

Turbo foreign object damage

The turbocharger is a highly sophisticated and fragile component. It is a turbine-driven device that forces extra air into the engine's combustion chamber, thus increasing engine efficiency and power output. The turbocharger operates in extremely demanding and tough conditions: up to 250,000 RPM and 1,100 °C of hot exhaust. At these high performance levels, improper working conditions as well as dirt and foreign objects inside the system, can very easily damage the turbo.

Problem

The presence of any foreign objects inside the turbocharger can cause immediate and total failure of the turbo. Commonly, foreign object damage is caused by materials entering the turbine, compressor or bearing housing, thus impacting the rotating wheels and shaft. Damages lead to a loss of efficiency and extra noise from the turbo, or in the worst case scenario, a totally destroyed turbo.

In severe cases of foreign object damage, it is common for the fragments of internal components, that are moving at very high speed, to cause instantaneous and irreversible damage to the engine, exhaust system or intercooler. This can cause total engine failure and render a vehicle unfeasible for repair.

Recommended solution

Always ensure that the entire air system is totally clean and free from any objects, which may cause the damage to the turbo. Any splits or gaps in pipe work can pull in unfiltered objects all the way from the air filter box to the turbo, including EGR, manifold and engine breather system. Also, make sure to check that air hoses and connectors are intact and in good working condition.

Using new gaskets helps to prevent the risk of gasket break up, and to ensure a perfect seal.

The engine oil, along with the oil supply and return pipes and fittings, should be flushed, changed and thoroughly inspected for evidence of foreign objects.

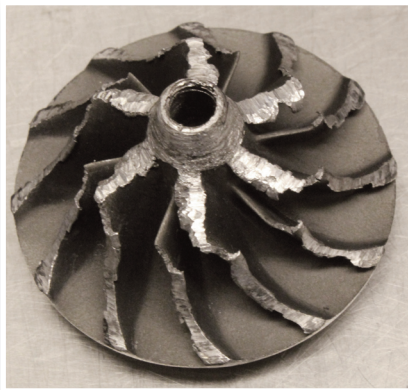
Be sure always to adopt a methodical approach to removing and cleaning every component after a turbo failure, caused by foreign object damage or total breakdown. If there are any doubts, check the system again.

Frequent sources of foreign objects

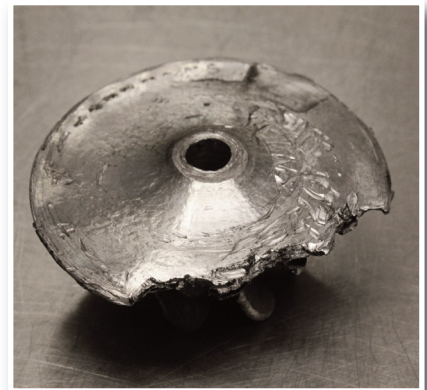
Foreign objects enter the turbocharger either through the compressor, turbine or oil inlet.

Compressor wheel

- Poor, worn or badly maintained air intake filters allowing particles through
- Damaged piping and connections, allowing particles to enter the intake
- Gasket fragments entering the intake
- Parts from a previous turbocharger failure not fully removed from the system
- Foreign objects such as screws, nuts and bolts



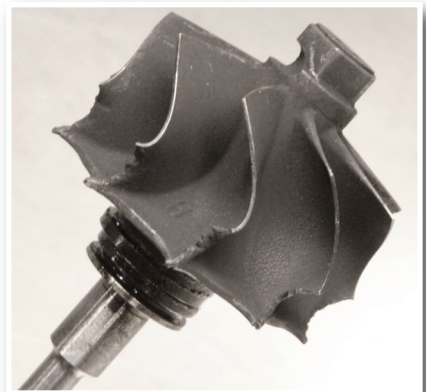
These Compressor wheel blades have been hit repeatedly by foreign objects, and the compressor housing will also bear signs of impacts



Overspeeding failure tears fragments off the Compressor wheel that will continuously destroy the turbo



Hardened particles inside the exhaust system have continuously impacted and damaged these variable guiding vanes



The turbine blades are hit by foreign objects and eventually combined with high exhaust temperatures

entering the new compressor as a result of negligence

- Turbo overspeeding, causing the compressor wheel to break down

Turbine wheel

- Debris from exhaust manifold, turbine housing or engine parts such as engine valves pistons impacting the turbine wheel and the variable mechanism
- Exhaust contamination by hardened, burned fuel and oil particles, oil sludge, burned additives particles and other coked debris coming from the combustion chamber

Signs of foreign object damage

Look for the following signs when suspecting foreign object damage:

- Noise from the turbo during operation
- Loss of performance
- Chipping of compressor or turbine blades
- Pitting around the compressor inlet
- Pitting on the compressor blades

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