

# Three Myths About Ethanol

By Bob Adriance

In the five years since ethanol began to be widely used in the United States, a lot has been written about its properties, the problems it has created, and how to best cope with its possible effects. Some of the advice has been based on science and some on hearsay.

Seaworthy talked to two engineers who have over 75 years of combined experience working with gasoline: Jim Simnick, technical advisor at Global Fuels Technology and Lew Gibbs, a senior engineering consultant and a Chevron Fellow. Seaworthy asked three questions about popular “myths” of how to deal with ethanol-enhanced gasoline. Their answers are summarized below.

**Question:** *Does ethanol-enhanced gasoline (E-10) lose octane much faster than regular gasoline?* This is an especially important question because many mechanics believe that octane loss during winter storage could be great enough to damage an engine when it is run in the spring. These same mechanics will often recommend leaving the tank almost empty so that fresh gasoline can be added in the spring to raise depleted octane levels.

**Answer:** While all gasoline loses octane as it ages, ethanol-enhanced gasoline loses octane at about the same rate as regular gasoline. Both Gibbs and Simnick said that the loss of octane over the winter would not be sufficient to damage an engine. Note, however, to keep any gasoline, including E10, as fresh as possible, they said it's good practice to always add an antioxidant whenever the boat will be idle for long periods.

The recommendation to leave a tank mostly empty is bad advice because it could significantly increase the amount of water that gets into the tank through the vent. (When enough moisture is attracted, the ethanol will “phase separate” (see below for a description of phase separation) from the gasoline.)

Leaving a tank mostly empty does three things to increase the chances of phase separation: 1. It increases the volume of open space in the tank (its “lung capacity”) so it can “breathe in” moist air. 2. An almost empty tank leaves more space on tank walls for condensation to form. 3. Leaving less gasoline in the tank means there will be less ethanol to absorb the condensation. It's interesting to note that in areas of the Midwest that have been dealing with E-10 for over a decade, topping off tanks is common practice. (As an alternative, completely emptying the tank would eliminate any chance of phase separation.)

If phase separation occurs, the highly corrosive ethanol/water mixture will settle to the bottom of the tank and remain there even after fresh fuel is added in the spring. The only way to remedy the problem would then be to drain the tank and add fresh gasoline. The best way to avoid phase separation over the winter (aside from draining the tank, which isn't practical) is to leave the tank full (95-percent full to allow for expansion) so that there is less moist air in the tank, less space for condensation to collect, and more gasoline to absorb whatever moisture does accumulate.

**Question:** Since E-10 attracts water, is it important to install a water separator to prevent the water reaching the engine?

**Answer:** Unlike regular gasoline, which can absorb almost no moisture, E-10 can hold up to ½ percent of water by volume, and the water molecules will dissolve in the fuel. The solubilized water will bypass the water separator and burn harmlessly through the engine. Only if phase separation were to occur would a water separator do its job, but by then the fuel itself would be the problem. Phase-separated gasoline consists of a water/ethanol mixture on the bottom of the tank and reduced-octane gasoline floating at the top, either of which will damage your engine.

Note, however, that a fuel filter (10-micron) is essential to keep gunk from reaching your engine. Ethanol is a solvent that dissolves resins, rust and dirt that have accumulated on older tank walls. Especially when you first make the transition to E-10, it is important to carry spare filters and a galvanized bucket to store used filters prior to disposal. Even in new engines and tanks, E-10 will sometimes form a mysterious gooey substance that will also clog filters. Richard Kolb, the manager of Emissions and Regulations for Volvo Penta, believes the goo is caused by water mixing with one or more of the 108 approved compounds that can be used in gasoline. These compounds vary among suppliers, so one solution is to change to a different brand of gasoline. Another is to use carburetor cleaner, which he says has sometimes remedied the problem.

**Question:** Are there additives that will prevent phase separation?

**Answer:** Both Gibbs and Simnick said that the additives that eliminate water may work incrementally to protect against phase separation, but as Jim Simnick said there is no additive that will stand up to a good slug of water.

Curiously, if E-15 were to be allowed, it would be less prone to phase separation than E-10 since the additional alcohol would absorb more water. That's the good news. But—the bad news—adding more ethanol raises other issues with materials compatibility: elastomers, plastics and metals may be affected because alcohol is more corrosive than gasoline and engines have only been tested with E-10. Also, adding oxygen in the fuel may cause the engine to run hotter, especially if a computer does not control combustion.

Lew Gibbs says the best way to prevent phase separation in E-10 is to “keep it dry, keep it dry, keep it dry.” That means keeping the tank filled to prevent condensation.

Bob Adriance is Editor of Seaworthy, the BoatUS Marine Insurance damage-avoidance publication.

Phase Separation describes what happens to gasoline containing Ethanol when water is present. When gasoline containing even small amounts of Ethanol comes in contact with water, either liquid or in the form of humidity; the Ethanol will pick-up and absorb some or all of that water. When it reaches a saturation point the Ethanol and water will Phase Separate, actually coming out of solution and forming two or three distinct layers in the tank.

Reprinted from the June, 2010 issue of the Boat/US Seaworthy Magazine.