



## Tuning With Different Gasolines

***Summary: Carburetion adjustments must usually be made to properly evaluate a new/different racing gasoline. In some cases, spark timing will also require adjustments for optimization.***

“Try a different racing gasoline?? Are you kidding, they’re all the same.” Don’t bet on it. You may be missing the easiest and least expensive performance enhancement there is by subscribing to the above policy. There just may be a free lunch.

Many racers will spend big bucks on new heads, manifolds, carburetors, etc. before trying a different liquid in the fuel tank which could significantly increase performance, but just pouring in a different gasoline may not provide an improvement without fine tuning. It’s just like putting on a new carburetor without making any adjustments. If it works perfectly right out of the box, you probably got lucky.

I am going to address a few things necessary to get the most out of your “test” gasoline so you will not abandon something that may be a performance improvement.

There are two main variables that must be considered when trying a different gasoline. The first and most obvious is carburetor jetting, and the second is spark timing. We will address the jetting issue first.

How do we know if the carburetor calibration for the old gasoline is okay for the new gasoline? If it is not okay, should it be richer or leaner? To answer these questions, we need to know the specific gravity (SG) of the gasoline. Most racing gasoline suppliers have this information available in their literature. SG is a measure of how heavy the gasoline is compared to water. If a gasoline has a SG of 0.726, this means that it is 72.6% the weight of water. The higher the SG number, the higher the float sits in the gasoline. This shuts the fuel flow off earlier at the needle and seat thereby providing a lower liquid level in the float bowl. With a lower liquid level, there is not as much pressure from the “head of gasoline” to help get the fuel moving through the jets with a given air flow when compared to a carburetor with a higher liquid level. The height of the liquid level is important and should be maintained the same for each fuel used. That is what the sight hole in the float bowl is for. Use it.

The general rule of thumb is that if we are moving from a higher SG gasoline to a lower SG gasoline, we need to richen the mixture by going to larger jets. On the other hand, if we are moving from a lower SG gasoline to a higher SG gasoline, we need to lean the mixture by going to smaller jets.

How much leaner, or how much richer?? Here is some ballpark information to get you started. If the new fuel is lighter (lower SG) than the old fuel, richen the mixture by one jet size for every 0.010 difference in SG. If the new fuel is heavier (higher SG) than the old fuel, lean the mixture by one jet size for every 0.010 change in SG. This will only work if the carburetor was correctly jetted for the old gasoline. If we are out to lunch with the old gasoline tune, we may still be out to lunch with the new gasoline.

Example 1: The old gasoline has a SG of 0.716, and the new gasoline has a SG of 0.726. Since the new gasoline is heavier than the old gasoline, the mixture needs to be leaner by about one jet size. If the new gasoline had a SG of 0.736, the mixture should be leaned by about two jet sizes.

Example 2: The old gasoline has a SG of 0.724, and the new gasoline has a SG of 0.704. The new gasoline is lighter than the old one, so the mixture needs to be richer by two jet sizes since the new gasoline is 0.020 lighter than the old one.

These general rules are most accurate with a Holley four barrel carburetor and racing gasoline. They may not be accurate with street gasolines that contain oxygen compounds like MTBE and ethanol. They also do not apply unless you adjust the carburetor float level to provide the correct liquid level.

The second variable that needs to be addressed is spark timing. One degree can make a difference, so don't get too hasty and move the spark timing more than one degree at a time. Try going both ways from where you were optimized with the previous gasoline to see what combination works best.

The reason you should explore the spark advance arena is because different gasolines can burn at different rates. This is normally referred to as flame speed. For maximum torque, **MAXIMUM CYLINDER PRESSURE** should occur at about 12° ATDC. If there is too much spark timing, the peak pressure will occur too soon, power will be lost, and detonation is possible. If the timing is not enough, than the peak pressure will occur too late in the power stroke and power will be lost. Without a fully instrumented engine and dyno, optimum spark timing (and maximum horsepower) can be found by watching lap times in circle track racing, and watching mph in drag racing.

Let's summarize this discussion so we are all on the same page. If the new gasoline is heavier (higher SG) than the old one, lean the mixture by reducing the jet size. If the new gasoline is lighter than the old one, richen the mixture. If we don't have a clue to the SG of either fuel, follow this rule that an old guy told me when I was about 17 years old. **“When in doubt, go richer”**. This puts you in a safe position. If the mixutre is too rich, than lean it down cautiously.

Spark timing should also be explored due to differences in gasoline flame speed. If you were “dialled in” with your previous gasoline, very little change should be required with your new gasoline unless it is some special fast burn blend.



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