Portable Power

# Service Letter

**SL:** 40030
**Date:** 25 January 2013
**Product:** All Products
**Subject:** Turbocharger Troubleshooting Guide

**Visual And Mechanical Checks**

**⚠ WARNING**

**Turbochargers, operate at high speed and high temperatures. Keep fingers, tools and other objects away from the inlet and outlet ports. Avoid contact with hot surfaces.**

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Inspect the turbocharger exterior and installation. Listen for unusual mechanical noises. Visually check and test for leaks, blockage, high heat, restrictions or conditions that have allowed wheels to contact the housings. Leaks that are small and insignificant at idle or low power can greatly affect air / fuel ratios and pressures within the housing at full power. At full power, those leaks become problematic.

- Listen for unusual mechanical noise and watch for vibration.
- Listen for a high pitched noise that can indicate air or gas leaks.
- Listen for noise level cycling. It can indicate a restriction in the air cleaner or ducting.
- Inspect for missing or loose nuts, bolts, clamps and washers.
- Inspect for loose or damaged intake manifolds, exhaust manifolds, ducting and clamps.
- Inspect for damaged or restricted oil supply and drain lines.
- Inspect for cracked or deteriorating turbocharger housings.
- Inspect for external oil and coolant leakage; external dirt deposits (indicates air, oil, exhaust or coolant leakage.
- Inspect for obvious heat discoloration.
- Inspect the air filter for restrictions.
- Check the air charge cooler for dirt and debris.
- Check the wastegate for free movement and damage. Be sure that hoses are in good condition and that the connections are tight. Check the calibration and control system.

Remember that correcting these problems does not in itself remove any residues that were the indicators of the problem. The remaining residues often cause inaccurate turbocharger evaluation. Incorrect turbocharger evaluation may result after the situation has been corrected and the residues remain. For example, an air filter replaced just previous to your inspection would lead you to conclude that air blockage is not the problem even though the residue indicates blockage.

**Common Symptoms**

Turbochargers and engines have common problem symptoms. These include:

- Engine lacks power
- Engine exhaust smoke
- Oil consumption
- Noisy operation.

Any of these symptoms could be the result of an internal engine problem and might not involve the turbocharger at all.

The engine troubleshooting section provides details to determine the turbocharger condition and prevent unnecessary removal.

**Main Reasons For Turbocharger Failure**

- Lack of lubrication
- Contaminated oil
- High exhaust temperature
- Foreign objects
- Turbocharger problems

**Engine Troubleshooting**

Engine troubleshooting consists of several basic steps that should be taken before the turbocharger is removed from the engine. Any external or engine related faults found must be corrected before a replacement turbocharger is installed.

**Figure 1**

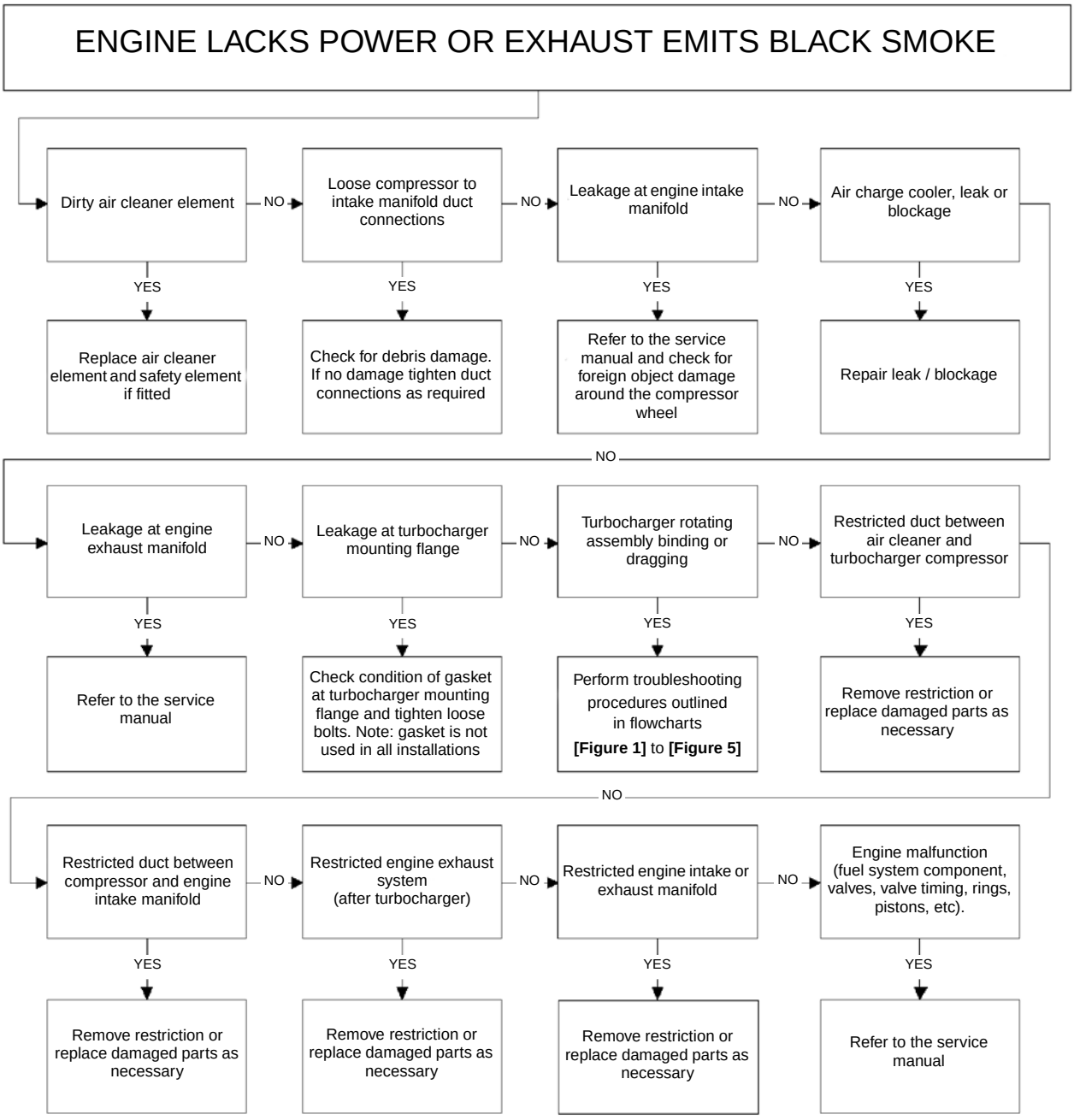
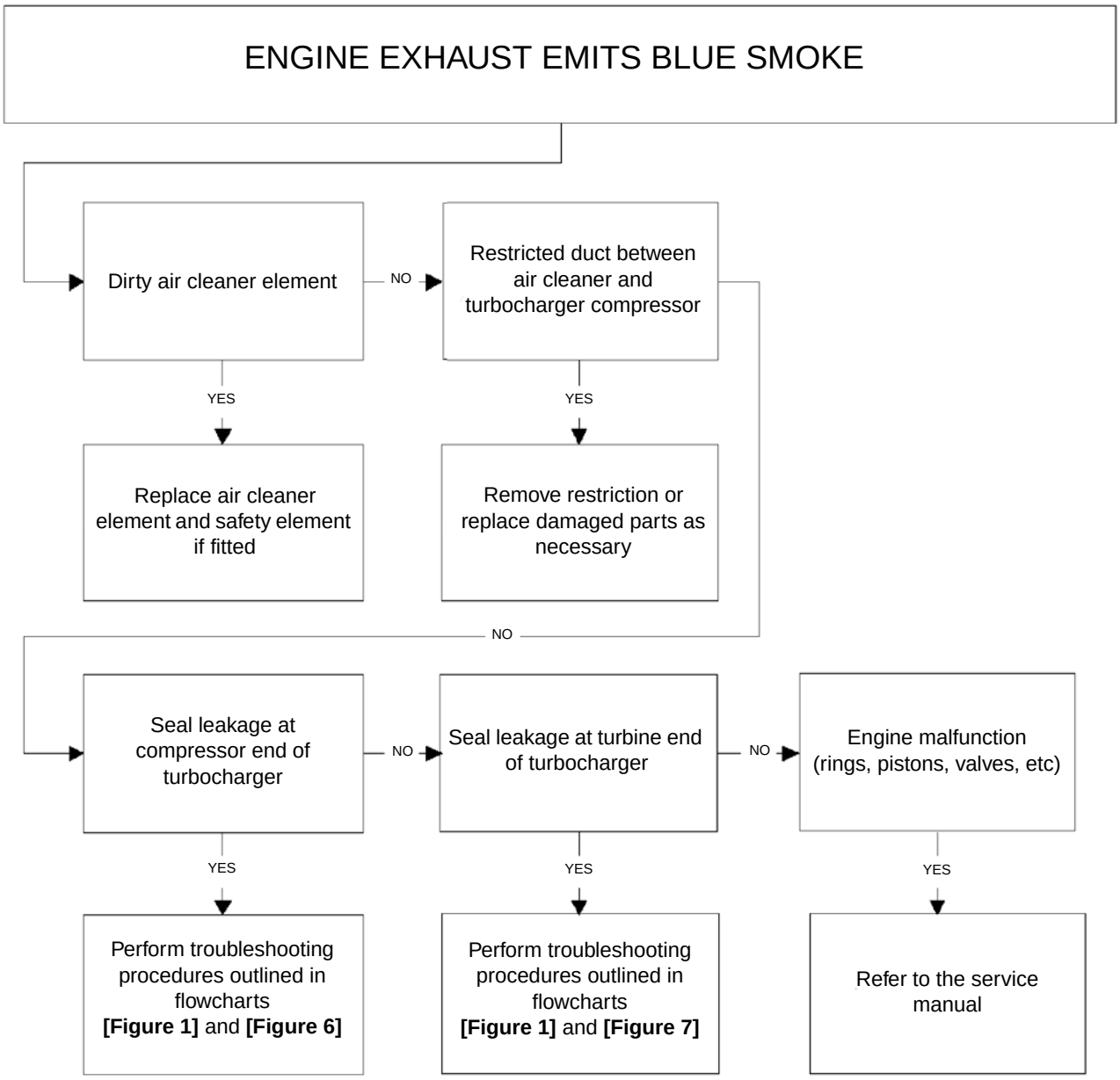

ENGINE LACKS POWER OR EXHAUST EMITS BLACK SMOKE
Dirty air cleaner element
NO
Loose compressor to intake manifold duct connections
NO
Leakage at engine intake manifold
NO
Air charge cooler, leak or blockage
YES
Replace air cleaner element and safety element if fitted
YES
Check for debris damage. If no damage tighten duct connections as required
YES
Refer to the service manual and check for foreign object damage around the compressor wheel
YES
Repair leak / blockage
NO
Leakage at engine exhaust manifold
NO
Leakage at turbocharger mounting flange
NO
Turbocharger rotating assembly binding or dragging
NO
Restricted duct between air cleaner and turbocharger compressor
YES
Refer to the service manual
YES
Check condition of gasket at turbocharger mounting flange and tighten loose bolts. Note: gasket is not used in all installations
YES
Perform troubleshooting procedures outlined in flowcharts [Figure 1] to [Figure 5]
YES
Remove restriction or replace damaged parts as necessary
NO
Restricted duct between compressor and engine intake manifold
NO
Restricted engine exhaust system (after turbocharger)
NO
Restricted engine intake or exhaust manifold
NO
Engine malfunction (fuel system component, valves, valve timing, rings, pistons, etc).
YES
Remove restriction or replace damaged parts as necessary
YES
Remove restriction or replace damaged parts as necessary
YES
Remove restriction or replace damaged parts as necessary
YES
Refer to the service manual

**Figure 2**




**NOTE: White smoke generally means the engine has water in the combustion chamber. Possible causes:**

- **Bad head gasket**
- **Cracked head**
- **Cracked block**
- **Internal leak in EGR cooler**

**Figure 3**

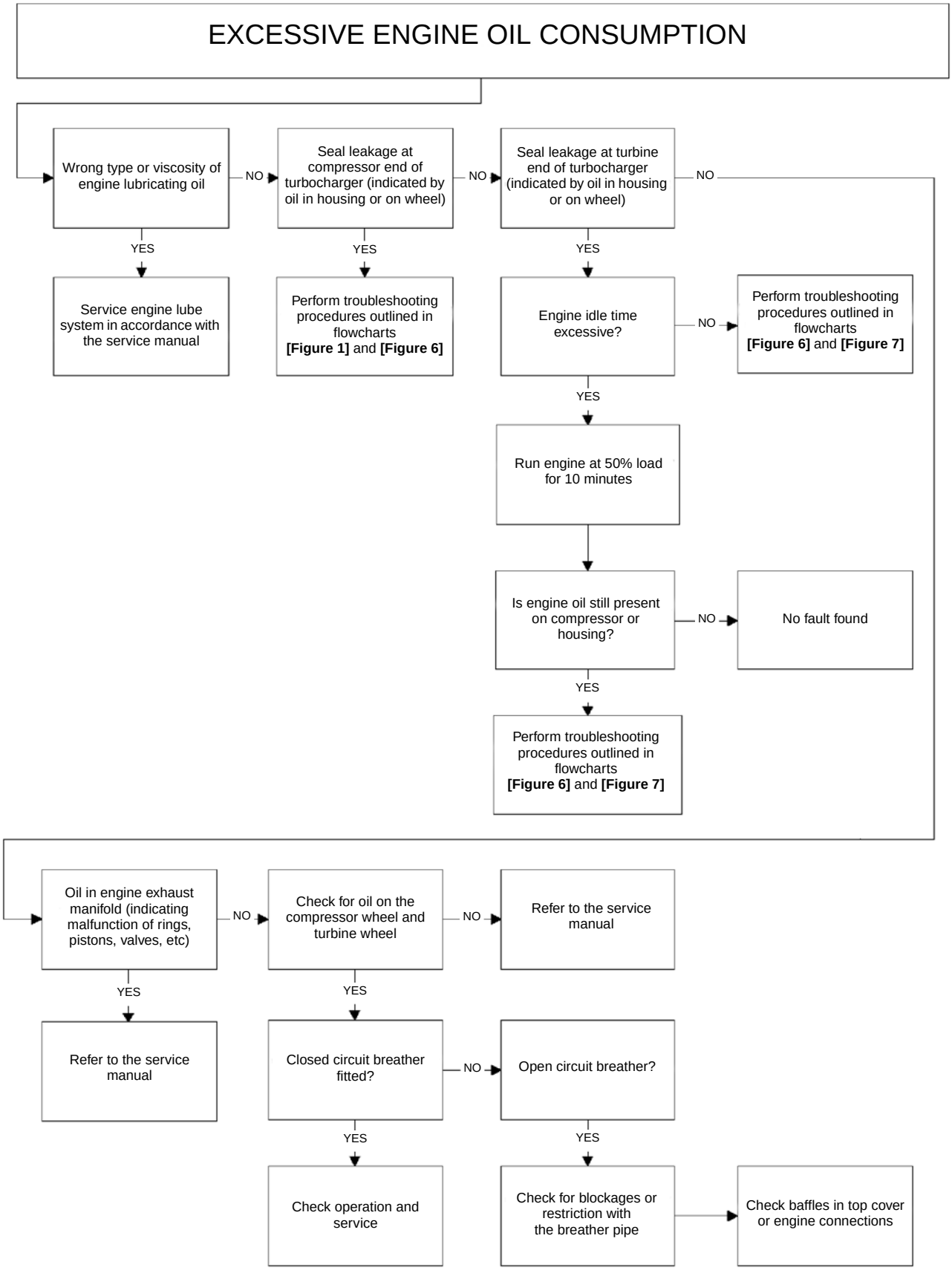

EXCESSIVE ENGINE OIL CONSUMPTION
Wrong type or viscosity of engine lubricating oil
NO
Seal leakage at compressor end of turbocharger (indicated by oil in housing or on wheel)
NO
Seal leakage at turbine end of turbocharger (indicated by oil in housing or on wheel)
NO
YES
Service engine lube system in accordance with the service manual
YES
Perform troubleshooting procedures outlined in flowcharts [Figure 1] and [Figure 6]
YES
Engine idle time excessive?
NO
Perform troubleshooting procedures outlined in flowcharts [Figure 6] and [Figure 7]
YES
Run engine at 50% load for 10 minutes
Is engine oil still present on compressor or housing?
NO
No fault found
YES
Perform troubleshooting procedures outlined in flowcharts [Figure 6] and [Figure 7]
Oil in engine exhaust manifold (indicating malfunction of rings, pistons, valves, etc)
NO
Check for oil on the compressor wheel and turbine wheel
NO
Refer to the service manual
YES
Refer to the service manual
YES
Closed circuit breather fitted?
NO
Open circuit breather?
YES
Check operation and service
YES
Check for blockages or restriction with the breather pipe
Check baffles in top cover or engine connections

**Figure 4**

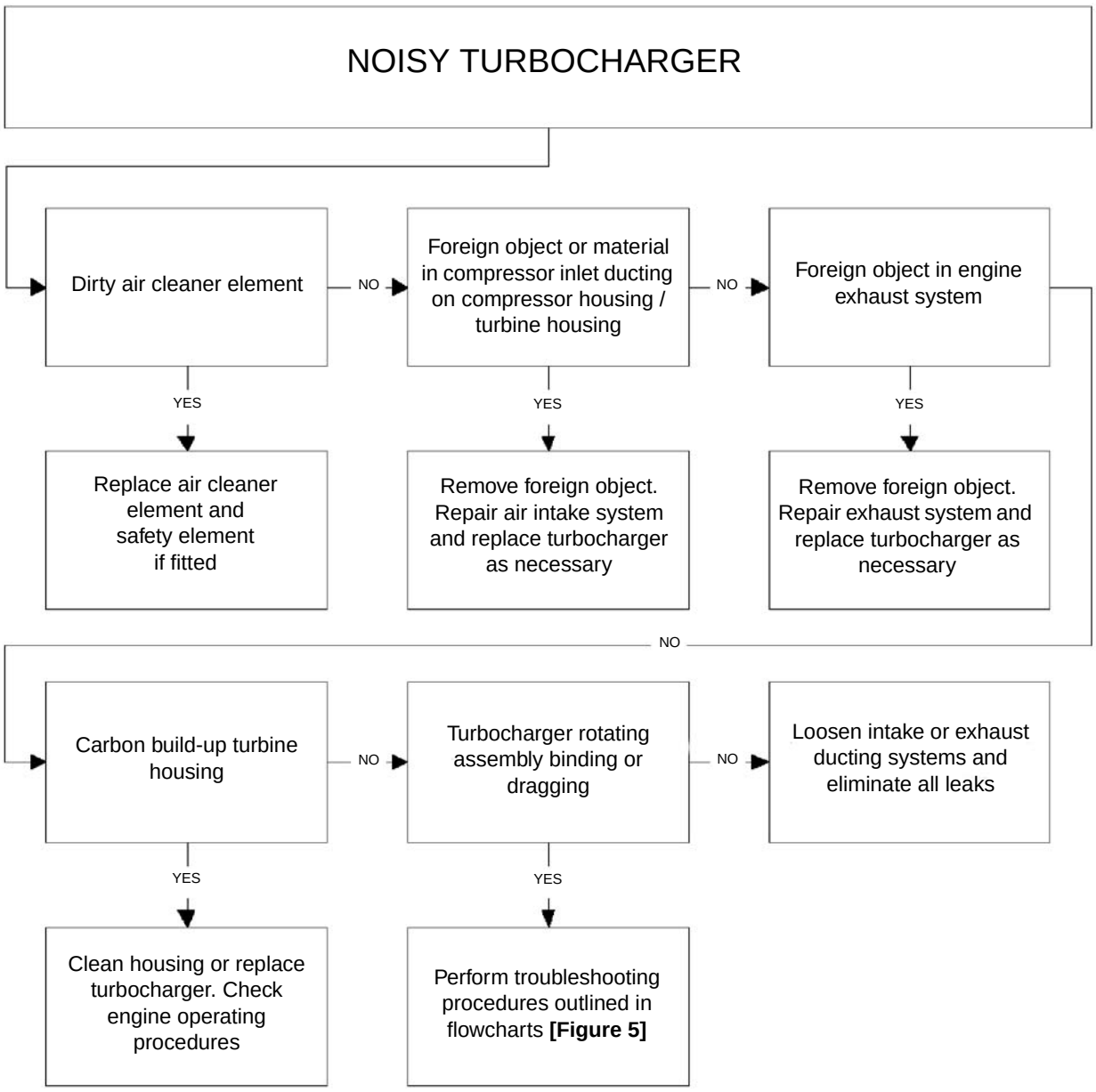

NOISY TURBOCHARGER
Dirty air cleaner element
NO
Foreign object or material in compressor inlet ducting on compressor housing / turbine housing
NO
Foreign object in engine exhaust system
YES
YES
YES
Replace air cleaner element and safety element if fitted
Remove foreign object. Repair air intake system and replace turbocharger as necessary
Remove foreign object. Repair exhaust system and replace turbocharger as necessary
NO
Carbon build-up turbine housing
NO
Turbocharger rotating assembly binding or dragging
NO
Loosen intake or exhaust ducting systems and eliminate all leaks
YES
YES
Clean housing or replace turbocharger. Check engine operating procedures
Perform troubleshooting procedures outlined in flowcharts **[Figure 5]**

**Figure 5**

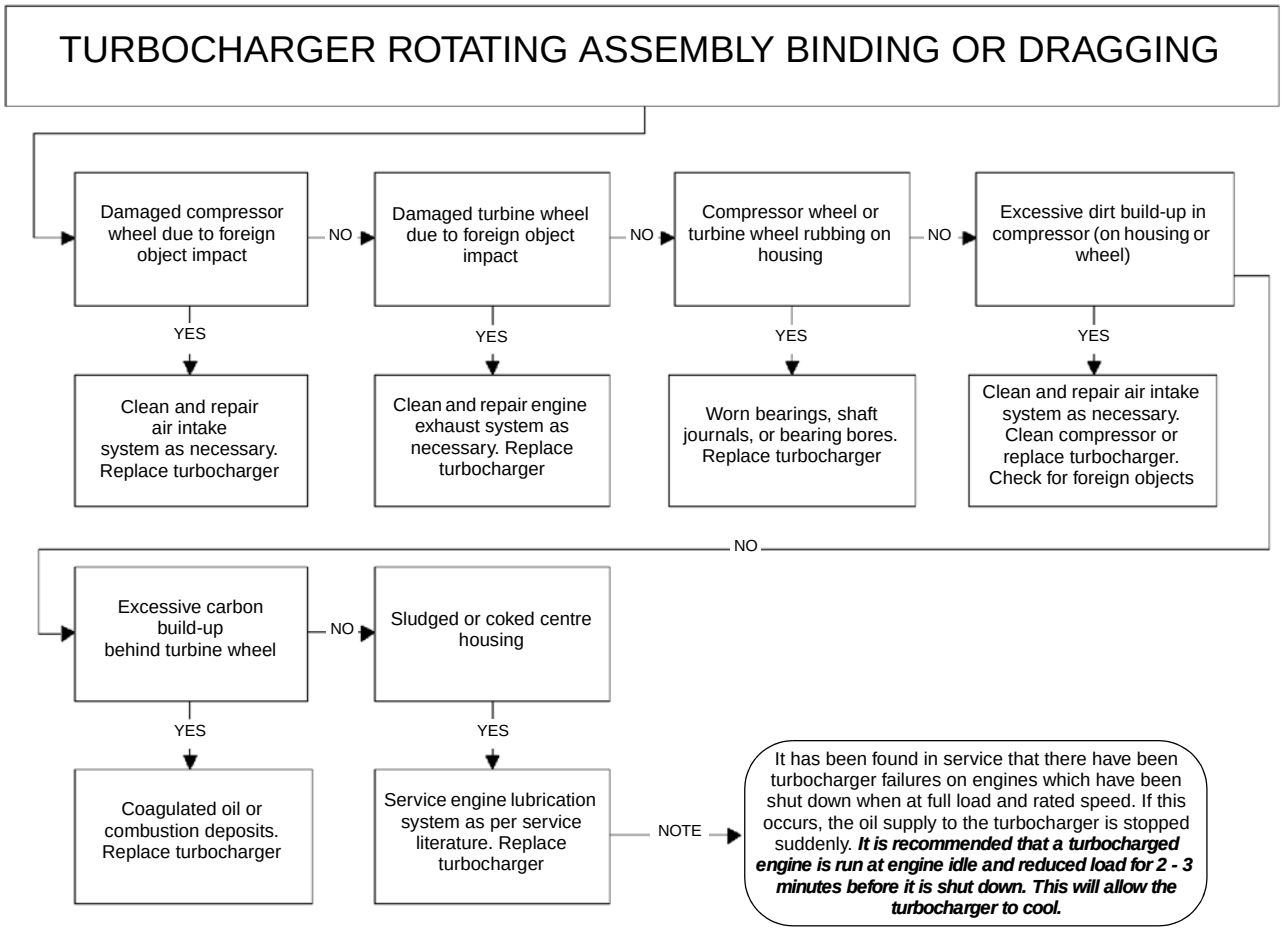



**Figure 6**

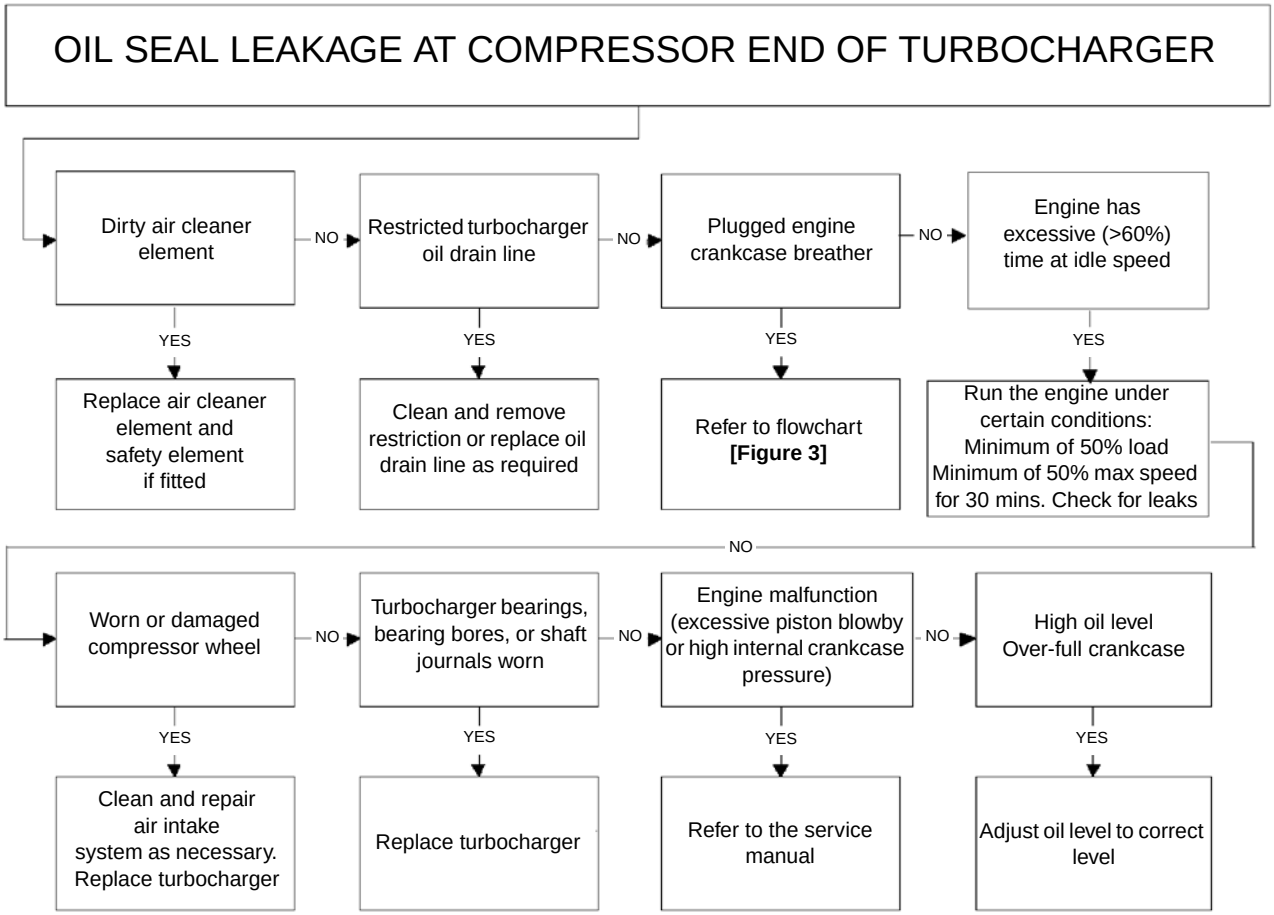
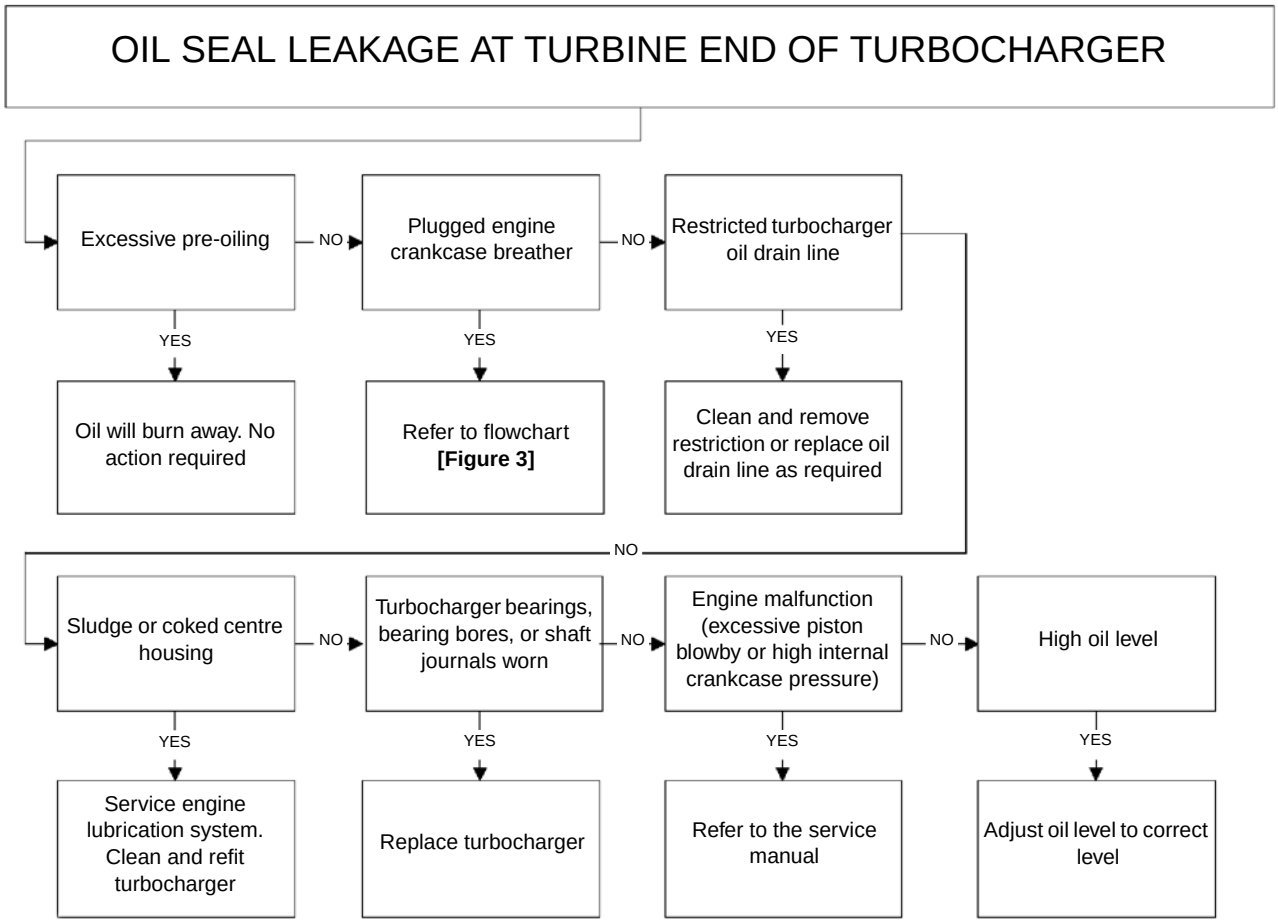


**Figure 7**




The following links point to turbocharger manufacturer websites where additional product specific information can be viewed:

- http://www.holset.co.uk/mainsite/files/4_3-Know%20your%20Turbocharger.php
- http://www.turbobygarrett.com/turbobygarrett/troubleshooting
- http://www.turbodriven.com/en/turbofacts/troubleshooting.aspx

**This letter is provided as technical information only and does not alter warranty coverage.**