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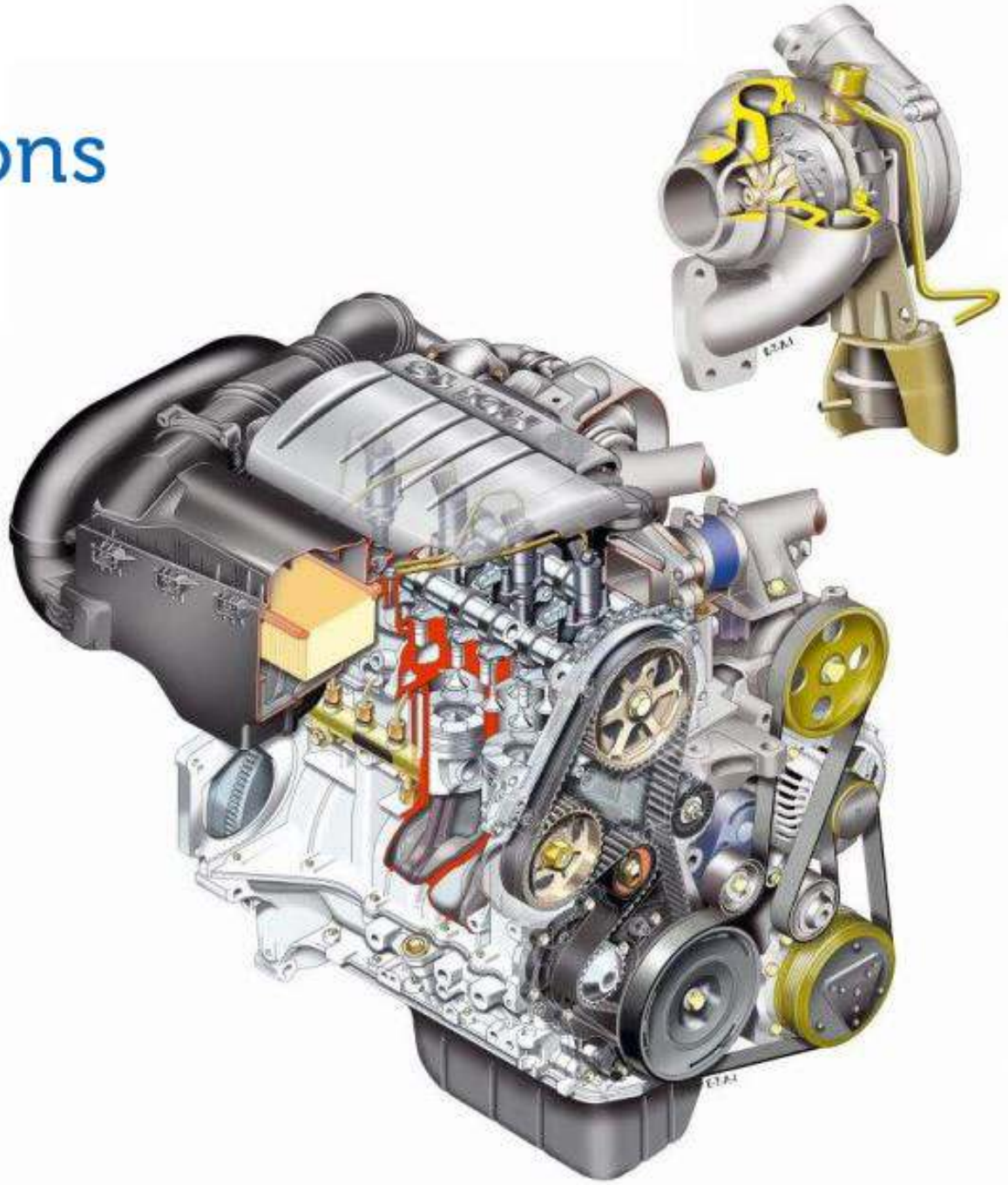
01325 485800

1.6 HDi PSA Engine
DV6TED4



Evidence of carbon build up in a 1.6 HDi PSA Group engine leading to total turbocharger failure

Case Study

•Engine Type:	1.6 HDi PSA Group Engine – DV6TED4
•Engine Year:	2007
•Vehicle Year:	2007
•Miles on Engine:	109,087
•Miles on Original Turbocharger before replacement:	107,800 Miles approx
•Miles on 2nd Turbocharger before replacement:	937
Miles on 3nd Turbocharger before failure:	350
•Service history:	Serviced by a main franchised dealer 2 times from new, at every 30,000 miles approx , and 3 times by an independent garage 3 times in total, every 15,000 miles.
•Oil used at service:	Manufacturer 's recommended grade oil.
•Notes:	Oil feed pipe changed during turbocharger replacement

Case Study

•**Notes:**

The following pictures detail an engine that has caused the failure of 2 new turbochargers in a short period of time.

In an attempt to remove carbon particles that have caused the failure of the first turbo, this engine has been 'flushed' with an engine flush 2 times prior to strip down.

The following information applies to both the:

- **Garrett turbo**

&

- **Mitsubishi turbo**

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Overview of oil contamination, particle build up and oil path restrictions in the engine leading to turbocharger failure

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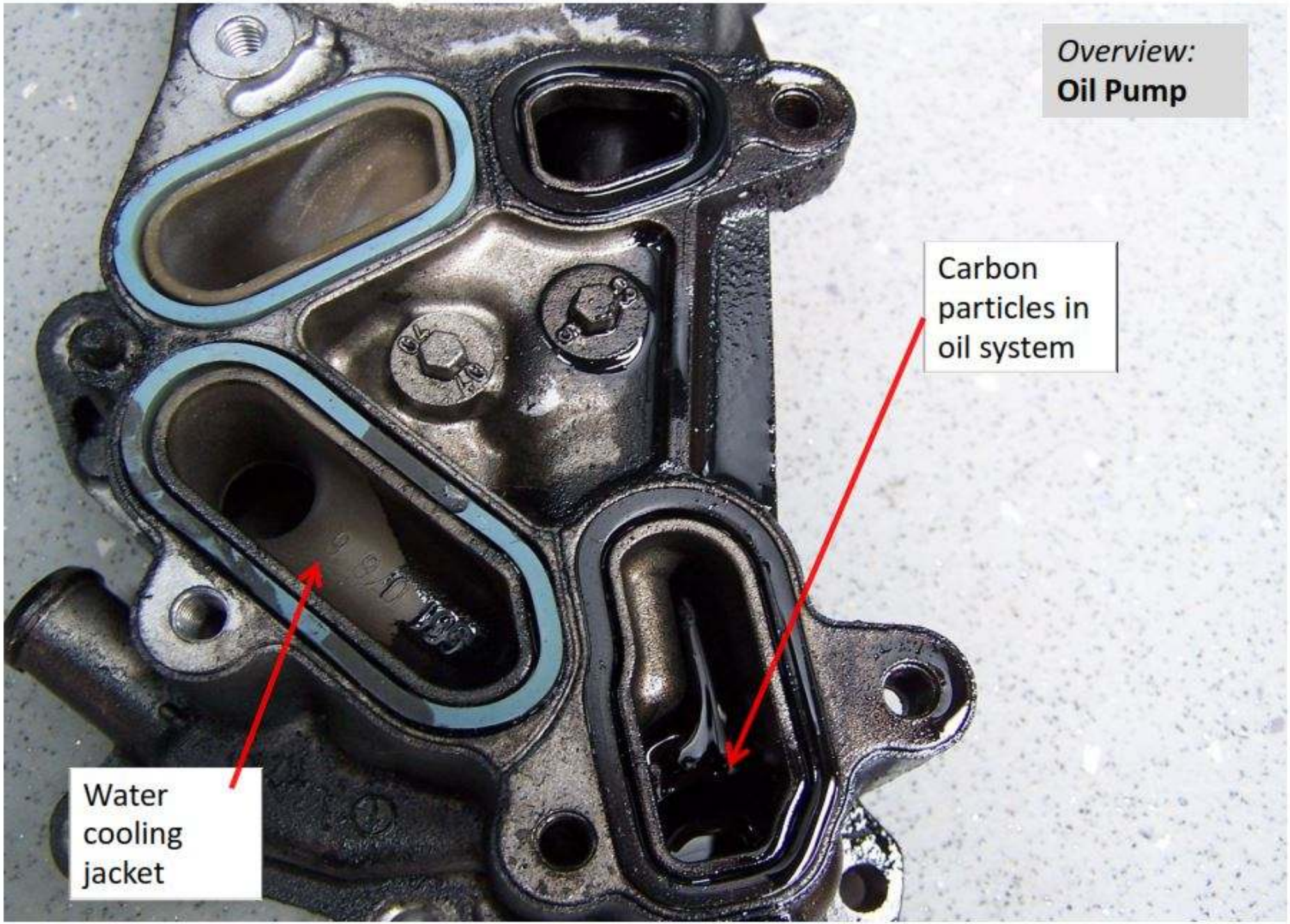
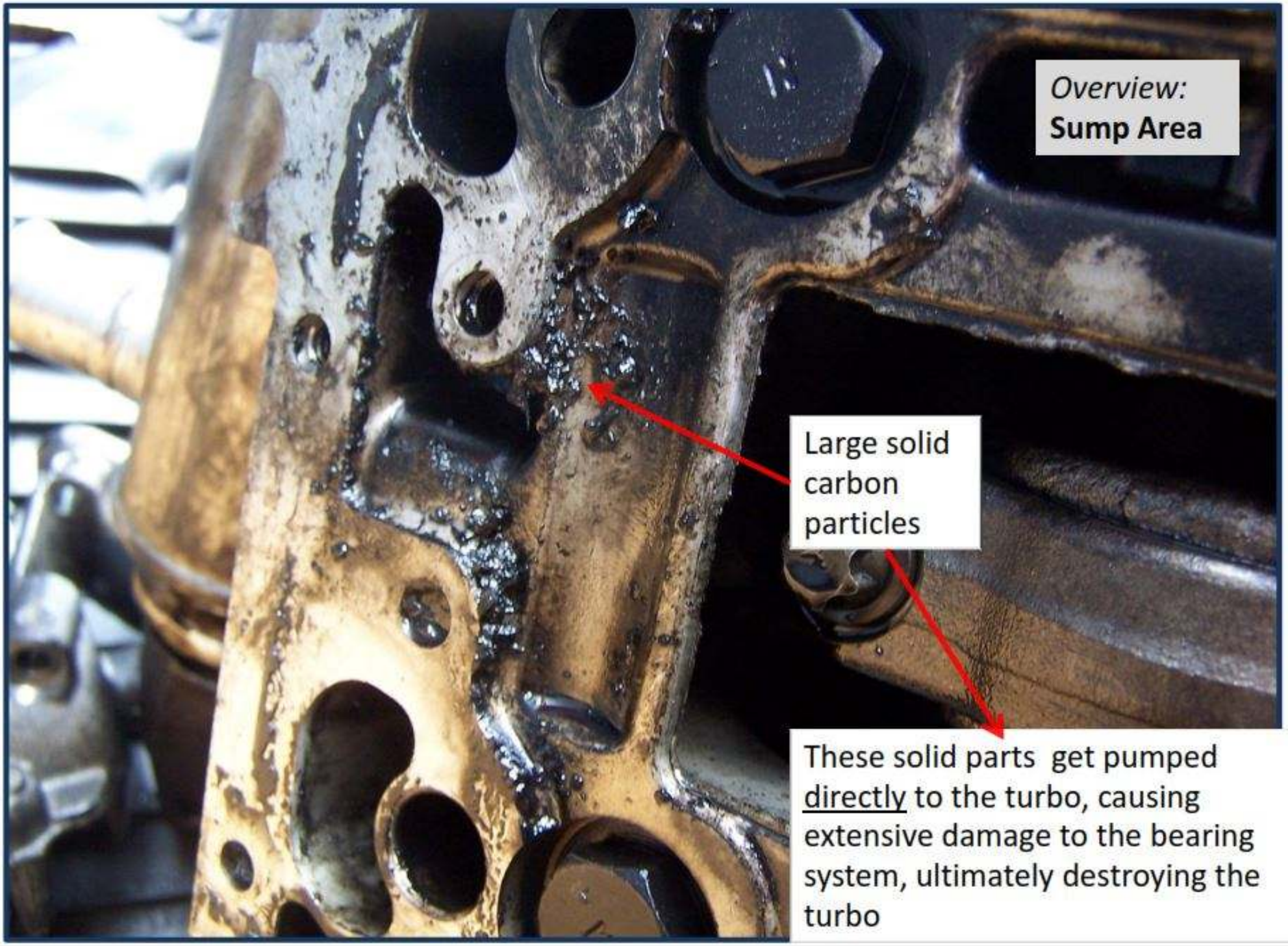
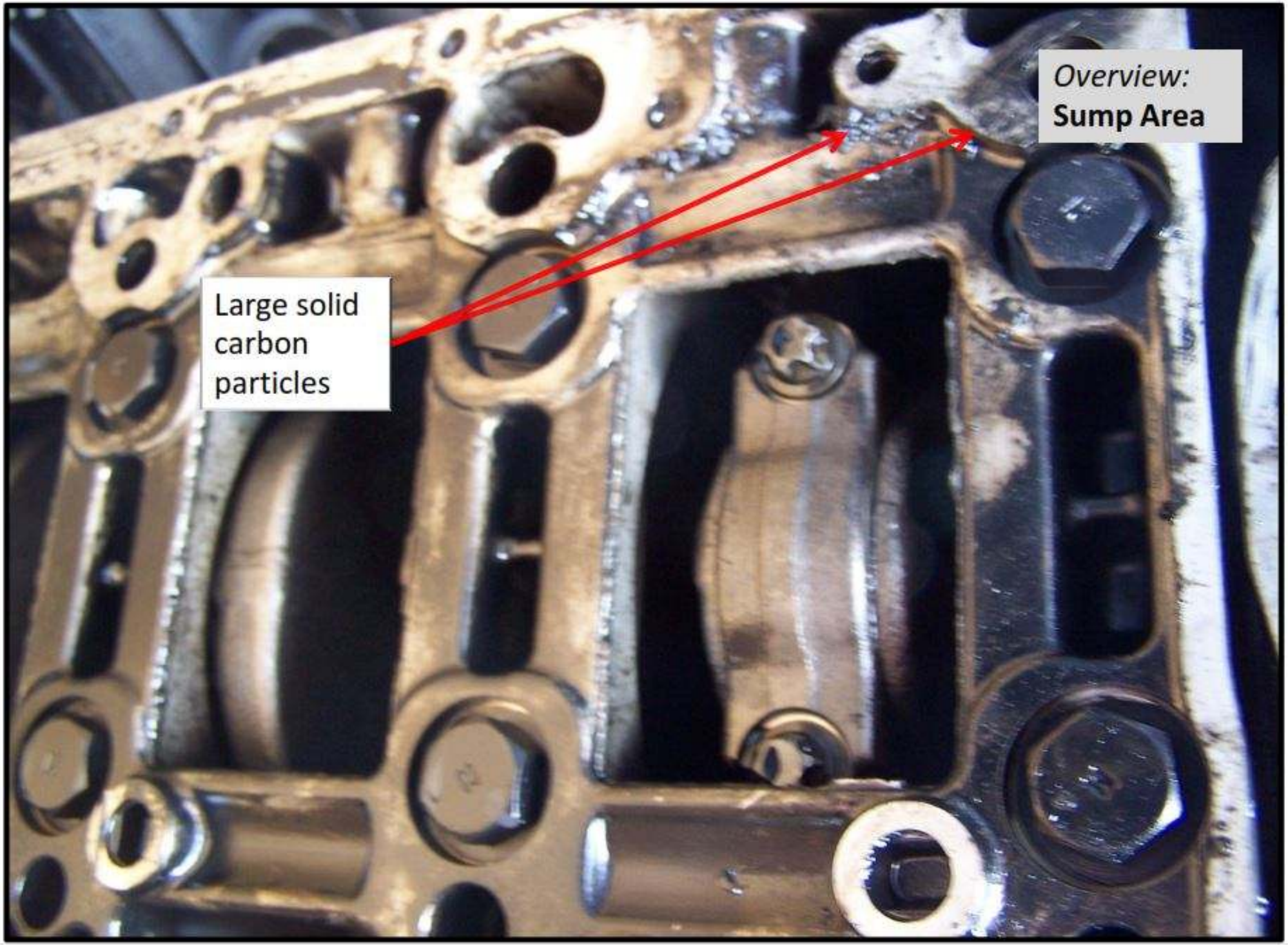
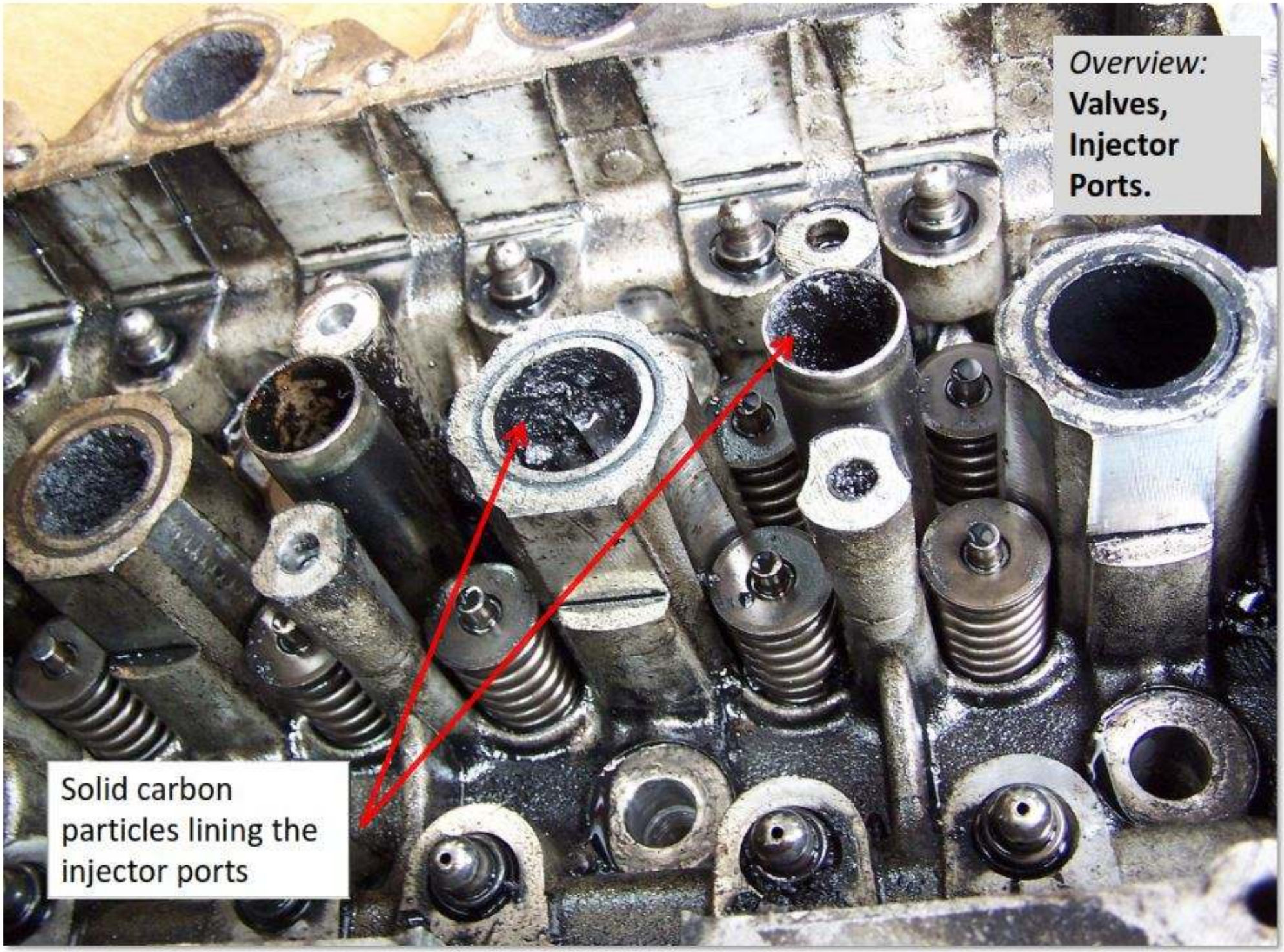
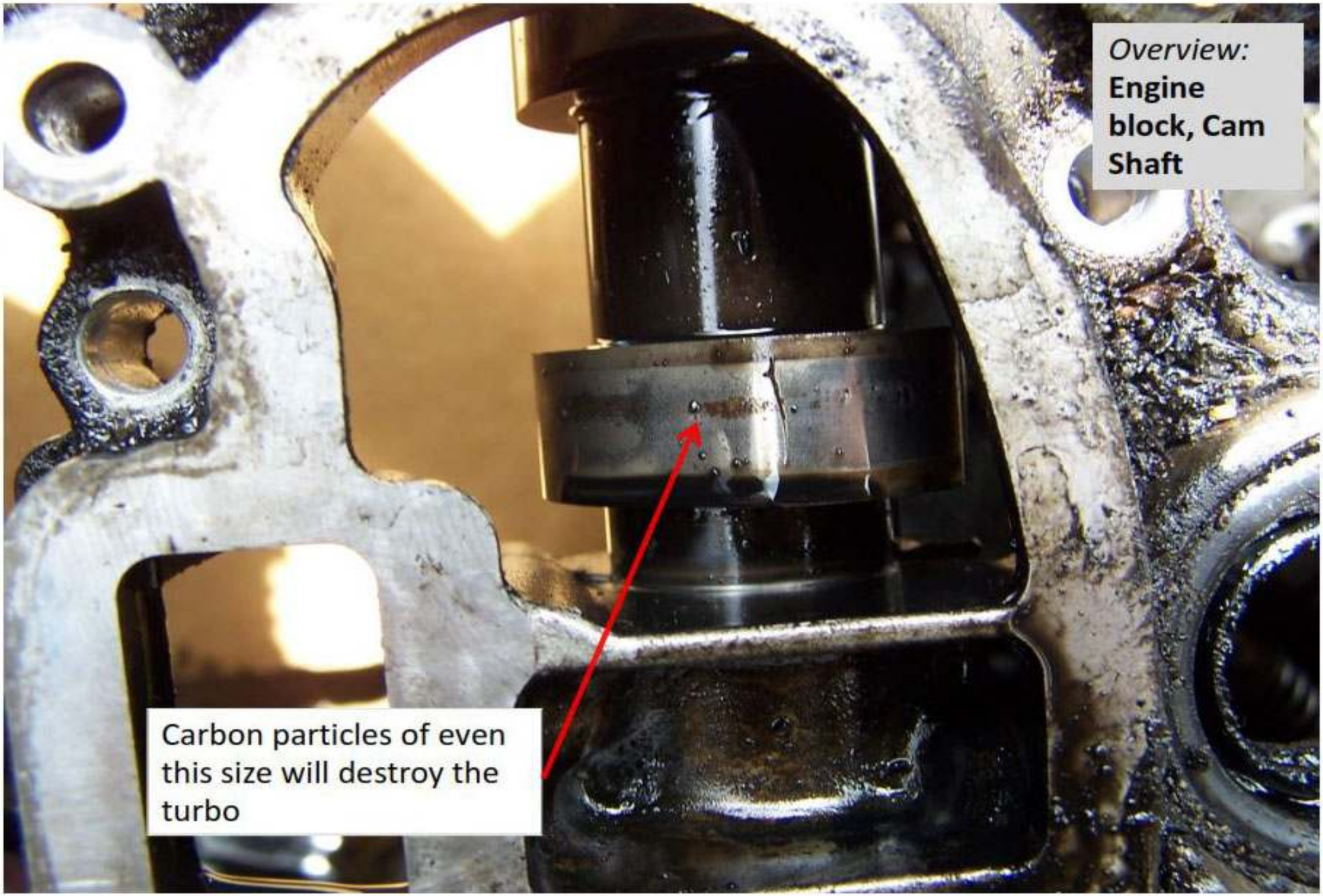
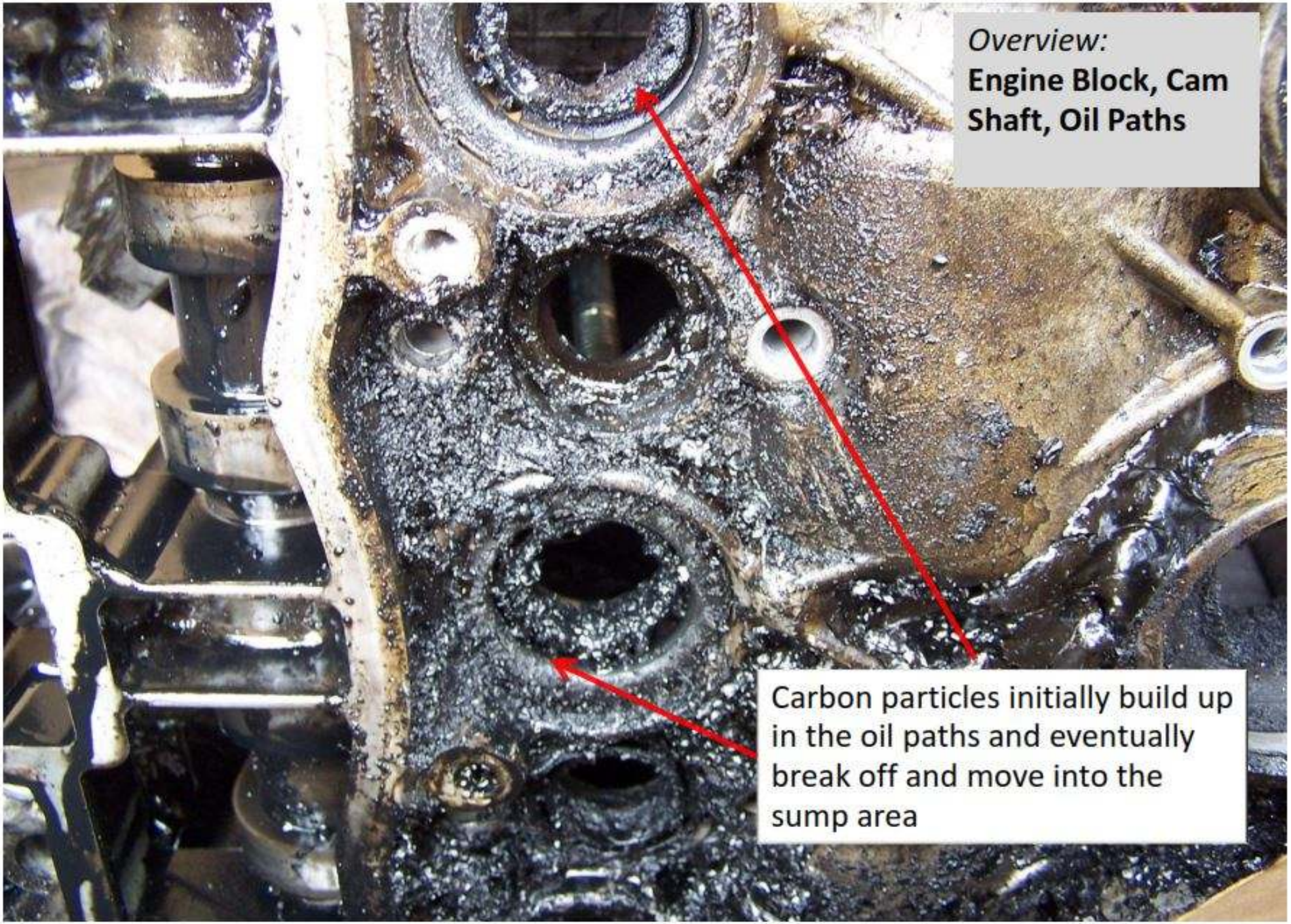

Overview:
Oil Pump
Carbon particles in oil system
Water cooling jacket

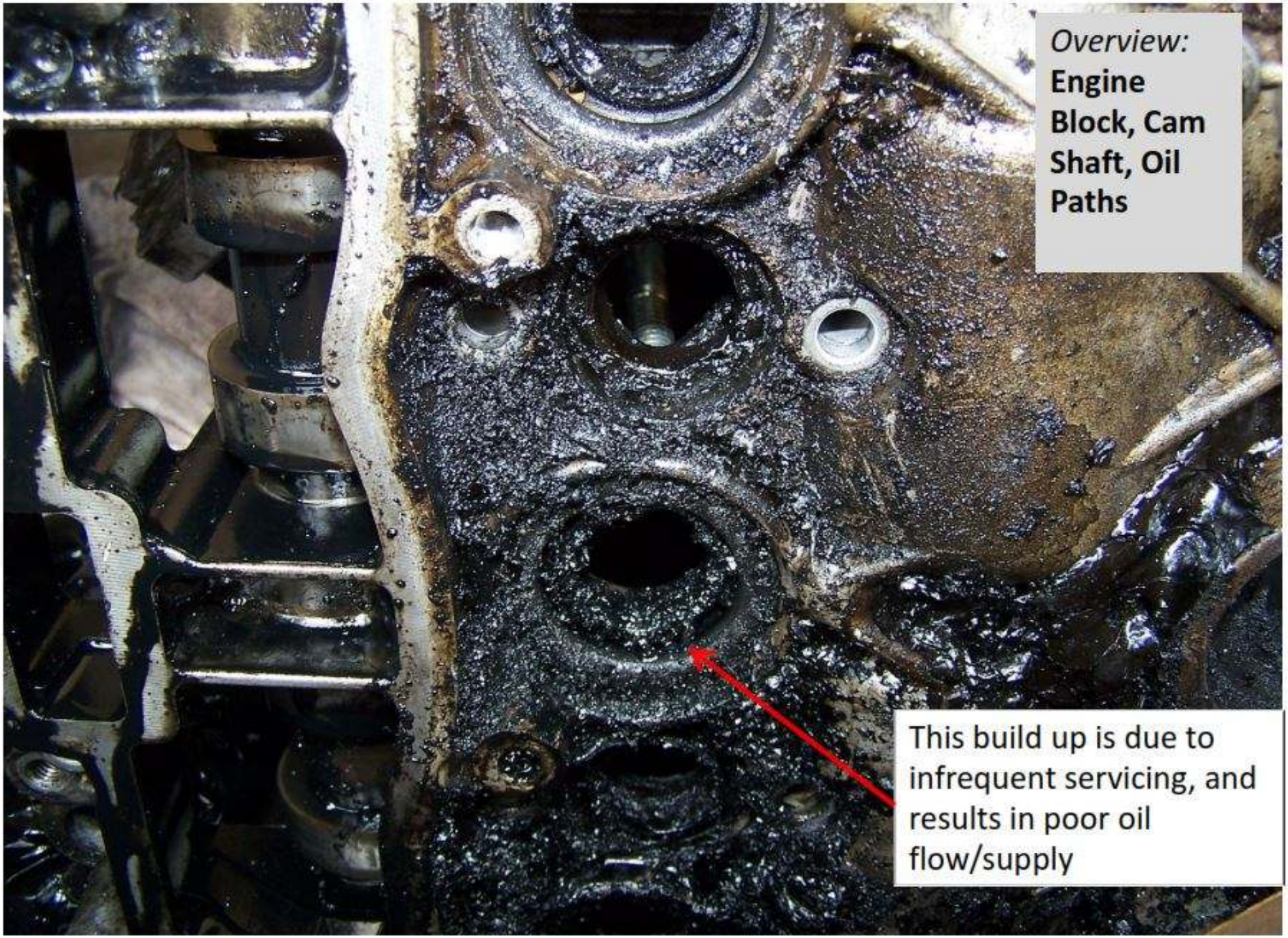

Overview:
Sump Area
Large solid carbon particles
These solid parts get pumped directly to the turbo, causing extensive damage to the bearing system, ultimately destroying the turbo

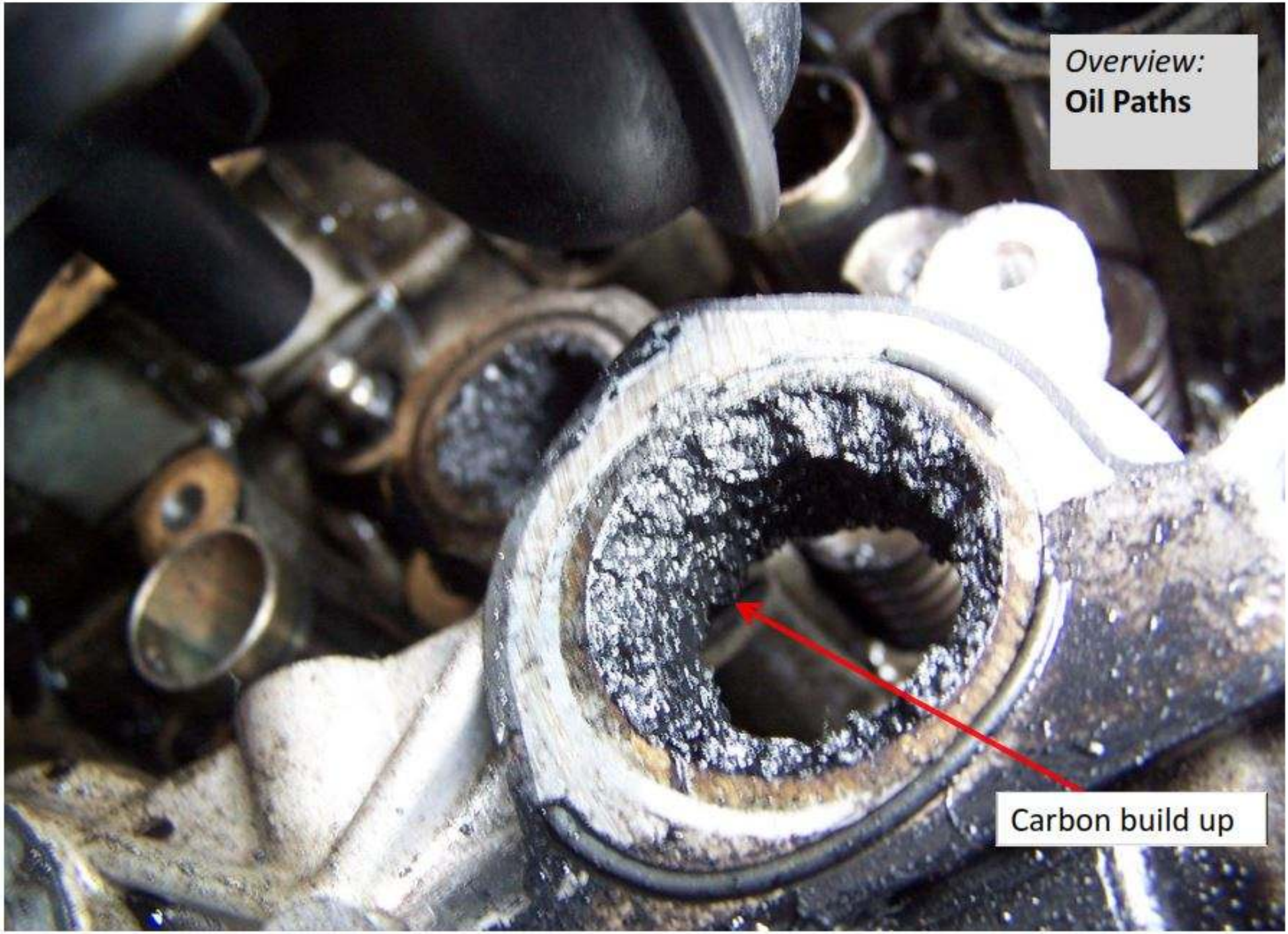

Overview:
Sump Area
Large solid carbon particles

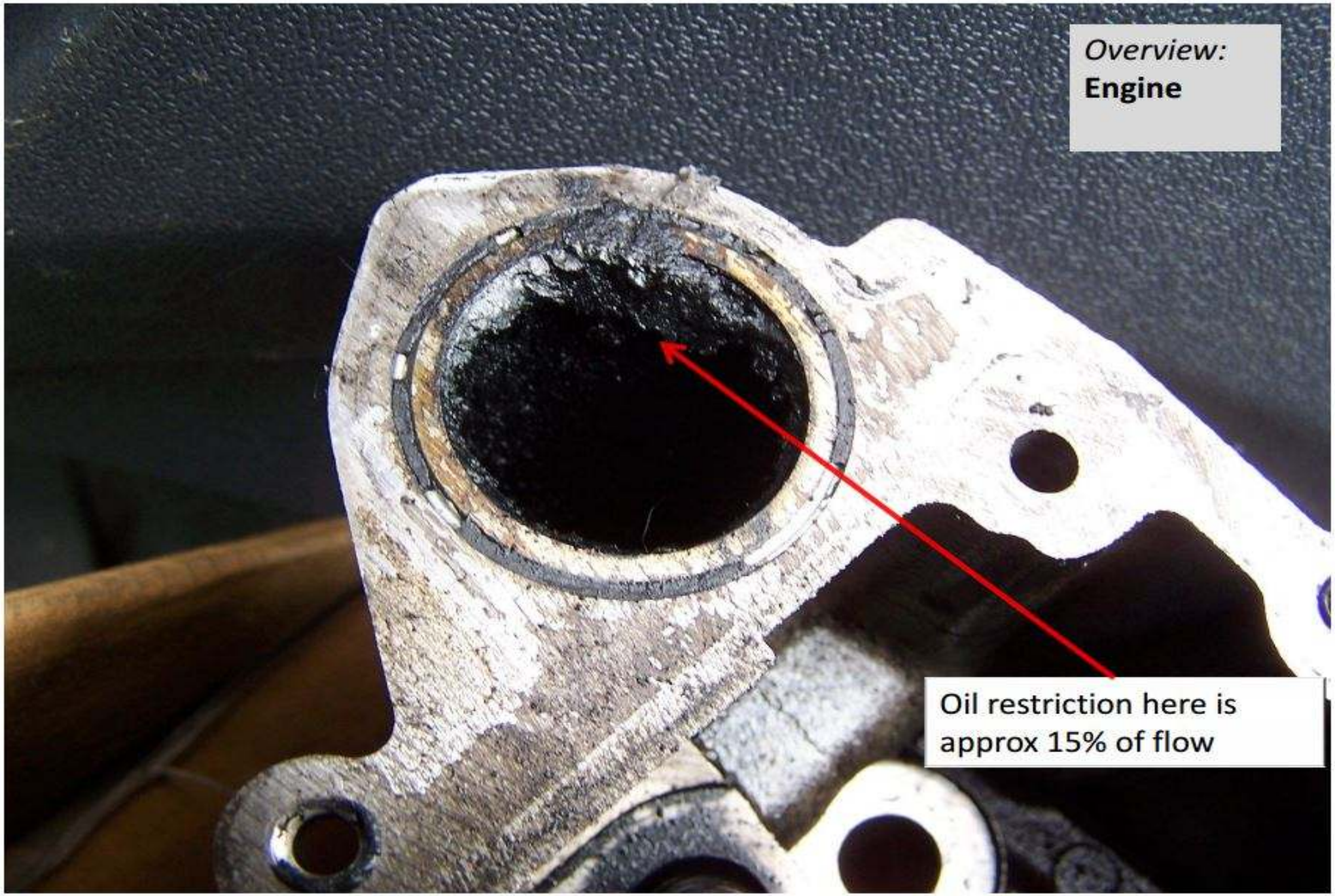

Overview:
Valves, Injector Ports.
Solid carbon particles lining the injector ports

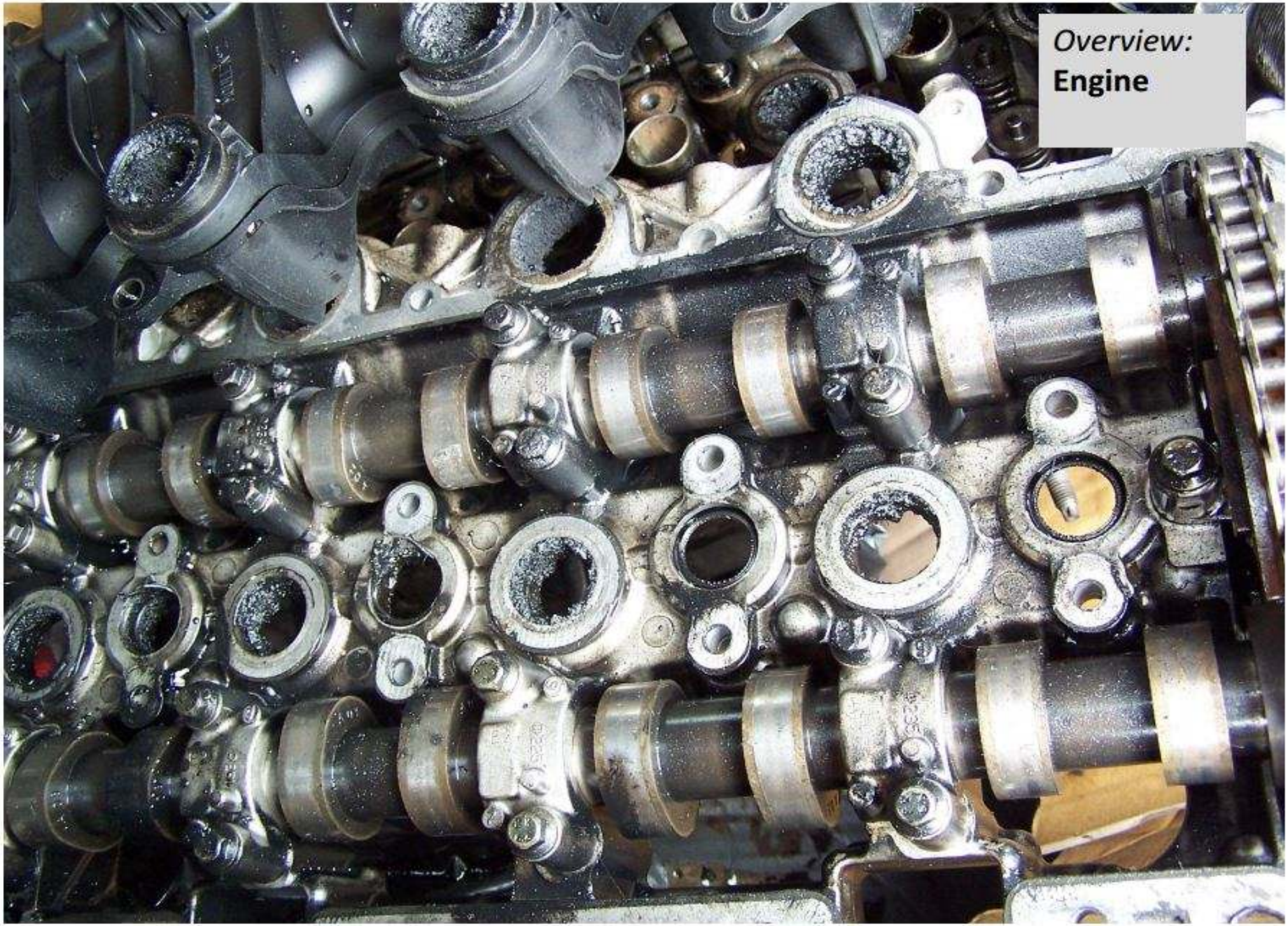

Overview:
Engine block, Cam Shaft
Carbon particles of even this size will destroy the turbo

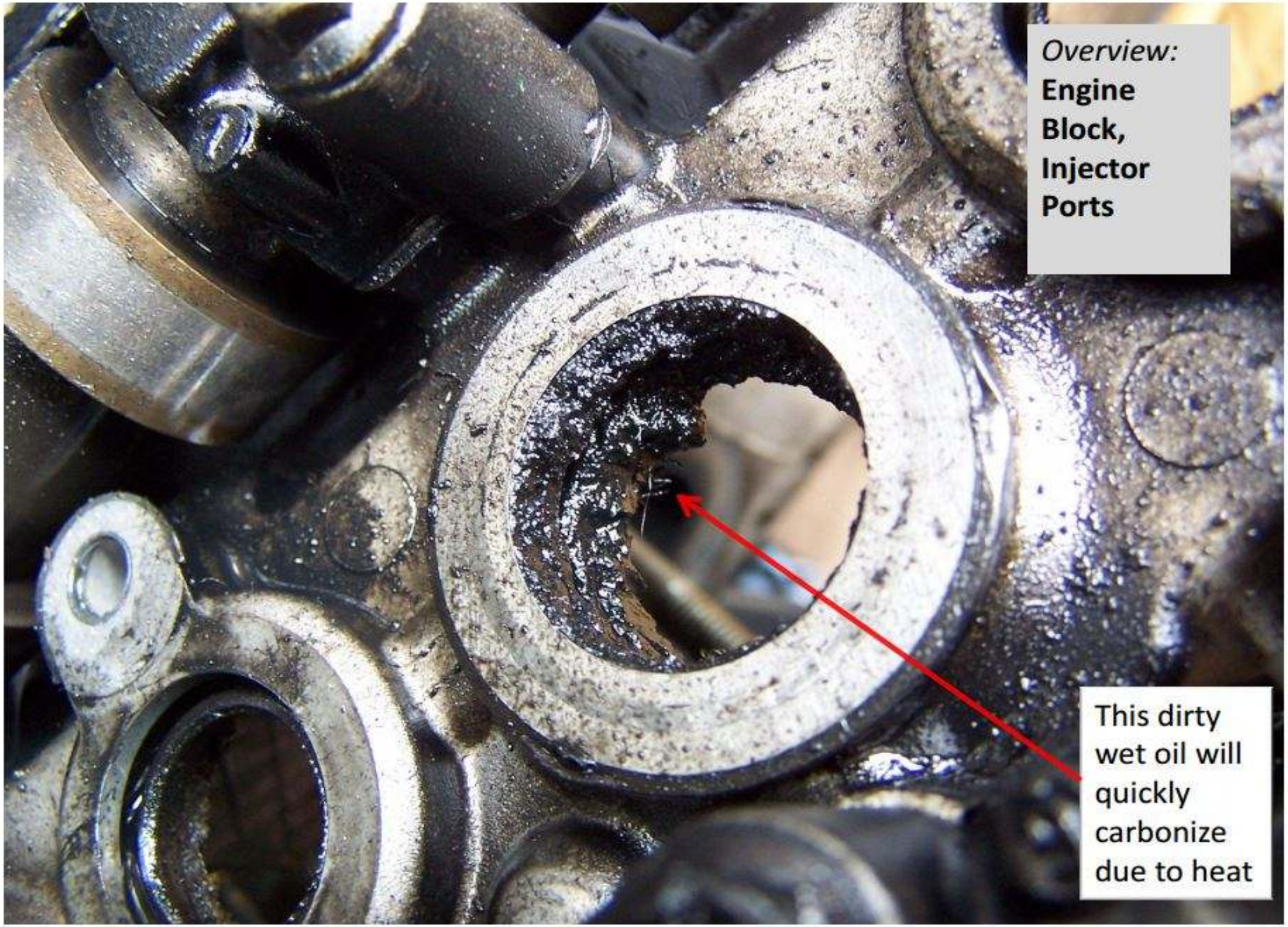

Overview:
Engine Block, Cam Shaft, Oil Paths
Carbon particles initially build up in the oil paths and eventually break off and move into the sump area

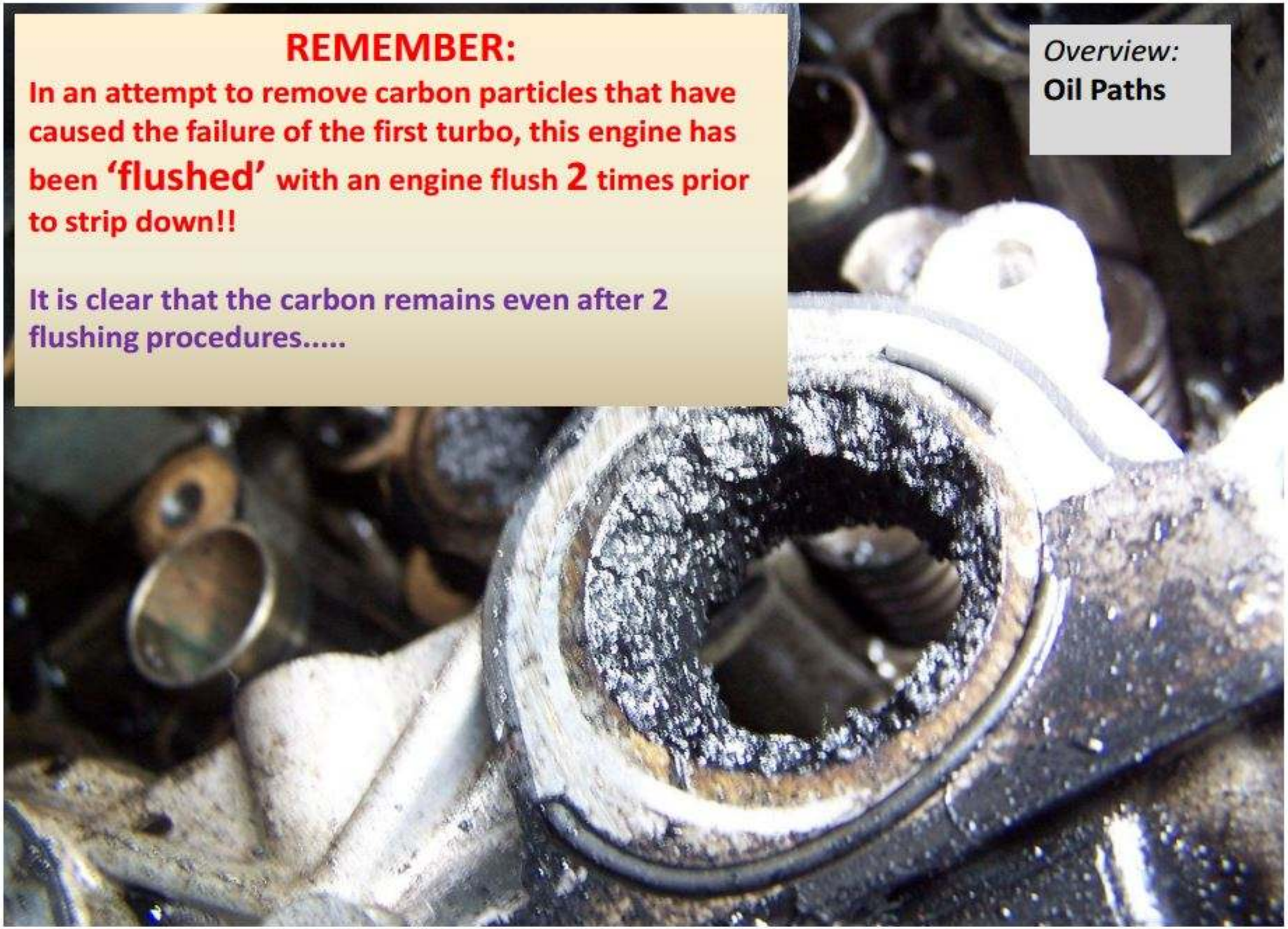

Overview:
Engine Block, Cam Shaft, Oil Paths
This build up is due to infrequent servicing, and results in poor oil flow/supply


Overview:
Oil Paths
Carbon build up


Overview:
Engine
Oil restriction here is approx 15% of flow


Overview:
Engine


Overview:
Engine Block, Injector Ports
This dirty wet oil will quickly carbonize due to heat

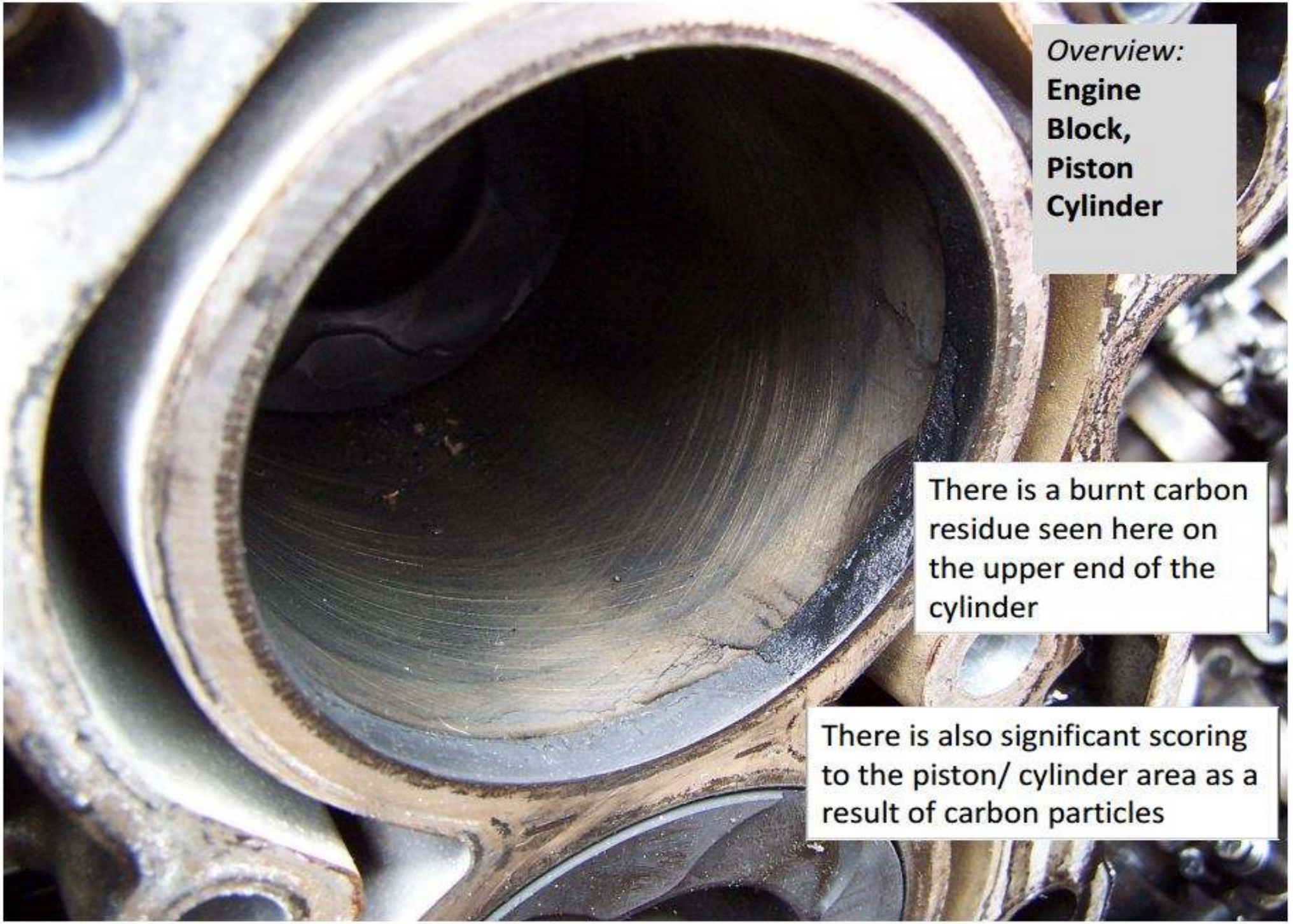


REMEMBER:

In an attempt to remove carbon particles that have caused the failure of the first turbo, this engine has been 'flushed' with an engine flush 2 times prior to strip down!!

It is clear that the carbon remains even after 2 flushing procedures.....

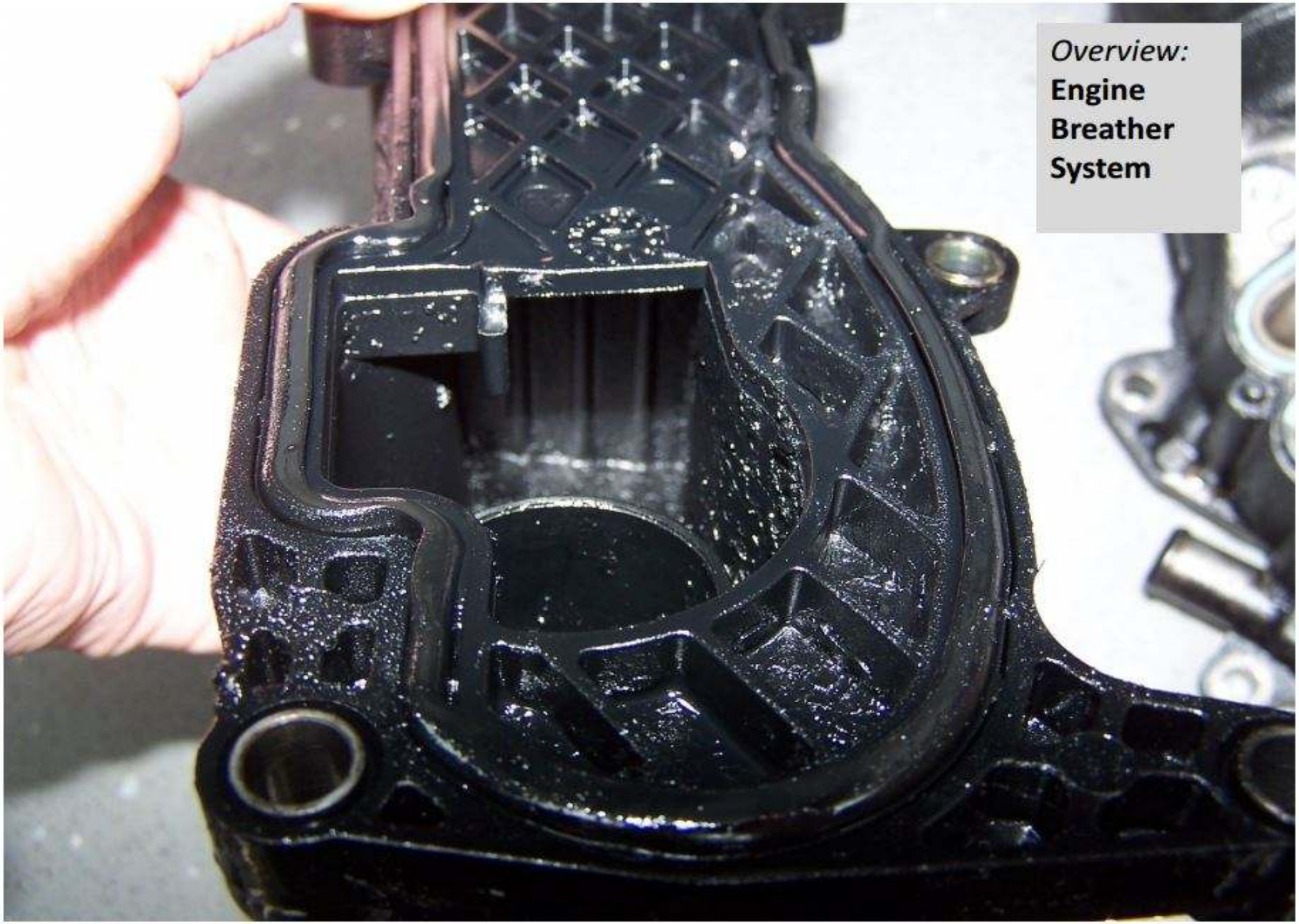
Overview:
Oil Paths


Overview:
Engine Block, Piston Cylinder
There is a burnt carbon residue seen here on the upper end of the cylinder
There is also significant scoring to the piston/ cylinder area as a result of carbon particles

Overview:
Engine Block, Piston Cylinder


Overview:
Engine Block, Piston Cylinder


Overview:
Engine Breather System
Carbon build up in the engine breather system


Overview:
Engine Breather System


Overview:
Engine Breather System

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Engine Breather System

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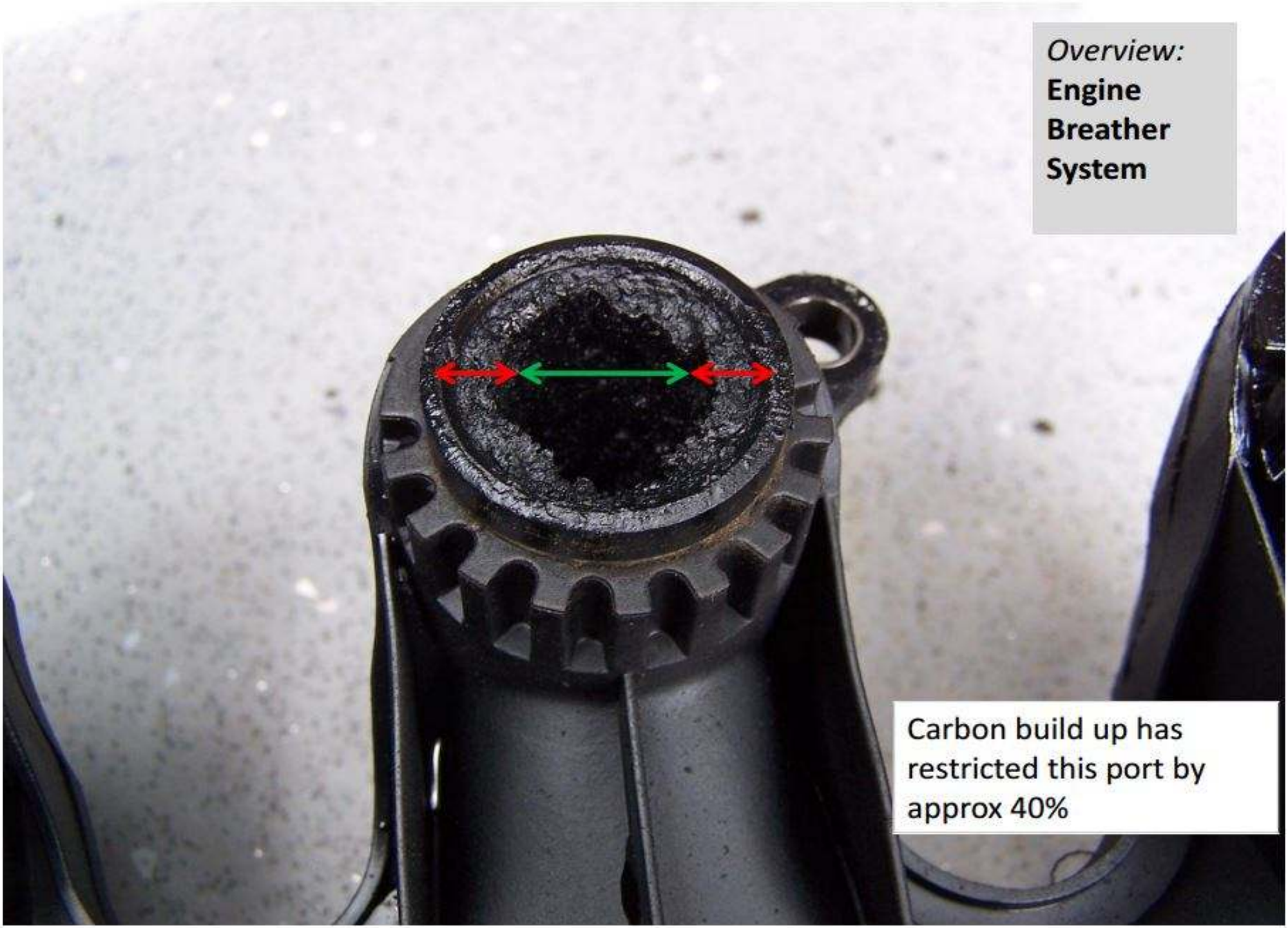
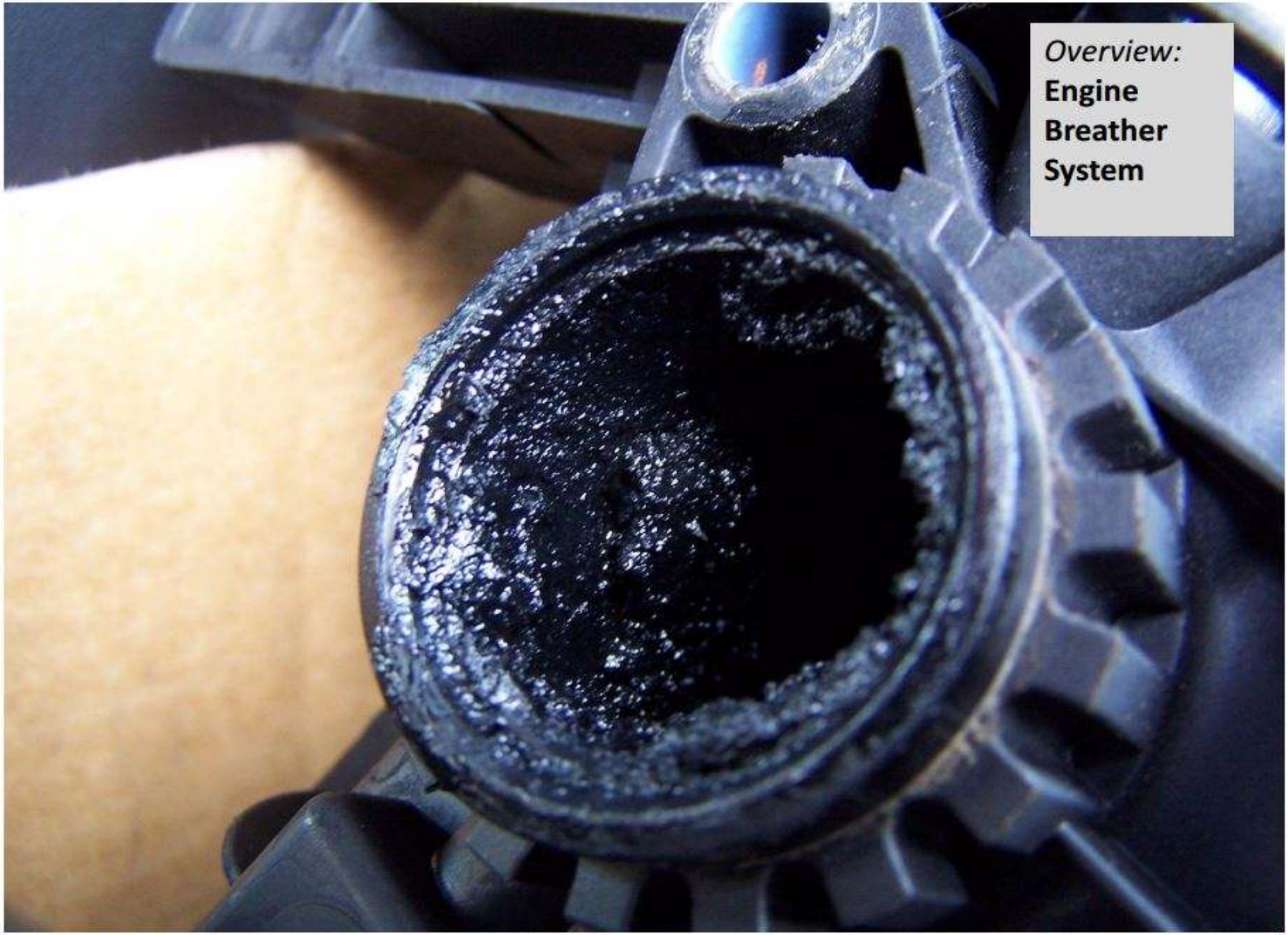
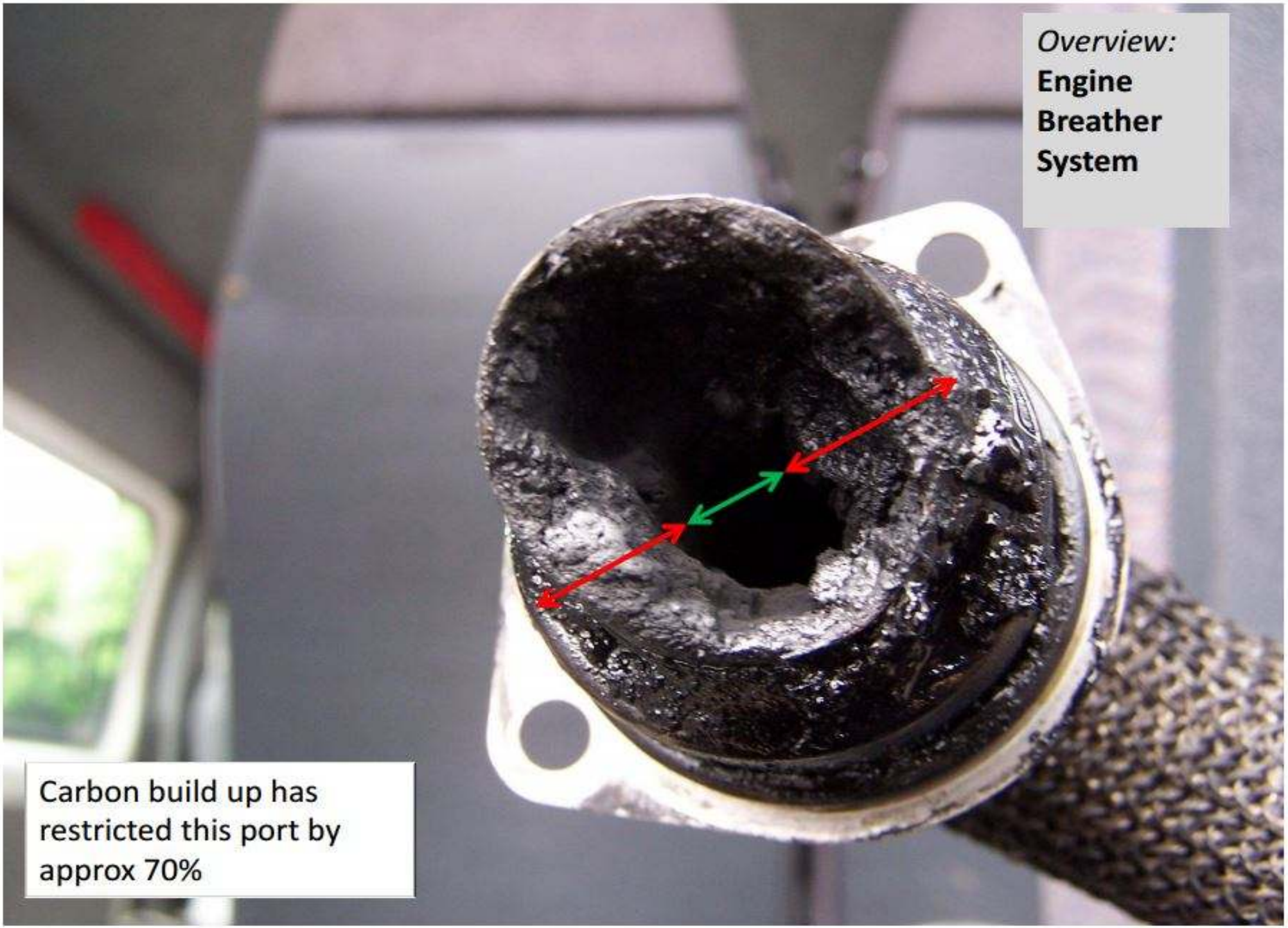
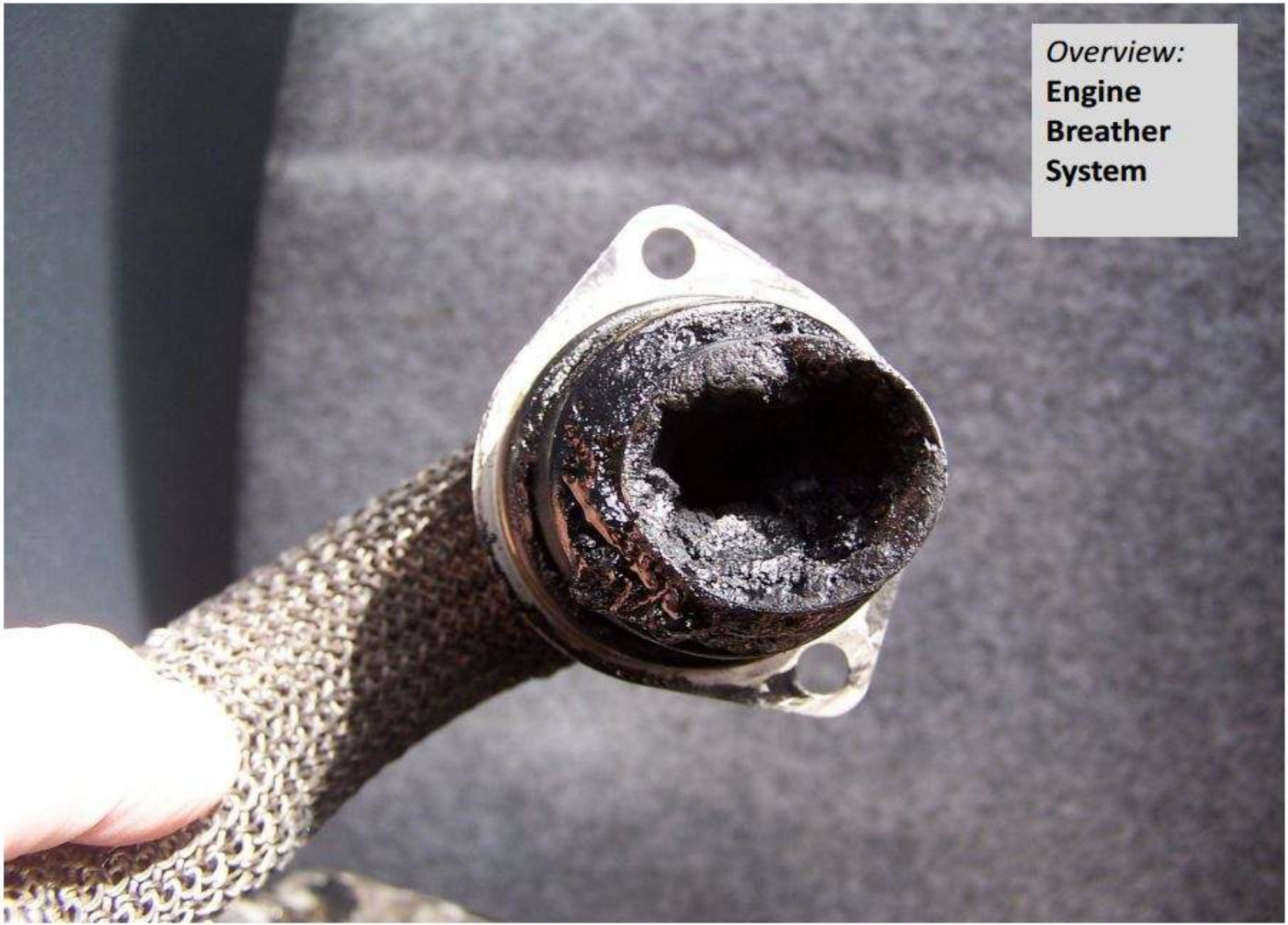

Overview:
Engine Breather System
Carbon build up has restricted this port by approx 40%


Overview:
Engine
Breather
System


Overview:
Engine
Breather
System


Overview:
Engine Breather System
Carbon build up has restricted this port by approx 70%


Overview:
Engine Breather System

Overview of oil contamination, particle build up and oil path restrictions in the turbocharger leading to total failure of the turbocharger bearing system

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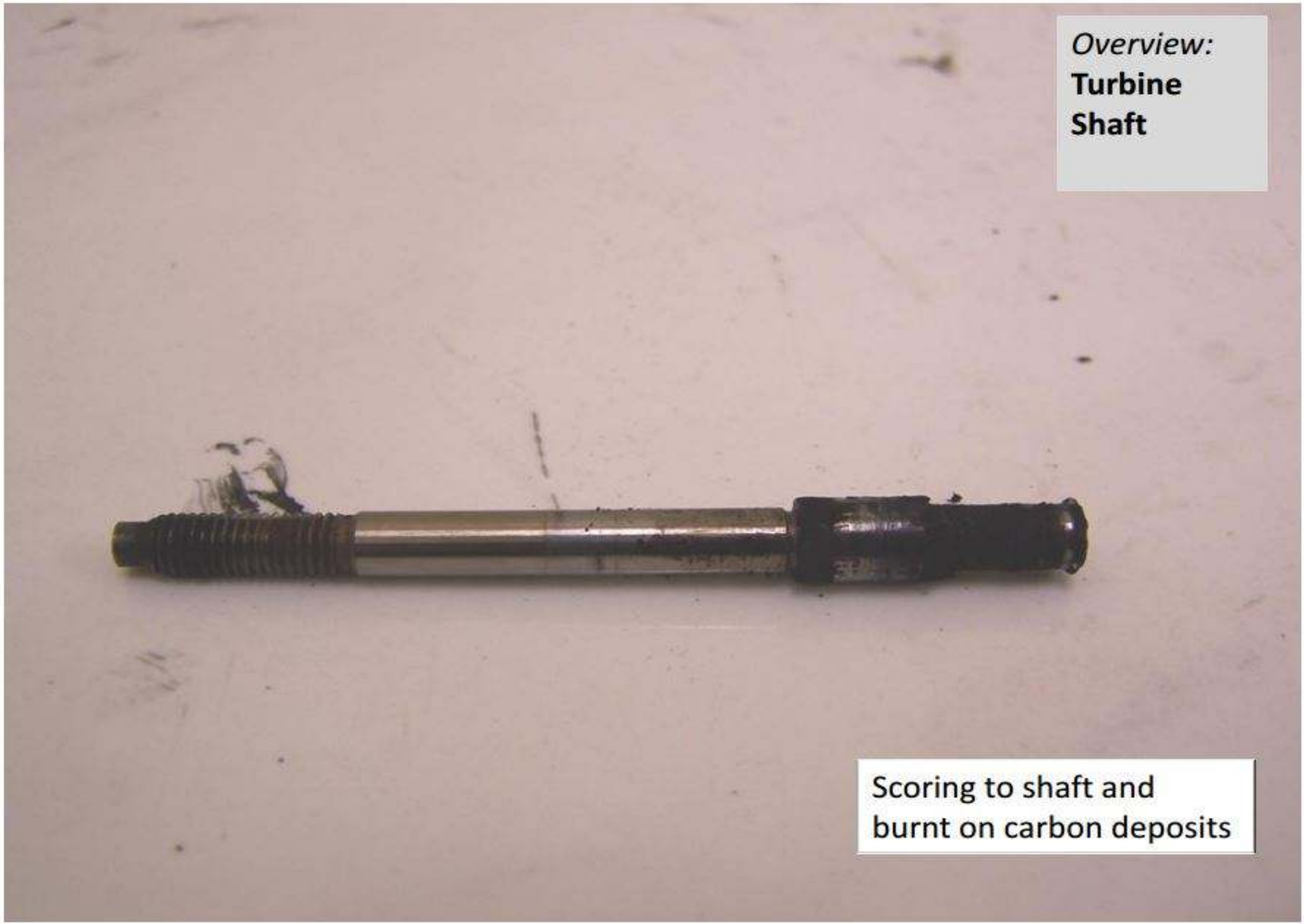
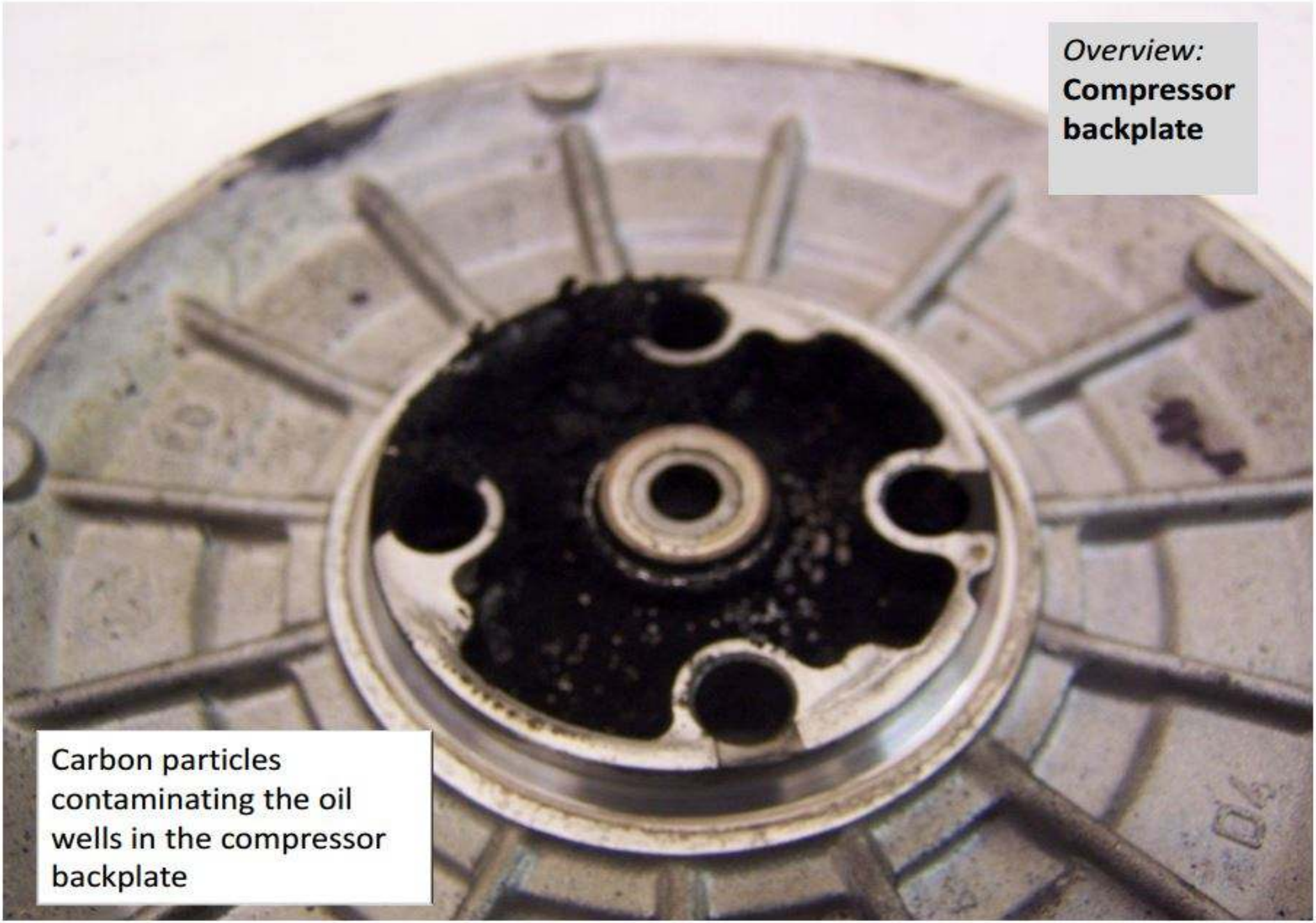
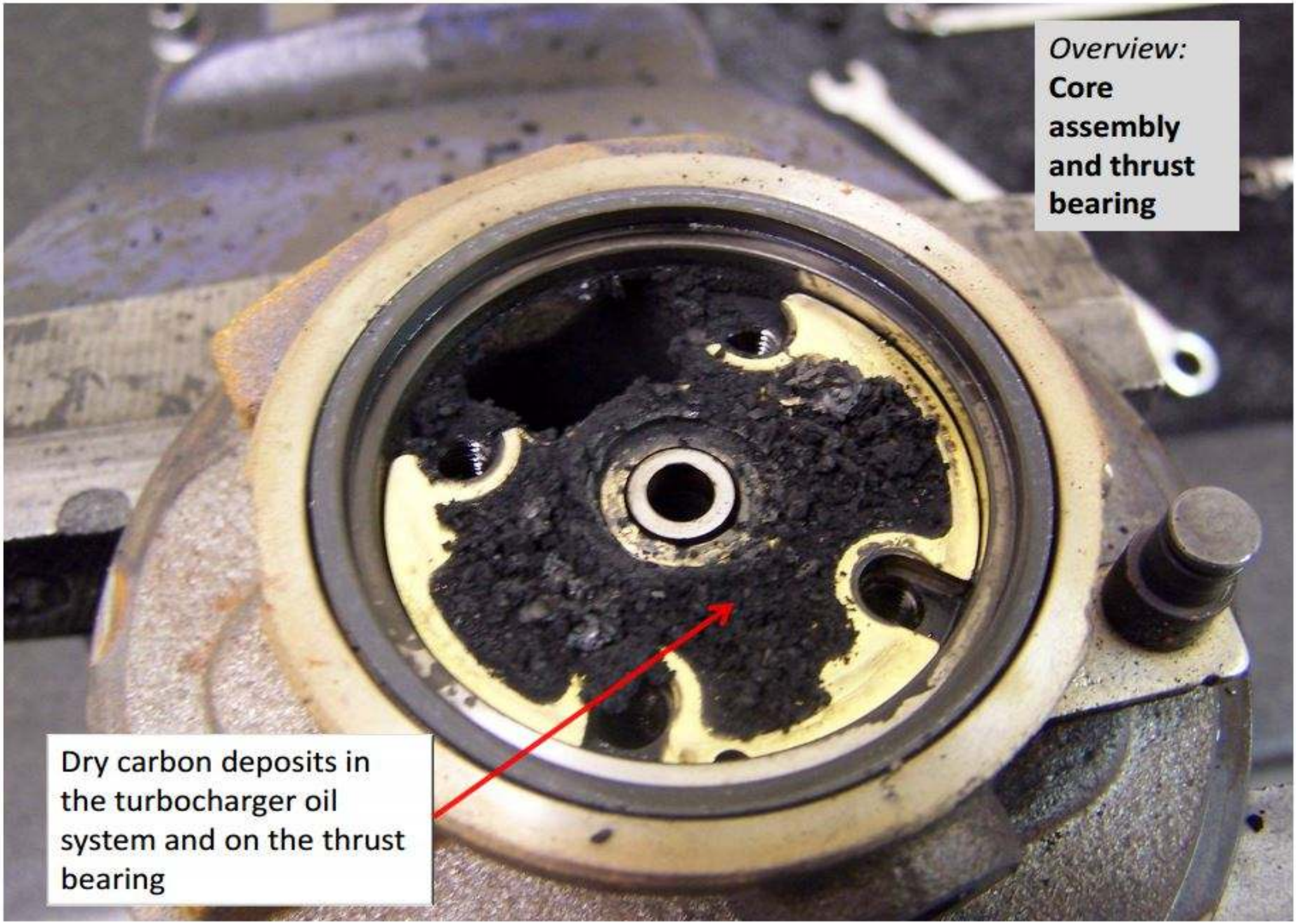
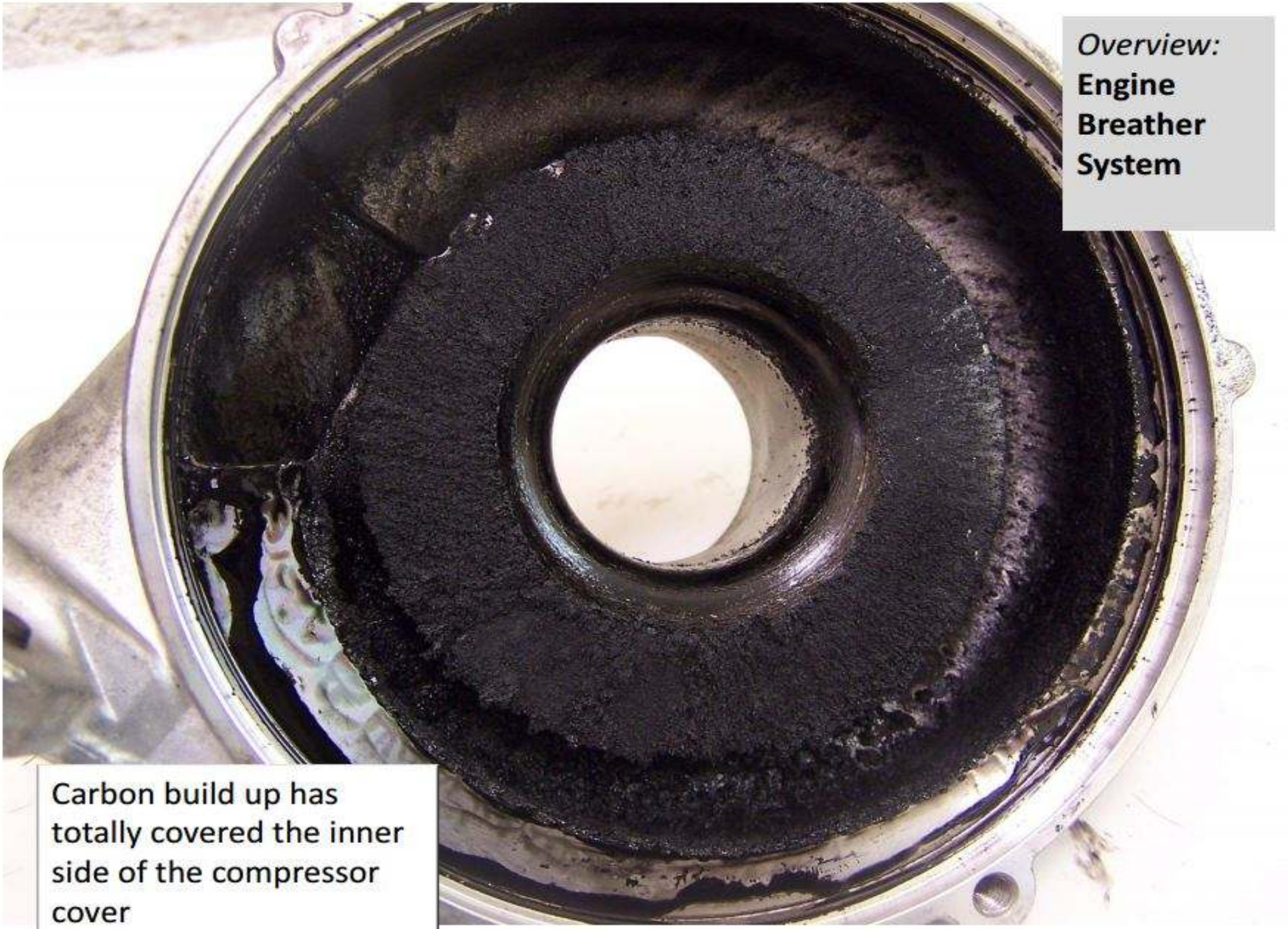

Overview:
Turbine Shaft
Scoring to shaft and burnt on carbon deposits


Overview:
Compressor backplate
Carbon particles contaminating the oil wells in the compressor backplate


Overview:
Core assembly and thrust bearing
Dry carbon deposits in the turbocharger oil system and on the thrust bearing

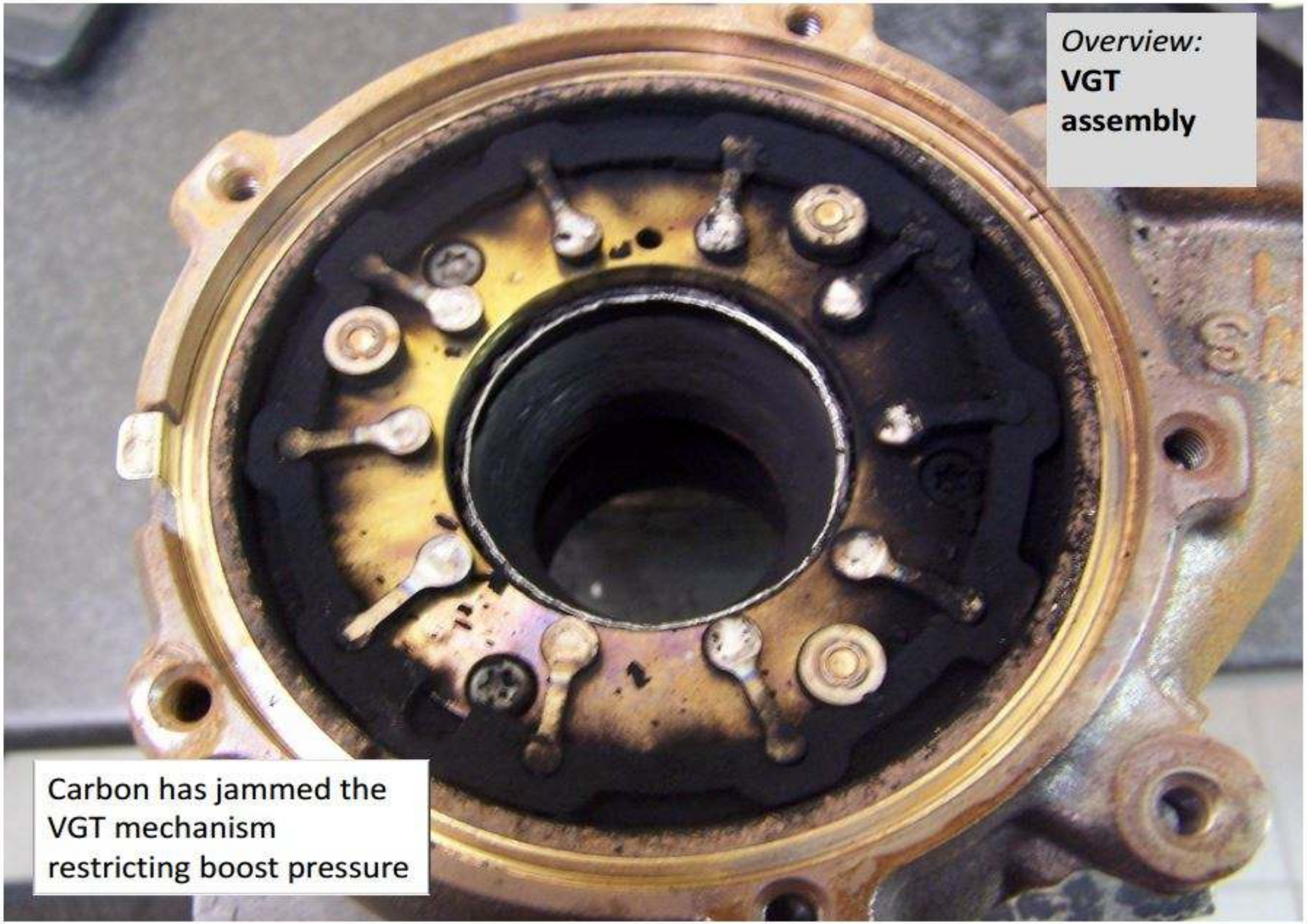


Overview:
Engine Breather System

Carbon build up has totally covered the inner side of the compressor cover

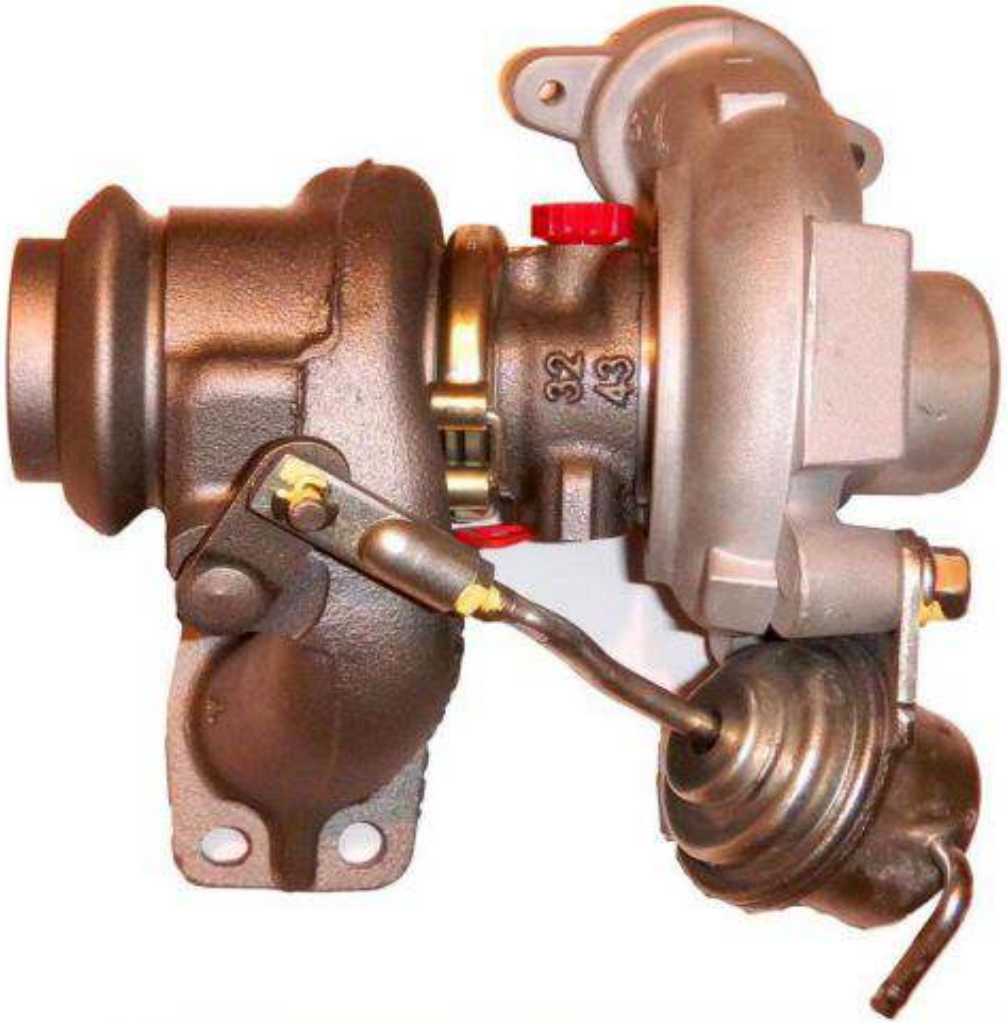

Overview:
Engine Breather System
These carbon deposits restrict oil flow and score the critical polished surfaces in the turbo bearing system

Overview:
Compressor and turbine wheels


Overview:
VGT assembly
Carbon has jammed the VGT mechanism restricting boost pressure


Overview:
Engine Breather System
As a result of an insufficient oil supply due to restrictions, and scoring as a result of carbon ingress, overheating and scoring has occurred , destroying the journal bearing

Checklist for correct turbocharger installation



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CARBONIZED OIL IS A MAJOR CAUSE OF FAILURE OF THE TURBO, ON THIS APPLICATION!!

Carbon may build up and may block oil feed to turbocharger. This can occur in, but is not limited to the following areas:

- Filter at engine block
- In-line filter on oil feed pipe to turbo
- Oil return pipe from turbo to engine block
- Internal oil galleries inside the engine block

Ensure to check all other areas for signs of carbon build up/ blockages.

The following components MUST also be replaced to prevent another turbo failure:

Oil feed lines

Oil pickup pipe

Banjo bolts

Turbochargers fail for a reason, usually air or oil related. Before fitting this turbo make sure to correctly diagnose and rectify the cause of the previous turbo failure

Please ensure that engine has the latest specification of oil dipstick – turbo failure may be attributed to incorrect oil levels

CHECK LIST

For Correct Turbocharger Installation

In order to avoid any possible damage while installing your turbocharger or premature operating problems, either of which could invalidate the warranty, it is vital that the installation technician follows every step in these instructions carefully and completely.

- ❑**Ascertain why the old unit failed.** You don't want the same problem to recur and damage the new unit.
- ❑**Check for cleanliness.** The smallest particles of dirt can do irrevocable damage to a turbocharger so check the engine intake/exhaust and after cooler systems for cleanliness and obstructions, carefully removing oil, pieces of gasket, dust, dirt and other debris. Replace the air filter.
- ❑**Check that the oil inlet and oil drain flanges are clean** and free from obstruction, internal carbon and sludge, removing them to clean if necessary. If in doubt, replace with new.
- ❑**Turbo oil feed pipe** and banjo bolts **must** be changed.
- ❑**Oil pump** should be removed and checked for correct operation and checked for blockages.
- ❑**Oil cooler** and filter assembly should be removed and cleaned.

CHECK LIST

❑**Sump must be removed,** checked for heavy carbon deposits, cleaned and oil strainer (pick up filter) cleaned thoroughly or replaced, to remove carbon sludge build up. Check with vehicle manufacturer that the sump is of the correct (new and revised) specification.

❑**Remove charge air cooler,** ensure to drain off any oil and clean thoroughly.

❑**Check and clean** all inlet and outlet hoses.

❑**Diesel Particulate filter (DPF)** should be cleaned, static regeneration in accordance with manufactures guidelines should be carried out or the unit replaced.

❑**If oil has leaked** from old unit or engine into the exhaust system, ensure to check entire system (e.g: Catalyst, DPF etc) for contamination, heavy carbon deposits and blockages.

❑**Remove brake vacuum pump** to check for debris/ carbon deposits and clean as necessary.

❑**Check that the manifold casting is not cracked on the outside** or breaking up internally. If in doubt, replace with new.

❑**Replace the oil and filter,** including the prime filter, ensuring that only OEM recommended parts and specified oil are used. Check the exhaust-mounting flange is flat and free from cracks and carbon debris, and the studs are in good condition.

❑**Check that engine** has the latest specification dipstick

❑**Check fuel injector seals** are not burnt, damaged or compromised. Replace as necessary.

❑**Mount the turbocharger on the exhaust flange** checking that the turbine inlet gasket fits correctly to give a gas tight seal.

CHECK LIST

❑**Fill the turbocharger oil feed hole with clean engine oil** and rotate the rotor by hand (Never rotate a new turbo without priming with oil).

❑**Oil flow must be checked -**

Suggested procedure:

❑**Fit turbo** to engine leaving oil **return pipe off**

❑**Install a longer oil return line and feed into suitable container**

❑**Start engine** and idle for 60 seconds only, then switch off engine

Measure volume of oil in container

❑***60 seconds of Idle power should produce at least 0.3 Litres of oil***.

❑**Repeat this test 3 times to ensure oil flow is correct**

DO NOT ALLOW ENGINE OIL LEVEL TO RUN BELOW MINIMUM OIL LEVELS!!!

❑**Connect the oil drain pipe**, using the gaskets supplied, or using genuine OE gaskets only.

❑**Never use silicon type sealant for gaskets.** This sealant can break away and clog the turbochargers oil feed holes.

❑**Connect all external fittings to the turbocharger.** Start engine and idle for two minutes, checking that the oil warning light has gone out and that all air, gas, and oil connections are tight and free from leakage, using leakteck/ soapy water to help detect gas leaks. Tighten any fastenings as appropriate.

❑**Vehicle should be** driven **30 to 40 kilometres**, then the **oil**, **filter** and **banjo bolts** replaced ***again***

❑**Banjo bolts** should thereafter be changed at ever service interval.

Please Remember:

It is ultimately the responsibility of the mechanic/ installation technician to ensure that all of the above steps are completed in their entirety.
Failure to follow the above procedures will result in premature turbo failure and/or further complications!

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