

Implementing Pencool Maintenance Programs

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Introduction:

Many customers have expressed a desire for information and recommendations regarding the use of Pencool coolant filters or Pencool liquids (Pencool 2000 and 3000) with engines where the customer has either not practiced a coolant maintenance program or has been using another brand of coolant or SCA.

Optimum protection, quality control and cooling system efficiency can only be expected when the primary recommendation is followed.

Primary Recommendation:

There is a very strong argument that customers should invest the time and money to carefully clean and then refresh the cooling system with a properly blended mix of "fully formulated" antifreeze and deionized water, normally at 50 vol% each. "Fully formulated" coolants are defined in TMC Recommended Practices 329 and 330. They are also defined by ASTM specifications D-6210 (EG) ASTM D-6211 (PG). Customers should be concerned that over-treatment of coolant with SCAs may cause additive drop-out, possibly damaging the cooling systems or engines. Under-treatment of the coolant with SCAs is likely to result in one or more serious consequences, such as cavitation-erosion of cylinder liners, or radiator corrosion.

For optimum performance, maintain systems as follows:

1. Drain, clean and flush the cooling system.

Drain the engine coolant and recycle it properly through reverse osmosis (R/O). If R/O recycling service is not available, dispose of the used coolant properly, clean the cooling system with a quality product (Penray 2001 or 2015) cooling system cleaner, and flush the system thoroughly with clean water.

2. Use a proper initial fill coolant.

Use "fully formulated", premixed coolant for best consistency. Penray recommends phosphate-free coolant that meets the TMC RP-329 specification, such as Detroit Diesel PowerCool® or Caterpillar® Heavy-Duty Diesel antifreeze. Use 50% to 60% TMC RP-329 antifreeze mixed with purified (i.e. deionized) water. If tap water is used, make sure it meets the water quality requirements specified in ASTM D-4985 and most OEM cooling system maintenance guides. In warm climates, use good quality water (see water quality recommendations in ASTM D-4985) pre-charged with 5% Pencool 3000 liquid.

3. Periodic maintenance:

- a. **Test:** Test the coolant at every PM interval to assure that adequate freeze point (-34oF recommended) and nitrite levels (1,200 to 2,400 ppm) are being maintained. Use a Penray Two-Way Heavy-Duty Test Strip (TS-100 or TS-102)
- b. **Maintain the SCA level:** For Need-Release® equipped vehicles change the Need-Release filter every 3,000 hours, 15 months or 150,000 miles, whichever comes first.
- c. **Or, if using traditional Pencool:** Every 15,000 miles or 250 operating hours, add 1 pint of Pencool liquid for every 20 gallons of cooling system capacity.

4. Observe Coolant Change intervals:

- a. **Need-Release Program:** There is no prescribed coolant change interval. Change the coolant only if high coolant conductivity of 3,000 mhos or more in a solution of 10% coolant and 90% distilled water is observed. Thoroughly clean the system, and then refill it with coolant as described above.
- b. **Conventional and Marine Programs:** Change the coolant every 2 years, 200,000 miles or 4,000 operating hours. Thoroughly clean the system, and refill with coolant as described above, in "Step I". The cooling system should be monitored with a Penray 2 Way Heavy-Duty Coolant Test Strip every three months for proper nitrite and freeze-point protection. Experience has shown that monitoring is necessary to detect major dilution of the coolant chemistry that may occur while the engine is in service. Unless the system is improperly serviced, addition of Pencool during this period may not be necessary.

In-Service Application:

For those customers who have records and knowledge of the maintenance performed and who choose to use Pencool on "in service" engines, without performing the recommended cooling system service, the following procedure is advised:

1. Evaluate the existing level of inhibitors by laboratory (preferred) or field test, checking at least the nitrite and conductivity.
2. If the conductivity of a 10% coolant and 90% distilled water solution exceeds 3,000 mhos, the solids content of the fluid may be hazardous to the water pump and should be drained, the system cleaned and then refilled with fresh, fully-formulated coolant as described above.
3. If conductivity is less than 3,000 mhos, test nitrite level, [NO₂], and proceed as follows:

If [NO₂] of the undiluted coolant removed from the cooling system is greater than 4,000 ppm then submit a sample for laboratory testing.

OR

If [NO₂] is less than 1,200 ppm, add 1 pint of Pencool 3000 for each 20 gallons of cooling system capacity. Run the engine 30 minutes, recheck, and repeat if necessary.

When [NO₂] exceeds 1,200 return the engine into service until the next regularly scheduled maintenance interval.

IN NO CASE SHOULD ORGANIC ACID OR AMINE COOLANTS BE MIXED WITH AMERICAN NITRITED ANTIFREEZES OR SCAs. ENGINE DAMAGE MAY OCCUR.