

Chapter 3 Maintenance

1 Technical Maintenance

Considering that the engine is used under normal working conditions, the maintenance intervals stipulated are determined. When working in extremely adverse conditions, it is recommended that the planned maintenance should be executed at shorter intervals.

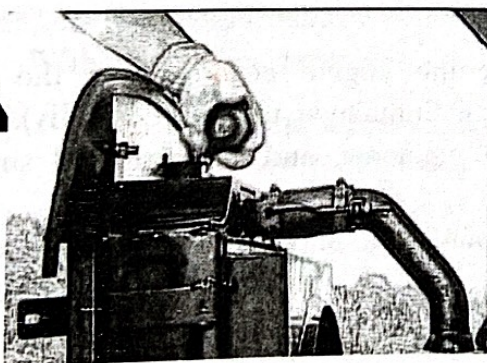
Maintenance intervals stipulated are divided into four maintenance periods.

- 1.1 Daily Maintenance: Every 8 to 10 hours.
- 1.2 Class I Maintenance: Every 50 hours (about 2000 km for vehicles).
- 1.3 Class II Maintenance: Every 150 hours (about 6000 km for vehicles).
- 1.4 Class III Maintenance: Every 900 to 1000 hours (about 35000 km for vehicles)



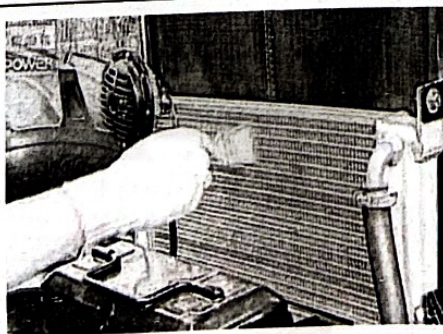
For the turbo-charged and turbo-charged with intercooler diesel engines, the period should be shortened by 20%

2 Daily Maintenance (After 8 to 10 hours)

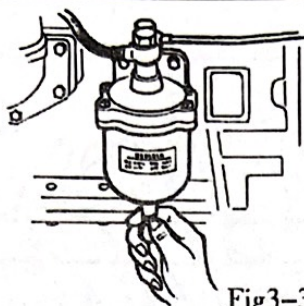


2.1 Before starting the engine every day, check whether the oil level in oil sump and injection pump without pressurized lubrication is correct. Refill the oil if necessary. Pay attention to check whether there is water in oil.

2.2 Check the coolant level in the radiator, refill them if necessary (see Fig3-1).



2.3 Clean sundries and dust on radiator grille. Remove the dust and oil outside the engine. For the engine used for tractors, do clean them at any time (see Fig3-2).



2.4 Drain the water from filter element with drain cock, and sedimentation filter (see Fig 3-3).

Fig3-3 Drain the Water



2.5 Check and retighten all fastening screws. Correct any fuel, water gas leak found (see Fig3-4).

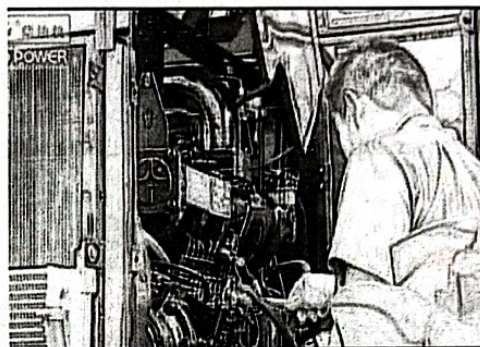
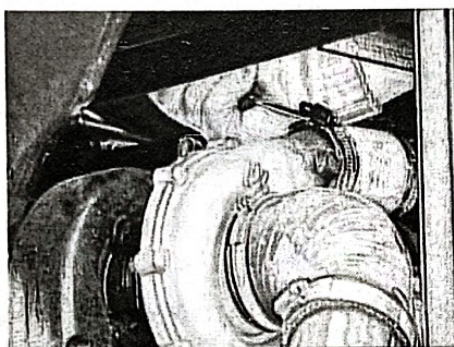
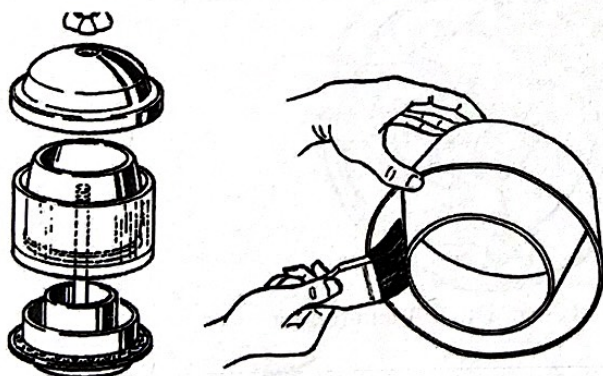


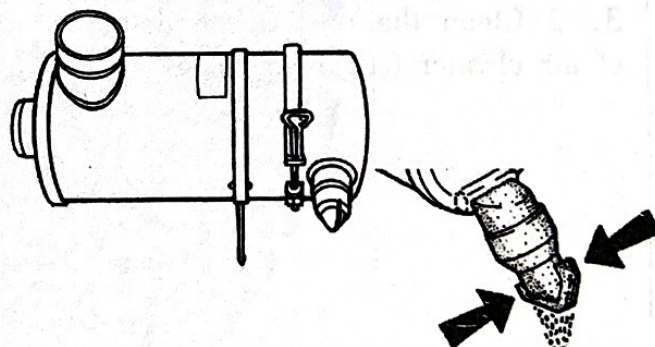
Fig 3-4 Check the Leaks

2.6 Air Cleaner

2.6.1 Clean the dust accumulator of oil bath air cleaner.



2.6.2 Clean the drain valve of dry air cleaner.



For the engines under the special conditions, cleaning time should be shortened. Recommended cleaning time is listed in Table 3-4.

Table 3-4 Recommended Cleaning Time

Harvesters	Every 4 hours
Tractors	Every 6 hours
Construction machinery working in mines with more dust	Every 4 hours
Machines working in general condition	Every 8 hours

3 Class I Maintenance (after 50 hours)



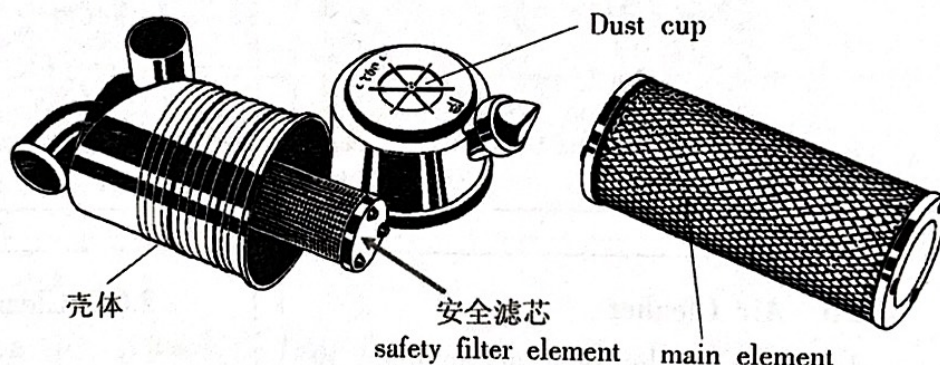
3.1 Perform all the items in Daily Maintenance.



3.2 Clean dry air cleaner

Do not wash the dry paper filter element with water, diesel oil or gasoline. Be careful not to touch the paper filter element, and sealing ring should not forget to be installed in order to avoid air filter damaged. For the air cleaner with safety filter element, do not remove the safety filter element during operation and maintenance so as to avoid excessive wear due to broken main element. Replace the main element immediately when finding it out broken (including safety filter element).

3.2.1 All the junction parts of dry oil filter must be reliable. Do not go on working when any breakage happens.



3.2.2 Clean the dust accumulator of air cleaner (see Fig3-5).

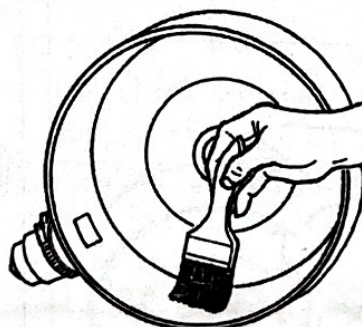


Fig 3-5 Clean Dust Accumulator

3.2.3 The filter element can be cleaned by finger tapping the upper and lower covers. Clean the dust on filter element with brush, or use compressed air along the pleats to blows the dust from inside to outside, and then from outside to inside, and finally from inside to outside (see Fig 3-6).

The filter element installation sees section 4 in chapter 3

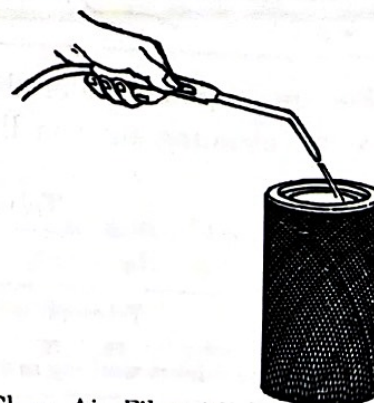
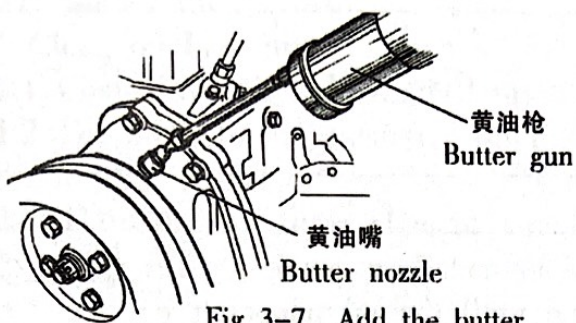


Fig 3-6 Clean Air Filter Element



3.3 Add the butter of 15g to water pump bearing (see Fig 3-7). For maintenance free water pump, does not to add the butter.

Fig 3-7 Add the butter



Running the engine with failure is prohibited. Pay a special attention to observe and hear abnormal noise and vibration, and watch whether the smoke color is normal. If finding out the failure, correct them immediately.



3.4 Measure the degree of tightness of fan belt. Press the belt between water pump and generator by hand. The deflection should be 10-20mm. Adjust belt tension if necessary by changing the position of the generator (see Fig3-8). Do not use the new and old one or different brands together.

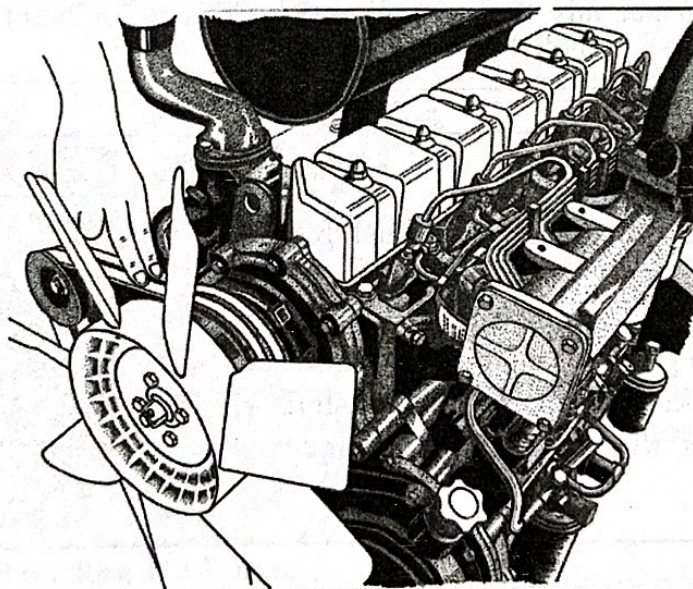


Fig 3-8 Check Belt Tension



3.5 For the first Class I Maintenance of a new or overhauled engine, change the lubrication, and clean the oil sump and air filter. Check the torques of main bolts and nuts. Check and adjust valve clearances and fuel supply advance angles. For details, please see section 4 and 5 of chapter 3.

4 Class II Maintenance (after 150 hours)



4.1 Perform all the items in Class I Maintenance.



4.2 Warm up the engine until the oil temperature reaches 50~60°C. Unscrew the oil drain plug to drain the oil (see Fig3-10). Add cleaned diesel oil to clean the oil sump, and then drain them. Refill new oil after tightening the screws.

Fill the new lubrication.

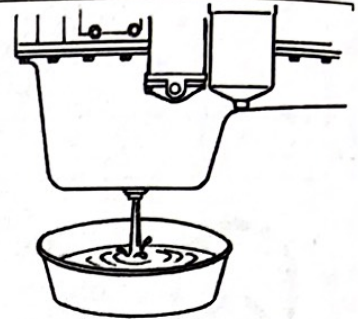


Fig 3-10 Drain the Oil



The used oil should be properly dealt to prevent pollution of the environment.

Pay attention to prevent hot injury by hot oil when adding.



Do not mix the new oil with old oil or different brands oil together.



4.3 Replace diesel fuel filter element: remove single use filter element with special tools (see Fig3-11). Before installing new filter element, daub a thin coat of oil on the sealing ring, then fix with the unloading torque.

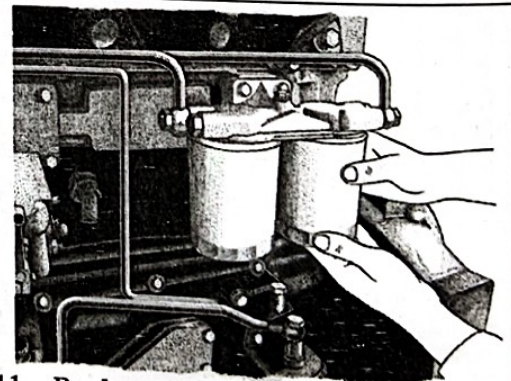


Fig3-11 Replace Diesel Fuel Filter Element



4.4 Replace spin-on oil filter element; remove oil filter with special tools. Daub a thin coat of oil on the sealing ring of new filter, and install new filter until the filter can be firmly connected with the sealing ring (see Fig3-12). For some filters with paper filter element, filter element is only replaced.

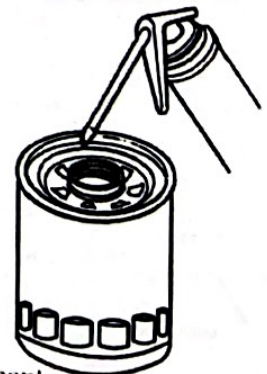


Fig3-12 Replace Oil Filter Element

4.5 Clean air filter

4.5.1 Clean oil bath air cleaner

4.5.1.1 Change the oil in oil bath air cleaner. Add the oil to the specified level.

4.5.1.2 For oil bath air cleaner, wash the filter element assembly with diesel oil or kerosene until it is clean.

4.5.1.3 Marinate the filter element assembly with engine oil. Make the engine oil adhere to the filter element, and then install it.

4.5.2 Replace filter element of dry air cleaner

4.5.2.1 Take out the old filter element. Clean the filter shell and its dust cup with clean wet cloth (see Fig3-13).

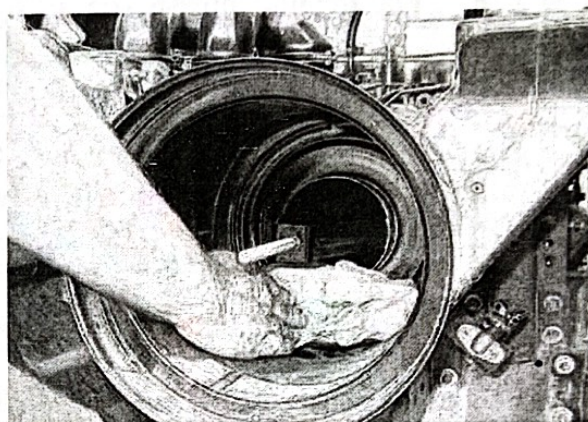
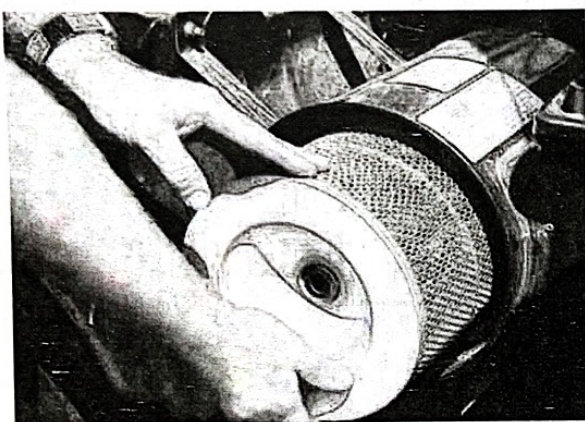
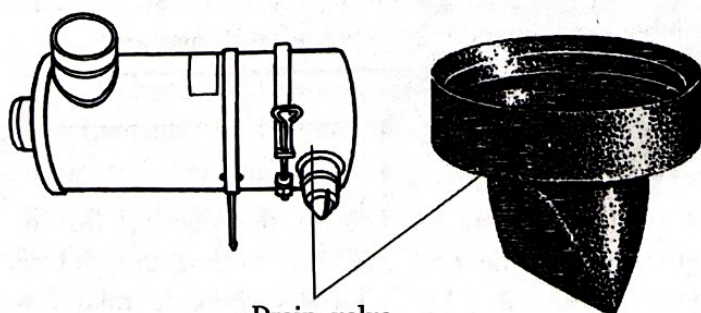


Fig3-13 Clean the Shell and Dust Cup



Fig3-14 Rubber Ring Installation

4.5.2.2 For a new filter element, check the elasticity and leak tightness of rubber ring. Press the rubber ring by hand, and make it reliably be connected to filter element (see Fig3-14).



Drain valve
Fig3-15 Drain Valve

4.5.2.3 After installing the filter element, check the drain valve. If any breakage occurs, replace it immediately (see Fig3-15).



4.6 Check the injection pressure and quality of sprayer (see Fig3-16). The opening pressure of J series fuel injection is 19.6 MPa to 20.8MPa. The opening pressure of P series fuel injection is 25 MPa to 26MPa. Clean the soot and adjust the pressure if necessary.

When nozzle is blocked, it must be replaced. It is suggested that all the jobs are finished by the professionals.

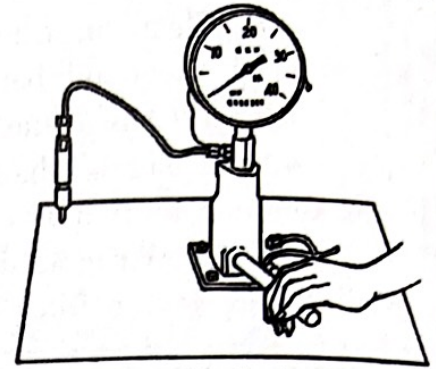


Fig3-16 Check the Injector



4.7 Check and adjust the fuel supply advance angle of the injector. For details, please see section 5 of charter 5.



4.8 Check and adjust the clearances of exhaust valve and intake valve. The clearance of intake valve is 0.3mm to 0.4mm, the clearance of exhaust valve is 0.4mm to 0.5mm. For details, please see section 2 of charter 5.



4.9 Check and tighten all screws and nuts with specified torques. For details, please see section 1 and 2 of charter 5.



4.10 Check the leakage of intake pipe and exhaust pipe of air compressor. Check and clean the dirt on the exhaust valve and intake valve. Check the leakage. Remove the faults. The profile of the air compressor sees Fig 3-17.

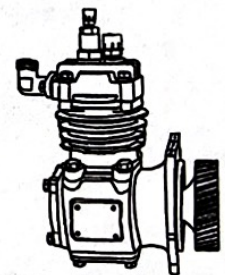


Fig 3-17 Air Compressor

5 Class III Maintenance (after 900 hours)



5.1 Perform all the items in Class II Maintenance.

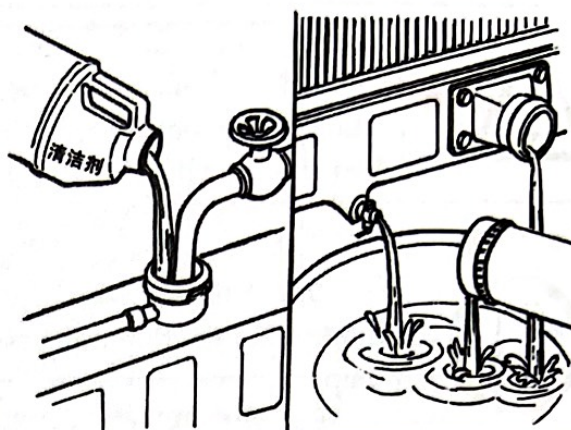
If the users could not independently finish them, it is suggested that the Class III Maintenance jobs are finished by specialized agency.



5.2 Wash and Clean the Cooling System

The scale deposit in the cooling system can cause the cooling failure of diesel engine. Remove it regularly. The general method is that the detergent is poured into the cooling system to wash them. The detergent is mixed with 750g caustic soda and 150g kerosene. Washing the cooling system as fol-

lows: Fill the detergent into engine as coolant. Run the engine at middle speed for 5~10 minutes. Stop the engine. Restart the engine after making the detergent stay at the engine for 10~12 hours. Let off the detergent after running the engine at middle speed 15~20 minutes. let the engine run at middle speed 15~20 minutes after refilling the clean water. Drain the water in the engine.



5.3 Remove the cylinder head. Clean the soot on the valve. Replace the valve oil seal (see Fig3-18).

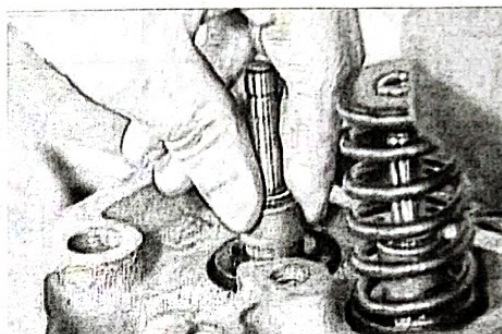


Fig3-18 Clean the Soot



5.4 Check if there is the cinch marks on the liner and piston. Check if the clearance of piston ring is correct (see Fig3-19).

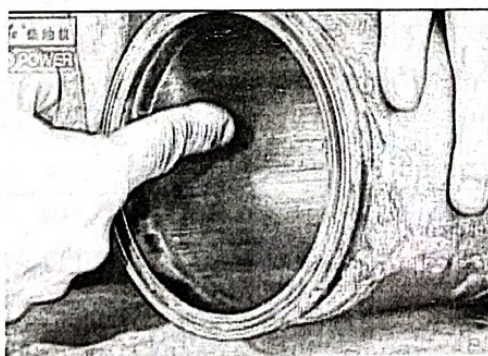


Fig3-19 Check Liner and Piston

5.5 Check crankshaft, main bearing and connecting-rod bearing shell. Replace it if the wear of cinch marks is bigger (see Fig3-20).

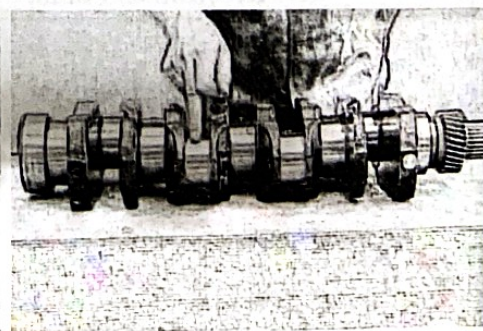
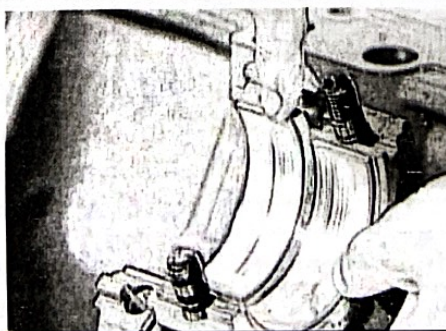


Fig3-20 Check Crankshaft, Main Bearing and Connecting-rod Bearing Shell



When performing the class III maintenance, if any part of the piston, piston ring, liner, main bearing and connecting-rod bearing shell has been replaced, do not operate the engine until rerunning-in the engine is finished completely according to the specified procedure.



5.6 Check water leakage of water pump. Change the water sealing of water pump as necessary (see Fig3-21).

For details, please see section 6 of charter 5.

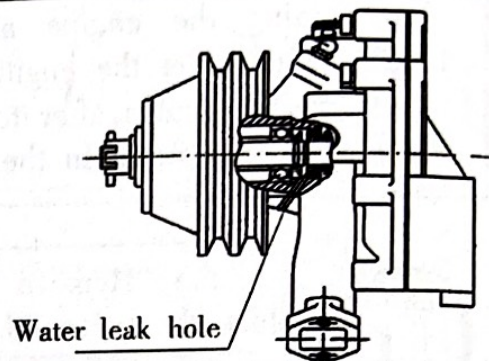


Fig 3-21 Check Water Leakage

6. Turbocharger



The turbocharger maintenances should be carried out with the engine maintenance.

6.1 Daily Maintenance

Tighten the connection between the turbocharger and the engine. Look for oil seepage and leakage gas, and correct them. Check if the cushion at the connection flange between the turbocharger and exhaust pipe is breakage. Replace it as necessary. Keep outside the turbocharger clean. The structure of the turbocharger sees Fig3-22.

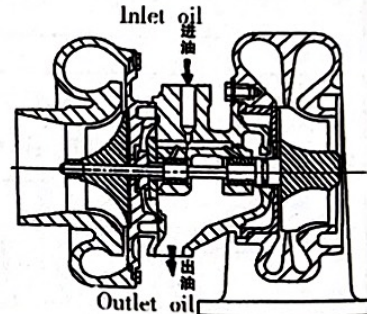


Fig 3-22

6.2 Turbocharger Regular Maintenance



The regular Maintenance of the turbocharger is performed when the Class II Maintenance of the engine is carried out.

It is suggested that the maintenance of the turbocharger is carried out by professionals.



Do not dismount and adjust the turbocharger by laypeople.
Do not allow something to go into the intake system and exhaust system when checking the turbocharger.



6.2.1 Replace filter element of the turbocharger: dismount oil filter with special purpose tools. Daub a little bit oil on sealing ring. And then make the new filter be installed firmly (see Fig3-23).

Turbocharger filter element

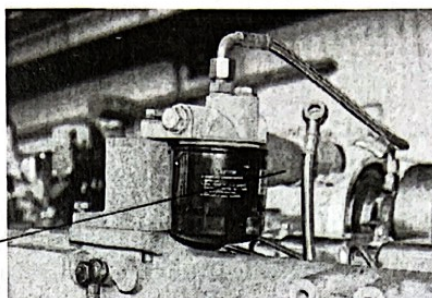


Fig3-23 Turbocharger Filter Element

6.2.2 Wash the intake connector pipes, compressor impeller and compressor shell. Clean the soot in the impeller and turbine casing.

6.2.3 Check the moving parts in the turbocharger. Turn the rotor moving with finger. If the rotor can move some revolutions by inertia force, it is considered moving flexible. If the rotor rotates roughly and knocking noise is heard, find out the cause and correct it.

6.2.4 Check the axial displacement of rotor shaft. If the axial displacement is more than 3mm, which shows that the wear of thrust bearing in the turbocharger is bigger, find out the cause and correct it.

6.2.5 Check the radial displacement between compressor impeller and casing. Press the impeller in radial direction by hand. If the displacement is over 0.1mm, find out the cause and correct it.

6.2.6 When the engine run at the idle speed, unscrew the oil drain connector of the turbocharger. Observe if the lubrication flows through the turbocharger. Check and reinstall it if necessary.

7 Maintenance in Winter Season

In winter season (ambient temperature below 5°C), it is difficult to start the engine due to the cooler engine block and stickier oil. The oil in the transmission system and running gears of tractors, vehicles and construction machinery will become stickier due to low temperature. This will cause higher resistance. Therefore, the engine operation and maintenance must be carried out more carefully when the engine runs at the low temperature



When the ambient temperature is below 60°C, do not let the engine run at the full load just after starting.

7.1 Cooling System

7.1.1 The engine should use coolant with antifreeze additives in winter season.

7.1.2 Before starting the engine without antifreeze additives, fill the cooling system with 60~70°C hot water, and then with 90~100°C hot water until the water flowing out at the water drain cock. Fill the radiator with 60~70°C hot water, and then start the engine.

7.1.3 During operation, the coolant temperature should not be below 60°C. If the engine without antifreeze additives is to be stored for a long period of time, drain the cooling system when the coolant temperature reduces at the 50~60°C.

7.2 Lubrication System

Use winter lubrication oil in winter season. When the ambient temperature is below -10°C , turn on the switch to preheat the engine for about 30 seconds before starting.

7.3 Fuel Supply System

Use winter fuel in winter season. Keep rain, snow or dirt away from entering fuel system. If the water in the fuel tank is found out, drain the fuel system completely to prevent fuel line choked due to freezing. Refill the fuel tank with new fuel.

8 Storage and Maintenance

Use the following procedures to store the engine for over 3 months.

8.1 Turn the crankshaft several revolutions so that the surface of moving parts are equably coated with oil film.

8.2 Drain out the fuel, oil and coolant, including the oil in the injection pump, oil bath air filter.

8.3 Remove the trash, dust and rust outside the engine. Smear anti-rust oil on the unpainted parts and jointed points.

8.4 Plug the air intake, exhaust port and oil filler to prevent something entering the engine.

8.5 Store the engine in dry, clean and good ventilation place. There are no corrosive gases nearby. If the engine is stored outside, cover it with plastic sheet.



For a long period of storage, make a through examination, and run the engine at middle speed and accelerator for 3 to 5 minutes every half a year so as to maintain the moving parts with oil film. Restore the engine with specified requirements.