

Keeping a new turbo healthy

The causes of turbocharger damage generally do not lie in the turbocharger itself. If the actual cause of failure is not remedied, then the new turbo will probably fail. In order to save time, nerves, and money, it is advisable to identify the actual cause of damage for every failure. MAHLE provides some useful guidance.

Suspicious Noises: Whistling and Clanging

When whistling noises occur immediately after installation, it is often hastily concluded that a crack in the turbocharger or a manufacturing defect is the cause. However, an examination of returned turbochargers usually reveals something else:

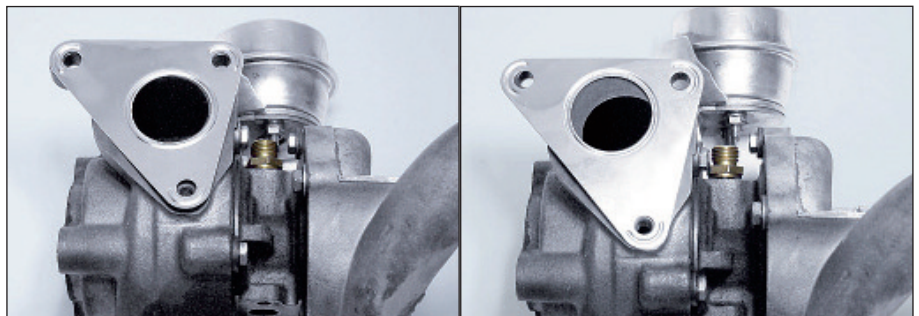
- A gasket inserted the wrong way around. This reduces the diameter and therefore also the flow rate, which can lead to whistling noises and/or a decrease in performance.
- Incorrect fit of the hoses/components of the charge air line. This can cause air to escape and as a result, whistling noises.
- Incorrect mounting of the housing. For certain types of turbochargers, the compressor housing is adjusted by loosening and tightening the mounting screws. If the screws are not tightened correctly, they can become loose during engine operation. The resulting angle of the housing causes the impeller to strike the housing, audible as "scratching" or whistling noises.

Metallic or rattling clanging can indicate a detached piece of metal in the exhaust manifold. Important: the error must be eliminated immediately to avoid major turbocharger and consequential damages.

Blockages: Smoke and Oil Loss

Smoke emissions and loss of oil are among the most common reasons for an unnecessary turbocharger replacement. Here a little background knowledge is necessary. Almost all series turbochargers have hydrodynamic bearings, where oil acts to "separate" the moving parts. An adequate supply and removal of oil is therefore essential for the durability and operation of the turbocharger.

If the oil supply is hindered or the oil pressure is too low, an adequate lubricating film cannot form and friction occurs between the shaft and the bushing, resulting in major turbocharger damage. Clear indications for inadequate lubrication include a loose nut on the impeller, a broken shaft or discolouration due to high temperatures. If the defect is not remedied prior to the installation of a new turbocharger, then it will also become damaged immediately



An incorrectly positioned gasket, at right, can cause a whistling noise and loss of performance



A carbonised oil return line may cause a replacement turbo to fail

Because the oil can no longer flow out into the oil sump after lubricating the bearings of the turbocharger, it accumulates in the bearing housing. At the same time, the oil pump supplies fresh oil to the bearing points for lubrication and cooling. The oil must now somehow flow out of the bearing. However, since the return flow is blocked due to the clogged line, it searches for another path: despite the sealing piston rings, it is forced into the compressor and turbine side where it is carbonised, or is burnt in the combustion chambers via the intake air and the exhaust system via the turbine.

Poor Performance

In the event of poor performance, the turbocharger is also suspected much too often. The possible actual culprits are:

- **The exhaust gas system:** The various exhaust gas after-treatment and recirculation systems used in modern vehicles, create many contact points where throughput can be reduced. If the exhaust gases cannot flow freely, similar symptoms to a turbocharger fault

occur. Only close examination of the exhaust gas tracts will unveil the real culprit.

- **The recirculation air valve:** The boost pressure control valve enables fast responsiveness, prevents abrupt braking of the rotor when the throttle valve is closed, and protects petrol engines from overspeeding. When these adjustments aren't made and if a pronounced turbo lag is noticeable, often the complete turbocharger is replaced. But in many cases, the valve can be replaced separately (ideally promptly, in order to prevent damage to the turbocharger).

- **The air mass flow meter:** It determines the air volume flowing into the engine. The engine control unit thus calculates the optimal quantity of fuel and additional values for the air-fuel ratio. An incorrect measurement can lead to poor performance and even to dry running symptoms, which could also mimic a defective turbocharger. A glance at the measurement values of the air flow meter helps to find the actual cause.

- **Cracks in the air-guiding area:** These can lead to unfiltered air entering into the system within specific speed ranges. The result is an inadequate air-fuel ratio, along with a noticeable lack of performance and gradual wear of all mechanical parts. A leak detection spray is recommended for quick identification of the leak points.

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