



NISSENS' TECHNICAL ARTICLES

This series of technical articles have been written based on the technical insights from AC system professionals with many years in the system service field, Nissens' quality engineers, and Nissens' technical trainers involved in the best AC service practice sharing.



AC SYSTEM FLUSHING

Complete review of the most basic and the most critical service procedure recommended by experts and by the major compressor manufacturers

One of the major problems that any AC system can suffer from is inner impurities. The refrigerant and lubricant necessary for the system's vital operation can get contaminated by various substances. Moisture, particle formation due to uncontrolled chemical reactions, or careless use of additives such as UV dye or leak-stop agents are among the most common contaminant sources. All of these problems can quickly cause clogs in the narrow system channels leading to consequential severe failures.

Reading this article, you will learn why it is essential to keep the AC system clean, flush using one of the top three recommended flushing methods, and flush Hybrid and Electrical Vehicles HVAC systems.

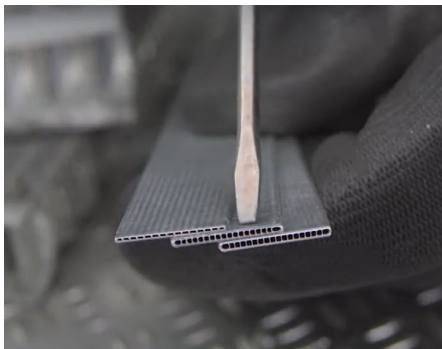


CLEANNES - THE KEY TO THE SYSTEM'S VITALITY

The AC system to perform must be clinically clean inside. Refrigerant, lubricant, and precise mechanisms inside the loop must be clean to work optimally, and the system can maintain the appropriate pressure and temperature parameters.

The modern AC system design employs many components with very narrow passages. The majority of today's cars apply micro tube-design condensers with tiny diameter channels. Another example is the externally controlled AC compressors with precise and very sensitive to impurities ECV valve steering the pumping capacity. The system's expansion device and the TXV, in particular, are other types of loop components that can quickly suffer from impurities limiting their proper function. All of these can get clogged by particles, splinters or even by a too viscous lubricant that doesn't match the car's specification. Any system flow restriction or stoppage can have catastrophic consequences. The limited refrigerant flow will lead to a decrease in the system's performance, cause instant pressure increases, impair the overall system lubrication, and consequently create an abnormal temperature load that is very dangerous for the AC compressor.

Furthermore, it is also critical to mention that the potential system contaminants and



The newest condenser design applies extremely narrow passages within the micro tubes below 1 mm thickness. The design offers a superior heat exchange but is also very susceptible to impurities.

moisture affect the lubricant, impairing its characteristics. These can instantly affect the compressor's mechanical parts, exposing it to seize. Similarly, if the lubricant gets diluted by excessive additive use (like overdosing with

UV dye), the improper condition will lead to irreversible compressor failures.

TECHNICIAN'S DUTY OR A COURTESY?

Naturally, the flushing procedure and the extra time spent on the service add to the total service bill, which someone must pay. Here is one reason why technicians skip it, often on a clear command from the client's side who does not wish to spend extra. This, however, should be seen from a completely different perspective. Flushing is not an optional choice, but actually, it is the most basic and necessary treatment, often conditional for serious system repairs.

Flush the system whenever you diagnose it with clogs, stoppages, or receiver dryer



Excessive contamination spotted on the receiver dryer's couplings. This system suffer from severe contamination and must critically be flushed.

failures. Although it might be the previous garage's failure, you should equally flush the system whenever you conclude an excessive or improper use of additives such as UV dyes or stop leak agents. Visual inspection by a sight-glass tool will ease the diagnosis process. The loop must obligatorily be flushed before installing a new compressor. Carbonized oil particles, metal chips, splinters, and other impurities that caused the previous compressor to fail can quickly kill the new unit if the system is not flushed correctly before the replacement.

We point to another importance that the flushing has for the system's heart by the compressor's replacement process. Besides cleaning impurities, it is the only way to determine the total lubricant level inside the loop.

FLUSHING ABC

There are several basic rules you have to observe

to flush appropriately. The AC compressor must be detached. You will probably be replacing the compressor after, but if not, the compressor must be separated or bypassed from the flushing. The system expansion devices, such as either orifice tube or expansion valve, should be detached or bypassed, too. The receiver dryer or desiccant should be removed and replaced after flushing. Parallel-flow, thin and micro-tubes condensers, and evaporators cannot be flushed effectively and should be replaced or back flushed whenever serious contaminants impaired the system or by the previous compressor seizure.

When it comes to the flushing methods, several are worth considering and are relatively accessible. It all depends on the garage



Jelly-like or crystallized sticky substance at the compressor's suction port. This severe pollution was caused by uncontrolled chemical reaction of moisture and additives like leak-stop agents. Only flushing can remove it all from the loop.

equipment and possible access to extra tools. In general, the flushing must be effective and should not harm the system, which might be the case by the use of improper methods.

Keep in mind! For any of the methods, the cleaning agent residues must be thoroughly removed after flushing, and the AC loop must always be thoroughly dried, preferably by means of nitrogen and a long-process vacuum. Once the AC system is properly flushed, and all of the necessary components have been replaced, you can proceed with the system charge by the prescribed type and volume of refrigerant and lubricant. Remember, flushing is not courtesy and can save you from a repeat repair after installing a new compressor.



THE TOP 3 MOST RECOMMENDED FLUSHING METHODS

01 USING A DEDICATED FLUSHING DETERGENT

Bases upon circulating the detergent throughout the loop and injecting it directly from a pressure container or distributing it by a special flushing machine. This flushing method dissolves all sorts of particles, sludge, stubborn soil, and residues.

TIP The method can easily combine with highly pressurized Nitrogen to push the flushing agent through the ducts. Ideally, the loop segments are flushed separately. This method has proven effectiveness against stubborn soiling and the Nitrogen is very effective at moisture removal besides facilitating the impact of the flushing agent.

02 REFRIGERANT & FILLING STATION

Bases on circulating through the loop the R134A/R1234yf refrigerant with the filling station. The station must be equipped with a flushing function, specially designed filters, and a container to collect contaminants. This flushing method effectively cleans loose particles, but isn't very effective for rinsing serious sludge and soil.

03 REFRIGERANT DIRECTLY FROM BOTTLE

Applies the R134A/R1234yf refrigerant as the cleansing agent. The refrigerant is circulated through the loop by heating up the bottle. An additional bottle for contaminated gas must be prepared as well as adapters set and hoses to ensure proper, tight system connection for the procedure. This flushing method does not require any additional agents or machine. It effectively cleans loose particles, but isn't very effective for rinsing serious sludge and soils.

SIGHT-GLASS INSPECTION – a tool to spot possible contaminants circulating in the loop. This low-cost and useful tool is highly recommended for an effective system contamination diagnostics, performed in various situations: before, during and after flushing.



Flushing Hybrid & Electrical Vehicles

Many of the new energy vehicles' HVAC systems are based on a heat pump solution equipped with reverse flow valves and switches. A special OBD command is needed to release the flow steering valves to flush these systems, thus enabling the free flow of the flushing solution through the loop's ducts. It is, however, highly recommended to detach the loop elements and flush them separately as otherwise, the flushing will not be possible. Some of the valve assemblies cannot be flushed and must be replaced.



Learn more

1. [Flushing poster to guide you step-by-step in the top 3 flushing methods](#)
2. [Flushing app to guide you step-by-step in the top 3 flushing methods](#)
3. [NTC self-learning module](#)

To find more technical support assets as well as possible training and learning modules from Nissens, visit [showroom](#).