

Driveline Flushing Procedure

TMP500001.00

ENVIRO 500

Revision No: 01

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2. Purpose

This procedure defines the requirements and methodology for flushing and cleaning the **driveline coolant circuits** of an Enviro 500 DSL double deck bus, including the engine cooling circuit, gearbox cooling circuit, radiator, and header tank, following contamination by grease, oil, degraded coolant, or particulate matter.

The objective is to restore system cleanliness and thermal performance while preventing damage to cooling system components and materials.

This procedure applies to maintenance, repair, commissioning, and contamination remediation activities carried out by qualified personnel in accordance with AD specifications and applicable safety requirements.

3. Scope

This procedure applies to all components within the **driveline coolant circuits** containing a 50/50 glycol-based coolant mixture, including:

- Engine cooling circuit pipework and flexible hoses
- Gearbox cooling circuit pipework and hoses
- Radiator assemblies
- Gearbox and engine heat exchangers (oil coolers)
- Electric and/or mechanically driven coolant pumps
- Control valves and distribution manifolds
- Header tank / expansion tank assemblies
- Associated fittings, sensors, and connecting hardware

The procedure covers:

- Complete system draining
- Heated chemical flushing
- Filtration and contamination control
- Rinsing process
- System refilling and deaeration (bleeding)
- Final inspection and cleanliness verification

4. Cleaning Objectives

The flushing and cleaning process shall remove:

- Grease and oil contamination originating from engine and gearbox interfaces
- Suspended particles and wear debris
- Degraded coolant and thermal breakdown by-products
- Sludge, fouling, and deposit buildup within radiators and heat exchangers
- Residual chemical contaminants from previous maintenance or flushing activities

The process shall restore system cleanliness without damaging:

- EPDM hoses, seals, and elastomer components
- Radiators and engine/gearbox heat exchangers (oil coolers)
- Electric and mechanically driven coolant pumps
- Mechanical seals and bearing interfaces
- Temperature, pressure, and level sensor assemblies

5. Safety Requirements

5.1. Personnel Requirements

All work shall be performed by trained and authorised personnel familiar with:

- Handling of glycol-based coolant systems
- Operation of heated fluid systems
- Use and handling of chemical cleaning agents
- Working with pressurised cooling and hydraulic systems
- Electrical isolation and safety procedures

5.2. Personal Protective Equipment (PPE)

The following PPE shall be worn:

- Safety glasses or face shield
- Chemical-resistant gloves
- Protective clothing
- Safety footwear

5.3. System Safety Controls

Prior to commencing work:

- Isolating electrical systems where required
- Ensure the driveline system is depressurized
- Allow components to cool before draining

- Verify adequate ventilation in the work area
- Confirm compatibility of all cleaning chemicals with system materials

6. Hydraulic and Thermal Control Requirements

6.1. Hydraulic Control

The flushing process should maintain turbulent flow conditions where it is practical to maximize contaminant removal efficiency.

The system shall be operated to avoid:

- Cavitation
- Air entrainment
- Excessive pressure differential
- Flow short-circuiting

Cavitation Prevention

- Maintain adequate NPSH at pump suction
- Keep tank fluid level above minimum operating level
- Eliminate air ingress points

6.2. Thermal Control

Elevated temperature improves:

- Oil mobility
- Grease breakdown
- Detergent effectiveness
- Contaminant suspension

Recommended operating temperature:

- Sufficient to exceed the radiator thermostat opening temperature and maintain full system circulation.

7. Flushing Procedure - Draining (Engine and Heater Circuit)

DRAIN & FLUSH PROCEDURES PERFORMED (Approx 8 hour process to complete)

1. Remove the drain plug from the radiator to drain the coolant. In addition, remove lower radiator hose under oil pan to finish getting all coolant out of the engine. Once the coolant stops, install the plug and hose.



2. Add the **Fleetguard Restore Coolant Cleaner CC2610** and top off with plain water. Start bus and let run on high idle. Place TK control panel to full heat. Go upstairs and use the Grayson box (located in REDC) to turn on all the heater fans on high and open all the valves. Let bus run for 2 hours. Allow system to cool down for safe draining. (approximately 1 hour)

Fleetguard Restore Coolant Cleaner

- Use Fleetguard Restore coolant cleaner CC2610
- Drain the cooling system and dispose of contaminated coolant.
- Backflush the system.
- Add 1 gallon of Restore and fill the system with plain water
- Turn the heater temp switch to high, with all taps open
- Run engine for 2hrs
- Drain and flush the system with clean water
- Refill with fully formulated coolant and bleed system



3. Drain the Cooling system with the drain plug and remove lower engine coolant hose as described in step 1.
4. Reinstall hose and plug as in Step 2, refill system with plain water and run bus for approx. 30 mins, drain again as in step 1, also remove T hose at front demister 3-way valve and use compressed air to push remaining liquid from pipes to be sure all flush is removed from system.
5. Remove old coolant filter. Install new coolant filter and install drain plug and lower hose when drained. Re-attach T hose at 3-way valve.



6. Add coolant until topped off. Go upstairs and use the Grayson box to turn on all the heater fans on high to open all the valves. Place TK control panel to full heat. During filling the air must be vented from the engine coolant passages. During filling wait 2-3 minutes to allow air to be vented, then bring to correct level. Let bus run again for one more hour on high idle with valves open (using Grayson box). Let bus cool down and recheck levels to make sure all air is bleed out. Top off as needed. Shut switches off at Grayson box upstairs..



7. Place bus back in service.

8. Rinse Acceptance Indicators

The rinse process shall continue until:

- No visible oil sheen remains
- Conductivity stabilises between cycles
- pH approaches neutral
- Foam generation is eliminated

Carryover Risks

Residual cleaning agents may cause:

- Foam formation
- Corrosion
- Sensor interference
- Long-term coolant degradation

9. Cleanliness Acceptance Criteria

9.1. Field Acceptance Criteria

Parameter	Acceptance Requirement
Visual oil film	None
Suspended solids	Negligible
Foam tendency	None
Odor	Neutral

After flush Filling (General)

Only use the recommended coolant, never use water alone (CUMMINS OAT Extended life coolant)