Technical Tip: **Exhaust Gas Recirculation (EGR)**

EGR Valves – High Effort Required for Replacement

Exhaust gas recirculation systems help reduce nitrogen oxides and improve emission performance. In the event of a failure, replacement is usually very time-consuming.

Originally, exhaust gas recirculation (EGR) was used to reduce fuel consumption in gasoline engines.

Today, EGR is generally used to reduce nitrogen oxide emissions in both gasoline and diesel engines. There are t**wo types of systems:**

In a high-pressure exhaust gas recirculation (EGR) system, a portion of the exhaust gases is tapped directly behind the exhaust valve and fed back into the intake air in the combustion chamber via the EGR valve, which reduces the intensity of combustion. EGR valves operate pneumatically, via a pressure converter, or are directly controlled electrically by a PWM signal.

As part of further pollutant reduction, the EGR valve was combined with an EGR cooler to form an EGR module. By cooling the exhaust gases before entry, a further reduction of nitrogen oxides is achieved, which is usually deactivated during the warm-up phase by an electrically controlled bypass valve.

Under unfavorable driving conditions, the EGR module is damaged by aggressive exhaust condensate. Additionally, product improvement measures by the vehicle manufacturer can sometimes lead to higher thermal stress, which may cause a failure after a short time. Depending on the vehicle, replacing the EGR module can take up to 10 hours, as adjacent pipes and sensors may also be affected.

Modern EGR modules operate with a potentiometer and are monitored by the engine control unit (ECU) as part of the On-Board Diagnostics (OBD) system. The mass air flow sensor plays an important role in enabling controlled EGR. The intake fresh air can be calculated from the engine speed and intake air temperature and compared with the stored target values in the ECU. If there is a significant deviation, the check engine light illuminates and the vehicle logs a fault in the data memory

Due to the stricter Euro 6 standard and limited operating conditions, the low-pressure EGR system has meanwhile become standard equipment in every new vehicle. In this system, the exhaust gas is taken only after the particulate filter and, for example, recirculated before the turbocharger. This ensures that the recirculated exhaust gas is cleaned, which prevents coking of the EGR cooler. However, due to the lower exhaust gas pressure in this case, an additional

A throttle valve must be installed behind the particulate filter. By closing it, the exhaust gas pressure is increased again. Monitoring is usually carried out by an additional pressure or differential pressure sensor.

A **combination of both systems** is possible and ensures a high efficiency.

Dangers of Manipulation

To avoid the often considerable labor involved in the event of a failure, dubious providers offer updates for the engine control unit that simulate an EGR system regardless of its actual condition. These modifications cause altered exhaust emissions, resulting in the vehicle's operating license being revoked. Such changes are always marked with a timestamp, allowing the exact time of the intervention to be determined.

Due to the manipulation of the control unit, the EGR system is subjected to even higher stresses. Since exhaust temperature sensors are sometimes also tampered with, this can lead to excessive heating of the module and consequently to a fire in the vehicle.

A professional, albeit labor-intensive, replacement is therefore unavoidable.

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