CARWOOD®

Technical bulletin

PRODUCT: Turbocharger

OEM: BorgWarner, BMTS, Continental, Garrett, IHI, Mitsubishi

FITS: Various

JOB: How to troubleshoot a turbo failure due to overspeeding

With the trend for tuning modules and remapping allowing owners to squeeze more performance out of their vehicles, overspeeding is becoming an increasingly common cause of turbo failure. Yet because its symptoms can mirror other issues, it is often overlooked, leading to repeat failures. Knowing ***how to spot and prevent*** *will help ensure an accurate diagnosis from the outset, and a right-1st-time vehicle repair for your customer.*

What is overspeeding?

Turbochargers are engineered to rotate at just the right speed for the application they fit - this can be upwards of 300,000 revs per minute. However, issues in the system such as leaks and wastegate restritctions or non-dealer remapping, can cause the turbo to spin faster than it was designed to do, pushing the unit beyond its safe operating limits. This can cause the turbo to spin out of balance and damage the turbine or compressor wheels and bearings. Over time, it can also overboost the engine, resulting in severe damage to its internal components, and sometimes complete engine failure.

What causes overspeeding?

- leaks, cracks or poor seals between the compressor and the engine – for example a worn shaft piston ring seal
- poor combustion – incorrect air and fuel mix
- non dealer engine modifications including chipping/ remapping
- a torn or completely detached air hose and/or restrictions in air intake filter or pipe work impacting the flow of air to the turbo
- split or damaged intercooler lines resulting in a loss of pressure and a boost leak
- worn fuel injectors allowing excessive fuel to be injected
- fitting the incorrect turbo
- restrictions in the wastegate or VNT mechanism causing it to stay closed at higher boost settings
- loss of signal to the REA (Rotary Electronic Actuator) SREA (Simple Rotary Electronic Actuator) for the VNT control

What are the signs of overspeeding?

- pitting or rippling marks on the back of the compressor wheel, otherwise known as the ‘orange peel’ effect, caused by the continual flexing of the material due to excessive centrifugal forces
- scoring to shaft journal surfaces and journal bearings – this is subsequent damage and often mistaken for oil contamination
- staining/discolouration of parts as a result of oxidation or increased heat – can be misdiagnosed as oil starvation
- engine running rich or lean due to disrupted or incorrect air-fuel ratio
- check engine light illuminated – if the boost leak is severe enough, the ECU might put the vehicle into ‘limp home’ mode
- noticeable lag in acceleration because of the boost leak
- whistling or whining noises due to leaks in the air

orange peel on back of compressor wheel

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- a snapped shaft due to the warped wheel rubbing against the housing – the break up of components can cause foreign object failure
- similarly, fatigue fractures to/breakage of inducer blades
- premature wear to turbo seals/bearings

How to prevent turbo failure due to overspeeding:

- avoid non-approved chipping or over-fuelling – any engine modifications should be performed by a specialist
- only ever fit the right turbo for the application
- check the entire air intake system including the air filter, hose and pipework, for leaks or wear that may restrict air flow – replace parts as needed
- inspect the intercooler lines for any wear or tear, and replace as appropriate
- check the seals are in good order – replace if needed
- ensure the wastegate or VNT mechanism is operating freely and is calibrated to OE specification
- check the electronic sensors and ECU are operating correctly
- only use engine oils as specified by the vehicle or engine manufacturer

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