

## OCTANE

Octane is a chemical molecule. When referred to as ISO-octane in testing to find the "Octane" of a sample of gasoline, it is the reference fuel with the value of 100. In the testing of gasoline we use two reference fuels. The other one is N-Heptane which has an Octane value of 0 or zero.

### ***OCTANE RATING***

This is an anti-knock scale developed in the 1920's to rate the quality of a gasoline's ability to resist knocking or pinging. Samples of any gasoline are placed in a laboratory Knock Engine (this is a small, one cylinder engine with a variable combustion cylinder). While the engine is running, the combustion ratio is increased until the engine begins knocking. Now the gasoline is replaced with N-Heptane with an octane of zero and is mixed with the 100 octane ISO-Octane at various ratios until the motor "knocks." If you end up with 10% N-Heptane and 90% ISO-Octane ratio, your test sample has an octane of 90.

### ***FUEL DENSITY***

The weight of gasoline in relation to the weight of water. Gas floats on water so it is lighter; F&L Fuel has a density of .721 lb/gal. The important thing is to always use the same density fuel. Changing fuels can richen or lean an engine. Good race fuels never change their density. Fuel density is kind of like oil viscosity. Heavier weights flow less volume through a given opening. This is the same with gasoline; change the density and you can flow less or more through the same carburetor jet.

### ***KNOCK, DETONATION OR PING***

This is an intense pressure wave within the cylinder. The sound you hear is from the actual vibration of the cylinder wall; or if the gas air mixture goes off by itself a micro second before the spark plug fires, you have two intense high pressure waves clapping together and that energy wave hitting each other is the sound you hear.

### ***OCTANE REQUIREMENT OF YOUR MOTOR***

The sum total of all the factors in your motor's equation. Change the spark plug location, valve timing or valve clearance, compression ignition advance, thermostat, the air cleaner loads up, on and on. All of these will affect the requirement. Put it all together, test it and the engine will tell you what it needs. Add one more octane than it requires and it won't go any faster. Higher octane does not equate to more horsepower. Modern Formula One engines in Europe run on octane around 100. As modern racing engines are developed, particularly with electronic fuel management systems, the octane requirement will go down due to the electronic management system's ability to instantaneously monitor air fuel ratio, outside ambient temperature and altitude, and engine running condition.

### ***CFR ENGINE***

Cooperative Fuel Research. The small, one cylinder engine that the lab uses to rate the octane of gasoline. The difference between research octane and motor octane is that the engine turns at 600 RPM's for research and 900 RPM's for motor octane tests. Also during the motor octane test, the intake manifold is heated to increase the air temperature going into the carburetor.

### ***FLASH POINT***

The lowest temperature at which the fuel vapors will burn. Gasoline's flash point is usually around minus 20f.

### ***FREEZING POINT OF GASOLINE***

Point at which hydrocarbons start to form crystals. Then they fill in the venturi of the carburetor and the motor quits. To retard this problem, add less than one percent of Isopropyl alcohol.

### ***REID VAPOR PRESSURE (RVP)***

Tendency of the gasoline to evaporate. Too high a RVP and fuel might boil or evaporate in the pump or fuel lines. Too low and the engine won't start when cold. Racing fuels have a RVP of approximately 5.0 PSI.

### ***STOCHIOMETRIC AIR FUEL RATIO***

The exact air fuel ratio required to completely combust a fuel to water and carbon dioxide. You get all the energy out of the fuel at this point. Racing gasoline ideally burns at a 14:1 ratio. (14 parts air, 1 part gas).

### ***STORING RACING FUEL***

Store fuel in sealed metal drums. Keep fuel in cool dry environment. Do not store fuel outside in direct sunlight or in plastic container's. Use plastic containers for transferring fuel only. If stored correctly fuel can last for months. When fuel has a terpentine smell it has gone bad. Do not race with old fuel.

### ***SAFETY***

Follow material safety data sheet (MSDS) instructions regarding shipping, handling, and storage of your racing gas. MSDS can be obtained from your fuel manufacturer upon request.

## PERFORMANCE

### ***ALTITUDE***

As you increase your altitude the octane requirement decreases 1-2 octane per 3000 feet elevation. This is because the density of the air is reduced or there is less air available for your motor to burn. The higher the altitude, the richer your motor will run, making it necessary to re-jet the motor in order to lean it out. The fuel volume remains the same and the air volume goes down. If you have a vacuum advance, as the altitude increases, the motor makes less vacuum and the air fuel ratio becomes richer due to the decreasing air to fuel volume.

### ***TEMPERATURE***

When the temperature goes up, the air density decreases, thus you have less air available for combustion and your air fuel ratio becomes richer. The same works in reverse. As the temperature goes down, you end up with more air per cubic foot, and without re-jetting your carburetor, the engine will run leaner.

### ***AIR DENSITY***

As the air density increases, your engine will lean out. As the air density goes down, the engine runs richer. Like driving up a mountain, at the top, the motor has less power because you have less air to burn.

### ***HUMIDITY***

When the humidity increases, octane requirements ease. The formula is something like... for every one gram of water increase per one kilogram of dry air the octane decreases by .25 to .35. WWII aviation engines used water injection and it worked well for a short time by cooling the cylinder temperature. As temperature goes back the effect goes away.

## HANDLING

Handling of Racing Fuels **UNION88™** are specifically designed for use in high-performance engines. To guarantee the quality of our Racing Fuels, we place maximum priorities on product quality and safe and proper handling. This combination enables us to remain focused on making "SIMPLY THE BEST" racing fuels from batch to batch. Listed below are some tips that we have found to be effective. They are as important as having the proper engine timing, gearing, and tire selection. For a complete listing of safety guidelines, please refer to the MSDS for the fuel you are using.

- Remember that racing fuels are flammable. Observe safety rules to avoid unplanned meetings of the three components of the fire triangle: air, fuel, and an ignition source.
- Avoid skin contact. Do not use racing fuels as a solvent for cleaning parts or your hands.
- Avoid ingestion. Do not siphon racing fuels by developing a vacuum with your mouth.
- Store racing fuels in a manner that prevents small children from coming in contact with them (preferably under lock and key). Keep storage container caps closed tightly as a further deterrent to small children.
- Do not remove the hazardous warning label from the racing fuel drum.
- Be advised that federal, state, and local laws prohibit illegally dumping a drum.
- Drums containing racing fuels are not suitable for any other application except racing fuels until that drum has been properly reconditioned by a license drum recycler.

### ***Performance Storage Tips***

To preserve the front or light ends of racing fuels and maintain good throttle response:

- Drums containing racing fuels are not suitable for any other application except racing fuels until that drum has been properly reconditioned by a license drum recycler.
- Keep storage containers and gas tanks capped at all times and minimize opportunities for vapor loss during transfers.
- Cool both of the containers that will be involved in fuel transfers to further limit the loss of vapors.
- Exposure to direct sunlight will cause racing fuels containing lead to deteriorate.
- To preserve the integrity of your fuels, they should be stored in a cool environment.

***For more information upon Octane, Racing Fuels, Detonation, Pre-Ignition visit our web-site.  
You could download a great number of PDF files for free.***

# www.union88.tk

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