

DIRECTOR GENERAL BORDER ROADS
GENERAL MAINTENANCE INSTRUCTION NO. 179
ON
YWA RUSTON AIR COOLED DIESEL ENGINE

INTRODUCTION

It is essential that regular periodic and preventive maintenance is carried out as enumerated below, on Ruston YWA Air Cooled engine to minimize the break downs and give longer trouble and free service.

Aim

To enumerate the details of periodic and preventive maintenance and lubrication of Ruston Engines.

Action by

(a) **User Units**

To carry out periodic inspections, regular servicing and preventive maintenance tasks as laid down.

(b) **Field Work Shops**

(i) To check the records of maintenance and lubrication in the log book of the equipment during its inspection and repairs, whether unit carried out as per maintenance and lubrication schedules given in this instruction.

(ii) Advise user units in respect of any lapses observed.

Details

Details of operating procedure and the periodic maintenance and fault diagnosis have been tabulated in appendix 'A', 'B' & 'C' to this instruction.

Caution

NEVER ALLOW THE ENGINE TO IDLE FOR LONG PERIODS ON NO LOAD, SHUT DOWN, ENGINE AND START AGAIN WHEN REQUIRED. Idle running will cause unburnt carbon collection on the piston, which will cause undue wear on the cylinder bore resulting in weak compression, excessive oil consumption and black smoke in the exhaust.

Operating Procedure Before Starting

- (i) Check fuel and lubricating oil
- (ii) Where possible ensure that the driven unit is dis-engaged for case of starting.

Starting

(a) By hand

- (i) Ensure that the starting lever is in the 'RUN' position.
- (ii) Move the decompress or lever to the 'START' position and rotate Engine rapidly.
- (iii) When the engine is turning freely at sufficient speed, move one decompress or lever over the RUN position. During this operation continue rotating the engine, the turning effort must not be slackened.
- (iv) When the engine fires, continue turning and at the same time move the remaining decompressor levers to the 'RUN' position, when engine accelerates, withdraw starting handle, do not release hold on the handle before with drawing it from the shaft.
- (v) If the engine does not start at first attempt, move the decompressor levers to the starting position and turn the engine slowly with the stopping lever in the 'STOP' position before attempting to start again.

(b) Electronic Starting

- (i) Ensure that the stopping lever is in the 'RUN' position.
- (ii) Place the decompressor levers in the 'RUN' position
- (iii) Press the starter button firmly until the engine fires. Replace the button as soon as engine fires.
- (iv) If it does not fire at once, wait until the starter motor and crank shaft stop turning before pressing the starter button again. Since damage can occur if the starter button is pressed when the engine is turning.

Note : Do not use the starter continuously if the engine will not start, find out the reason continuous use of starter will result in over discharge and damage to the battery.

(c) Cold Starting

A manually operated start pilot unit is provided for cold starting in the specific low temperature condition. Only a few strokes of the start pilot pump are necessary to obtain instantaneous start. However the exact number will demand on the condition of the engines and the ambient temperature are to which the engine is cooled.

Running

- (i) Run the engine for few minutes in order to warm up before applying load.
- (ii) The load should be applied gradually.

Notes

- (i) Check Oil pressure after warming up, it should be 2.3 - 2.8 Kg/Km² (35-40 Lb/Sq²)
- (ii) Never allow the engine to idle for long periods or NO LOAD shut down the engine and start again when required.

Stopping

- (i) Move the load gradually if possible.
- (ii) Move the stopping lever to the stop position
- (iii) Clean down the engine while it is still warm
- (iv) Return stopping lever to RUN position for subsequent starting sequence.

NOTE

Engine should never be stopped by turning off the fuel supply or reprising will be necessary. On no account should the decompressor gear be used to stop the engine, as this may result in damage to the valve gear.

Always

- (i) Keep the oil sump topped up to the correct level and use correct grade of lubs oil; renew the oil filter element regularly.
- (ii) Keep the fuel tank filter and piping clean and change fuel filter element regularly.
- (iii) Keep the fan air in takes clean and the cyl head and barrel fins free from obstruction.
- (iv) Keep the air in take filter element clean. A partially crooked will lead to increase exhaust temperature with consequent danger. Valve failure.

3. After First 2-3 Hours Run on Load

- (i) Remove crank case and check that bearing temperature is not excessive and all bearing nuts are tight and tab washers etc are in position.
- (ii) Tighten cylinder head stud nuts.
- (iii) Ensure that all nuts, bolts, screws, unions, guards etc are tight and securs.
- (iv) Check valve tappet clearance.

4. Aftor 100 - 150 Hrs.

- (i) Check that the cylinder head nuts are tightened.
- (ii) Check tappets and adjust.
- (iii) Remove lubricating oil filter element and replace with new one.

5. Aftor 500 Hrs.

- (i) Remove cylinder head and grind in the valves. Reset tappets. Thereafter follow maintenance schedules.

Periodic Maintenance

- (i) Check oil level with dipstick
- (ii) Check fuel
- (iii) Check and or electric gear starting
- (iv) Check tightness of all nuts, set screws, pipe connection and covers.
- (v) Remove any grease or straw from cooling fan guard and make sure that cooling fine on cylinder barrel and head are not obstructed.

At Shut down

- (i) Add, make up lubricating oil at the end of each shift to the full level mark in the dipstick.

Weekly

- (i) Lubricate the links and connecting of all external controls
- (ii) Check and adjust tension of fan belt
- (iii) Check grease caps or lubricator of any auxiliary equipment

Every 50 Hours

- (i) Empty fuel pump drip pot
- (ii) Tighten cylinder head stud nuts 40-45 lbs ft for new engine
- (iii) Check valve tappet clearance

Every 100 House

- (i) Remove air ducting and clean any deposits from cylinder barrel, head and cooling fins.
- (ii) Check and tighten cylinder head nuts
- (iii) Check and adjust tappets clearance
- (iv) Remove lubricating oil filter element and clean.

Every 200 Hours

- (i) Drain oil sump, clean strainer and filler guage
- (ii) Refill with new engine oil
- (iii) Renew lubricating oil filter element
- (iv) Prime the lubricating oil system
- (v) Clean fuel filter bowl
- (vi) Inspect air filter element for excessive dirt or element puppeteer and replace with new and if necessary.

Lubricating Oil

<u>Ambient Temperature</u>	<u>Grade of Oil</u>
Below 0°C (52°F)	Servo Super - 10
Upto 20°C (68°F)	Servo Super - 20
Upto 40°C(104°F)	Servo Super - 30
Above 40°C (104°F)	Servo Super - 40

Every 500 Hours

- (i) Renew Fuel filter element
- (ii) Check valve tappet clearance

Every 1000 Hours

- (i) Remove injectors and test spray fuel when discharged should form a mist or fine spray. Do not dismantle the fuel injector equipment without positive evidence that it is at fault.
- (ii) A new air filter element

Every 1500 Hours

- (i) Remove cylinder head, grind in valves. Check tappets.

Every 3000 Hours

- (i) Remove cylinder head and piston and do carbonized.
- (ii) Grind in valves. Examine and check wear with recommended maximum wear allowances. Reset tappet clearances.

New on Overhaul Engines

1. When a new / over haul engine is first placed in service, the following check on maintenance are necessary.
2. During the first Run on lead
 - (i) Check oil pressure 2.5 - 2.8 Kg / Cm² (35-40 lg/sq²)
 - (ii) Remove valve gear cover and check that an adequate amount of oil is reaching the valve gear. There should be a fine oil mist.

FAULT DIAGNOSIS

S/No	Symptom	No	Possible fault
1.	Engine Fails or is difficult to start	1	Defective injector
		2	Air in fuel system
		3	Incorrect fuel pump timing
		4	Obstruction in fuel system, filter element clogged.
		5	Faulty or incorrectly set fuel pump and governor controls
		6	Worn fuel pump plungers and guides
		7	Water in fuel tank
		8	Fuel leakage
		9	Blocked vent hole in fuel tank filter cap
		10	Incorrect lubricating oil viscosity
		11	Worn cylinder barrel
		12	Worn or broken piston rings
		13	Valves sticking or leaking
		14	Incorrect valve tappet clearance
		15	Broken or defective valve springs
		16	Choked air filters
		17	Discharged batteries
		18	Corroded battery terminals
		19	Incorrect or insecure connections
		20	Faulty starter motor
2	In 'A' check 1 to 16, 'B' Reduced Power and erratic running	1	Obsessive carbon on piston head
		2	Un even bumping clearance
		3	Engine is over loading
3	In 'A' check 1 to 7 and 13, 14 in 'B' Check 3 'C' over heating	1	Fin blockage on barrel or head
		2	Obstruction to cooling air flow particularly if in canopy or engine room.

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S/No	Symptom	No	Possible fault
	In 'A' check 10 'D' Low lubricating oil pressure	1	Fractured oil pipes or leaking union
		2	Insufficient oil in sump
		3	Choked oil filter elements
		4	Faulty or dirty pressure relief valve
		5	Faulty pressure gauge
		6	Excessive main and crank pin hearing clearance
		7	Worn lubricating oil pump gears
		8	Check sump strainer
4	In 'A' check 10, 11, 12, 13 & 16 in 'D' check 1. 'E' Excessive lubricating oil consumption	1	General Oil leaks
		2	Polished bores due to incorrect running in procedures
		3	Oil return holes in piston choked with carbon
		4	Worn valve stems and guides
		5	Oil level too high
		6	Engine is over heating
	'E' Smoky Exhaust		In 'A' Check 1,2,3,6 in 'B' check 3
		1	Unsuitable fuel
		2	Water in fuel
		3	Excessive lubricating oil consumption
	'G' Engine Knocks		In 'A' check 1 to 10 & 11,12,13,14,15 & 16. In 'B' check 1,2,3 In 'D' check 6

END