



## Turbocharger Diagnostic Troubleshooting

### Common Causes of turbocharger failures:

- Foreign material into the turbine or the compressor, loose hardware or other material left in the manifold or intake system.
- Dirty or contaminated oil
- Inadequate oil supply, due to low oil pressure, or coked oil inlet line. Due to high rotational speeds, up to 200,000 rpm, insufficient oil for a few seconds will cause turbocharger damage.
- Improper weight of engine oil.
- High exhaust gas temperatures caused by, over fueling, restricted air intake, dirty air filter or restricted exhaust.
- Hot shutdowns
- Fast starts in cold weather

Most of these failures can be avoided by regular maintenance. When maintaining the air filter system, for example, care should be taken that no foreign debris gets into the turbocharger, and that the seating area for the air filter is clean and free from debris.

### Oil Leaks, Diagnostic

1. Engine is operating for extended periods under light or no-load conditions (slobbering)
2. Inspect the compressor inlet and discharge, if oil is present in the compressor intake as well as the discharge, check upstream of the turbocharger for the source of the oil. Closed crankcase vent systems route oily crankcase fumes into the inlet of the turbocharger. You must compare the volume of oil coming into the turbocharger versus the volume coming out.
3. Intake restriction, plugged air filter
4. Turbocharger drain line is restricted
5. Restricted crankcase vent system or vent tube
6. Crankcase pressure is excessive, excessive blow by.
7. Oil level too high or fuel oil dilution
8. Engine has poor compression and high crankcase pressure, due to worn piston, rings, valve seals and valves.
9. Turbocharger oil seal is leaking

*Check the causes of oil leaks before performing the following test.*

1. Put an oil dye into the crankcase.
2. Operate the engine for 10 minutes.
3. Allow the engine to cool.
4. Remove the compressor inlet and discharge pipes from the turbocharger, also remove the turbine outlet pipe.
5. Use a black light to look for signs of oil coming out of the compressor or turbine housing.
6. If oil is coming out of the turbine housing, remove the turbocharger from the manifold and inspect the manifold with the black light for signs of oil in the manifold.

7. If there is no oil coming out of the manifold, replace the turbo

### **Blue smoke**

- Exhaust outlet restricted or clogged
- Dirty or restricted air filter system
- Oil level too high or fuel oil dilution
- Oil feed and drain lines restricted, leaking or distorted
- Valve guide, piston rings, engine or cylinder liners worn/increased blow-by
- Common condition of the engine is poor compression and high crankcase pressure in the engine due to worn piston, rings, valve seals and valves.
- Turbocharger defective, see oil leaks – diagnostic before replacing turbo

### **Black smoke**

- Restricted or plugged air intake or filter
- Turbocharger waste gate valve not operating properly
- Compressor or turbine wheel damaged
- Turbine housing damaged – crack
- Leak at exhaust manifold
- Charge air cooler restricted, or leaks
- Fuel injection pump or fuel injectors incorrectly set.
- Engine's brake is not operating correctly
- Engine has poor compression and high crankcase pressure, due to worn piston, rings, valve seals and valves.

### **Compressor or turbine wheel damaged**

- Foreign debris from air filter system
- The intake piping has a hole in it after the air filter
- Turbocharger bearing failure has allowed the wheels to rub. Find cause of bearing failure (normally insufficient oil supply) and repair before replacing turbocharger.
- Debris from the engine, valves, glow plugs or other engine parts.
- Turbine housing damaged, cracked exhaust manifold

### **Engine oil loss – high oil consumption**

- Engine outlet shaded or clogged
- Dirty or shaded air filter system

- Excessive blow by
- Oil feed and drain lines clogged, leaking or distorted
- Turbocharger defective
- Engine has poor compression and high crankcase pressure, due to worn piston, rings, valve seals and valves.

### **Low Power – boost pressure too low**

- Turbocharger waste gate valve not operating properly
- Compressor or turbine wheel damaged
- Charge air cooler restricted or leaking
- Injection fuel feed system incorrect
- Dirty or restricted air filter or intake system
- Air leakage at pipe from turbocharger to engine intake manifold
- Engine's brake is incorrect
- Engine intake or exhaust manifold cracked or insufficiency tightened
- Turbocharger defective
- Engine has poor compression and high crankcase pressure, due to worn piston, rings, valve seals and valves.

### **Turbocharger noise**

Loose turbocharger feed tubes or pipes

Engine intake system cracked/missing or loose gaskets

Exhaust manifold cracked/missing or loose gaskets

Rotor (wheel and shaft) is not in balance

Rotor's blades damaged – check turbine wheel and compressor wheel

Turbocharger defective

### **Boost pressure too high**

Waste gate valve does not open or defective

Variable turbine geometry is choked, vanes sticky

Fuel injection pump or fuel injectors incorrectly set