrigerant is sent back to the beginning of the A/C system where it is compressed again and transitions once more through the air conditioning cycle.

Step 2: Know the parts

Most A/C systems consist of five basic components, along with sensors and refrigeration lines. The components are:

Compressor: As its name suggests, the compressor pressurizes the refrigerant and is the first and last stop in the air conditioning process. An engine belt powers the compressor. An electrically operated clutch turns the compressor on and off as the demand for cold air increases.

Condenser: The condenser functions like a miniature radiator-cooling (by removing the heat) then liquefying the compressed, hot gaseous refrigerant as it passes through. The condenser is typically located near the vehicle radiator, sometimes directly in front of it. Like the radiator, the condenser sometimes is fitted with a fan.

Thermal Expansion Valve: This valve controls the flow of the liquefied refrigerant, allowing the motorist to determine how cool the air will be when it enters the vehicle cabin.

Evaporator: The evaporator is another kind of radiator, much like the condenser. The evaporator, however, reverses the work performed by the condenser. It "evaporates" the liquid refrigerant, turning it back into a gas that chills the evaporator fins. Air blown past the fins becomes icy-cold and is transferred into the vehicle where it cools the interior.

The refrigerant remains in the evaporator until it begins to warm and lose its cooling effect.

Accumulator or Drier (or Receiver Drier): The warm refrigerant makes its way back to the compressor but must pass through one more component -the drier.

Refrigerant can only be returned to the compressor in the form of a gas. Sometimes, however, liquid gets passed along (usually because the gas refrigerant warms and returns to a liquid.) Liquids pose a serious risk to the compressor, where they can cause severe damage. The drier catches and absorbs liquids using a chemical known as a desiccant. Because refrigerant carries dispersed oil to keep the compressor lubricated, the drier also includes a filter to trap any accumulations of oil or other “gunk” that may get passed through the A/C system.

Step 3: Obtain the proper tools

The majority of damaged A/C systems experience some type of leak, which means your techs will use UV dye set to identify where refrigerant is seeping through. Some OEM’s do not allow dying of their systems, so your techs should be making use of three other tools to spot system damage:

- Electronic refrigerant leak detector: Sometimes a UV dye set won’t reveal a leak. An electronic leak detector can check the entire system in a matter of minutes, including the evaporator.
- A/C manifold gauge set: Determining the pressure readings on the low and high sides of an A/C system are essential to troubleshooting problems, making an A/C manifold gauge set an absolute necessity. Newer sets include anti-blowback features, but techs should still wear safety glasses.
- Flexible inspection mirror: Because A/C components are packed tightly in the engine compartment, locating damaged parts -especially bent lines and damaged evaporators- can be difficult. A flexible inspection mirror can fit into these tight areas and help turn up hidden damage.

Step 4: Difficult diagnoses

Tom Griffin, owner of 2014 ABRN Top Shops winner Mayfield Collision Centers in Bedford Heights, Ohio, says in many cases an A/C system damaged in a collision event is easy to spot. A front-end collision should indicate the possibility of A/C damage. An inspection of the engine bay is the first step in uncovering problems.

Even if the A/C system appears fine, the next step is running the air conditioning and evaluating its performance. From there, a certified A/C tech can perform the necessary diagnostic tests and repairs. Most A/C problems can be traced to broken components or system leaks. Fractured hard lines (aluminum) and flexible (rubber) A/C lines are frequent culprits, as are punctured condensers, since they frequently are located at the front of the vehicle, near the radiator where they are vulnerable to damage in front end collisions.

Some A/C problems can be far more difficult to spot, especially passive refrigerant leaks. There are two types of leaks, active and passive. Active leaks constantly lose refrigerant and thus show up more easily during leak tests. These leaks are typically the result of collision damage to belts and lines that are bent or crimped when nearby engine parts are pushed into them. Engine and other mechanical components sit so close to one

another in the engine bay that even a light hit can press them into one another.

Passive leaks are intermittent so they may not show up during a standard evaluation and only appear at times when the vehicle is running. These leaks are the products of damage else where in the A/C system that interfere with the system temperature and pressure and create vibrations. Possible damage includes shaft seal leaks in the compressor or a cracked braze on an evaporator or condenser that is no longer properly supported.

In these cases, a UV dye test will be more effective at finding leaks than an electronic test.

Passive leaks can take time to diagnose. Sometimes, they may not be apparent until after a vehicle is returned to the customer. Your shop needs to keep these factors in mind when performing a final quality inspection on the vehicle and if a customer calls later with concerns over the A/C system. In many cases, the latter issue can be avoided by performing a UV dye test on every damaged (or potentially damaged) A/C system and by thoroughly examining the system during a road test.

Step 5: Offering further recommendations

Even if the A/C system isn't damaged in a collision, that doesn't mean you should ignore it during a vehicle inspection. Most vehicles on the road today (and well over 90 percent of new vehicles) have air conditioning. Repairing faulty A/C systems and offering maintenance can provide significant revenue.

Consider evaluating the A/C system in every vehicle that visits your shop, especially those older than three years or more with more than 100,000 miles. Over time, many of these systems need recharged to return them to proper functional levels. Air conditioning systems that aren't maintained pose significant, and potentially costly, problems for vehicle owners.

Inform your customers of the following

- Contaminated or low refrigerant or faulty A/C electrical wiring can ruin a compressor. This by itself is a serious issue, but it also can lead to even larger problems. Damaged compressors can send electrical surges throughout the A/C system and to other parts of a vehicle causing severe damage to both. Even if a vehicle escapes these issues, a faulty compressor can produce other issues, including draining the battery (thereby shortening battery life), reducing fuel efficiency and creating poor idling.
- A number of A/C problems can be repaired fairly inexpensively. Replacing the refrigerant is affordable as are other necessary services. For example, fluctuating A/C temperatures can be the result of moisture building up in an assembly or hose where the moisture turns to ice and creates a clog. Removing the ice is quick and easy. A weak or aging car battery can cause a number of A/C performance issues that can be remedied with a replacement costing around $100.

Foul odors emanating from the A/C are typically the result of bacteria that build up in the evaporator. A quick evaporator flush will eliminate the problem.

The beautiful new finish and fresh body work you've provided can restore a vehicle with a new look that shouldn't be paired with A/C problems. Collision repairs provide an ideal time to address other vehicle issues. One of the best ways to appreciate the sharp look of a repaired vehicle from the inside is with clean-smelling, fresh, ice-cold air. Motorists and repairers can both agree to that.

A NOTE ON REFRIGERANTS

Restrictions from the Environmental Protection Agency (EPA) phased out A/C refrigerant R-22 in favor of more environmentally-friendly R-134a. Now it appears that R-134a will steadily disappear as automakers turn to an even safer environmental alternative, 1234yf.

Half a million vehicles on the road worldwide already use 1234yf. Industry experts expect that number to increase rapidly in 2017 when Europe begins mandating 1234yf in all new passenger vehicles. In the U.S., automakers are switching now to 1234yf to earn EPA incentives.

U.S. vehicles using the new refrigerant include these models, beginning in these model years:

2013 Cadillac XTS
2014 Chevrolet Spark EV
2014 Chrysler 300
2014 Dodge Challenger
2014 Dodge Charger
2013 Honda Fit EV
2014 Jeep Cherokee
2014 Range Rover
2014 Range Rover Sport