



## Replacing the intercooler after a turbocharger fault

### General points

Almost every modern diesel engine with turbocharger has an intercooler. The hot air (up to 150 °C) compressed by the turbocharger is cooled down by the intercooler (Fig. 1) before it reaches the compression chamber. The compressed air is cooled down either by air from outside the vehicle (direct intercooling) or by the engine coolant (indirect intercooling). The set-up and function of the two systems is shown in more detail in the Technical Information sheet "Intercooler".



Fig. 1

### Reasons for failure and their consequences

Alongside the classical reasons for failure such as

- External damage (accident, gravel throw)
- Damaged/blocked hoses
- Reduced air flow due to soiled surface
- Loss of coolant/secondary air due to leaks
- Poor heat exchange due to inner soiling (limescale deposits/sealing agents)

other possibilities also have to be considered. These are usually linked with turbocharger damage.

In the case of mechanical turbocharger damage (Fig. 2-5) or an oil leak on the compressor side, oil and swarf can collect in the intercooler. That this soiling/blockage can lead to a drop in engine performance is the least harmful thing that can happen. Things become much more serious when the oil or swarf leave the intercooler and get into the combustion chamber. This often leads to engine failure. Some engines "overrev" after the turbocharger has been replaced. So much



Fig. 2



oil can collect in the intercooler that this is suddenly propelled through to the combustion chamber after installation of a new charger, which builds up the right charging pressure again. Any specialist can imagine what then happens shortly after the engine has been started up. To prevent such damage, as well as "subsequent damage" (metal particles are set free later in the intercooler and get into the combustion chamber), the intercooler and attachment parts must always be examined carefully every time a turbocharger is replaced.



Fig. 3

## Reason for damage, component test

Within the context of replacing a turbocharger, the reason for the damage must always be investigated. Otherwise the turbocharger could fail again within a very short time.

The installation regulations provided by the manufacturers of both the turbocharger and the vehicle must be heeded. Here are a few examples:

- Check control/switching valves and vacuum pipes
- Check air intake pipe and exhaust gas collecting pipe for impurities/residue and clean if necessary
- Check air filter and replace if necessary
- Replace oil supply pipe to the turbocharger (a visual inspection or cleaning are not sufficient)
- Check the oil return pipe, clean, replace if in doubt (impurities can get into the oil pan and be suctioned in again)
- Carry out oil change and filter replacement
- Do not use liquid sealing agents
- Pre-fill the oil inlet bore of the turbocharger with oil before putting it into operation
- Check/clean the air routing between turbocharger and engine
- Check the intercooler for oil residue/impurities, replace if necessary



Fig. 4



Fig. 5



## Cleaning the intercooler

Cleaning the intercooler is extremely problematical. There are different opinions about this on the market. In many cases, the vehicle manufacturer prescribes replacement of the intercooler. The intercooler always has to be replaced in the case of mechanical damage to the turbocharger (e.g. vanes damaged, Fig. 2-5). It cannot be guaranteed that swarf is completely removed when the intercooler is flushed out, particularly in the case of intercoolers with turbulence inserts (Fig. 6). The risk of subsequent damage caused by swarf becoming free and being suctioned into the engine later is simply too great. Cleaning the intercooler can only be considered if the only problem is that oil has collected in the intercooler (Fig. 7). In practice, however, flushing is extremely complex. Particularly where large pipelines are involved such as the ones found in the trucks range. In addition, only flushing media approved by the vehicle/component manufacturer may be used. The use of unsuitable flushing liquids can lead to material damage and the loss of warranty protection.

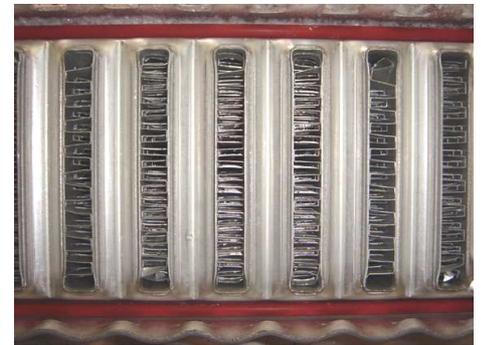


Fig. 6

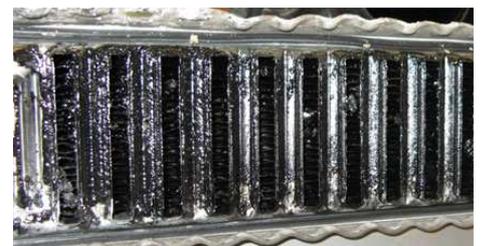


Fig. 7

## Notes on installing a new intercooler

No matter what the reason is for failure or replacement of the intercooler. Before installation of the new unit, the reason for the damage should be thoroughly investigated. The peripheral parts (turbocharger, crankcase ventilation, exhaust gas recirculation, air inlet to the turbocharger, exhaust system etc.) must be integrated in the troubleshooting process. Otherwise a fault can re-occur. For this reason, the following points should be considered:

- Check air routing between the turbocharger and intercooler with regard to impurities/particles/blockages/reductions in cross-sections



- Check air routing between the turbocharger and intake manifold with regard to impurities/particles/blockages/reductions in cross-sections
- Clean/replace damaged, blocked or soiled air routing and attachment parts
- Replace any air routing seals, coolant connections (in the case of water-cooled intercoolers) as required
- Make sure that all connecting elements are tight, no leaks occur and no "secondary air" is suctioned in.
- Check charging pressure

## Charger intercooler

