



NRF TECHNICAL ARTICLE

INTERCOOLERS - WORKING PRINCIPLE AND POSSIBLE FAILURES



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WHAT IS AN INTERCOOLER?

An intercooler is a device used to cool the air coming from the supercharger system (commonly, from the turbocharger, the so-called "Supercharger" in American cars or "Kompressor" in Mercedes-Benz).

WHAT IS IT'S FUNCTION?

The function of the intercooler is to cool the compressed air supplied by the turbocharger. The air needs to be cooled due to thermodynamic reasons.

According to thermodynamics, when a gas is compressed it tends to give up energy to the medium (i.e. it heats up). As it warms up, its density is reduced, which means that less air enters the engine, with a consequent loss of performance.

By placing an intercooler in the intake system (i.e. between the turbocharger and the intake manifold), a considerable decrease in temperature, volume and thus an increase in density is achieved. More air enters the engine!

TYPES OF INTERCOOLER

There are currently two types of intercooler, air-cooled and coolant-cooled.

› Air-cooled: These are located at the front of the vehicle, as their construction requires air to flow directly over them. The outside air flows through the fins of the intercooler, reducing the temperature of the compressed air. This type of intercooler is highly dependent on the outside air temperature and the vehicle speed.



Air-cooled intercooler NRF 30980

› Liquid-cooled: These are smaller, do not necessarily have to be located at the front of the vehicle and are less dependent on the outside temperature than air-cooled intercoolers. They use a circuit through which coolant circulates, which absorbs excess heat from the charge air. They are widely used in trucks, performance and racing vehicles.



Universal liquid-cooled intercooler

CAUSES OF INTERCOOLER FAILURE

1. External agents: An air-cooled intercooler is an element in direct contact with the outside. It is mounted on the front of the vehicle for cooling and is susceptible to impact damage, splashing and corrosion due to salt or other contaminants in the environment.
2. Lack of maintenance: A very common failure to maintain the vehicle is not checking the condition of the turbocharger. The shaft that joins the two turbines has a lubrication line. If this shaft does not fit perfectly, some of the lubricating oil passing through the shaft tends to leak into the turbines, entering the intercooler. By clogging the ducts with oil, the intercooler is forced to work with overpressure, which ends up damaging the ducts themselves, causing leaks, breakage or buckling. If the old intercooler is dismantled and traces of oil are found, the turbocharger must be checked and repaired immediately.

Oil in the intercooler due to leaks in the turbocharger (NRF photo)





RECOMMENDATIONS

1. Carry out regular maintenance:

The turbocharger turbine clearance should be checked periodically (especially on vehicles with high mileage), in addition to using a quality engine oil recommended by the manufacturer.

2. Check the general condition of the intercooler:

The condition of the intercooler should be checked, checking for leaks, damage to the fins and pipes and saturation level of the fins. As an element in direct contact with the exterior, the fins of the intercooler tend to become saturated with dirt such as dust, insects, stones or organic matter.

