HINO TRUCKS™
A Toyota Group Company

Tech Tip No:	09 - 014
Group:	17 – Intake & Exhaust
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ENGINE TECH TIPS

Subject:

OIL IN TURBOCHARGER AND AIR PIPING

1. RELEVANT MODELS:

2005 thru 2010 J05 and J08 Engines

2. CONDITION:

Oil is present in the turbocharger compressor wheel and air piping from slight residue to saturation in appearance.

Turbochargers are precision pieces of machinery which operate at high speeds using the heat of expanding exhaust gasses to boost intake manifold pressure. Turbochargers are often replaced by mistake for the following reasons:

- Low power complaint
- Oil leaks, residue or saturation
- Rotary Electric Actuator (REA) failure – Inactive or Active DTC's
- Noise

Most turbocharger failures result from poor maintenance, due to either dirty air filter and/or engine oil. Turbochargers are relatively simple devices and this simplicity should apply to diagnosing them as well.

3. PROCEDURE:

Low Power Complaint:

In cases where the engine performance is in question, the following is true:

a. If neither of the wheels rub on the housings, if the blades are not damaged, and if the shaft and wheels spin freely then **there is no reason to replace the turbocharger**. In these cases where performance is low and no fault lies with the turbocharger, the low power will likely be due to low fuel delivery, a restriction or leak in the intake or exhaust systems, or worn engine components (low compression).

b. The condition of the turbocharger relative to performance can be visually identified as shown in the following photos:

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Good condition **Bad condition**

- Good Turbocharger – The compressor blades are clean and straight. There are no large gaps between the compressor housing and the compressor wheel. No visible damage to blades. **This turbocharger should not be replaced.**
- Bad Turbocharger – Photo #2 shows the compressor wheel with bent and/or broken blades due to ingestion of foreign objects. This turbocharger should be replaced and the cause should be corrected.
- Bad Turbocharger – Photo #3 shows the compressor wheel blades with signs of erosion from dirt entering the intake air system. The blades are rounded off and there is dirt accumulation in the compressor inlet. This turbocharger should be replaced and the cause should be corrected.

***Normal* Oil Carryover:**

a. A condition that often leads to replacement of the turbocharger is the presence of oil in the compressor housing and/or at the hose connections of the inter-cooler system. For all 2008 – present engines, the oil vapors from the crankcase are vented into the turbocharger compressor from the crankcase breather. This venting will over time lead to the presence of oil residue in the turbocharger compressor housing, air pipes and the inlet to the inter-cooler. **An oil leak or seepage that is visible at the hose connections is NOT a sign indicating the turbocharger is defective.**

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b. Normal levels of oil carryover and seepage are shown in the following photos:

Normal oil carryover in the turbocharger compressor housing – oil residue and swirling is present

Normal oil carryover at turbocharger horn to inter-cooler

Normal oil carryover located in inter-cooler hose from turbo – some oil dripping may also be present

Normal oil carryover located at the inlet to the inter-cooler

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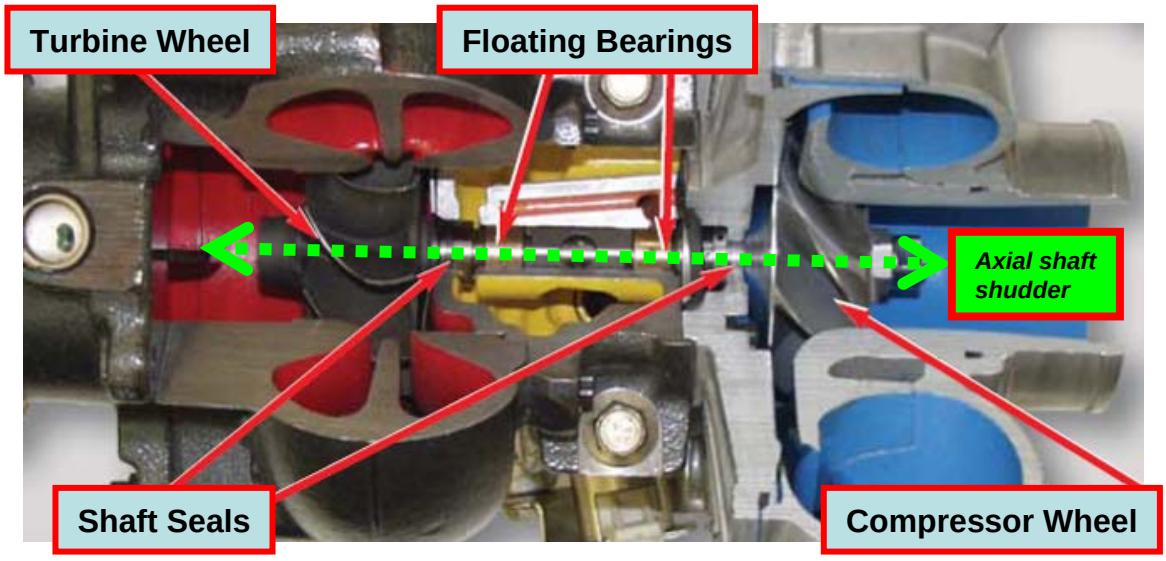
<u>Abnormal</u> Oil Carryover – or Excessive Oil Saturation:

a. Another condition that often leads to replacement of the turbocharger is the presence of **<u>excessive or heavy oil saturation</u>** in the compressor housing and/or at the hose connections of the inter-cooler system. In addition to the crankcase vapors as previously described, a poor running engine due to injector problems, bad fuel or compression variations will cause this condition.

b. The turbocharger used on all Hino engines utilizes a unique design of "floating bearings" and thrust washer style shaft seals. See the diagram below. Should the engine be running poorly due to injector problems, bad fuel or low compression, this will cause an imbalance in the turbocharger pressure differentials which will cause the shaft to shudder axially (as shown by green dashed line) which will cause oil to bypass the shaft seals and saturate the compressor wheel and intake pipes with oil. In most cases this condition is a result of a problem condition elsewhere. *<u>More than 90% of the turbochargers replaced under warranty for oil saturation had no problem with the turbocharger itself.</u>* **<u>Do not replace the turbocharger for oil saturation alone.</u>**



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c. Following are several photos of heavy or excessive oil saturation. As previously stated, **this condition is most likely the result of another problem** with the operation of the engine. **The turbocharger should not be replaced for oil saturation alone.**

d. Should a technician observe heavy or excessive oil saturation in the turbocharger and air pipes, proper diagnosis of the engine operating condition should be considered. Areas to consider inspecting for this condition are as follows:

- Injectors – i.e. injection quantity, correction balance, misfire or knocking
- Intercooler Hoses – i.e. inspect for leaks
- Air Filter – i.e. excessive inlet restriction due to dirty/blocked air filter
- Oil Level & Viscosity – i.e. possibly high oil level and reduced viscosity due to fuel dilution of oil
- Crankcase Breather – i.e. plugged crankcase breather

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Rotary Electric Actuator (REA) failure – Inactive or Active DTC's:

a. A turbocharger REA failure is generally associated with either a P0045 or U1123 DTC. In some cases the codes may be intermittent as noted by Inactive codes, and in other cases the codes may remain Active. In either case, a proper diagnosis is required. VNT tests and checks of electrical circuits and connections should be conducted per the procedures of the Hino Workshop Manuals prior to a turbocharger being replaced.

b. In most cases, either of the two trouble codes stated above are the result of an intermittent or active REA failure condition.

Excessive Noise:

a. Turbochargers have been replaced for noise concerns when the concern was an exhaust leak. Carefully inspect the exhaust manifold and turbocharger mounting gaskets. Check for any broken manifold studs.

b. If the turbocharger itself is responsible for excessive noise, expect to find wheel to housing rub, and bearing failure.

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