

DIRECTORATE GENERAL BORDER ROADS
GENERAL MAINTENANCE INSTRUCTION NO 187
ON
GENERAL HANDLING, MAINTENANCE AND CLEANING PROCEDURE FOR
TURBOCHARGER FITTED ON DIESEL ENGINES

Introduction

The diesel engines operating in high altitude areas loose power due to lack of Oxygen in air. To improve the efficiency, turbochargers are fitted to diesel engines to help draw more air. The turbochargers operate at high speed with the help of exhaust gases and need proper care and maintenance, to achieve full life and optimal power from diesel engines.

Aim

To lay down general handling, maintenance and cleaning procedure to achieve optimal performance from diesel engines fitted with turbochargers

Action by

- (a) USER UNITS - To carry out periodic inspection, handling, maintenance and cleaning tasks is laid down.
- (b) FIELD WORKSHOPS - To check the correct functioning, serviceability and maintenance during its repair and inspection.

Details

Details of handling, maintenance and cleaning procedure have been tabulated in Appendix 'A' to this instruction.

Conclusion

Correct handling, maintenance and cleaning procedure of turbochargers would improve the performance of diesel engine fitted with turbocharger deployed in high altitude area where there is generally shortage of oxygen.

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HANDLING PROCEDURE

- 1.1. Plug all opening in the turbo charger while handling, transporting or shipping to prevent the entrance of foreign material.
- 1.2. Before installation, prime the lubrication system of the turbocharger by adding clean filtered engine oil being used for eqpt into the oil inlet connection. Rotate the shaft and check for interference of the compressor or turbine wheel in the housing.
- 1.3. All connections to the turbocharger (manifold and piping) must be clean and free of foreign materials since serious damage to the turbocharger or engine could result, All connection must be air tight,
- 1.4. Install the turbocharger support brackets, if provided to relieve excess stress on the turbocharger inlet flange and exhaust manifold. Exhaust stacks extra long length and other fixtures should not be rigidly attached to the turbocharger, if extended stacks are used, they should be supported by hood. Exhaust stack must be higher than intake stack.
- 1.5. When handling or transporting a unit, the exhaust stack should be covered

CAUTION

Airflow requirement for diesel-turbocharged engines are considerably greater than for a non-turbocharged engine of the same size running at the same speed. Air inlet accessories such as pre-cleaners must be selected to minimize the restriction at this higher airflow and to maintain performance of the turbocharger unit.

OPERATION AND MAINTENANCE

- 2.1. When starting turbocharged diesel engines do not fully advance, the engine speed control lever or pedal immediately. Run the engine at part throttle or at low engine idle speed for a few minutes to allow through distribution of the lubricating oil or till completion the oil circulation system. The machine should not be placed under load until normal oil pressure is reached.
- 2.2. When turbocharged diesel engine has been storage for 30 days or longer, when an engine has been overhauled, or when a new turbocharger has been installed on an engine the following must be done before starting the engine:-
 - (i) Remove the oil inlet tube from the turbocharger.
 - (ii) Pour approximately five ounces of engine oil into the turbocharger core assembly
 - (iii) Re-install the oil inlet tube. The above precaution provides initial lubrication for the turbocharger bearings before engine oil pressure is built up.
- 2.3. Engine oil as recommended by the manufacturer, is to be used in all turbocharged engine, oil drain and filter change periods are as stated in operators manuals. Use of oil other than recommended will cause slogging and will damage it.
- 2.4. New engines are "run in" at the plant; therefore, all new engines are shipped without a turbocharger oil inlet screen. It is recommended that an oil inlet screen be installed in the turbocharger after an engine overhaul.
- 2.5. **Check air cleaner oil level** – Daily or at each trip, check oil level in oil bath air cleaner to be sure that the level is at indicated mark. Add oil if necessary, This is especially important if the oil bath cleaner is the only cleaner on the engine (Ref para 1 page 3-20 of

operation and maintenance H AND NH series diesel engine Cummins Bulletin No 983373-B
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2.6. **Clean Pre-Cleaner** – An engine working under extremely dirty conditions and air pre-cleaner may be used, clean daily or often as necessary dependent on operating conditions.

2.7. **Clean composite type cleaner element** – Composite type air cleaners feature two-stage air cleaning. In the first stage, centrifugal cleaning action deposits dust into a dust cup or fix at the bottom of the cleaner. The second stage is a dry type paper element, which catches remaining dust particles. Empty the dust cup or fix daily or at each trip if necessary. Clean the paper element with compressed air when air restriction exceeds maximum permissible limits.

NOTE

The maintenance operation must adjust to suit each engine application according to degree of dust concentration.

CAUTION

Do not damage paper element while cleaning, Breaks regardless of size, render element useless.

2.8 **Clean dry type cleaner element** – The paper element I a using a compressed air jet to blow off the dirt. Be sure that you do not hold the jet too close to the paper element or you may tear it. When you install the element make sure it seats on the gasket at the air cleaner cut let end.

CAUTION

Any holes in the element of a dry type air cleaner render the cleaner in operative and damage to the engine will result.

2.9 **Clean crank case breather**

(a) **Oil bath type** – Immerse the breather in kerosene or cleaning solvent wash thoroughly. Dry with compressed air. Fill the breather oil cup to the level indicate with oil of the same grade as used in the engine.

(b) **Horse hair element** – crank case breathers with horse hair element are used on turbocharged engines. Clean element by washing in cleaning solvent and drying with compressed air.

(c)

TURBOCHARGER CLEANING PROCEDURE

3.1 In the event deposits are discovered, the deposits should be removed and compressor impeller wheel and housing should cleaned. Cleaning should be done with a petroleum solvent and not with a chemical detergent cleaner. Do not use caustic solution or solvent that will attack aluminum. The removal of the deposits is to protect the engine and the turbocharger. All deposit must remove from the impeller wheel and housing so that balance of the rotation assembly will not be affected. Do not rest turbocharger weight on compressor wheel or end of shaft. Because of the high speed of the turbocharger rotating the assembly, turbocharger bearing and turbocharger failure.

3.2 Remove the compressor housing to prevent deposits and cleaning solvent from entering the engine intake system and facilities cleaning of the impeller wheel.

3.3 The safest cleaning procedure is to loosen the biggest portion of the deposits by using a non-metallic scraper scrapping thoroughly brush all deposits from the impeller a suggested combination cleaning tool would be a nylon bristle brush with the handle field square for scrapping purposes. Never use wire bristles or scraper.

- 3.4 Re-assemble the housing to the turbocharger.
- 3.5 Operate the turbocharger for a short period of time at low engine idle speed to remove any deposits which may have fallen into compressor housing. Do this before connecting the compressor discharge outlet to the engine intake manifold to prevent deposits and solvent from entering the engine.

IMPORTANT POINT /TO AVOID THE DAMAGES/PREMATURE FAILURE THE TURBOCHARGER ENGINES

- 4.1 The first 5 to 25 hours of operation of a newly overhauled engine used with screen. As this engine can clog with carbon that is normally suspended in the oil of a diesel engine. This clogging will "starve" the turbocharger bearings of oil and thus bring about premature bearing failure.
- 4.2 It is important to operate the engine at ½ throttle (no load) for three to five minutes before final shut down after operating under load. This will aid in the cooling of both the engine and turbocharger, thus minimizing the possibility of damage.
- 4.3 Crank the cap screws hold down nuts, air connection and oil connections and from the turbocharger for tightness periodic intervals. Re-torque after initial warm up following assemblies of these parts. Hoses and oil lines should be inspected and replaced when necessary.
- 4.4 Cover the exhaust stack to prevent water from entering and damaging the turbine during shut down periods.
- 4.5 When the air cleaner hose is removed at the filter change periods, check the compressor wheel for deposits, damaged beading, interference or excessive end play.
- 4.6 At 500 hours, intervals remove the compressor housing, inspect and clean if necessary.
- 4.7 It is advisable to allow exhaust manifold to cool before removing them from the engine thus will prevent warper.
- 4.8 When installing the turbocharger on the mounting flange, a liberal application of never seeze or a comparable compound should be applied to bolts or studs to provides easier future removal or to avoid damage and excessive.

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