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**DON'T BE FUELISH. THERE IS MUCH TO CONSIDER WHEN BUYING, TRANSPORTING AND STORING RACING FUELS.**  
STORY AND PHOTOGRAPHY  
BY RICHARD NEWTON

# RACE FUEL AND YOU



All of these fuel bottles are for track use only. They really aren't designed for fuel storage.

It shouldn't be this hard. Then again consider the fact VP produces 73 different types of gasoline. Then factor in ethanol coming out of all of our local gas pumps and it gets even more difficult. However, since you shouldn't be using ethanol in your vintage racer, that may be a moot point. I'll get back to that later.

I spent way too much time talking to different petroleum engineers and came away with more questions than answers. I have arrived at some very basic rules that everyone can agree upon. Maybe...

- Avoid your local gas station as a source of race fuel.
- Don't use ethanol blends in your race car
- Leaded gas is good for your vintage racer.
- Pay attention to how you transport and store your gasoline.

## Octane Numbers

Octane is important but it's just one of several things that need be considered when evaluating and selecting a fuel. Octane is a consequence of other things and is really a derived number. It's entirely possible for two fuels to have the same octane rating and perform very differently.

We're all familiar with the yellow stickers on the gas pump that state an octane number. Most of you even know that the pump number is an average of two numbers. A Research Octane Number (RON) and a Motor Octane Number (MON) are added together and then divided by two.

Both the RON and MON tests are done at very low speeds with low loads in archaic single-cylinder laboratory engines that are loosely referred to as "knock engines." The



anticipated. Now that NASCAR has switched to unleaded fuel (with ethanol) we can expect that even more technology will be brought to bear in the development of unleaded racing fuels. That might be good. It can't be bad.

Remember though, that we drive old cars. In an older car (pre-computer engines or engines built prior to the mid-'70s) lead is a good thing. If you can get leaded race fuel you should be using it. Your car will like it. It's not going to make you the fastest driver in your class but it might help your engine last just a little bit longer.

### Beware of Ethanol

Most of the gasoline sold in the United States today is what's called E10. In other words, it's about 10% ethanol and 90% gasoline. There are two major concerns with this fuel. First, ethanol is a solvent.

The boating industry claims to have seen cases where E10 has actually eaten through fiberglass fuel tanks. However, the fuel cell producers haven't seen anything like this. It has really become difficult to separate fact from fiction when discussing E10 (thanks to the ethanol lobby—*Ed.*). The only people with the facts are the people who refine the gas and most people don't trust them.

One reason for all of the ethanol talk is that it's the only gasoline ingredient that's identified on the pump. When someone has a problem it's nice to blame it on an ingredient you can actually name. Right now any problem with fuel is blamed on ethanol. That's probably not correct but it's the way things are.

These ethanol blends are required in a number of states and widely used everywhere else. At least two-thirds of the gasoline sold in the United States is E10. If you buy fuel at a local station just assume that you're getting some sort of ethanol blend. That's why you need to find other sources for your race fuel.

There's no question that gasoline with ethanol acts as a fuel system cleaner. If parts of your fuel system are old they may

have a certain amount of varnish in them. Ethanol has different solvency behaviors than does gasoline, which allows E10 to loosen rust, and debris that might otherwise lay undisturbed in fuel systems. If you're running a stock fuel tank rather than a new fuel cell you may have a problem. E10 will certainly clean all of the old varnish out of the tank. Even the non-ethanol parts of gasoline are powerful solvents. This means that the varnish in the tanks and lines end up in the fuel filter or the idle jets of a carburetor.

The second issue is what petroleum engineers call "phase separation." Ethanol is hygroscopic and similar to brake fluid in that it actually attracts water. Ethanol-enhanced gasoline can absorb roughly 10 times as much water as fuel blended with

the old MTBE (Methyl Tertiary-Butyl Ether). The problem is that when ethanol becomes saturated with water from sitting over a long period of time, the ethanol separates from the gasoline. You now have two separate solutions. This is called phase separation and it's bad news for the engine. An engine won't run on the water-laden ethanol solution. This ethanol/water mix also

sinks to the bottom of the fuel tank and is highly corrosive.

### Fuel Stabilizers

If you top your fuel cell up after each event there is no need to use a fuel stabilizer. The only reason you might need a fuel stabilizer is if you leave fuel in the car for several months, which many do.

Fuel stabilizers are, for the most part, anti-oxidants. Oil companies use these chemicals to extend the shelf life of their gasoline, also adding other shelf-life extenders such as corrosion inhibitors and metal deactivators.

Sta-Bil is the largest producer of fuel stabilizers. The company recently introduced a new

Marine Formula that is like Sta-Bil on steroids. It contains four times the fuel system cleaner as the old product and twice



There are now so many different kinds of fuels and additives you can't say with any certainty how the fuel cell foam is going to interact with the fuel. You're simply going to have to monitor your own situation. If you think you have an issue you can talk to the fuel cell makers. They should be able to provide some guidance.



Given the nature of the new gasoline formulations you might be better off with a new fuel cell than your old gas tank because of varnish in the tank. A fuel cell is also far safer in a crash.

relationship between the octane levels measured from these knock engines and actual knock performance in real-world vehicles is somewhat strained.

Recent research has shown that in many applications there is a better relationship between RON and engine knock than MON. In some cases fuels with the same RON but lower MON numbers actually exhibit better anti-knock characteristics. This goes against conventional wisdom and it underscores the vast difference between laboratory knock engines and modern production engines. At best it demonstrates that octane is only one characteristic that's important when it comes to purchasing race fuel.

### Unleaded Race Fuel

This is happening much faster than anyone



These red jugs are much better for storing gasoline than the clear jugs. Most (but not all) gasolines are photosensitive.



This is going to be an easy fuel filter to change. Change filters often—more often if the fuel has a blend of ethanol.



This Porsche 935 uses a combination of braided steel and braided fabric fuel lines. Some of the new race fuels may not be compatible with these older fuel lines. Call the fuel line manufacturer and ask questions.



More rubber fuel lines. The best thing is to simply replace all your rubber lines. Look for new lines that aren't affected by ethanol and other corrosive chemicals. Or, just make sure you never use fuel from your local gas station.

the amount of corrosion inhibitor as the old automotive product.

The folks at Sta-Bil claim that if you use their product you can leave fuel in the tank for up to 12 months, eliminating the need to drain the tank after each event.

Most oil companies treat over-the-shelf fuel stabilizers a lot like oil additives. They aren't real happy with you adding things to their gasoline. They won't say it's harmful but they won't say it helps anything either. Actually they don't know. They test their own products a great deal but they're not about to test, let alone certify, another company's product.

### The Fuel Cell

You shouldn't have a problem with your

fuel cell. No one is going to say this with any degree of certainty, however. There are hundreds of different gasoline blends on the market. Even more exotic chemicals will be introduced in the future. It's impossible for the fuel cell manufacturers to keep up with all the changes.

The best we can say is that you probably shouldn't leave race fuel in your cell more than 60 days. You should never leave fuel in your cell during the off-season. Drain the cell after the last race of the season and don't add anything until you get to the first race of the season.

The foam should last as long as the bladder lasts. Most companies, and the FIA, give you five years for the life of a bladder. You should be using military-spec foam

inside your fuel cell. This is often called Military Spec B-83054. Ask for it.

Fuel cell problems may become more of an issue as pump gas is changed to an E15 blend. Right now we just don't have a great deal of experience with E15—just one more reason that in the future we might all be draining our fuel cells at the end of every weekend. The main reason for topping off fuel cells is to minimize "breathing" where outside air is drawn in to the cell when it cools. Topping off the fuel cell helps to keep moisture from building up since there's less space for moist air above the liquid layer.

### Fuel Filters

Fuel filters should be changed more often than in the past, pre-ethanol. This is especially important if you use pump gas. Your local gas station sells E10 gasoline. Remember E10 gasoline is really good at cleaning up an older fuel system. That means more stuff is going to get captured in your filters. If you use pump gas in your vintage racer you're going to have an issue.

In most cases the fuel filter is easy to get to and it's not going to be that expensive. You might also consider upgrading the fuel filter to one that captures 10-micron debris. Most fuel filters use 28 microns as the standard. Even if you never let E10 in your tank you need to consider changing the fuel filter before each event. It's cheap insurance.

### Fuel Lines

This seems to be more of a problem with boats than race cars. Then again there are a lot more boats out there and boat owners neglect their boats even more than we neglect our race cars. One problem is that boats sit in water. The other issue is that the tanks and pumps in a marina are not subject to the same laws and regulations as the neighborhood gas station. The marine folks have a set of issues slightly different from our issues.

There probably aren't many rubber fuel lines in your race car. However, braided stainless steel fuel lines are common. Many of these stainless steel braided lines are actually a rubber (or some sort of elastomer) hose with a stainless steel braided cover. Stainless steel braid on the outside doesn't always mean there's a bulletproof hose on the inside. Check with the people who sold you the fuel lines and see if they've had any problems.

### Fuel Storage

The two biggest enemies of gasoline are time and sunlight. Remember when using leaded fuel, ultraviolet rays will actually cause the lead to fall out of the composition. Many use the ubiquitous clear plastic fuel jugs during the course of the weekend. The remaining



These bottles are only good for use during the weekend. Besides being made of a clear plastic, it's almost impossible to get them sealed tightly. Before you leave the track put the gasoline in a sealed opaque container. Metal cans are the best way to store and transport race fuel. They seal much better than the plastic jugs.



◀ Sunoco brings these portable pumps to the Indy car races. The gas is pumped directly from the tanker truck. Most of the major fuel suppliers seem to be moving away from using underground tanks.

fuel is usually transported home or back to the shop. These very popular translucent jugs are a poor choice for storage since sunlight can degrade all racing fuels.

If you have to actually store fuel, you should be storing it in metal containers. According to VP Racing Fuels, plastic jugs are designed for transfer and not long-term storage. When purchasing fuel jugs, choose ones opaque in color.

Even if you can keep sunlight from your fuel you can't protect it from time. The longest fuel should be stored in a plastic jug is a few days. It begins to deteriorate in a short amount of time.

Fuel in a sealed metal drum is a whole different situation. As long as the drum is not opened, the fuel might be good for at least a year. The gasoline in a fuel cell could also be okay for a year. It depends on the fuel tank venting system and if the cell is filled to the top.

Draining the fuel out of the car every weekend just isn't safe because of the way some people do it. Some argue the only time fuel should be completely drained

is when the car is going to be sitting for a long period of time. At the end of the season completely draining the fuel cell is highly recommended but in all cases follow the fuel cell manufacturer's guidelines, provide

adequate ventilation and make sure there are no open flames such as pilot lights, and be aware that static electricity and fuel vapors can trigger an explosion and fire.

### Where Do I Purchase Fuel?

This gets a little complex. We can make good arguments for both bringing your own fuel to the track or purchasing it at the track. If you can avoid transporting fuel, you should. Why take a chance on problems if you can buy fuel at the track? It may cost more but the price difference is not a major factor in an annual budget.

You may not have a lot of faith in the fuel being sold at the track, however. Or, the fuel there may not be the particular fuel your car likes. Now that NASCAR is using an ethanol-blended racing fuel, Sunoco no longer keeps the race fuel in the ground. The fuel is transported in, and dispensed from, specially-built Sunoco tankers. Is that a clue?

Shell, Sunoco and VP will drop ship fuel to the track. That means the fuel will be exactly the same from weekend to weekend. You can use exactly the same fuel at the track that you use on the dyno stand. Anytime you can eliminate a variable it's a good thing.

### Safety First

This is extremely important. You can burn your car to the ground. One huge concern

is transporting fuel. I generally carry empty jugs in my trailer. That's probably more dangerous than having them full. Gasoline won't burn or explode but the vapors sure will. Each empty fuel jug is a potential bomb. You should have a system for securing your fuel jugs inside the trailer. If you tow with full fuel jugs you surely don't need a jug falling over and spreading gasoline over the floor of the trailer. And when filling the jugs, make sure they touch the ground and that the fuel nozzle stays in contact with the jug to eliminate the possibility of static electricity sparks.

Consider adding additional vents to the trailer. If you smell fuel when you open the trailer door, you have a problem. That means you need to add some vents. They allow fresh air to circulate. Quit worrying about the dust on your cabinets and start thinking about the potential of a fire. A fire suppression system might be a consideration. At the very least carry a few fire extinguishers and know where they are so you can access them quickly.

All of these new gasoline formulations don't mean we're going to see the end of vintage racing. Companies such as Shell, VP and Sunoco are investing a lot of money to make sure that we can continue to use their products. What is going to happen is we're going to have to change how we buy our gasoline. It also means we're going to have to be informed about these products. Change is never easy. Just because we race old cars doesn't mean we can keep doing things the way we did back when our cars were new.



It's almost impossible for fuel cell manufacturers to keep up with the new gasoline formulations. Each oil company is using a different blend. Changing out the bladder and foam on a regular basis may be wise.

**SOURCES**  
Aero Tec Laboratories Inc.  
45 Spear Road Industrial Park  
Ramsey, NJ 07446  
201-825-1400  
atlinc.com

Klotz Synthetic Lubricants  
7424 Freedom Way  
Fort Wayne, IN 46818  
800-242-0489  
klotzlube.com

Shell Racing Fuels  
333 Highway 6 South  
Houston TX 77082  
888-817-4355  
shell.com/globalsolutions/racing

Sta-Bil  
400 South Kildare Ave.  
Chicago, IL 60632  
800-367-3245  
goldeagle.com

Sunoco Race Fuels  
PO Box 1226  
Linwood, PA 19061  
800-722-3427  
racegas.com

VP Racing Fuel  
7124 Richter Road  
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