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## FUEL PRIMER

# BAD GAS BLUES

Be aware of what you're putting in your tank!

By Pete Bengel



*There are various chemical or mechanical ways to protect your fuel supply. A little extra care can help you avoid costly engine damage!*

So you're riding along on your favorite off-road toy, whether it's your ATV, motorcycle, snowmobile or watercraft, when suddenly things take a turn for the worse. Maybe you start to lose power and hear a rattle before the eerie silence, or maybe it just up and quits with no warning. Either way, you're left powerless in the middle of the track, trail, or water. You've just become a victim of bad gas... and all the "Bean-O" in the world isn't going to help you now!

This past winter, while snowmobiling in Michigan's Upper Peninsula, less than 6 miles past our latest gas fill up, my trip came to an abrupt end. What happened to an engine with less than 600 miles on it since a routine rebuild could happen to anyone, and was the result of a "perfect storm" of circumstances. First of all, I'd violated one of my own cardinal rules. In my quest for that little bit of extra performance, I had my midrange jetting closer to "optimal" than I normally would. I normally like to see a somewhat dark chocolate color on my plugs, but I'd shimmed my needles to clean up my midrange performance a bit. The second part of the storm was that the Citgo station we'd filled up at last uses a blend of 9% ethanol (confirmed by MDA testing) in their fuel as do the majority of stations these days. Ethanol blended fuels, which are sometimes referred to as "oxygenated" fuels, cause your mixture to be leaner than it would be on 100% gasoline. The third, and most damning of the ingredients of my engine failure, was something far more common than you'd

expect... water. In addition to the 9% ethanol that I really didn't care for but couldn't avoid, my latest fill up had a gratuitous helping of water in it.

While any of the above factors can cause damage to your engine by themselves, combining any of them is a recipe for sure disaster. Read on, and we'll give you some helpful hints to keep your engine safe from surprises in your fuel tank.

### **DON'T BE AN ALCOHOLIC.**

Unless you're a serious horsepower junky with an engine built specifically to run on it, alcohol is a very bad thing for your fuel system and engine. Ethanol, the form of alcohol that is commonly and widely blended into all grades of fuel these days, has a few qualities that can cause major headaches when used in your power sport vehicle engine. Ethanol is an oxygenate, which means that it contains or draws in oxygen. This has the same effect on your engine as an air leak in your intake tract or seals, causing your engine to run considerably leaner.

Another bad quality is that it is hygroscopic, meaning that it ingests water. The ethanol in your fuel will, by nature, draw moisture from the atmosphere. The longer it is exposed to air, the more it will ingest until it gets to the point that the alcohol/water mixture becomes heavier than the gasoline that suspends it. At this point something very bad happens... phase separation. The mixture of alcohol and water falls out of suspension in the gasoline

and becomes a blob of nasty crud in the bottom of your fuel tank, float bowl, or gas can.

Phase separation causes two very bad problems. One problem is the blob of crap that will inevitably find its way into your engine where it will wreak havoc, but the underlying problem can cause just as much trouble or more. When phase separation occurs, the gasoline that is left behind loses its octane rating. Ethanol naturally has a higher resistance to self-ignition than gasoline. This resistance to self-ignition is the basis for your octane rating. The higher the number, the more a fuel will resist self-ignition. For example, if your blended fuel had a rating of 87 and you take away the octane benefits of the ethanol, your rating will drop considerably. If you're already playing tight to the fence of your octane requirements, this could signal the end of your engine's lifespan.

Still another item on the negative side of ethanol is that it does not facilitate an oil mixture as well as gasoline... at least not for long. Over time your two-stroke oil will separate from the alcohol just as the alcohol will separate from the gasoline. While it may not be quite as big of a deal for oil-injected engines, it can be vital in a premix situation.

How do you avoid these problems? The best answer is to avoid blended fuels whenever possible. While it is no longer legally required that a station discloses its ethanol content on the pump, most will be able to tell you whether their fuel is blended or not. If you can locate a station that still sells 100% gasoline, put them on your Christmas card list! You can avoid all of the above mentioned problems by avoiding ethanol whenever you can.

### **LEAN REALLY CAN BE MEAN.**

If your machine still uses a carburetor, make sure you don't have your jetting too lean. Most OEM jetting is calibrated on the rich side to avoid problems with blended fuel, but if you've adjusted your jetting on the edge for 100% gasoline, a 10% blend will have you firmly planted in leanville. Fuel injected machines aren't quite as susceptible to these issues, but they're still not completely safe. Some EFI machines even have ways to alter the fuel mapping if you know you're going to be running an ethanol blend, usually as simple as disconnecting a wire.

### **DON'T STORE FUEL.**

Due to the inherent problems with blended gasoline, it has a very short lifespan compared to 100% gasoline. Even when stored in a sealed container it becomes questionable at 30 days. If it's in your fuel tank or another vented container, that lifespan decreases even more. If you have gas that you think may be too old, it's best not to use it in your small engine. You can probably dump it into your car or truck as those engines have much more complex fuel management systems as well as knock sensors to keep them from self destructing from detonation. But don't be so quick to burn pre-mix in your automobile. Two stroke oil + oxygen sensors + catalytic converters = big repair bill!



**This is what can happen when just a little bit of water finds its way through your carburetor or fuel injector. Cool moisture hits your hot engine and boils the lubrication from the cylinder wall and piston. CHA-CHING!**

**DRY GAS. DO OR DON'T?**

A lot of people are in the habit of using dry gas as a safeguard against water in their fuel. While this is a good idea to a point, there is a large grey area. If your fuel already contains up to 10% alcohol, or higher in some states, adding more surely isn't going to help your cause. If you do use dry gas, use it sparingly! A couple of ounces to a tank full of gas will probably be just fine, but a half bottle can cause more harm than good. And avoid methanol dry gas at all costs! Methanol can cause serious problems with the materials used in your fuel system. If you have to use dry gas, always use isopropyl types.

**PROTECT YOUR FUEL SUPPLY.**

Always keep your fuel protected from the elements and foreign debris. Keep your fuel in a sealed container, but don't forget... don't

keep it for long. Keep that sealed container in a clean, dry environment. Try not to let it get covered in dirt or other crud, and don't let it sit out in the weather. Anything that accumulates in or on top of your fuel container can easily find its way into your fuel system. Also, be aware of what's going on around you when you fill the tank on your ATV, snowmobile, etc. The wind can blow an amazing amount of grit and dirt into your tank while you're filling up, and remember that every snowflake that finds its way into your tank is a drop of water. Keep your fuel tank opening shielded from the elements while you fill up, and only keep the cap off for as long as it takes to fill it.

There is also a rather handy device that we've been using lately to help protect our fuel tanks. Mr. Funnel makes various sized funnels that have a built-in filter and water separator. There are bigger models for higher flow rates, and convenient smaller sizes that will fit right into your storage compartment of your machine so you can take them with you on the trail. They are a really easy and effective way to make sure the fuel going into your tank is clean and free of water.

**WHAT ABOUT FUEL ADDITIVES?**

There are about a million different fuel additives on the market, and short of having a testing laboratory on your hands, it's just about impossible to find out which one is the best, which ones work, or which ones don't. Some of the more popular treatments on the market are Sea Foam and Star Tron. Both of these additives claim to clean your fuel system as



**These funnels are a great way to protect your gasoline or diesel burning equipment or toys. They come in various flow rates as well as sizes that are easy to stow and take with you on your ride.**

well as stabilize the gasoline, protecting you from crud buildup and phase separation. Of course, being vigilant to keep your fuel fresh and clean is the best way to insure trouble-free performance without using additives.

The moral of this story is, protect your machine from circumstances that you have control over, and be prepared for those that you can't avoid. It is almost a complete certainty that at some point you'll have to subject your engine to ethanol blended fuels, so we suggest taking precautions against any damage it can cause by making sure your jetting is on the safely rich side. In the mean time, try to keep your fuel supply clean and as fresh as possible, and avoid adding a cocktail of additives that may do more harm than good. A little vigilance can be the difference between a successful ride and a costly engine failure. Send your pics and info to: [readers@atvillustrated.com](mailto:readers@atvillustrated.com). ●

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