Technical Messenger

MAHLE

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Replacing the charge air cooler after damage to the turbocharger

Following turbocharger damage, the charge air cooler must always be checked and, depending on the extent of the damage, replaced if necessary.

Turbochargers and charge air coolers

Turbochargers are among the most heavily stressed components in an engine. Since they're also very sensitive to disturbances in their environment, they fail comparatively faster than other components.

Charge air coolers are located in the charge air path between the compressor side of the turbocharger and upstream of the intake side of the engine. They cool the hot, compressed intake air, thus enhancing the engine's performance. To improve efficiency, the individual flat tubes of a charge air cooler contain turbulator inserts, which increase the surface area to ensure better heat dissipation to the ambient air (Fig. 3).

Avoidable consequential damage

In the event of turbocharger damage—e.g., an impeller damaged by foreign objects (see TM 07/2016)—the turbulator inserts of the charge air cooler act like a sieve in which fragments and chips collect. However, smaller particles can enter the engine via the charge air cooler, where they can cause score marks on the cylinder running surfaces or burned-out exhaust valves, among other things. Owing to the high exhaust gas velocity, these particles themselves can pass through the cylinders and damage the turbine wheel of the new turbocharger.

Figure 1: Impeller completely destroyed by foreign objects

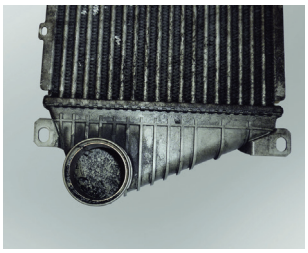

Figure 2: Chips from the destroyed impeller in the charge air cooler

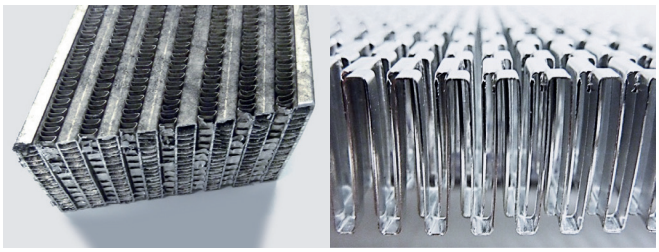

Figure 3: Section through a charge air cooler and structure of the turbulator inserts in the flat tubes

Important!

Following damage to the turbocharger caused by foreign objects, the complete charge air path needs to be thoroughly checked and cleaned. Since the charge air cooler cannot be completely cleaned because of its internal structure, it must be replaced in order to avoid expensive consequential damage.