

Problems With Ethanol In Gasoline

My problems with ethanol in standard pump gas began when I had to park my motorcycles while doing a lengthy home remodel project. Looking back, I feel fortunate that I learned about ethanol in a relatively harmless way. It could have been much worse for my treasured classic motorcycles.

One of the bikes which remained idle for almost a year was my 1966 Matchless G12 CSR. It had developed an oil leak between one head and barrel, a product of my hand-made solid copper head gaskets. I hadn't inserted o-rings at the top end oil gallery. When I finally got to a pause in the home remodel work, I dived into the G12 to install o-rings. As an aside, I believe that solid copper head gaskets with o-rings installed, for use in G12's, are now available from the AJSMOC Spares Scheme.

To remove the heads and modify my head gaskets to accept o-rings, I first had to remove the G12's gas tank. It contained about two gallons of gas, purchased for my last ride before the head gasket oil leak was discovered. I poured this old gas into a clean pan, intending to use it later in my gas lawn mower. This was about mid-morning, and the gasoline in the clean pan looked fine- clear and reddish in color. It didn't smell stale, as some older gas can get.

I left the pan of gasoline outside, and returned to my main task of removing the heads from the G12. After making good progress on that for the next few hours, I returned to deal with the gasoline in the pan, to move it to a better destination.

In the time that it had sat outside, what had first appeared to be normal, clear gasoline had turned so turbid that I couldn't see through it to the bottom of the pan, 2" beneath the liquid's surface. I was amazed by the change, and realized that I should discard the gas rather than use it in anything else. When I began pouring it into my waste oil can, I was also surprised to find about a tablespoon of water puddled at the bottom of the pan! There had been no trace of that earlier, although I might have missed it.

What I had experienced is termed "phase separation", a chemical process that is harmful for any of our gasoline-powered vehicles, from classic motorcycles to newer family automobiles. It is a particular demon for our classic bikes, which may not get started and used as often as we would prefer.

Before discussing the evils of phase separation, some understanding of how and why ethanol began to be added to gasoline is warranted. In California, and then throughout the US, ethanol was added to gasoline in the last decade as an "oxygenate" to make a cleaner-burning fuel with lower emissions, reducing air pollution. Ethanol replaced the first oxygenate added to gas, methyl tertiary butyl ether (MTBE), when that toxic compound was found to be leaking into groundwater near gas stations. Today, virtually all pump gas sold in California is E10, containing 10% ethanol. Different blends of ethanol in gas are also sold across the country, often varying in ethanol content by season. I believe ethanol has been used as a fuel additive in some parts of Europe as well.

Under pressure from the politically powerful corn grower and ethanol distiller lobby in the US mid-west, ethanol began to be considered a "green fuel", which would presumably help the US become less dependent on foreign petroleum. Unfortunately, this misguided argument ignores the reality that compared to the amount of petroleum use which is offset by adding ethanol to gasoline, it takes more fossil fuel energy (primarily in the form of diesel fuel) to grow, harvest, and transport corn, then distill it into ethanol, and finally transport it again to be mixed into pump gasoline. US dependence on foreign petroleum is only increased by mixing ethanol into gas.

Because it has a lower btu output than gasoline when burned, ethanol mixed in gasoline also reduces the miles per gallon that vehicles using it obtain. This factor seems not to bother regulatory agencies, gasoline retailers or government fuel tax collectors. For the same reason that mileage efficiency is diminished, E10 and other ethanol mixes run more lean in older engines with carburetors. For such engines that are run hard, re-jetting may be advisable.

The main problem for vehicles burning a mix of ethanol and gasoline is that water vapor in air, in the form of humidity, is actively attracted by the ethanol and dissolves readily in it. As your fuel tank breathes in and out through the gas cap vent, driven by daily cyclic changes in temperature, partly humid air is drawn repeatedly into the tank. This same process happens in the underground gas storage tanks of filling stations. To minimize the amount of time that ethanol in gas is exposed to and takes up humidity, ethanol typically isn't added to gas until refined gas reaches the bulk plant, the last storage step before it is delivered to retail stations. The amount of ethanol in what is sold to customers at the pump as E10 can actually be 13-14%, rather than 10%, since ethanol fuel subsidies encourage bulk plant operators to mix in and sell more ethanol than just 10%.

Gradually over time, the ethanol in stored gas picks up more and more water, until it reaches the maximum amount it can hold. This maximum amount of dissolved water in ethanol is a function of the temperature of the mix. Less water can be in solution if the fuel mix is cold, and more if it is warm.

If a previously warmer gas/ethanol fuel containing its maximum amount of dissolved water is cooled, some of the water and ethanol mix comes out of solution, and forms microscopic drops of liquid water. In other words, it “phase separates”. This is precisely what had happened to the old gas in my G12 tank, and in the pan I drained it into. The tiny drops of water that separate descend to the bottom of the tank and become a puddle of liquid water.

Ethanol in gasoline essentially becomes a chemical pump to draw more and more water into the bottom of your gas tank. Water in an unlined steel gas tank causes rust, of course, and it also causes the formation of gums and a fine suspended particulate which can reduce or clog the bores of jets in our carburetors.

Overall, ethanol in gasoline is very bad news for our classic vehicles, especially if they don't get used often. Gas containing ethanol that is older than six months or so should be discarded, or prior to that, transferred to and burned in another vehicle that is being used more regularly. For vehicles that are used regularly, ethanol in gas doesn't seem to be as much of a problem, especially if you “deep cycle” the fuel in your tank. Try to use up almost all of your older fuel before you refill the tank with (hopefully) fresher fuel at a gas station. It also may help to buy your gas from a major station that gets more frequent deliveries of fresh fuel.

Old gasoline left in a bike that has not been started in a year or so should be discarded, and the tank should be removed and carefully cleaned to remove any water, rust or fine particulate that have formed. Gas lines and carburetors should be similarly cleaned thoroughly. Change fuel often, and check it frequently for the presence of water to avoid more serious problems. Best wishes for trouble-free riding.

Paul Allen, San Luis Obispo, California