KAWISE

DIESEL ENGINE

OPERATION MANUAL

Direct Injection,
Fuel-efficient & Easy Start

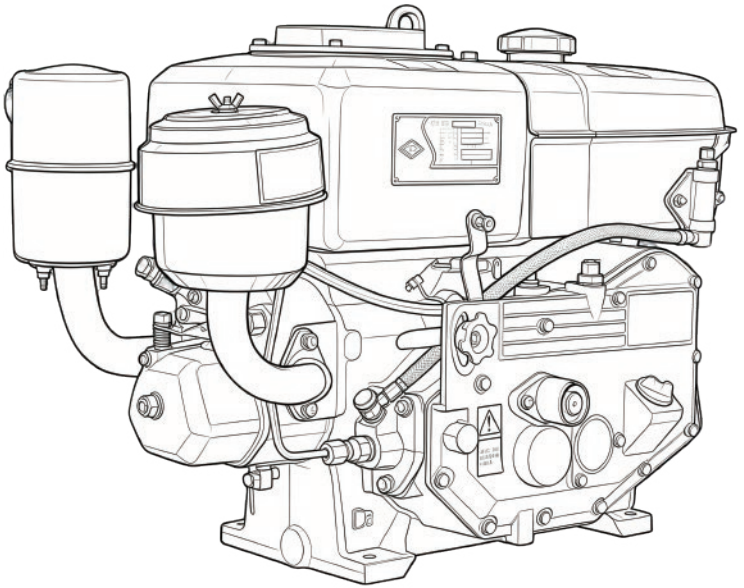

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TABLE OF CONTENTS

I.Overview

This series of small agricultural diesel engines adopts a brand-new direct injection fuel system with sufficient power, economical fuel consumption and stable operation. It also features smooth startup, simple installation and effortless daily maintenance.

The engine can serve as supporting power for various agricultural machinery, including feed pellet machines, straw cutters, grain cracking machines, hammer mills and wood crushers.

Standard operation and regular maintenance can effectively extend the service life of the complete unit, cut operating costs and eliminate potential safety hazards. Please read this manual thoroughly, operate and maintain the machine in strict compliance with specifications to guarantee the equipment maintains optimal running performance in the long term.

SAFETY WARNINGS

Failure to comply with the following precautions will void the product warranty and may result in equipment damage, serious injury or death.

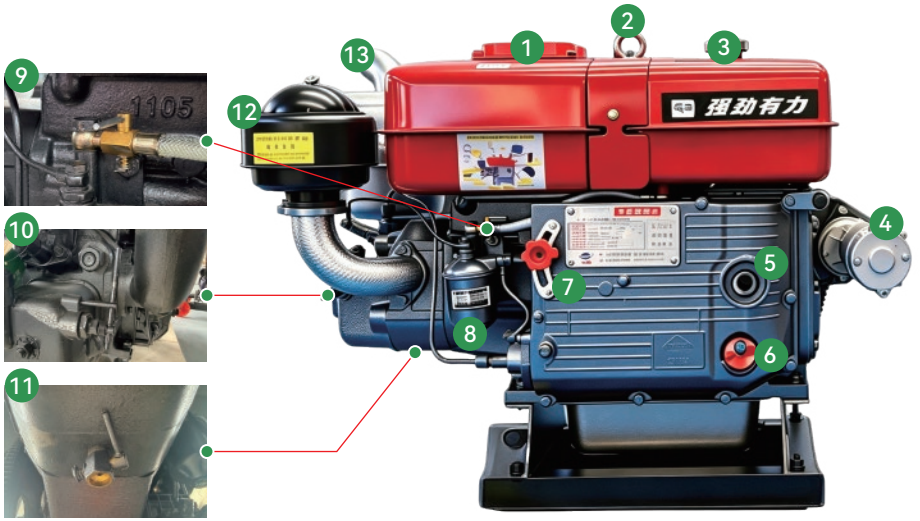
- **New Engine Break-in:** Run the engine for 30 hours under break-in conditions. Do not operate at full load or in harsh environments during break-in. After break-in, change oil, retighten cylinder head nuts, and adjust valve clearances before normal use.
- **Operation Limits:** Operate only at rated power on the nameplate. Do not overload, overspeed, or run continuously at low load/low speed. After starting, idle at low speed for 3-5 minutes and check oil pressure. Do not run at high speed/load immediately after starting.
- **Maintenance:** Understand engine principles; perform regular maintenance. Do not run with known faults or leave unattended. Do not stop via decompression unless in an emergency runaway situation.
- **Cooling System:** Do not use dirty/saline water in the radiator; do not run with boiling coolant. In temperatures below 0°C, drain coolant immediately after shutdown to prevent freezing damage.
- **Fuel & Lubricants:** Use only specified diesel and oil grades. Allow fuel to settle/filter; keep fueling tools clean. Change oil regularly; service the air cleaner (clean, maintain, replace filter as needed).
- **Exhaust Safety:** Do not run in enclosed spaces; ensure adequate ventilation.
- **Component Safety:** Prevent water from entering intake/exhaust valves. The flywheel nut must be tight; looseness can damage the crankshaft/flywheel and cause injury. Use caution when servicing the flywheel.
- **Personnel Safety:** Keep children, the mobility-impaired, and epileptics away from the work area. Do not operate if unwell or under the influence of alcohol.
- **Fastener Checks:** Regularly inspect and retighten all bolts.
- **Fire Safety:** Stop the engine before refueling. Use only specified fuel; never use gasoline. Clean up spills immediately; keep flammables away from the engine.
- **Rotating Parts Hazard:** Keep hands/body/clothing away from fans, pulleys, etc., while running. Stop the engine before maintenance; do not operate with guards removed.
- **Burn Hazard:** Mufflers, exhaust pipes, and radiators are extremely hot during/after operation—do not touch. Use caution when draining hot fluids; let the engine cool before draining coolant.
- **Starting Handle Safety:** The handle disengages automatically after starting; keep a firm grip to prevent injury.

II. Main Technical Parameters and Structural Drawings

1. Main Technical Specifications

Model	180	192	195	1100	1105	1110	1115	1125	1128	1130	1132	1135
Engine Type	Horizontal, Single-Cylinder, Water-Cooled, 4-Stroke, Direct Injection											
Cylinder Bore (mm)	80	92	95	100	105	110	115		125	130	132	135
Piston Stroke (mm)	80	90	115					120				125
1-Hour Power (kW)	5.66	9.70	10.6	12.1	13.3	14.7	16.1	18.7	21.8	22.1	22.6	26.4
Rated Power (kW)	5.15	8.82	9.7	11.03	12.1	13.2	14.7	17	19.8	20.1	20.6	24
Rated Speed (r/min)	2600		2200									
Piston Displacement (L)	0.402	0.598	0.815	0.903	0.996	1.093	1.193	1.473	1.473	1.590	1.659	1.789
Compression Ratio	21:1	18:1	17 : 1									
Mean Effective Pressure (kPa)	540	570	650	670	663	661	672	679	748	688	691	695
Specific Fuel Consumption (g/kW·h)	≤258.4	≤244.8	≤244.8	≤246.2		≤244.8	≤242.1			≤252.1		≤245
Cooling Method	Water Evaporative Cooling											
Starting Method	Hand Crank / Electric Start											
Injection Pressure (MPa)	18.5 ± 0.5							20 ± 0.5				
Overall Dimensions (L×W×H, mm)	615×330×445	690×380×530	864×412×639			867×440×699		880×466×730				900×480×750
Net Weight (kg)	60	95	140	160	165	180	185	190	200	215	220	230
Intake Valve Clearance (Cold, mm)	0.15 ± 0.05	0.20 ± 0.05	0.35 ± 0.05									
Exhaust Valve Clearance (Cold, mm)	0.15 ± 0.05	0.20 ± 0.05	0.45 ± 0.05									

2. Structural Drawing



1. Water Filling Port
2. Lifting Eye for Installation
3. Diesel Filling Port
4. Electric Starter
5. Hand Crank Hole
6. Engine Oil Filling Port
7. Speed Control Handle
8. Diesel Filter
9. Fuel Tank Valve
10. Pressure Reducing Valve
11. Water Tank Drain Hole
12. Air Filter
13. Muffler

III. Selection of Pulley Dimensions

When a diesel engine is matched with other working machinery, the selection of pulley dimensions directly affects the operating condition of the diesel engine and the production efficiency of the working mechanism. The pulley dimensions can be selected according to the following formulas:

$$D_1 = \frac{D_2 \times N_2}{N_1}$$

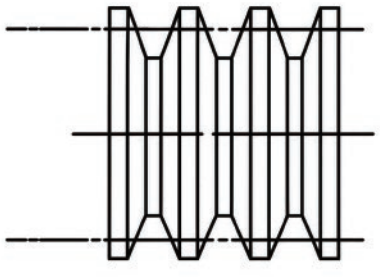
$$D_2 = \frac{D_1 \times N_1}{N_2}$$

Where:

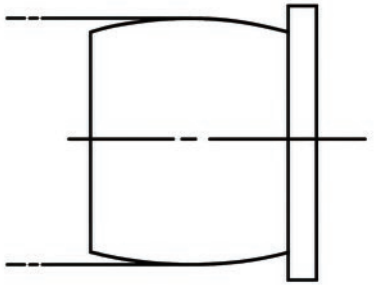
- D1: Pitch diameter of the diesel engine pulley
- D2: Pitch diameter of the working machine pulley
- N1: Rotational speed of the diesel engine
- N2: Rotational speed of the working machine

When the diesel engine leaves the factory, according to the user's needs, it can be supplied with one V belt pulley, with a pitch diameter of 125 mm, for matching use.

There is also one flat belt pulley, with a diameter of 130 mm. The user can choose according to the required matching use, and whether it will be supplied should be confirmed when placing the order.



V-belt Pulley



Flat Belt Pulley

IV. Operation and Adjustment of Diesel Engines

1. Pre-operation Preparation

Two preparatory tasks must be completed before starting the diesel engine:

General Inspection

- Check that the connecting bolts and nuts of all major components are securely fastened (cylinder head, engine base, flywheel).
- Verify that all moving parts operate smoothly.
- Inspect the valve clearance, fuel injection advance angle, and nozzle atomization quality.
- Ensure the lubricating oil circuit and fuel oil circuit are unobstructed.

Adding Lubricating Oil, Diesel Fuel, and Cooling Water

Adding Lubricating Oil:

- Use No. 30 diesel engine oil in summer and No. 20 diesel engine oil in winter.
- Pull out the oil dipstick and pour clean lubricating oil into the crankcase **(Figure 1)**. Add approximately 2.5 kg of oil so that the oil level in the crankcase is midway between the two marks on the dipstick **(Figure 2)**. Note: Do not exceed the upper mark when adding oil, and the level must not drop below the lower mark during operation.
- Set the speed control handle to the stop position. Turn the decompression handle clockwise with the left hand to place the diesel engine in the decompression state; at the same time, insert the starting crank into the starting shaft and crank the diesel engine, gradually increasing speed. Observe whether the red indicator on the oil valve of the cylinder cover rises. A rising indicator means the oil pump is working normally. If not, the oil level may be insufficient or the oil pump may be faulty, requiring careful inspection and maintenance.

Adding Diesel Fuel:

- Use No. 0 light diesel oil in summer and No. -1 or No. -2 light diesel oil in winter.
- Open the fuel tank and pour clean diesel fuel that has been fully settled and filtered in advance into the tank **(Figure 3)**. Take care not to introduce dust when refueling.
- Open the fuel tank valve. Diesel fuel will flow through the diesel fuel filter to the injection pump **(Figure 4)**.
- Use an open-end wrench to loosen the air bleed screw on the injection pump or the fuel line connection bolt to release air trapped in the fuel line. Tighten the screw/bolt only when the diesel fuel flowing out is free of air bubbles **(Figure 5)**.

1

Adding Engine Oil


2

Measuring Oil Level with the Dipstick


3

Adding Diesel Fuel


4

At the Fuel Tank Switch


5

Loosen the Fuel Injection Pump Air Bleed Screw to Vent All Air

Adding Cooling Water:

Pour water into the water tank until the red float indicator reaches its highest position. Do not use dirty water or hard water (such as well water), as this will cause water passage blockage and water tank corrosion **(Figure 6)**.


6

Adding Water

2. Starting

After completing the above preparatory work, perform a thorough inspection, then start the engine according to the following steps:

Hand Crank Starting

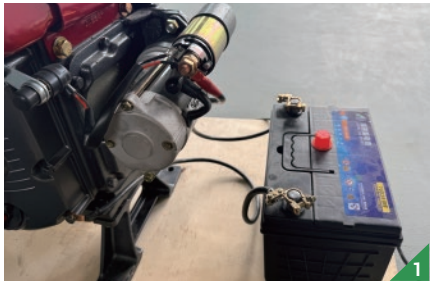
- Set the speed control lever to the **"START"** position on the speed indicator plate.
- To start with the decompression handle: pull the decompression handle, then crank the engine with the starting handle. When the engine reaches cranking speed, release the decompression handle. Continue cranking until the engine starts. The starting handle will slide automatically **(Figure 7)**.If the engine reverses, the ratchet and pawl mechanism limits reverse rotation (reverse angle ≤ 30°, reverse travel ≤ 100 r/min).
- After starting, check if the oil pressure indicator red flag is up, and listen for abnormal noise.
- After starting, run at idle for 3-5 minutes, then gradually increase speed and load. Do not run at high speed/high load immediately.
- The power and corresponding speed of the diesel engine shall be selected according to the matching requirements. Excessively high speed will shorten the service life, while excessively low speed will result in insufficient power.

7

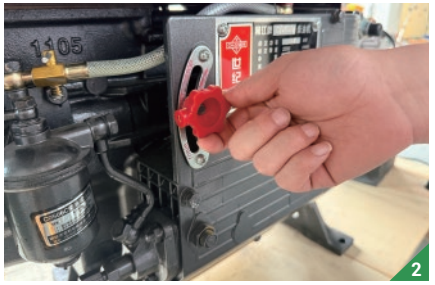
Crank Starting
1. Decompression handle 2. Starting handle

Electric Starting

- Make sure the machine is properly installed and unloaded. Check that the battery is sufficiently charged and all connections are secure.
- Set the throttle control lever to the middle Start position.
- Hold down the pressure relief valve first, then press the start switch. Release the pressure relief valve after 3 seconds, and release the start switch 2 seconds later.
- Release the ignition switch immediately after the engine starts.
- Run the engine at low speed for about one minute to confirm stable operation.



Check the battery



Move the control lever to the START position

Hold down the decompression lever and start the engine

Release the ignition switch

3. Stopping

After completing the above preparatory work, perform a thorough inspection, then start the engine according to the following steps:

- Remove the load, let the diesel engine idle, then move the speed control lever to the STOP position**(Figure 8.1)**. The engine will shut down.
- For emergency shutdown: Remove the air filter and block the air intake pipe with cloth or towel **(Figure 8.2)**; or loosen the high-pressure fuel line connection nut to cut off fuel supply; or open the decompressor if needed. The engine will stop immediately.

8

1.Rotate the speed control handle to the top stop position.

2.Blocking the Air Intake Pipe

4. Precautions for New Engine Operation

- Add engine oil to the air cleaner.
- Do not increase the speed setting on your own.
- Run the engine in for 30 hours. Do not operate at full load or use in harsh conditions during break-in.
- After break-in, change the engine oil, retighten the cylinder head nuts, and adjust the intake/exhaust valve clearances before normal use.

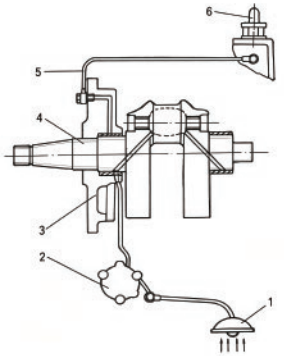
5. Precautions During Operation

- **Cooling Water:** This is a water-cooled evaporative engine. Water boiling/evaporating during operation is normal; do not add water just because it is boiling. Add water immediately when the float's red mark drops to the funnel opening.
- **Lubricating Oil:** Check if the red indicator on the oil pressure valve is raised regularly. If it drops, stop the engine immediately for inspection.
- **Diesel Fuel:** Refill the tank promptly when the fuel level drops below the sight tube.
- **Exhaust Smoke:** Do not operate the engine if it emits black smoke. If all parts are normal but smoke appears, reduce the load or enlarge the pulley on the driven machine. If there is a fault, inspect and correct it.
- **Operating Noise:** Listen regularly for abnormal sounds. Stop the engine immediately if any are detected.

6. Lubrication of the Diesel Engine

- Oil from the oil pan is drawn through the oil strainer into the oil pump, passes through the engine block oil passages to the main bearing cap oil passage, then splits into two paths.
- The first path goes through the oil hole in the flywheel-end main bearing, into the crankshaft angled oil passage, to lubricate the crankshaft and connecting rod journals. The second path flows through the oil line to the oil pressure indicator, and also into the cylinder head cover to lubricate moving parts inside **(see Figure 9)**.
- Proper operation of the lubrication system is essential for reliable engine performance; the operator must pay close attention to it.
- If a fault occurs in the lubrication system (e.g., blocked oil passages), it must be corrected immediately.

9



Lubrication Oil Circuit

1. Oil Strainer	4. Crankshaft
2. Oil Pump	5. Oil Line
3. Main Bearing Cap	6. Oil Pressure Indicator

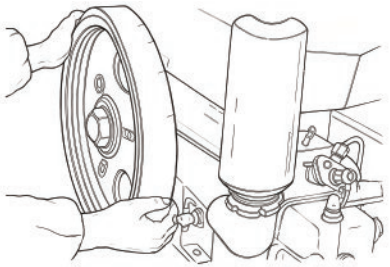
7. Post-Shutdown Precautions

- For long-term shutdown, open the drain valve and drain all cooling water **(Figure 10)**. In winter, drain the water immediately after stopping to prevent engine freezing damage.
- For long-term storage, align the "TDC" mark on the flywheel with the red mark on the water tank to set the piston at top dead center (compression position), preventing dust from entering the cylinder.
- Close the fuel tank valve.
- Check the oil in the air cleaner. If dirty or diluted, clean and dry the cleaner, then refill with new oil to the mark. This is especially important when operating in dusty conditions.
- Regularly check engine mounting connections. After installing a new cylinder head gasket, retighten the cylinder nuts after a few hours of operation. Tighten loose water tank bolts immediately after gasket replacement or loosening.
- Adjust valve clearances to specifications (0.30–0.40 mm for intake valves, 0.40–0.50 mm for exhaust valves). This is an essential procedure for proper diesel engine operation.

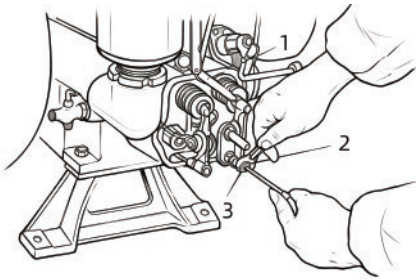
10 Draining Water

8. Valve Clearance Adjustment

- Remove the cylinder head cover.
- Turn the flywheel to align its "TDC" mark with the red mark on the water tank, positioning the piston at compression top dead center **(Figure 11)**.
- Loosen the lock nut, turn the adjustment screw with a screwdriver, and insert a feeler gauge between the valve stem and rocker arm to adjust the clearance (0.30–0.40 mm for intake valves, 0.40–0.50 mm for exhaust valves) **(Figure 12)**.
- Adjust the tension so the pushrod can be turned with fingers with slight resistance, not too loose. After correct adjustment, tighten the lock nut to prevent loosening during operation.
- Remove the feeler gauge and recheck the clearance.



11 Turn the flywheel to the "Top Dead Center (TDC)" position.



12 Adjusting Intake and Exhaust Valve Clearances

1. Feeler gauge
2. Lock nut
3. Adjustment screw

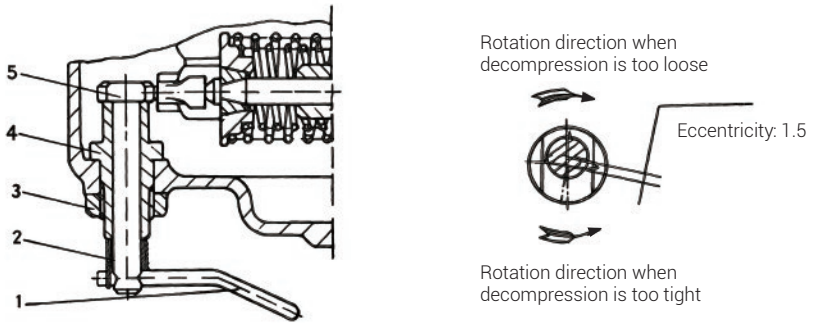
9. Decompressor Adjustment

Turn the decompressor handle clockwise with your left hand. If you feel firm resistance as the valve is depressed, and the engine turns easily, the decompressor is working properly.

Note: After releasing the handle, the decompressor shaft must not contact the valve rocker arm during engine operation.

If the condition is not as described above, perform the adjustment as follows:

- Loosen the lock nut.
- Turn the decompressor seat using the flat on its outer end. Adjust the decompressor via the eccentricity between its outer circle and inner bore. If the decompressor is too loose, rotate the seat clockwise; if too tight, rotate counterclockwise. Repeat until the decompressor meets the above requirements **(Figure 13)**.



13 Decompressor Adjustment

1. Handle
2. Decompressor handle spring
3. Lock nut
4. Decompressor seat
5. Decompressor shaft

V. Troubleshooting and Maintenance of the Diesel Engine

Difficult Starting

Cause	Remedy
Insufficient fuel flow	Check the fuel tank and filter for water or contaminants. If the filter is clogged, clean it with clean diesel fuel. If water is present, drain the tank and replace with specified-grade diesel fuel.
Air in the fuel line	Bleed air from the fuel system (top to bottom), inspect all connections, and tighten all line fittings.
Incorrect fuel injection timing	Check and adjust to specification.
Incorrect valve clearance	Check and adjust to specification.
Cold weather, thick oil makes cranking difficult	To aid starting: add hot water to the radiator, or preheat engine oil before pouring into the oil pan (do not heat the pan directly). Alternatively, remove the drive belt to ease cranking. After starting, stop the engine, refit the belt, and restart.
Low compression pressure	Worn valves, piston rings, pistons, or liners are the main causes. Adding about 25g of oil into the intake can temporarily improve compression. If the head gasket leaks, retighten the cylinder head nuts; replace the gasket if damaged.
Worn injection pump or injector parts	Replace with new parts.

Insufficient Power

Cause	Remedy
Low compression pressure	Refer to item 6 under "Difficult Starting". Replace any parts worn beyond service limits.
Incorrect fuel injection timing	Adjust to specification.
Incorrect valve clearance	Adjust to specification.
Clogged air cleaner	Clean with clean diesel or kerosene (brush and blow clean paper elements).
Incorrect engine speed	Adjust the speed control lever to reach the specified RPM.
Worn injection pump/injector parts or incorrect injection pressure	Replace with new parts, and adjust injection pressure to 18.63-0.5 MPa (190+5 kgf/cm²).

Engine Stalling

Cause	Remedy
Fuel supply cut-off	Refer to item 6 under "Difficult Starting". Replace any parts worn beyond service limits.
Insufficient oil or lubrication system failure causing component seizure	Check oil level with the dipstick and top up if low. Verify the oil pump and oil passages are functioning, then resolve the issue. Replace damaged parts promptly.
Seized injector parts	If there is no clicking sound from the injector when priming or cranking, the injector is likely seized. Clean and lap the injector components, or replace them if necessary.

Black Exhaust Smoke

Cause	Remedy
Engine overloaded	Reduce the load appropriately; adjust if it does not match the equipment requirements.
Faulty injector	Check the injection pressure and spray pattern, then calibrate. Replace if damaged.
Incomplete combustion	Primarily caused by faulty injectors, incorrect injection timing, leaking head gaskets, or low compression. Troubleshoot based on the specific cause.

Other Conditions

Stop the engine immediately if any of the following occur

Cause	Remedy
Erratic engine speed	Check the governor for smooth operation, and bleed any air from the fuel lines.
Sudden abnormal noise	Inspect all moving components carefully.
Sudden black smoke from exhaust	Inspect the fuel system, especially the injector.
Sudden drop in the oil pressure indicator red mark	Check the lubrication system for clogged filters or oil passages. Verify the oil pump is working properly.

VI. Maintenance of the Diesel Engine

Item	Maintenance Content	Interval
Cooling Water	Add cold water immediately when the red mark on the radiator float drops to the level of the filler neck.	Continuous
Lubricating Oil	Top up oil immediately if the level is below the lower mark on the dipstick.	Daily
	For new engines, clean the crankcase and oil pan, and change the oil after the first 100 hours of operation. Repeat every 200 hours thereafter.	First 100 hours & every 200 hours
Oil Filter	Remove and clean after the first 100 hours of operation. Clean every 200 hours thereafter.	First 100 hours & every 200 hours
Air Filter	In clean environments, clean and change oil every 100 hours. For tractor applications with a three-stage filter, clean and change oil every 50 hours.	100 or 50 hours
	In dusty conditions, clean and change oil every shift. For paper elements, brush and blow clean with soft bristles every shift.	Every shift
Diesel Fuel Filter Element	Clean the paper filter element with clean diesel fuel or kerosene, blowing air from the inside out during cleaning. Replace the filter element if it is damaged.	200 hours

Item	Maintenance Content	Interval
Cylinder Head Nuts	Retighten the nuts to 245 N·m after the first 30 hours of operation on a new engine.	First 30 hours
Fuel Tank and Filler Screen	Remove the screen and clean it thoroughly with clean diesel fuel.	50 hours
	Clean the inside of the tank by agitating it with clean diesel fuel.	500 hours
Valve Grinding	Apply lapping compound to the valve or seat and lap carefully (do not let compound enter the valve guide). After lapping, clean and dry the parts. Check valve sealing by pouring kerosene into the exhaust manifold and looking for leaks at the valve seat.	500 hours
Valve Clearance	Adjust according to the valve clearance adjustment procedure.	100 hours
Disassembly, cleaning and maintenance of the cylinder head and cylinder liner	Remove carbon deposits and clean thoroughly with kerosene. If the engine is running normally, disassembly is not required.	1000 hours
Crankshaft Connecting Rod Journal Oil Passages	Remove the crankshaft oil plugs, clean the connecting rod journal bores, and flush the herringbone oil passages.	500 hours
Cooling Water Passages	Fill the passages with a 25% hydrochloric acid (HCl) solution, let stand for about 10 minutes, then drain and flush with water. Repeat if necessary. Note: The radiator must be removed before cleaning.	500 hours

Primary Maintenance

Primary maintenance shall be carried out after the diesel engine accumulates 100 operating hours:

- Clean the engine oil filter, diesel filter and air filter. Inspect the paper filter element for wear; check the bottom of each pleat one by one. Replace the engine oil of the oil-bath air filter.
- Inspect and adjust the valve clearance.
- Check the engine oil inside the oil sump, replace or top up the engine oil.
- Check the quality of engine oil in the oil sump. The engine oil shall be fully replaced and the oil sump as well as oil passages cleaned after about 200 cumulative operating hours.

Secondary Maintenance

The timing of secondary maintenance depends on the technical condition of the diesel engine. In addition to all items of primary maintenance, the following work shall be completed:

- Clean the fuel tank, oil passages, exhaust pipe and muffler.
- Remove carbon deposits on fuel injectors, pistons, piston rings, cylinders, cylinder heads and other components.
- Inspect and adjust injection pressure, piston ring end gap and fuel supply advance angle.
- Check valve tightness. Grind the valves if any leakage exists.
- Verify the tightening torque of screws, bolts and nuts on connecting rods, crankshafts, flywheels and other parts.
- Inspect scale buildup in the cooling system; remove scale if the layer is excessively thick.
- Conduct test run inspection.

VII. Maintenance for Disused Diesel Engines

When the diesel engine will be out of service for an extended period, it must be preserved as follows to prevent corrosion damage.

- Unscrew the drain plug on the oil pan, drain the engine oil, then reinstall the plug. It is best to perform this task immediately after stopping the engine while the oil is still warm.
- Open the drain valve and drain all cooling water.
- Drain the diesel fuel from the fuel tank.
- Remove the engine block rear cover, take out the oil strainer, disassemble and clean it thoroughly.
- Clean the crankcase, then reinstall the oil strainer.
- Clean the air cleaner, its screen, and internal passages.
- Dehydrate 1.8 kg of filtered SAE 20 diesel engine oil by heating it to 110–115°C until all foam disappears. Pour about 1 kg of this oil into the crankcase, then crank the engine until the red mark on the oil pressure indicator rises, filling the lubrication system with oil.
- Take another 0.3 kg of dehydrated engine oil and pour it into the intake manifold. Then crank the diesel engine to coat the pistons, cylinder liners, and valve seats with oil. Finally, rotate the engine to the compression top dead center (TDC) position, thereby sealing the cylinder bores from the outside air.
- Add 0.2 kg of industrial petroleum jelly to the remaining dehydrated oil, then heat and stir until fully dissolved.
- Remove and clean the cylinder head cover. Use a brush to apply the oil mixture evenly to components such as the rocker arms and rocker shafts.
- Reassemble all parts, then clean and dry the engine's exterior.
- Seal the air cleaner, exhaust pipe opening, and radiator filler neck with plastic sheeting or oilpaper to prevent contaminants from entering.
- Finally, apply the oil mixture evenly to all unpainted exposed parts, such as the flywheel and fuel lines.
- Store the engine in a well-ventilated, dry, and clean area. Do not store it near chemicals such as fertilizers or pesticides.

This preservation method is effective for three months. Re-preserve the engine using the same procedure if the storage period is extended.

Recommended Flagship Equipment

Flat Die Feed Pellet Mill

Ring Die Feed Pellet Mill

Extruder

Hammer Mill

Forage Chopper

Stainless Steel Mixer

For Any Other Questions, Please Contact Us

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