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Service Information Bulletin

SUBJECT	DATE
Extended Storage	May 2012

Additions, Revisions, or Updates

Publication Number / Title	Platform	Section Title	Change
DDC-SVC-MAN-0026	EPA07 MBE 4000	Extended Storage (More than 30 Days)	Deleted "No. 1 diesel fuel or pure kerosene" and replaced it with "Ultra-Low Sulfur Diesel (ULSD) fuel."
		Procedure for Restoring to Service an Engine that Has Been in Extended Storage	Changed Detroit Diesel Power Cool to Detroit™ Power Cool.
		Extended Storage (More Than 12 months)	Deleted "No. 1 diesel fuel or pure kerosene" and replaced it with "Ultra-Low Sulfur Diesel (ULSD) fuel."



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2 Extended Storage (More than 30 Days)

To prepare an engine for extended storage (more than 30 days), follow this procedure:

1. Drain the cooling system and flush with clean, soft water. Refill with clean, soft water and add a rust inhibitor to the cooling system.
2. Circulate the coolant by operating the engine until normal operating temperature is reached.
3. Stop the engine.
4. With the engine at ambient temperature and cool to the touch, drain the engine crankcase oil into a suitable container. Remove the oil filters. Dispose of the oil and filters in an environmentally friendly manner, according to state and/or federal EPA recommendations. Replace the drain plug and tighten to 80 N·m (59 lb-ft) of torque.
5. Install new lubricating oil filters. Fill the crankcase to the proper level with Tectyl® 930A preservative lubricating oil or an equivalent 30-weight preservative lubricating oil meeting Mil-L-21260C, Grade 2 Specification.
6. Drain the fuel tank. Refill with enough clean Ultra-Low Sulfur Diesel (ULSD) fuel to permit the engine to operate for about ten (10) minutes. If draining the fuel tank is not convenient, use a separate, portable supply of recommended fuel.

NOTE: If engines are stored where condensation of water in the fuel tank may be a problem, additives containing methyl carbitol or butyl cellusolve may be added to the fuel. Follow manufacturer's instructions for treatment. Where biological contamination of fuel may be a problem, add a biocide such as **Biobor® JF** (or equivalent) to the fuel. When using a biocide, follow the manufacturer's concentration recommendations and observe all cautions and warnings.

7. Drain the fuel system and remove the fuel filters. Dispose of used filters in an environmentally responsible manner, according to state and/or federal EPA recommendations. Fill the new filters with Ultra-Low Sulfur Diesel (ULSD) fuel and install on the engine.
8. Operate the engine for five (5) minutes to circulate the clean fuel throughout the engine. Be sure the engine fuel system is full.
9. Stop the engine and allow to cool. Then disconnect the fuel return line and the inlet line at the primary filter and securely plug both to retain the fuel in the engine.
10. Transmission: Follow the manufacturer's recommendations for prolonged storage.
11. Power Take-Off: If equipped, follow manufacturer's recommendations for prolonged storage.

NOTICE: Failure to properly seal off the turbocharger air inlet and exhaust outlet openings before engine storage may permit air drafts to circulate through the turbocharger and rotate the turbine/compressor shaft without an adequate flow of lubricating oil to the center housing bearings. This can result in severe bearing damage.

12. Turbocharger: Since turbocharger bearings are pressure lubricated through the external oil line leading from the oil filter adaptor while the engine is operating, no further attention is required. However, the turbocharger air inlet and turbine exhaust outlet connection should be sealed off with moisture-resistant tape.
13. Apply a non-friction rust preventive compound to all exposed engine parts. If convenient, apply the rust preventive compound to the engine flywheel. If not, disengage the clutch mechanism to prevent the clutch disc from sticking to the flywheel.

NOTE: Do not apply oil, grease or any wax-base compound to the flywheel. The cast iron will absorb these substances, which can "sweat" out during operation and cause the clutch to slip.

14. Drain the engine cooling system.
15. Drain the preservative oil from the engine crankcase. Reinstall and torque the oil drain plug to 80 N·m (59 lb-ft).
16. Remove and clean the battery and battery cables with a baking soda-water solution and rinse with fresh water. Do not allow the soda solution to enter the battery. Add distilled water to the electrolyte (if necessary) and fully charge the battery. Store the battery in a cool (never below 0° C or 32° F) dry place. Keep the battery fully charged and check the level and specific gravity of the electrolyte regularly.
17. Insert heavy paper strips between the pulleys and drive belts to prevent sticking.
18. Seal all engine openings, including the exhaust outlet, with moisture-resistant tape. Use cardboard, plywood or metal covers where practical.
19. Clean and dry the exterior painted surfaces of the engine and spray with a suitable liquid automobile body wax, a synthetic resin varnish, or a rust preventive compound.

NOTICE: Do not use plastic sheeting for outdoor storage. Plastic is fine for indoor storage. When used outdoors, however, enough moisture can condense on the inside of the plastic to rust ferrous metal surfaces and pit aluminum surfaces. If a unit is stored outside for any extended period of time, severe corrosion damage can result.

20. Protect the engine with a good weather-resistant tarpaulin and store it under cover, preferably in a dry building which can be heated during the winter months. The stored engine should be inspected periodically. Outdoor storage of the engine is not recommended. If units must be kept out of doors, follow the preparation and storage instructions already given. Protect units with quality, weather-resistant tarpaulins (or other suitable covers) arranged to provide for air circulation. If there are any indications of rust or corrosion, corrective steps must be taken to prevent damage to the engine parts. Perform a complete inspection at the end of one year and apply additional treatment as required.

3 Procedure for Restoring to Service an Engine that Has Been in Extended Storage

If an engine has been in extended storage, prepare it for service as follows:

1. Remove the covers and tape from all the openings of the engine, fuel tank and electrical equipment. Do not overlook the exhaust outlet.
2. Remove the plugs from the inlet and outlet fuel lines and reconnect the lines to their proper positions.
3. Wash the exterior of the engine with fuel oil to remove the rust preventive. Do not wash electrical components.
4. Remove the rust preventive from the flywheel. Flush any soluble oil rust inhibitor (if used) in the cooling system.
5. Remove the paper strips from between the pulleys and drive belts.
6. Fill the crankcase to the proper level with the required grade of lubricating oil. Use a pressure lubricator to insure all bearings and rocker shafts are lubricated.
7. Fill the fuel tank with the required fuel.
8. Close all drain cocks and fill the engine cooling system with clean, soft water and required inhibitors. If the engine is to be exposed to freezing temperatures, install genuine Detroit™ Power Cool antifreeze or an equivalent ethylene glycol-base or propylene glycol-base antifreeze solution which provides required freeze, boil over, and inhibitor protection.
9. Install and connect the battery. Make sure the average specific gravity of the battery is 1.260 or higher. Charge the battery, if necessary.
10. Service the air cleaner, if required.
11. Transmission: Follow the manufacturer's recommendations covering the return of the transmission to service.
12. Power Take-Off: If equipped, follow the manufacturer's recommendations covering the return of the power take-off to service.
13. Turbocharger: Remove the covers from the turbocharger air inlet and turbine outlet connections. Reconnect piping as required. Pre-lubricate the turbocharger center bearing housing.



WARNING: ENGINE EXHAUST (i)(eov34)

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

NOTE: The small amount of rust preventive which remains in the fuel system will cause smoky exhaust for a few minutes.

NOTE: Before subjecting the engine to a load or high speed, allow it to reach normal operating temperature. Then check for trouble codes.

14. After all preparations are completed, start the engine.

4 Extended Storage (More Than 12 months)

To prepare an engine for extended storage (more than 12 months), follow this procedure:

1. Drain the cooling system.
2. Flush with clean, soft water.
3. Refill with clean, soft water and add a rust inhibitor to the cooling system. Refer to section "Coolant Flushing and Changing" .
4. Circulate the coolant by operating the engine until normal operating temperature is reached.
5. Stop the engine.
6. Install new lubricating oil filters. Refer to section "Changing the Engine Oil and Filter" .
7. Fill the crankcase to the proper level with Tectyl® 390A preservative lubricating oil or an equivalent 30-weight preservative lubricating oil meeting MIL-L-21260C, Grade 2 specification.
8. Drain the fuel tank.
9. Refill with enough clean Ultra-Low Sulfur Diesel (ULSD) fuel to permit the engine to operate for about ten minutes. If it is not convenient to refill the fuel tank, use a separate, portable supply of recommended fuel.

NOTE: If engines in vehicles are stored where condensation of water in the fuel tank may be a problem, supplemental additives containing methyl carbitol or butyl cellusolve are effective. Follow the manufacturer's instructions for their use. The use of isopropyl alcohol is no longer recommended due to its negative effect of fuel lubricity.

NOTE: In environments where microbe growth is a problem, a fungicide such as Biobor® JF (or equivalent) may be used. Microbial activity may be confirmed with commercially available test kits. Follow the manufacturer's instructions for treatment. Avoid the use of fungicides containing halogenated compounds, since these may cause fuel system corrosion.

10. Drain the fuel system.
11. Replace the fuel filters. Refer to section "Fuel/Water Separator Pre-Filter Element Cleaning" and Refer to section "Removal of the Fuel Filter" .



WARNING: ENGINE EXHAUST (i)(eov34)

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

12. Operate the engine for five minutes to circulate the clean fuel oil throughout the engine. Ensure the engine fuel system is full.
13. Disconnect the fuel return line and the inlet line at the primary filter and securely plug both lines to retain the fuel in the engine.
14. Service the air cleaner.
15. To prepare the transmission, power take-off and turbocharger:
 - a. Follow OEM recommendations for prolonged storage to store the transmission.
 - b. Follow OEM recommendations for prolonged storage to store the power take-off.
 - c. Since turbocharger bearings are pressure lubricated through the external oil line leading from the oil filter adaptor while the engine is operating, no further attention is required; however, the turbocharger air inlet and turbine outlet connections should be sealed off with moisture resistant tape.

NOTICE: Do not apply oil, grease, or any wax base compound to the flywheel. The case iron will absorb these substances, which can sweat out during operation and cause the clutch to slip.

16. Apply a non-friction rust preventive compound to all exposed engine parts. If convenient, apply the rust preventive compound to the engine flywheel. If not, disengage the clutch mechanism to prevent the clutch disc from sticking to the flywheel.

NOTICE: Incomplete draining of the water pump may result in rusting of the impeller to the pump body during extended engine storage, especially if inadequate inhibitor was used in the remaining coolant. Damage from freezing temperatures may occur if the coolant remaining in the engine has insufficient antifreeze to prevent it from freezing and expanding. To ensure complete pump drainage, always remove the drain plug from the bottom of the pump before extended storage. If a coolant filter/inhibitor system hose is attached to the bottom of the pump, disconnect the hose and allow the pump to drain completely. Open the drain cock at the bottom of the filter. Do not reinstall the pump drain plug or filter hose or retighten the filter drain plug until the engine is put back into service.

17. Drain the engine cooling system.
18. Drain the preservative oil from the engine crankcase.
19. Remove and clean the battery and battery cables with a baking soda–water solution and rinse with fresh water. Do not allow the baking soda solution to enter the battery.
20. Add distilled water to the electrolyte (if necessary) and fully charge the battery.

NOTICE: To avoid possible battery damage caused by freezing, never store a battery in a place below 0°C (32°F).

21. Store the battery in a cool, dry place. Keep the battery fully charged and check the level and specific gravity of the electrolyte regularly.
22. Insert heavy paper strips between the pulleys and drive belts to prevent sticking.
23. Seal all engine openings including the exhaust outlet, with moisture resistant tape. Use cardboard, plywood, or metal covers where practical.
24. Clean and dry the exterior painted surfaces of the engine and spray with a suitable liquid automobile body wax, a synthetic resin varnish, or a rust–preventive compound.

NOTE: Plastic may be used for indoor storage.

25. Protect the engine with a good weather–resistant tarpaulin and store it under cover, preferably in a dry building which can be heated during the winter months.