

50 years in automotive air conditioning and still growing strong !

Purpose and Anatomy of Condensers

Condensers are a critical component of any air conditioning system. A condenser is in most basic terms, is a heat exchanger, just as heater cores and evaporators are. Its job, in simple terms, is to draw the heat from the refrigerant and oil mixture circulating through an automotive air conditioning system and expel it leaving cool air to blow out of the vents. How does it accomplish this?

Condensers have evolved a great deal to become more efficient. Some of these changes in design have made them more efficient and less prone to complete failure. **However, the changes have made them impossible to flush and have caused drastic compromises in functional efficiency, as the vehicle gets old.** This means the condenser MUST be replaced whenever a major system service or maintenance is performed, such as replacement of the compressor. As condensers have evolved they have also become less expensive, as have most of the air conditioning components, relative to other vehicle maintenance costs. To understand how and why this has happened, you must understand some basics of condenser design and functionality.

Originally condensers were made up of one long copper tube that snaked back and forth multiple times (why they were sometimes referred to as a coil) with aluminum fins attached to them to expel the heat of the Freon flowing through them. This was one path and if it became blocked at any point it completely ceased to function. It was also a very inefficient design since only the refrigerant actually coming into contact with the tubing itself could expel any heat. A positive of this less efficient design was that if technicians flushed blockages cleanly they could be reused.

Newer style condensers increase the surface area the refrigerant has



Tube & Fin / Serpentine	Parallel / Piccolo	Parallel Flow	Parallel / Micro Channel
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contact with in order to greatly enhance heat exchange. Present day condensers are usually some form of parallel flow. Parallel Flow condensers are designed with multiple passageways in each runner and smaller runners in piccolo style. The multiple much smaller passageways put more of the refrigerant in direct contact with the outer walls (airflow). This style of condenser is far more efficient as a heat transfer device, however it is far more likely for sections to become constricted which can choke the system.

Modern Condenser Technology

Parallel flow condensers, as described in the previous paragraph, are the most common designs found in today's vehicles. While more efficient, parallel flow condensers are most definitely not free from their technical issues. When contaminants of various types from bits & pieces of piston rings to liquefied / coagulated Teflon from the piston rings get into the A/C system they create varying degrees of blockage & constriction. While the drier or accumulator & orifice tubes normally catch such debris sometimes the "gunk and junk" does get past the "filtration" system and when it does, the condenser is not doing it's job. Some technicians may attempt to flush out the condenser but parallel flow condensers are near impossible to completely flush by design.

Extremely hot days, coupled with normal wear & tear can break down the piston rings in the compressor. Liquefied Teflon from the piston rings then circulates through the system & enters the arteries of the condenser. As it cools, it solidifies in the channels of the condenser & causes internal blockage. This has been proven by cross-section dissections of condensers. The blockage & constriction that is in the system is like a ticking time bomb. On a very hot day it can break loose & clog or destroy major components of the system, like the compressor.



Replace Condensers for Optimum System Performance

Additionally, if condensers are not replaced when a system has encountered blockage issues, customers may keep screaming, "It is the compressor! Can't you hear it knocking?" Well, indeed the compressor may be making noise but that is because a partially blocked condenser is overworking the compressor. There is an immediate need to replace the choking condenser in order to bring relief and normal functioning to the entire system or risk death to the whole system yet again. The small tubes of a parallel condenser trap particles so well that flushing simply can not solve the problem.

Even when all other components of the system are flushed properly particles trapped in the condenser can be freed upon starting the system or on the next very hot day. Then BAM, the whole system is contaminated again and fails to work properly or a catastrophic failure occurs. If customer satisfaction and cooler auto air are your goal AND you have found the need to flush your system, it is imperative to replace the condenser for optimum functioning. If you have struggled with the "quality" of compressors and wonder why they keep malfunctioning, it more than likely is the condenser that is the issue.