CHECKLIST FOR INSTALLING TURBOCHARGERS

1. Inspect the intake and exhaust systems leading to and from the turbocharger to ensure absence of foreign material, including burrs and loose lining fragments.
    a. Be thorough – even small particles can cause sever rotor damage if inducted during high speed operation.
2. Use new and approved gaskets at the various air, oil and exhaust connections to the turbocharger
    a. Avoid the use of sealing or jointing compounds at all flanged connections.
3. Use a high temperature anti-seize compound (such as Fel-Pro C5A) on all threaded fasteners connected to the turbocharger.
4. Limit the drain port tilt to 20° from bottom center in either direction.
    a. Tilting in excess of this amount can create a low-idle leakage tendency at both the turbine and compressor seals.
5. Fill the oil inlet port to overflowing with clean engine oil before connecting the oil feed hose to the turbocharger.
6. If the clamp tabs or V-band are loosened for angular orientation of the compressor cover or turbine housing, be certain that the mating flanges are tightly reseated, and that the fasteners are retightened to the torque levels specified in the appropriate manual.
    a. Complete the orientation of the cover and housing before making any rigid connections to the compressor inlet and outlet, or to the turbine outlet; this will make certain that all ducting aligns closely with the turbocharger; this will minimize the external stresses acting on the unit.
7. Before connecting the oil drain hose, crank the engine without firing until a steady stream of oil flows from the drain port.
8. Operate the engine at low idle for at least three minutes after completing the installation of any turbocharger. This will prevent oil starvation damage to the bearing system, and will tend to purge any residual contaminants from the bearing housing prior to the unit acceleration.

NOTE: Warrant will be denied if the turbocharger is installed on any application not previously approved by BD Diesel Performance.

General Factors Affecting Turbocharger Service Life

An analysis of turbochargers removed from service indicates that approximately 40% of the troubles are due to foreign material going through either the turbine or the compressor. An additional 40% are due to lubrication failures. The remaining 20% are of a miscellaneous nature.

Come of the foreign material damage is the result of pieces of burned or broken valves and combustion cups going through the exhaust system into the turbine. Other turbine damage is due to casting fins that may break out of the manifolds and ports. Occasionally improperly installed gaskets will permit pieces of gasket to overhang a port and break off into the exhaust system. Damage due to the nuts and washers that are dropped into the exhaust system is also altogether too frequent. Occasionally engine suffer from scuffed and broken pistons. Pieces of these pistons will damage turbine wheels.

Compressor wheel breakage also occurs due to foreign material although not as frequently as turbine wheel damage. Sometimes pieces of the air cleaner will break loose and go through the compressor. There have also been instances where hose connections fail and pieces of rubber or wire reinforcing from the hose gets into the compressor wheel.

Again, carelessness in allowing nuts, bolts and washers to get into the intake system sometimes causes compressor wheel failures.

Lubrication failure may be any one of a number of types. Undersized or plugged oil lines are quite common. It is essential to have an adequate supply of oil at full engine oil pressure for turbocharger bearings. The turbocharger runs at very high speeds and will very quickly overheat with even a momentary failure of oil supply.

The oil supplied to the turbocharger should first pass through a good filter of adequate size so that there is always fill oil pressure at the turbocharger bearing. With an adequate supply of clean oil, turbocharger bearing will run for thousands of hours with no measurable wear.

Failure may occur due to extreme exhaust temperatures encountered in excessive altitude operation. Any engine that is operating close to its limits on exhaust temperatures at sea level will have excessive exhaust temperatures when operated at altitudes above 5000 feet.

Altitude operation will cause the turbocharger speed to increase and may cause failures due to over speeding as well as high temperatures unless the engines fuel system is derated according to the manufacturer's recommendations.

Inlet restrictions due to plugged air cleaners, collapsing hose connections, or undersized air pipes have the effect of reducing the air supply to the engine and result in excessive exhaust temperatures. Both inlet restriction and the excessive altitude operation can cause turbine wheel failures due to excess temperatures.

With any turbocharger, it is possible to accumulate enough dirt in compressor housing and diffuser to reduce the airflow capacity and the efficiency of the compressor if air cleaning system is not maintained. Reduced air flow will cause the engine to run hotter and may result in burned valves and pistons which in turn will cause turbocharger failure.

Leaking gaskets or connections on either the intake or exhaust system of the engine will cause a reduction in the air supply to the engine and will result in high exhaust temperatures.

Sometimes air connections and exhaust connections are made in such a manner that thermal expansion of the exhaust manifold and other parts connected to the turbocharger will produce very high loads on the turbocharger. These high loads result in housing distortions that cause the compressor and turbine wheels to rub.

Excessively heaving piping that is supported only by the turbocharger may also cause distortion.

Turbocharger mounting that are not sufficiently rigid to prevent excessive vibrations in the turbocharger can also cause distortions and failures.

In conclusion it can be stated that every few turbocharger failures would occur if no foreign material were permitted to enter either the turbine or the compressor; if precautions were taken to prevent excessive exhaust temperatures, and if the turbocharger were always supplied with an adequate amount of clean oil.

IMPORTANT SAFEGUARDS

WARNING:

Misuse or modification of the turbocharger can result in serious injury and property damage. Basic safety precautions including the following should always be followed.

1. Read and comply with all instructions including “Checklist for Installing Turbochargers” before installing or using turbochargers. Read “General Factor Affecting Turbocharger Service Life”. (Contact BD Diesel Performance for any additional copies).
2. Install turbocharger only on an engine which has been approved for such application (check BD Diesel Performance Catalog). The turbocharger is a precision built product which has been matched and test for the intended application.
3. Do not modify or substitute any parts of turbocharger. Do not remove metal from any part of the turbocharger.
4. Disassembly and reassembly should done only in accordance with the appropriate set of the instructions provided with the turbocharger.
5. Do not modify or substitute any parts of the engine except in accordance with the engine owner’s manual. Do not modify engine fuel control system or restrict exhaust system or inlet excessively.
6. Do not operate at excessive altitudes (consult engine owner’s manual for altitude restrictions).
7. Be sure that oil supply and drain line are adequate (see “Check List for Installing Turbochargers”).
8. Always warm up engine for 2-5 minutes to allow oil to reach the turbocharger before operating under load.
9. Performance all maintenance specified by the engine manufacturer each time or at intervals maintenance is recommended by the engine manufacturer. Concurrently inspect turbocharger for any deficiencies described in the “General Factors Affecting Turbocharger Service Life”, and correct all observed or suspected deficiencies before operating the engine and/or turbocharger.
10. SAVE THIS LIST OF IMPORANT SAFEGUARDS, THE ENGINE OWNER’S MANUAL, “CHECKLIST FOR INSTALLING TURBOCHARGER”, AND “GENERAL FACTORS AFFECTING TURBOCHARGER SERVICE LIFE”.