

## One. Precautions

1. Adjustment and maintenance should be made according to the procedure specified in this manual during operation of the engine.
2. Running the engine at high speed or with high load immediately after start is strictly forbidden. It is recommended to run the engine at low speed with no load first then gradually increase to high speed and full load.
3. Diesel fuel should be clean. Before use, it should be thoroughly precipitated over 72 hours.
4. Keep water at normal temperature of 75~95°C. You must first open the radiator, then let the cooling water out, open the switch attached on the cylinder block at last.
5. Normal lubricating oil pressure should be 200~400kPa.
6. Load of engine should be strictly controlled, no overload is permitted. Otherwise, the reliability and service life of the engine would be affected.
7. Run in the engine at medium speed and low load for 30 minutes at least after renewing or replacement of injector. Before fitting, the nozzle couple should be cleaned in kerosene or light diesel fuel to remove the coating of rust-resistance.
8. A new engine or overhauled engine should be running in gradually.

## Two. Operation

1. Fuel, lubricating oil and cooling water

Fuel: Grade of light diesel fuel is to be chosen according to local seasons and temperature. Fuel should conform to Chinese standard GB252<Light fuel for diesel engine>. (See the following Tab)

Recommendation: Use marked diesel fuel which sulfur content is lower than 0.5%. If the sulfur content is higher, it will shorten the replacement period of fuel.

Fuel use and precaution

before use; it should be thoroughly precipitated over 72 hours. Then use the clean fuel without water and impurity.

**Warning:**

- (1). Run in the engine, infuse fuel is forbidden.
- (2). No smoking when infuse fuel.
- (3). Use clean oil pipe and not spread out.
- (4). Clean the exuded fuel. Put the materials with fuel to a safe place.

1. Lube oil should conform to Chinese standard GB11122<Lube oil for diesel engine>. Oil viscosity is greatly affected by temperature. Grade of lube oil is to be chosen according to temperature.

## 2. Cooling water

It is recommended to use rain water, tap water or clean river water. Hard water (well or springiest.) should be softened, if they are used. Boiling up is a common practice to soften the hard water. After precipitation and removal of impurities, the softened water may be used as cooling water. When the engine operates in cold weather the cooling water is liable to freeze, antifreeze should be added to the cooling water. Common antifreezes are glycol or alcohol.

Precaution:

The antifreeze has a characteristic of the larger volume the higher temperature, so the quantity of cooling medium is 5%~6% less than the total capacity of the cooling system.

Glycol—toxic antifreeze, should pay more attention when use. The boiling point of glycol is 194.4°C. The water existed in the antifreeze is easily evaporated, so you should add proper alcohol after a period.

You should often remove the scale deposits when you're not using the antirust antifreeze.

After a long period of operation, scale deposits will form on surfaces of water jacket space, which will affect heat radiation of engine, so periodic removal of scale deposits should be made as follows:

1. Smear machined surfaces with grease to prevent any corrosion. Fill water jacket space with a solution of hydrochloric acid (HCL) of 25% concentration, keep it for about 10minutes and then drain it off. Then blow—wash with fresh water. Repeat it again if not thoroughly cleaned.
2. Fill water jacket space with a solution of caustic soda (NaOH) in a ratio of 1 liter of water to 78~80 grams of caustic soda. Then start the engine and run it at medium speed for about 10 minutes. Keep the solution in the water jacket space for 10—12 hours. If not thoroughly cleaned, repeat it again.

The filling of cooling water and Precaution:

1. Fill the cooling water to the marked point
2. Close the valve after effusing the cooling water
3. Screw down the filling head
4. Start the engine and run to normal temperature till the opening of thermostat(the water pump get warmer when cycle)
5. After first run-in, stop the engine and check the fluid level.

## Three. Preparation before operation

1. Before the first start of new engine, check the mounting of engine for reliability. Be sure that all control handle are in good order.
2. Check to see whether the oil level in the oil sump and injection pump is between the upper and lower limit mark on the dipstick.
3. Check the capacity of the fuel tank, open the valve and make the fuel flow to the injection pump, remove the air from the fuel system.
4. Check the battery and the connections of electric system. Check the electrolyte level in the battery.
5. Check the cooling system and full of cooling water.
6. The engine should be placed in a warmer place in cold weather. In the fieldwork, must fire the oil sump and fill hot water for two or three times before starting the engine.
7. Be sure the clutch is disconnected when start the engine.

#### **Four Starting**

Before starting, make sure that all preparations has finished and affirmed, the clutch is disconnected. As the following steps:

1. Pull the lock switch and start the engine. Every time for starting should be less than 5 seconds in order to protect the engine and battery. If failed, wait 2 minutes and start. If the engine still fails to start after three consecutive starting operation, it is necessary to check causes. After remedy has been done, start the engine again.

Once the engine starts, release the start key, and pull the lock switch back.

1. Check the oil pressure after start the engine. Under idle operation, the oil pressure should not be lower than 0.05Mpa. Check the oil level in the sump 5 minutes after the starting of engine and fill oil, if necessary, make sure the oil level lies between the upper and lower mark lines on the dipstick.
2. Within one minute after starting, check the water temperature immediately to affirm the cooling system in normal operation.

#### **Five Operation of engine**

1. Running the engine with full load immediately after start is strictly forbidden, gradually warm the engine at low and medium speed.
2. Always regard the oil pressure and water temperature when in operation. The oil pressure should be 0.2~0.4MPa(2~4kgf/cm<sup>2</sup>) at rated output. It is feasible that the outlet water temperature near the 80~90°C.
3. During operation, observe the gauges and check the operating conditions of the engine from time to time. If any abnormal noise is noted, stop the engine for check. Allow start the engine after finding out the cause.

4. Observe the sealing conditions of the connections of oil/water pump. If there's leakage, remove immediately.
5. During operation, the charging generator should be in charge operation for charge of the battery and the pointer of ampere meter should point to "+".
6. A new or overhauled engine should not be running at full speed and full load after running 50~100 hours.

### **Six Stopping**

- Before stopping, reduce the load gradually and let the engine run at idle speed, take out the switch key.
- When the weather temperature is below 5°C, after the engine has stopped, it is necessary to drain out the cooling water completely in order to prevent subsequent cracking of cylinder block because of freezing.
- Remove the fault during operation immediately after stopping and make necessary check. Check/maintain engine and remove faults are the basic requirements of keep the engine running in normal, avoid badly fault and gain good economic benefit.