

TURBO FAILURE: OIL CONTAMINATION

FACT
SHEET

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- **Turbochargers are very reliable: less than 1% of turbos fail due to a manufacturing fault with the turbo itself.**
- **95% of turbo failures are because of problems with oil starvation, oil contamination or foreign object damage.**

BEFORE YOU FIT A NEW TURBO, FIND OUT WHAT CAUSED THE FIRST UNIT TO FAIL OR YOU RISK THE REPLACEMENT FAILING TOO.

Why does oil contamination damage turbos?

As turbochargers can operate at over 240,000 rpm and endure temperatures of 950°C, turbo bearings are under great stress. The turbine shaft and bearings rotate in a thin film of oil. Consequently any fault with the oil supply to the turbo means its bearings are likely to fail before the engine's main bearings. Running a turbo without oil for five seconds is as harmful as running an engine without oil for five minutes.

While it is important to check the engine oil pressure meets the manufacturer's specifications, it is even more critical that the oil feed pipes to the turbo are clean and clear, so you are certain they can supply uncontaminated oil, at the correct pressure. Contaminated or dirty oil will scratch or score the bearings, leading to rapid wear and ultimately, turbocharger failure.

What causes contaminated oil?

- A blocked, damaged or poor quality oil filter.
- High carbon build-up in the engine. This can rapidly contaminate even new oil.
- Accidental contamination of new oil during servicing.
- A malfunctioning oil filter bypass valve.
- Engine wear, leaving swarf deposits in the oil.
- Oil that has degraded due to excessive temperatures or extended service intervals

Preventing turbo failure caused by contaminated oil

- Always use fresh oil and new oil filters as recommended by the engine manufacturer when fitting a new turbo.
- Ensure the oil is the correct grade for the engine.
- Clean or replace oil inlet pipes to eliminate any carbon deposits or sludge that could enter the turbo or restrict oil flow to the bearings

BTN Turbo supplies brand new replacement turbochargers, made by the original manufacturers to the highest quality standards. Though we confidently guarantee them, our standard warranty does not cover turbocharger failure caused by oil contamination.

This is one of a series of Turbo Failure Fact Sheets from BTN Turbo.

Safeguard your reputation and your business – make sure you read them all.



This marking is evidence of contaminated oil



Severe scoring on the journal bearings



Extreme wear on the turbine shaft



The Turbochager People

TURBO FAILURE: IMPACT DAMAGE

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How do ingested objects damage turbos?

Turbochargers can spin at over 240,000 rpm and endure temperatures of 950°C. In these conditions, even the smallest object ingested or sucked into the turbo can damage or destroy the compressor and turbine, leading to low pressure or total failure.

Compressor damage is caused by objects being sucked into the air intake. Turbine damage is usually caused by engine components, such as injector tips or valve train parts.

What are the causes of impact damage?

- Items sucked into the air intake because of a damaged, poor quality or missing air filter.
- Damaged hoses allowing small particles to enter the intake.
- Gasket material entering the intake.
- Nuts, bolts, washers, rags or other items left in the intake pipe during servicing.
- Broken engine components, e.g. injector tips, valves or fragments of damaged piston.
- Fragments from a previous turbocharger failure.

Preventing turbo failure caused by impact damage

- Ensure all air hoses are in good condition, intact and free from blockages or loose items.
- Always use new gaskets to create perfect seals and avoid gasket breakup.
- Always fit the correct new air filter.
- Check there are no turbo or engine fragments in the system from the previous failure, before fitting the replacement.

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Any object sucked into the compressor will damage it



Even small items can completely destroy the blades



Damaged blades mean the turbo won't provide boost



The Turbocharger People

TURBO FAILURE: OIL LEAKS

FACT
SHEET

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Why does oil leakage damage turbos?

Turbochargers can spin at over 240,000 rpm and endure temperatures of 950°C. The turbo relies on the thin film of oil that lubricates the bearings on the turbine shaft. This oil is kept in place by seals for the turbine and compressor ends of the bearing housing.

These seals are unlike conventional oil seals, and similar to piston rings. They need positive air pressure inside the compressor and turbine to keep oil lubricating the bearings and prevent it seeping into the end housings. A restriction on the inlet side will create a vacuum that will pull oil past the seals at the compressor end housing. If the engine idles for long periods, the turbo will rotate at very low speed with correspondingly low air pressure. The resulting vacuum will cause oil to seep into the turbine housing. Either situation results in insufficient oil for the turbine bearings.

What causes oil leaks at the compressor end?

- Blocked or restricted air intake filter.
- Blocked or restricted air intake pipe or hose.
- Air leaks on intake hoses or at the intercooler.

What causes oil leaks at the turbine end?

- Leaks in the exhaust system.
- Leaks in the EGR system.

What causes oil leaks at both the compressor and turbine end?

- Any restriction in the oil drain pipe from the turbo to the engine.
- Restriction in the engine breather.
- Physical damage to the turbo's rotating parts, and excessive bearing clearance.
- Repeated hot engine shutdowns leading to carbon deposits (coke) in the centre housing.
- Incorrect turbo fitted.

Preventing turbo failure caused by oil starvation

- Ensure there are no blockages or restrictions in the air and oil systems.
- Ensure there are no leaks in the exhaust system.

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Compressor end oil leakage due to low air pressure



Turbine end oil leakage due to restriction in oil drain



Compressor end oil leakage



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TURBO FAILURE: OIL STARVATION

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Why does oil starvation damage turbos?

As turbochargers can operate at over 240,000 rpm and endure temperatures of 950°C, turbo bearings are under great stress. The turbine shaft and bearings rotate in a thin film of oil. If oil is not present at start-up and while the turbo is running, the bearings will fail. Running a turbo without oil for five seconds is as harmful as running an engine without oil for five minutes.

While it is important to check the engine oil pressure meets the manufacturer's specifications, it is even more critical that the oil feed pipes to turbo are clear and clean, so you are certain they can supply oil at the correct pressure.

What causes oil starvation?

- Low engine oil level in the sump.
- A bent or kinked oil feed pipe.
- Carbon deposits (coking) in the oil feed pipe.
- Blockage caused by applying silicone to the oil inlet gasket.
- Incorrect oil inlet gasket restricting oil supply.
- A blocked, damaged or poor quality oil filter.
- Worn oil pump.
- Failure to prime the replacement turbo with oil during fitting.
- The engine not being used for long periods, particularly in cold weather.

Preventing turbo failure caused by oil starvation

- Do not use silicone on oil gaskets; it can easily become detached and block oil passages.
- Clean or replace oil inlet pipes to eliminate any carbon deposits or sludge that could restrict oil flow to the bearings.
- It is important to check the oil pressure and oil supply to the turbo.
- Always use fresh oil and new oil filters as recommended by the engine manufacturer when fitting a new turbo.

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Extreme heat damage due to lack of oil



The blue colouring indicates excessive temperatures



Scored and discoloured surface due to insufficient oil



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