



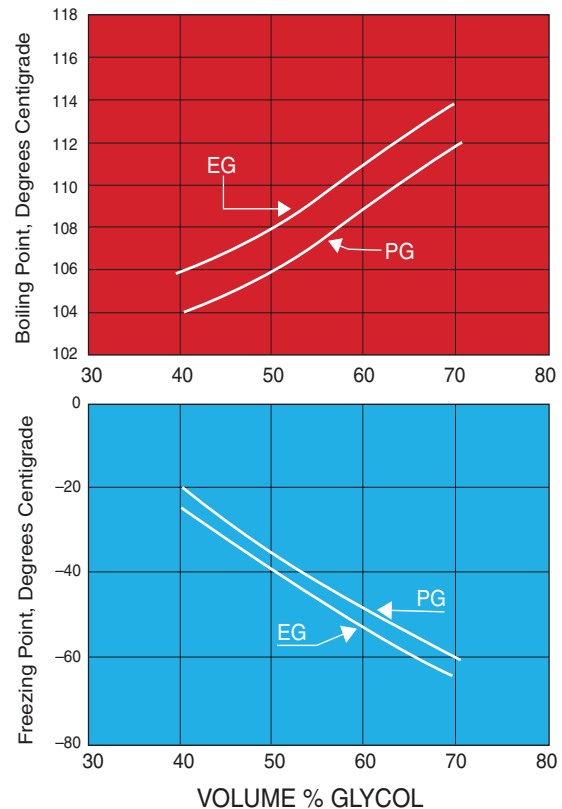
“Perfect together”: Mercedes-Benz anti-freeze coolant and distilled water in a 50-50 mixture in the cooling system. An aftermarket brand that meets the Mercedes-Benz specification and/or deionized water will give the same good protection.

Changing the anti-freeze/coolant in a Mercedes-Benz vehicle, or even topping up the reservoir, is a straightforward procedure. But picking the right anti-freeze to use is not so straightforward. There are many anti-freezes on the market, and most are advertised as compatible with all others in all cars. StarTuned would like to tell you why not to use just any anti-freeze in a Mercedes-Benz, even if it’s a reputable brand.

You may be thinking, “Mercedes-Benz is just trying to sell its own approved anti-freeze. It’s just another one of those not-invented-here things.” Sorry, but that isn’t true, and we think we can explain – and hopefully convince you – to use either Mercedes-Benz’s own anti-freeze, or only an aftermarket equivalent that meets the current Mercedes-Benz specification. This is particularly true today, when most of the anti-freeze aftermarket brands you’ll find are very different in important respects.

First, let’s explain that because Mercedes-Benz vehicles are marketed worldwide, the manufacturer must make allowance for great differences in water quality. The coolant in an engine normally is a 50-50 mixture of water and anti-freeze, and the water both improves heat transfer at high temperature, and lowers the temperature at which the coolant will freeze.

BOILING POINTS AND FREEZING POINTS OF PG AND EG IN AQUEOUS SOLUTIONS



Charts show boiling and freeze points of anti-freezes in a 50-50 mixture with water. Note that EG (ethylene glycol, the glycol used in most anti-freeze) has a slightly higher boiling point and a slightly lower freeze point than PG (propylene glycol). At concentrations above 70% anti-freeze, the freeze point of the coolant actually starts to rise, so more anti-freeze is not better. The 50-50 mixture provides the best combination of freeze and boilover protection, and good heater transfer from the engine.

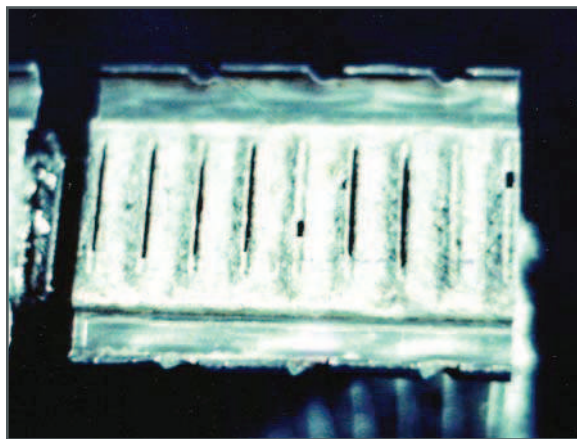
Water quality not only affects the rust/corrosion inhibitors in some anti-freezes, but it may contribute to electrolytic corrosion in the cooling system, which can produce deposits that affect coolant flow and heat transfer. And if the water is very hard, certain anti-freeze inhibitors – particularly phosphates – may react with the calcium and magnesium (and even iron) in hard water to produce deposits that add to the coolant flow and heat transfer problem. See accompanying report: “When to Use Tap Water in a Cooling System, and When Not To”.



A refractometer provides the most consistently accurate indicator of freeze protection of a coolant mixture, and should be used by a professional technician, instead of a hydrometer or test strip.

Mercedes-Benz anti-freeze is formulated without phosphate inhibitors that produce these particular concerns about deposits. Does that mean you can use any anti-freeze without phosphates? You shouldn't, even in areas without a hard water problem, because the factory fill already has established a specific type of rust/corrosion protection mechanism. A different type of rust/corrosion inhibitor package will not continue with that form of protection and might even cancel out protection.

Consider a situation in which the amount of each different inhibitor package is split, from



Excessive electrical activity in the coolant produces electrolysis damage – corrosion that restricts coolant flow through the radiator and heater core.

use of two anti-freezes with different rust/corrosion protection mechanisms, so that each is under 40% of the coolant (as low as 25% even with a 50-50 concentration). Neither inhibitor package may be strong enough to provide its normal type of protection.

Further, Mercedes-Benz is the only passenger car/SUV manufacturer to build into the cooling system a slow-release protection device, that on some late-models permits a 15-year, 143,000 or 150,000 mile coolant replacement interval. The protection device – a packet of silica gel in the coolant reservoir – is designed to work with a Mercedes-Benz specification coolant, and not others. And that's not just a claim. We'll be very specific. (Note: That new service interval has not been extended to all models yet, and it should not be applied retroactively to older models).

Fifteen years/143,000 or 150,000 miles? That must be one of those new anti-freezes you've heard about, that are used in other manufacturers' vehicles. No it isn't. And despite anything you read about "compatibility," these new anti-freezes are not approved for use in Mercedes-Benz vehicles, for specific technical reasons. So you understand the technical basis for these different anti-freezes, a brief technical summary of what they are follows.

But first, a couple of preliminary points:

All original equipment anti-freezes and most aftermarket brands are about 93-95% ethylene glycol, about 3-5% rust/corrosion inhibitors, plus about 2-3% water and/or solvent (required to keep the rust/corrosion inhibitors in solution in the container and as the anti-freeze is poured into the system)—and a leak-trace dye.

A few aftermarket anti-freezes are made with propylene glycol, which often is promoted as a less-toxic chemical, but which is not quite as effective at freeze protection. So when an anti-freeze producer says his product is "compatible" with all original equipment anti-freezes and other aftermarket brands, he's basing this on his own laboratory tests, which simply identify a possible "battleground" issue. That is, when chemicals are "incompatible," there is quick metal damage that shows up.

WARNING: Contains ethylene glycol (107-21-1), diethylene glycol (111-46-6), sodium 2-ethyl hexanoate (19766-89-3), and sodium neodecanoate (31548-27-3).

PRECAUTIONARY MEASURES: Do not drink anti-freeze or solution. Do not breathe the mist or vapors. Avoid prolonged exposure. Avoid skin and eye contact.

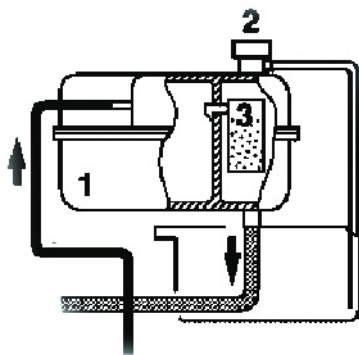
FIRST AID TREATMENT: If **swallowed**, do NOT induce vomiting. **IMMEDIATELY** call a Poison Control Center or hospital emergency department. If **breathing** is affected, move into fresh air. If in **eyes**, rinse thoroughly with water for 15 minutes. If on **skin**, remove contaminated clothing and wash skin well with soap and water. If **irritation** develops and persists, call a doctor.

Ethylene glycol causes birth defects in laboratory animals. Solution is poisonous to animals.

KEEP OUT OF REACH OF CHILDREN

WARNING!
HARMFUL OR FATAL IF SWALLOWED OR INHALED.
DO NOT drink antifreeze or solution. DO NOT store in opened or unlabeled containers. Avoid inhaling mist or hot vapors. Poisonous to animals. Ethylene Glycol has caused birth defects in certain laboratory animals when given orally.
KEEP OUT OF THE REACH OF CHILDREN AND ANIMALS.
CONTAINS: Ethylene Glycol (107-21-1), Diethylene Glycol (111-46-6), Sodium Tetraborate (1303-96-4), Sodium Benzoate (532-32-1), Corrosion Inhibitors, Defoamers, Silicates and Dyes.
FIRST AID:
EYES: Flush with large amounts of water. Get medical attention if irritation persists.
SKIN: Wash exposed areas with soap and water.
INHALATION: If affected, remove to fresh air.
IF SWALLOWED: Give 1-2 glasses of water. Call a physician or Poison Control Center immediately. Ethylene Glycol based. N.Y.F.D. C. of A. No. 4880
24-HOUR EMERGENCY NUMBER 1-800-832-6825

Read the backs of these two containers of coolant. Note the Mercedes-Benz coolant contains forms of borate (sodium tetraborate) and benzoate (sodium benzoate) as well as silicates. The other anti-freeze contains only organic acids (2-EHA and neo-decanoate).



Section of a Mercedes-Benz maintenance chart. Note that the “replace coolant” interval is 15 years or approximately 143,000 miles. The mileage interval is as high as 150,000 miles on some vehicles with the long-life recommendation, based on the scheduled maintenance interval.

However, “compatibility” doesn’t mean equal protection. Even if an anti-freeze works well in one make of vehicles, it doesn’t mean it will work well in all others, as we’ll explain when we talk about the different types of rust/corrosion inhibitor packages.

You also should understand that the leak-trace dye simply identifies a leak. It does not tell you the type of anti-freeze. The most popular anti-freeze colors are green (various shades), yellow/gold, orange, blue, red and amber. In some cases, the colors were chosen by the anti-freeze producer to differentiate a change to a different formula, but not necessarily a specific one. In others, the color was picked because it was considered unlikely to be confused with fluid leakage from another component (washer fluid reservoir, transmission, power steering, etc.). Mercedes-Benz anti-freeze presently is dyed yellow/gold, but so are anti-freezes with totally different formulas and rust/corrosion protection mechanisms. The bottom line: ignore dye color.

Anti-freeze inhibitor packages are classified as “conventional,” and “extended life.” The service interval for “conventional” typically is 2-3 years and/or about 24-40,000 miles. To date, extended life may be “moderately extended” (3-4 years) or five years or more, and up to 150,000 miles. Mercedes-Benz, as noted with its 15-year/150,000-mile interval, has broken new ground.

Rust/Corrosion Inhibitor Packages

You don’t have to be a chemist to understand the rust/corrosion inhibitor packages. All you should do is note the ingredients, see that they differ and realize why Mercedes-Benz anti-freeze protection mechanism truly is different, and the reasons why.

“Conventional green”: The inhibitors are sodium silicate and phosphate, both proven protectors for aluminum, plus benzoate and borate (broad-range metal protection) and a “triazole,” one of a group of inhibitors that protect copper-brass, plus an inhibitor that protects cast-iron.

“Japanese” green or red “conventional”: It typically contains phosphates and benzoate, a triazole; plus molybdate (cast-iron protection) and nitrate (a specific type of aluminum protection). It contains no silicate.


Organic acid technology/extended life coolants (called "OATs"): Although benzoate is an organic acid, it is not used in an exclusive package with other organic acids in an OAT. The organic acids used in American anti-freezes include one 2-EHA, among others (such as sebacate and neo-decanoate). They contain no silicates and no phosphates. Japanese OAT anti-freezes do not use 2-EHA but they do contain phosphate. Note: 2-EHA (2-ethylhexanoic acid) is a "plasticizer," which means it softens plastics. Gaskets are made with plastic and there have been laboratory tests reported by other manufacturers, that raise concerns about coolant-sealing gasket leakage with 2-EHA.

Mercedes-Benz type hybrid: Originally developed to work well with both diesels and gasoline engines, this anti-freeze uses a low-silicate formula. It also contains benzoate and borate, plus benzo-triazole for copper-brass protection, nitrate and nitrite (protects cast-iron liners in diesels). It was demonstrated to be a robust formula that would work for extended intervals, and with Mercedes slow-release "refreshment" of the coolant, capable of long life in a well-maintained system.

It's the Mercedes-Benz cooling system itself - the metallurgy, the gasket materials, the flow pattern of the coolant plus the use of the silica gel packet - that combine with the field experience to assure that a particular anti-freeze is the right choice.

The long-term validation of the Mercedes coolant in a Mercedes cooling system avoids the need to deal with the concerns about OAT coolants. Why would you want to take a chance with anything other than the Mercedes-Benz recommended hybrid type? If you buy your anti-freeze from an aftermarket source, use a reputable brand that meets current Mercedes-Benz formulation, typically labeled a G-05 coolant. We bought Mercedes-Benz authorized anti-freeze from a Mercedes-Benz dealer, and the list price was only a dollar and change more than the price of national brand anti-freezes in an auto parts store.

Note: some anti-freeze suppliers claim their products meet specifications of all manufacturers, and provide a long list of manufacturers' specifications their products meet. However, over the years all vehicle makers have used a number of different specifications, not all of



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