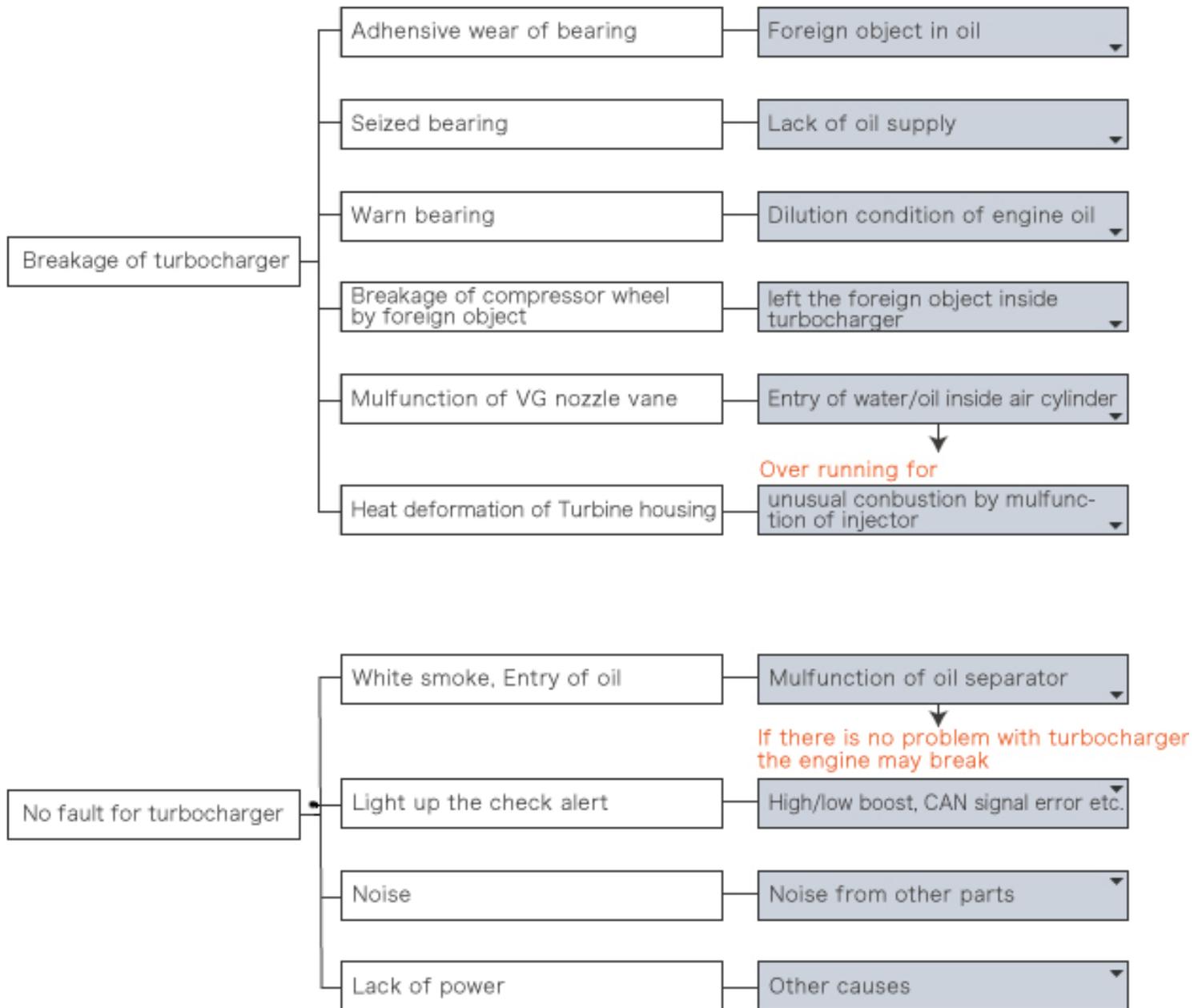


Troubleshooting : Bus / Truck

Troubleshooting



Examples for damage of turboparts



Oil leak from at compressor end



Oil leak from at turbine end



Foreign object in compressor end



Foreign object in turbine end



Burst of the compressor wheel (by low-cycle fatigue)



Unburned product on turbine housing



Sticking the sludge on thrust bearing



Scratches from foreign objects in the oil



Lack of lube; heat discoloration of shaft/ journal bearing



A lot of soot (because of bad combustion) Left: turbine housing Right: VG nozzle



crank link of VG nozzle is worn



link parts of VG/ air cylinder are worn down



Deformation of VG nozzle by unusual combustion



Deterioration of air cylinder (Infiltration of water/oil)

Check list for turbocharger damage; confirm the condition

Turbocharger has high percentage of recurrence of same problem. The best solution is find the basic cause and prevent.

Please confirm removed broken turbocharger by appearance; follow the direction below to prevent.

The most of the problem caused by engine and it is rare for turbocharger problem.

Excessive rotor shaft clearance (unusual bearing damage)

Unusual worn occurs by problem of **lube** from engine.



Lack of engine oil/ low oil pressure (seizing of bearing)
Confirm the oil content /oil pressure, blockage of oil pipe

Foreign objects in oil (bearing scratches)
Adhere of bypath connection valve for oil filter
Sludge inside of oil cooler
Contamination of cut chip for repairing engine in the oil



Diluted engine oil (Excessive worn for bearing)
Mixing gas oil in engine oil
The vehicles (2-4tons) and buses which occurs DPF forcible regeneration frequently.



Overrun for rotor (Excessive worn of bearing)
Overrun for roter by losing control of VGS
Air leak by contamination
Fixation of controll valve for air cylinder
Turbocharger overrun because of engine overrun



Please exchange both engine oil and oil filter when the turbocharger is replaced.

Confirm the excessive bearing clearance

How to check the clearance of the shaft; put the dial gauge to oil drain port. Hold the compressor/turbine wheel with both hands and move parrallel to measure. For easy way to confirm, rotate the rotor forward without any wheel rub to housing.



Do not rotate the rotor opposite way. It may cause damage to thrust bearing.

FAQ for Turbocharger

Q Is it excessive shaft clearance?

A Before the oil is not reached the shaft and no oil pressure, the clearance is excessive. However, if the oil run through the turbo and oil pressure applied, the clearance is appropriate. Please see above about "How to check the clearance of shaft"

Q Heavy roatation/ stuck rotation

A When the rotor assembly has opposite rotation, the heavy rotation or stuck rotation for thrust bearing occurs. It may cause the damage to thrust bearing.

Q The alarm lamp for engine check is on.

A When the alarm lamp is on and got the error message has appeared after the replacement, please check and make sure there is no problem with connector/ harness/ ECU (Engine Controll Unit). For another possibility is problem for the sensors.

Q noise from turbocharger

A For diesel engine, it is difficult to catch the noise of turbocharger. If there is no symtoms like white smoke, lack of engine power, or boost, there is little possibility of noise. The turbocharger is broken if the big noise from turbocharger.

Q White smoke appears even after the replacement.

A For most of the reason is oil suction from breather. Please confirm any mark on turbocharger air inlet. It may caused by excessive blowby gas or dirty oil separater.

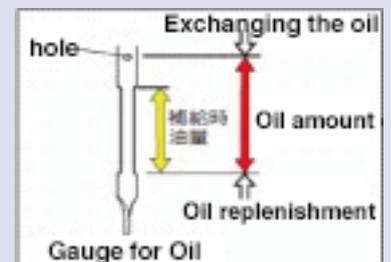
Attention for oil dilution and DPF turnover

****After EURO4 the code begin with ACG, ADG, AKG**

For small-middle truck or city bus after **EURO4 (regulation code: ACG,ADG,AKG)**, has rare opportunity to run highways. For vehicles has many opportunity for DPD/DPF forcible regeneration, please read below carefully.

When regenerate DPD/DPF forcible, non-conbution oil mix the engine oil and may cause low viscosity of oil. This is caused excessive worn of the bearing of turbocharger.

If the oil level is between high and low, it is possible to use. **If the oil level is over the hole, it means low oil viscosity. Please exchange the oil immediately.**



Please use **the oil from recommended by manufacture** (e.g. DH-2) or **sulfur-free fuel** (diesel fuel). Using other oil/fuel makes more sulfur in exhaust gas and increase PM(soot) oxidation catalyst.



Damage of turbine wheel brade (VG nozzle with air cylinder)

If there is damage on turbine wheel brade, **it may cause high-cycle fatigue; sympathetic bibration by rotor overrun.**



The reason for turbine wheel blade damage is high-cycle fatigue.

If the water is inside of the air cylinder, the grease deteriorate and caused mulfunction of air cylinder.



Caution:

Any mark of oil or dirt on air supply port, there is possibility for mixing water. (exchange the air dryer)

Mulfunction for air cylinder
Mulfunction for control valve
Mulfunction for control system of air cylinder



Mulfunction for VG system



Overrun for rotor assembly
Sympathic vibrate causes damage to turbine wheel blade



High-cycle fatigue

The damage mainly causes on turbine wheel, the natural frequency of turbine wheel blade and pressure change of exhaust gas causes sympathetic vibration and make a crack on it. Especially for VGS turbocharger is difficult to avoid the pressure change for exhaust gas.

Reference



Burst of compressor wheel



Milled wheel with forged aluminum (MFS)

Low-cycle fatigue of compressor wheel

Compressor wheels is stressed by strong rotation change of rotor by many stop and go by signal/ up and down on hill. It will cause repeated centrifugal force to wheel. As a result, the stress builds up and burst the wheel suddenly.

Oil leak from outlet of compressor/turbine side

** The vehicles does not have PCV

If there is the oil leak for trucks and buses turbocharger before EURO II - III and does not have PCV, please refer the cause of the problem below.

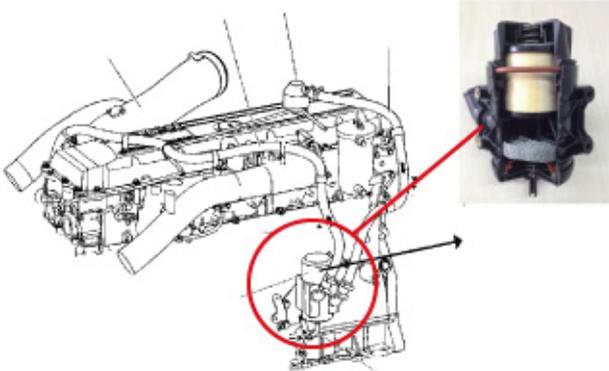
- Increase in internal pressure by amount of engine blowby gas increase and destruction/ sticking of blowby hose
- New/immediately after the overhauled engine, the blowby is high and oil leak from turbocharger may occur.
- Do not maintain idle RPM for long time. The oil leak will occur from turbocharger.



Turbocharger works correctly with high temperature.

Compressor housing coverd by oil ** Correspond to PCV system

Oil from breather is sucked into compressor side. Then oil come out from housing. **This is misjudged as oil leak from turbocharger.**



A lot of oil suction from breather , the oil in intercooler goes to engine and caused unusual combustion. **It may break by engine overrun.**

It sometimes misjudge about oil suction from turbocharger; **oil inlet for turbocharger is too small to suck so many oil.**



The oil inlet for turbocharger is too small, and there is no possibility to suck so many oil into it.

Caution of alarm for turbocharger

If the DTC(diagnosis trouble code) has appeared for VG turbo with electric actuator, it is important to deal with it carefully. There are many cases there is no problem with turbocharger even if the code has appeared and replaced.

Check List

Check the ECU, boost sensor, and speed sensor.

Any corrosion or snap wire for the connector of actuator or harness between the vehicle

Check the voltage for battery

Check the EGR, DPD (DPF)

Check the VG controll system (it may not work well by over-voltage)

Confirmation for re-programming. (For Hino vehicles including buses)

DTC (Diagnosis Trouble Code)

· P0045 · U1123 · U0073



DPF for small trucks

What is DPF (Diesel Particulate Filter)?

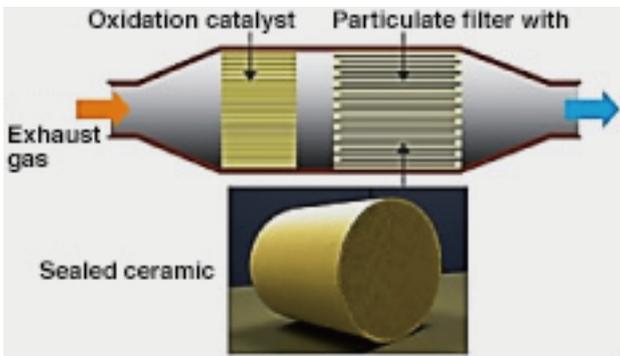
DPF is filter system for remove the soot from exhaust gas in diesel engine. If the DPF collect soot and fulfill the filter. The function will be lower with clogging filter. DPF DPF regeneration(burn the soot to remove) is remove the clogging the soot from filter.

DPF regeneration and turbocharger, built up the carbon on VG nozzle parts

Any oil marks on compressor inlet or a lot of carbon on turbine outlet, **the carbon built up on VG nozzle and linkage and cause the malfunction of nozzle (lack of air supply)**

1. Problem with cleaning DPF (malfunction of cleaning program, high frequency of cleaning)
2. Oil suction from breather and a lot of soot in combustion gas
3. The cause of bad combustion by malfunction of injector. Please check the engine and peripherals.

The oil leak from turbo does not make any soot.



Accumulation of carbon on turbine outlet



Accumulation of carbon on VG nozzle

About Engine overrun

The oil suction from oil separator, the oil pooled inside of the intercooler.

Starting or running the engine, **pooled oil sucked into cylinder and fire.**

There is the possibility of break the turbocharger. The engine does not stop even if it is turned off, **engine overrun** or the detornation has occurred while driving.



New product



Turbocharger absorbs so much blowby gas.



Intercooler



Oil separator



Oil supply hole for turbocharger is too small to suck so much oil in engine.

Overrun for VG turbocharger

The damage mainly causes on turbine wheel, the natural frequency of turbine wheel blade and pressure change of exhaust gas causes sympathetic vibration and make a crack on it.

Especially for VGS turbocharger is difficult to avoid the pressure change for exhaust gas.

Turbo is overloaded by malfunction of VG actuator, turbo is overloaded and it may cause the danger the breakage above.

There is frequent malfunction for air leak especially for air cylinder.

Main cause → Lack of maintain the air dryer



Air dryer



Frequency of heat deformation for turbine housing occur some model.



Crack of the housing

For some model, deformation /crack of turbine housing and VG nozzle by high temperature occurs in high percentage. For many return cores happen same problem. Crack or deformation caused malfunction of VG nozzle. There are some symptoms of over boost and lack of acceleration. Please confirm unusual increasing the temperature of exhaust gas and fix it. It may cause same problem in short term.



The main cause of increasing exhaust gas temperature

If there are deformation or crack on turbocharger or exhaust manifold, engine may have problem; unusual combustion or increase of exhaust gas temperature by causes below.

Unusual combustion by injector problem

Bad spray/Mark on dribbling fuel

Please check the injector and exchange if it is necessary.

Exhaust gas temperature is increased by malfunction of tappet roller.

(Problem of exhaust gas progress → heat accumulation)

Please check the camshaft and tappet and exchange these if necessary.

Breakage of the wheel by foreign object

Turbine wheel(①) Nozzle vane(②) has broken. The broken piece may stay inside the exhaust manifold, so it should remove completely. The broken piece may brake the turbocharger again.

Compressor wheel (③) is damaged. Please remove the nut or any other foreign objects completely. The remain object will come and back between the turbocharger and air cleaner and caused damage(④) to turbocharger.



If the foreign object is big like nut, it cannot go through the narrow difuser passage of compressor housing. It also cannot go through the fin of the intercooler. It is difficult to go through the foreign object which may cause the damage to engine.



The mark hit by foreian objects.

Noise

Noise from inside of the turbocharger means damaged and no functions at all.

There is possibility to replace the turbocharger without any problem only by misjudge for noise.

Air/gas leak from boost hose, vibrating sound or whistling sound of the plumbing part

The sympathetic sound/ resonant sound from engine parts around the turbocharger

Please confirm the list above and take care if it is necessary.

Lack of power

If there is lack of boost pressure/ lack of acceleration without any problem on turbocharger appearance, please confirm the reason below.

Drive mode turn to safety mode, lack of acceleration by overboost (vehicle controlled by computer), sticking/destruction for air cleaner, intake hose or pipes, lack of boost for intercooler, lack of pressure from pipes, power source, problem of voltage (problem with ignition), snapping wire/ lack of wire(for motor type/VG turbo/VG with REA type)

(from TTS)