



# The challenge of REPLACING FUEL FILTERS

REGULAR FILTER REPLACEMENT IS MANDATORY—IT IS AN UNAVOIDABLE PREREQUISITE FOR RELIABLE FUNCTIONING AND LONG ENGINE SERVICE LIFE. FOR FUEL FILTERS IN DIESEL VEHICLES, DEPENDING ON THE MANUFACTURER'S RECOMMENDATIONS AND THE FUEL QUALITY, REPLACEMENT INTERVALS OF 15,000 TO 30,000 KM ARE SPECIFIED. REPLACEMENT IS THUS A ROUTINE TASK IN THE REPAIR SHOP—BUT ONE THAT TRULY PRESENTS ITS CHALLENGES.

## WHAT A FUEL FILTER NEEDS TO DO TODAY

Diesel injection systems in passenger car and commercial vehicle engines work with very high fuel pressures—2,000 bar and higher are entirely typical. The high-pressure pump, the control valves, and the injectors are thus subjected to corresponding stresses.

Because lubrication for these parts is provided exclusively by the fuel, the parts react very sensitively to even the slightest impurities in the diesel fuel: even tiny foreign particles can destroy the delicate components, as can minute amounts of water in the fuel. If there are contaminants in the fuel, they will clog the fine bores in the injectors—and the jet pattern (i.e. the distribution of the fuel) and thus the charge air flow will be disrupted. The actual filter media for fuel filters in diesel engines must therefore meet particularly high requirements.

## NOT ENTIRELY LEAKPROOF? THIS IS OFTEN NOT THE FILTER'S FAULT!

Again and again it happens: the engine won't start after replacing the filter, or cuts off after a short time. Because the repair shop assumes a direct connection between the new filter and the trouble, the filter is removed and returned as defective.

In most cases the experts at the MAHLE technical laboratory determine after investigating that there are no leaks in the housing, the permeability and differential pressures of the filter medium meet the specifications exactly, and there are no deviations from the strict production requirements to be found. In short: the filter is defect-free. But then what was the cause of the problem? The description from the repair shop is ultimately clear: there must have been a leak somewhere, where the fuel pump sucked in air instead of diesel fuel. But where?

## PROBLEMS IN THE LINE

One common cause for the feared bleed air is defective fuel lines. Rubber hoses in particular are prone to this problem. The high temperatures in the engine compartment and the continuous vibrations lead to wear effects on the fuel hoses. The illustration shows an extreme example from the field. The photo was taken after a filter change, during which the embrittled hose was kinked slightly. One of the cracks thereby expanded to the point that bleed air was drawn in: this was the cause of the failure.



A fuel line cracked due to embrittlement: the cause of bleed air entering the system.

The fuel lines at the injectors and the fuel return lines to the tank should also be checked very carefully. Fuel lines must be run in the vehicle and on the engine such that they do not abrade under vibration and are not damaged by hot, rotating, or moving components. Therefore, the mounting points and protective covers on the vehicle should always be checked every time the filter is changed.

**BITTEN?**

Another cause of bleed air in the fuel system is the Martes foina, the beech marten. Typically native to rural areas, the small predator is drawn to the residual heat of the engine space in the engine compartment, especially in the evening and at night. There it finds soft insulation material on the bulkhead and the inside of the bonnet. But water hoses, ignition cables, air conditioning hoses, and fuel lines also attract the rodents. Martens have very sharp teeth that can easily perforate the lines. When observed more closely, teeth marks that look like pinpricks are evident. If a marten damages a fuel line, undesired bleed air can be drawn in. The results: the engine is hard to start, runs roughly, or dies out.



Another cause of bleed air being drawn in could be an uninvited guest in the engine compartment.



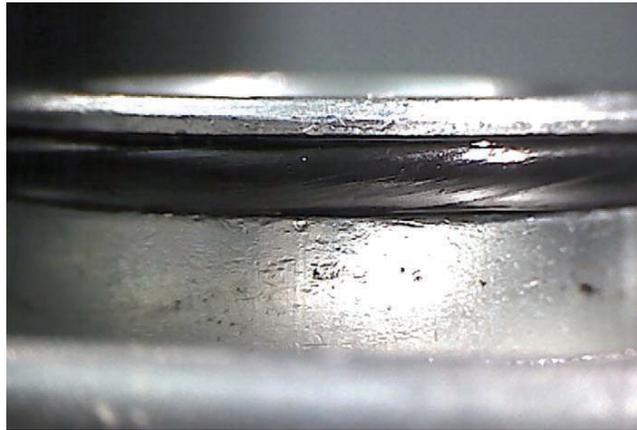
Typical damage scenario for rodent gnawing: small teeth marks on the fuel line through which bleed air is drawn in.

**GASKETS: THE ESSENTIALS**

In order for gaskets to be truly leakproof, some details must be observed. For fuel filters, new O-rings should always be installed on the housing covers. For some inline fuel filters, a fuel preheating valve is sealed with an O-ring that should also be replaced when the filter is changed.

Care must be taken during installation to ensure that the O-ring is not damaged. Therefore, sharp tools (e.g. screwdrivers) should never be used to install the O-rings. Sharp edges on the housing, cover, or preheating valve can also cut into the O-ring and damage it.

Another risk is that the O-ring becomes twisted during the fitting of the preheating valve or the housing cover. This can be prevented by coating the O-ring with clean diesel fuel prior to installation. In general: when lubricating gaskets, the medium that will be sealed against later should be used, because the gasket material is resistant to this medium and will thus not be corroded. (Therefore, clean diesel fuel should be applied to the gaskets for diesel filters, and lubricate oil filter gaskets with clean engine oil.)



An O-ring that becomes twisted during installation causes leaks. The ring should therefore be coated with an appropriate lubricant (fuel or oil) before the cover is put in place.

For screw covers on fuel filters, the correct position of the O-ring must also be checked: it must be seated completely in the provided groove. For more information, see the Technical Messenger TM 6/2012, downloadable at [www.mahle-aftermarket.com](http://www.mahle-aftermarket.com).



Fuel filters with screw covers: only a correctly placed O-ring is truly leakproof.

**COVER ON!**

For snap-on covers of filter housings, such as are used in some VW applications, care must be taken that the cover is not deformed when it is either opened or closed, as otherwise leaks may occur. Please also follow our TM 5/2012 at [www.mahle-aftermarket.com](http://www.mahle-aftermarket.com).



A fuel filter housing cover deformed by defective opening and/or closing.