Understanding Alcohol Fuel and Fuel Systems

Alcohol is the preferred fuel for bracket racing or most class racing where the rules don't require gasoline. Why? The four basic fundamental advantages of alcohol are as follows in the order of importance:

1. Density altitude has about 5 times less effect on engine performance with alcohol then with gasoline, making it much easier to predict consistency. That does not mean performance will not change with weather changes. It means it will change only 1/5 of the amount of gasoline. Gasoline will usually need jet changes when weather changes, alcohol would need a major weather change to require rejetting. The one exception is alcohol does not like humidity. Rule of thumb, if you can see the moisture in the air, dial up. The engine will slow down with a lot of water in the air.
2. It's almost impossible to overheat an alcohol engine. For the racers that plan on being in the race at the end, cooling will never be an issue. Cooling is almost always an issue with gasoline.
3. The average price of alcohol is under $2.00 per gallon, as opposed to $5 to 7.00 per gallon for racing gasoline. Going a lot of rounds at a 3-day event, this will save a lot of money.
4. Alcohol does not add much peak horsepower, but it adds a lot of torque. Therefore it usually runs about a tenth or more quicker and about 2 or 3 mph faster.

All these benefits, there must be some disadvantages?

There are. The main disadvantage is that you have to understand alcohol compared to gasoline.

1. **Alcohol can be very corrosive** - It is mandatory that all your fittings and fuel system parts are of good condition and all parts are anodized or coated to protect against corrosion.
2. **Alcohol myths** - You must drain your fuel system and lubricate all components after every race. This is just a myth. Always add lube to your alcohol (most alcohol comes with lube already added). Before leaving the racetrack, fill tank right to the top, spray WD40 or equivalent down the carb or injector and you are done.
3. **Starting a cold engine in cold weather** - This can be a very frustrating experience for the new alcohol racer. It takes twice the amount of alcohol to run the engine, so it will take twice the amount of pumping the throttle (accelerator pumps). Pump the throttle twice as much, crank the engine with ignition off, pump a few more times, crank, then turn on ignition while cranking. When engine fires, keep at a fast idle till the engine warms up. Not pumping enough fuel into engine usually makes the engine backfire. This can start a fire (keep cranking engine if this happens to suck fire back into engine) or the backfire usually will bend the floats in the carburetors (check floats if you back fire engine). If all else fails, squirt some gasoline into the carb or injector and that will start the engine. Once you get use to the alcohol, you won't need to squirt the gasoline in the engine.
4. **Tuning your engine on alcohol** - Think about it this way, gasoline requires a choke when it's cold. Alcohol is exactly opposite. As the engine parts get hot, the alcohol evaporates on the way into the cylinder. The hotter the engine gets, the richer the engine needs to be. Alcohol requires the choke after it is hot? Sound confusing? It is confusing at first. A perfectly tuned hot alcohol engine will be dead rich when it is first started. It needs air to get warmed up. Open the butterflies just enough to make for a fast idle. Not to fast, as the boosters will start feeding fuel and the engine will actually get colder. If you are running injectors, close the fuel shutoff partway to lean engine. As engine warms up, it will increase rpms. Either close the butterflies on the carbs or open the fuel shutoff with injectors. Always warm engine till oil temp is hot.
5. **Timing** – Typically an alcohol engine will run best with about 4 degrees less timing the gasoline. If throttle response is needed, increase timing until it hurts mph.
6. **Temperature?** - Install an oil temp gauge. That's the only important temp. 10 degrees difference in oil temp on the dyno can vary HP by about 10 HP. To be consistent, keep oil temp the same all the time. The oil will be hot at the end of the race, so make it hot in the beginning of the race. That way, the performance will stay the same throughout the race. Don't be concerned with water temp. It does not have very much effect on performance. A properly tuned alcohol engine will have trouble keeping water temp hot. Don't worry about it. The oil temp should be the only thing to be concerned about.
7. **Fuel Supply** – This is the most misunderstood area and creates most of the problems with an alcohol engine. It is an absolute must that the fuel system be adequate to supply enough fuel for this much horsepower. An alcohol engine will burn approx. 1 lb. of fuel per horsepower. As soon as you approach 700 plus horsepower, most electric

fuel pump systems are just not adequate and not very reliable. We highly recommend a belt driven mechanical fuel pump mounted below the fuel level in the tank. Inlet lines should be #12. Any bypass or return lines should be at least a #8 and kept as short as possible. Most needle and seats will not flow enough fuel to make more then 200 HP per needle and seat unless the fuel pressure is at least 10lbs or higher all the way to the end of the race track. It is difficult to keep fuel from flooding past the needle and seat at idle with these high pressures. The belt driven pumps allows the engine to idle at 5 to 7lbs, with 10 to 12lbs. on the way down the track. Even with the higher fuel pressures you must have enough needles and seats, as this is the biggest restriction. Most alcohol engines are actually running the float bowls dry at the end of the track, richening the jet worsens this problem as it empties the float bowls quicker with bigger jets. High horsepower engines must use PCI dual needle and seat float bowls or dual carbs or both. If you have any questions about this, call 631 737 0372. **Your engines horsepower and performance will be will be limited to the amount of fuel that actually gets into your engine.**

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