
Fleet Coolant System Flush and Antifreeze Concentration Testing

1.0 Maintenance Objective & Frequency

The objective of this procedure is to remove accumulated contaminants, scale, and degraded coolant from the engine cooling system, and to verify that the antifreeze concentration meets the OEM specified freeze point and corrosion inhibitor levels. This prevents overheating, cavitation damage to cylinder liners, and cold-weather freeze-ups.

Frequency: Annually or every 2,000 operating hours, whichever comes first. Perform immediately if coolant appears discolored, oily, or has a pH below 7.5.

2.0 Lockout/Tagout (LOTO) & Safety

- Engine Shutdown: Ensure the engine is off and has cooled to below 40°C (104°F) to prevent scalding.
- Electrical Isolation: Disconnect the battery negative terminal to prevent accidental starter engagement.
- Pressure Relief: Slowly loosen the radiator cap to the first stop to release any residual pressure before removing completely.
- PPE: Wear safety glasses, acid-resistant gloves, and a shop apron. Coolant is toxic and can cause skin irritation.

3.0 Required Tools, Parts & Lubricants

- Coolant collection container (minimum 20L capacity)
- Distilled water (sufficient to fill system, typically 15-25L)
- OEM-approved antifreeze concentrate (e.g., ethylene glycol or propylene glycol based)
- Hand-operated coolant siphon pump or flush kit adapter
- Digital refractometer (0-40% Brix scale) or hydrometer
- pH test strips (range 6.0-9.0)
- Funnel with fine mesh filter
- Torque wrench (for drain plug, typical range 20-40 Nm)
- Shop rags and drip tray

4.0 Step-by-Step Maintenance Procedure

1. Verify the engine is cool and the battery is disconnected. Place a drip tray under the radiator drain valve and engine block drain plug.
2. Open the radiator drain valve fully. Remove the engine block drain plug using the appropriate socket. Allow all coolant to drain into the collection container.
3. Inspect the drained coolant for signs of oil contamination (rainbow sheen), rust particles, or sediment. If present, note on work order for further investigation.

4. Close the radiator drain valve. Clean the engine block drain plug threads and reinstall. Torque the plug to 25 Nm (or per OEM spec).
5. Fill the cooling system with distilled water through the radiator neck. Run the engine at idle for 10 minutes with the heater on full to circulate the water through the heater core.
6. Shut off the engine and allow it to cool. Drain the flush water completely by repeating steps 2 and 3. Dispose of the flush water in accordance with local environmental regulations.
7. Close all drains. Using the refractometer, measure the concentration of the new antifreeze concentrate. Record the reading on the work order.
8. Calculate the required mix ratio for your target freeze point (typically -37°C for 50/50 mix). Pour the calculated amount of concentrate into the radiator, then top off with distilled water.
9. Install the radiator cap. Reconnect the battery. Start the engine and run at high idle (1500 RPM) for 5 minutes to purge air pockets. Check for leaks at all drain points and hose connections.
10. Allow the engine to cool to operating temperature. Remove the radiator cap carefully. Use the refractometer to verify the final concentration is within $\pm 2\%$ of the target. Adjust by adding concentrate or distilled water as needed.
11. Use a pH test strip to verify the coolant pH is between 7.5 and 9.0. Record the pH value on the work order.
12. Top off the coolant reservoir to the cold fill line. Reinstall the radiator cap securely.

5.0 Verification & Return to Service

1. Perform a final visual inspection for any coolant leaks at the radiator, hoses, water pump, and heater core connections.
2. Run the engine through one full warm-up cycle to operating temperature. Verify the temperature gauge stays within normal range and the cooling fan cycles on/off as expected.
3. Confirm the coolant level in the reservoir is stable after the engine cools. Top off if necessary.
4. Sign off on the PM work order in ServiceGrid, attaching the recorded concentration and pH values.

Regulatory Disclaimer: This document is a generic maintenance template provided for educational and informational purposes only. It does not constitute professional engineering or reliability advice. The end-user assumes all liability for validating all step sequences, torque specs, and LOTO protocols against specific machinery OEM manuals before deployment to a live production floor.