

NRF TECHNICAL ARTICLE

LIQUIDS IN THE COOLING SYSTEM



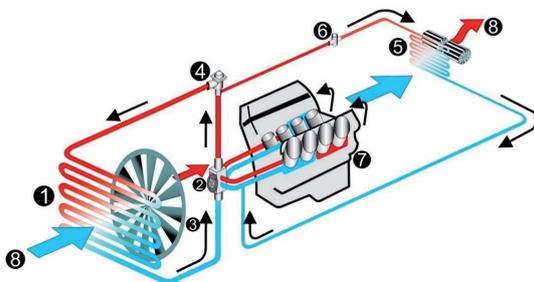
By Dave Talbot, technical specialist

HOW IT WORKS?

A cooling system consists of a water pump that impels the coolant, a radiator that dissipates the engine heat, a thermostat that allows the system to open and close, some pipelines where the coolant flows and one or more temperature sensors.

The radiator has one (or few) inlets and one (or few) outlets. The hot coolant enters through the upper pipe, forced by the flow generated by the water pump, and comes out through the lower pipe.

In this journey, by the action of the flowing air, the temperature decreases. In the lower pipe of the radiator, coolant is recirculated to the engine again, doing a new cooling cycle.



Picture 1: The cooling system: 1. Radiator, 2. Water pump, 3. Fan, 4. Thermostat, 5. Heater, 6. Heating valve, 7. Vehicle's engine, 8. Air flow

POSSIBLE SYSTEM FAILURES:

- > **External agents:** The radiator is an element that is in direct contact with the outside and therefore sensitive to shocks, to corrosion by salt or other pollutants present in the environment.
- > **Use of non-recommended liquids:** Using fluids not recommended by the manufacturer (tap water, unapproved or recommended coolants, distilled water, etc.) can damage the system, especially the radiator. Let's see why:

COMMON MISTAKES:

- > **Tap water:** Tap water has in dissolution a lot of substances, some of them are ionic compounds (salts) that, in dissolution and high temperature can be corrosive for the ferrous metals the engine is made of. The continued action of those substances gradually oxidizes the engine metal, creating rust deposits.



Picture 2 and 3: Rust sediments inside the radiator's tubes

To the naked eye, the coolant in the expansion tank turns rusty brown. As time passes, this rust turns into corrosion, causing more sediment, and it tears off some of the metal flakes from the more damaged elements, which seize the radiator's tubes, forcing it to operate under overpressure. Eventually the radiator will start to leak



Picture 4 and 5: Sample of tap water used as coolant, and engine's corrosion (NRF photo)



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› **Not approved coolants:** A not approved coolant is normally tap water with some dye, it seems very similar to a normal and good quality coolant. In order to reduce the costs, those products didn't have any system protector additives (anti rust, stabilizers, anti-emulsifier or acid neutralizers). It takes a little more time, but the action in the system is the same that using tap water.

› **Distilled water:** Many people think that adding distilled water to the cooling system is harmless. When you add distilled water, it is because the vehicle ran out of coolant. Mixing distilled water with coolant results on the dilution of it, reducing his properties and making in long term the same effect that using tap water or unapproved coolant. Mix distilled water with pure and clean coolant only when recommended by the manufacturer.

› **Not recommended coolants:** The use of non-recommended coolants in a cooling system can lead to failure or complete breakdown. A not recommended coolant may not be compatible with some elements of the system (rubber hoses, aluminum or even copper), with the same effect as the previous fluids.

Always use good quality and recommended by the manufacturer coolants! The use of not allowed liquids will void the product's warranty!

