ELECTRO-MOTIVE

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MAINTENANCE INSTRUCTION

FLUSHING DIESEL ENGINE LUBRICATING OIL SYSTEM

INTRODUCTION

The purpose of this Maintenance Instruction is to present a standard procedure covering flushing of the lube oil system of a diesel engine. The procedure is basically one in which the engine and its lube oil system are drained and cleaned to the greatest extent possible without major disassembly. Under normal operating conditions, performance of the appropriate Scheduled Maintenance Program concerning filter and oil changes will be sufficient to keep the engine lube oil system functioning properly. It is not necessary or recommended to perform the flushing procedure as a routine maintenance practice. However, there are some instances in which flushing of the system is required. Use the following information as a guideline in determining when flushing is necessary.

FLUSHING IS NOT REQUIRED WHEN-

1. Draining oil and replacing with fresh oil of the same brand and type.
2. Replacing oil that has been diluted with diesel fuel oil.

FLUSHING MAY BE REQUIRED WHEN-

1. Replacing oil with another type or brand of oil. Consult oil supplier on the question of oil compatibility.

FLUSHING IS REQUIRED WHEN-

1. A part failure has occurred.
2. Oil has been contaminated with an excessive amount of water.
3. Oil has been contaminated with an excessive amount of permanent type anti-freeze.
4. The engine is very dirty or badly lacquered.
5. The engine is being removed from storage.

FLUSHING OIL

Optimum results of flushing are obtained by using regular (SAE40) engine oil heated to 65° - 90° C (150° - 200° F).

CAUTION

Use of flushing compounds or strong solvent flushing oils is not recommended. Their use would remove sludge and lacquer deposits too rapidly without properly dissolving them. These materials might clog restricted oil passages before they could be flushed from the system.

FLUSHING AFTER A PART FAILURE

WARNING

Following a part failure it is extremely important that all debris be removed from the engine. The severity of the contamination will dictate the extent and thoroughness of the operation. Read entire procedure, including all note, cautions, and warnings, before performing operation.

*This bulletin is revised and supersedes previous issues of this number.

Areas of change are indicated by vertical bars in the margins.

BLOWER-TYPE ENGINES

1. Drain all lube oil from engine, strainer housing, and filter housing.

2. Clean oil pan, oil strainer, and all lube oil reservoirs.

CAUTION

To prevent further contamination of engine parts, it is extremely important that the oil pan be thoroughly cleaned of all metal debris and contaminants.

3. Remove pipe plug at the main lube oil pump discharge elbow and connect an external pumping source.

4. Pump regular engine oil into engine at a minimum pressure of 69 kPa (10 psi). Continue pumping oil into engine until oil level reaches 51 mm (2") below oil pan handhole opening.

5. Repeat Steps 1 and 2.

6. Renew all lube oil filters and clean main filter housing.

7. Inspect main bearings as recommended in the Engine Maintenance Manual and the Inspection and Qualification of Engine Main Bearings book. If main bearings are dirt loaded, inspect connecting rod bearings.

8. Reconnect the external pumping source.

9. Pump regular engine oil into engine at a minimum pressure of 69 kPa (10 psi). Continue pumping oil into engine until oil level reaches 51 mm (2") below oil pan handhole opening.

10. Check oil level in oil strainer housing, and if required, add oil to strainer housing until it overflows into the oil pan.

11. Perform prelubrication procedure as outlined in the Engine Maintenance Manual.

CAUTION

Under no circumstances should any engine be started or run unless connected to a generator, reduction gear box, or equipped with the proper flywheel. The low inertia of a "bare" engine can allow the engine to accelerate at such a rapid rate that the turbocharger or rear gear train may be damaged.

Before a starting attempt is made the engine should be barred over manually to eliminate the possibility of hydraulic lock. If fluid discharge is observed from any cylinder test valve, find the cause and make the necessary repairs.

12. Start engine and allow it to run at idle, no load, for 15 minutes.

NOTE

After engine has run for 60 seconds, check lube oil dipstick for proper level.

13. Shut engine down and perform a "feel over" check of each main bearing. See the Engine Maintenance Manual and the Inspection and Qualification of Engine Main Bearings book. Inspect bearings that show signs of overheat.

14. Repeat Steps 1 and 2.

15. Remove and clean oil cooler core.

16. Renew all lube oil filters.

17. Recharge engine with new lube oil qualified for use.

Engine is now ready for use.

TURBOCHARGED ENGINES

1. Drain all lube oil from engine, strainer housing, and filter housing.

2. Clean oil pan, oil strainer, and all lube oil reservoirs.

CAUTION

To prevent further contamination of engine parts, it is extremely important that the oil pan be thoroughly cleaned of all metal debris and contaminants.

3. Remove pipe plug at the main lube oil pump discharge elbow and connect an external pumping source.

4. Remove turbocharger oil filter.

5. Pump flushing oil into engine at a minimum pressure of 69 kPa (10 psi). Continue pumping until all debris and contaminants are discharged through turbocharger filter inlet line.

6. Perform Steps 5 through 17 under BLOWER-TYPE ENGINES.

Engine is now ready for use.

FLUSHING AFTER WATER CONTAMINATION

The procedure for flushing after water contamination is essentially the same as the procedure following a part failure. However, these hints should be kept in mind:

1. Repair leak that caused contamination.

2. Use kerosene spray to break down and remove as much of the oil-water emulsion as possible.

FLUSHING AFTER ANTI-FREEZE CONTAMINATION

This procedure will effectively remove sludge and the tar-like buildup caused by permanent type (ethylene glycol) anti-freeze contamination of the lube oil. The severity of the contamination will dictate the extent and thoroughness of the operation. Read entire procedure, including all notes, cautions, and warnings, before performing operation.

WARNING

It is recommended that this operation be performed outdoors. If this is not possible, provide adequate ventilation to remove exhaust and solvent fumes. Area must be clear of open flames and lights.

1. Repair leak that caused the contamination.

2. Drain all lube oil from engine, strainer housing, and filter housing.

3. Clean oil pan, oil strainer, and all lube oil reservoirs, including main filter housing.

4. Renew all lube oil filters.

WARNING

"Butyl Cellosolve" (Ethylene glycol monobutyl ether, available from Union Carbide) must be handled with care. Do not inhale vapors or allow solvent to come in contact with skin, If solvent comes in contact with skin, bathe area with large quantities of water immediately. Use of rubber gloves and a face shield is strongly recommended while performing this operation.

5. Recharge engine with a mixture of one part "Butyl Cellosolve" to two parts regular lube oil (unheated). Fill engine until oil level is 51 mm (2") below oil pan handhole opening. Save 20-40 liters (5-10 gallons) of "Butyl Cellosolve" to clean top deck parts.

6. Check oil level in oil strainer housing, and if required, add oil to strainer housing until it overflows into the oil pan.

7. Perform prelubrication procedure, as outlined in the Engine Maintenance Manual.

CAUTION

Under no circumstances should any engine be started or run unless connected to a generator, reduction gear box, or equipped with the proper flywheel. The low inertia of a "bare" engine can allow the engine to accelerate at such a rapid rate that the turbocharger or rear gear train may be damaged.

Before a starting attempt is made the engine should be barred over manually to eliminate the possibility of hydraulic lock. If fluid discharge is observed from any cylinder test valve find the cause and make the necessary repairs.

8. Start engine and allow it to run at idle, no load, for 20 minutes. After engine has run for 60 seconds, check lube oil dipstick for proper level.

CAUTION

Shut engine down if water temperature approaches 66° C (150° F). Lubrication may become inadequate at temperatures greater than 66° C (150° F).

Periodically check top deck for sufficient lubrication and to evaluate cleaning progress.

9. After 20 minutes shut engine down and inspect top deck. If deck shows no signs of sludge proceed to Step 12. If sludge buildup remains, perform Steps 10 and 11.

10. Brush retained "Butyl Cellosolve" on the top deck parts. This will dissolve any remaining sludge.

11. Restart engine and run at idle for 5 minutes.

12. With engine stopped, drain all lube oil.

13. Clean oil pan, oil strainer, and all lube oil reservoirs, including main filter housing.

14. Renew all lube oil filters.

15. Charge engine with new lube oil until level is 51 mm (2") below oil pan handhole opening.

16. Repeat Steps 6 through 8.

NOTE

Step 16 is a rinse procedure to further purge the engine of all remaining contaminants.

17. Shut down engine and drain all lube oil.

18. Perform a "feel over" check of each main bearing. Inspect bearings that show signs of overheat. Refer to the Engine Maintenance Manual and the Inspection and Qualification of Engine Main Bearings book.

19. Recharge engine with new lube oil qualified for use.

20. Close and latch top deck covers.

Engine is now ready for use.

FLUSHING A VERY DIRTY ENGINE OR AN ENGINE REMOVED FROM STORAGE

Charging an engine with new lube oil warrants special attention when the engine is very dirty or badly lacquered, or is removed from storage. The primary concern is the possibility of deposits remaining in the engine, even after flushing, that would have adverse affects on the new lube oil and its filters. This condition is most critical after extended use of an oil which has allowed considerable deposits to build up within the engine.

1. Drain all lube oil from engine, strainer housing, and filter housing.

2. Clean oil pan, oil strainer, and all lube oil reservoirs, including main filter housing.

3. Renew all lube oil filters.

4. Remove pipe plug at main lube oil pump discharge elbow and connect an external pumping source.

5. Pump regular engine oil into engine at a minimum pressure of 69 kPa (10 psi). Continue pumping oil into engine until oil level reaches 51 mm (2") below oil pan handhole opening.

6. Check oil level in oil strainer housing, and if required, add oil to strainer housing until it overflows into the oil pan.

7. Perform prelubrication procedure as outlined in the Engine Maintenance Manual.

CAUTION

Under no circumstances should any engine be started or run unless connected to a generator, reduction gear box, or equipped with the proper flywheel. The low inertia of a "bare" engine can allow the engine to accelerate at such a rapid rate that the turbocharger or rear gear train may be damaged.

Before a starting attempt is made the engine should be barred over manually to eliminate the possibility of hydraulic lock. If fluid discharge is observed from any cylinder test valve, find the cause and make the necessary repairs.

8. Start engine and allow it to run at idle until water temperature reaches 50° C (120° F). After engine has run for 60 seconds, check lube oil dipstick for proper level.

9. Run engine at 25% rated load for 15 minutes, return to idle for 5 minutes. Repeat two times.

10. Shut down engine and drain oil from oil pan, strainer housing, and filter housing.

11. Perform a "feel over" check of each main bearing. Inspect bearings that show signs of overheat. Refer to the Engine Maintenance Manual and the Inspection and Qualification of Engine Main Bearings book.

12. Clean oil pan, oil strainer, and all lube oil reservoirs, including main filter housing.

13. Renew all lube oil filters.

14. Recharge engine with new lube oil qualified for use, making certain that strainer housing is filled.

Engine is now ready for use.

REUSE OF FLUSHING OIL

Flushing oil may be reused, provided it is cleaned after each use. Proper straining and filtering will prepare it for reuse. However, if oil is contaminated with water or ethylene glycol it should be disposed of.

Store flushing oil in a covered container to prevent dirt and other contaminants from entering. Mark container to prevent inadvertent use.