

How does an internal combustion engine work?

Combustion, also known as burning, is the basic chemical process of releasing energy from a fuel and air mixture. In an internal combustion engine (ICE), the ignition and combustion of the fuel occurs within the engine itself. The engine then partially converts the energy from the combustion to work. The engine consists of a fixed cylinder and a moving piston. The expanding combustion gases push the piston, which in turn rotates the crankshaft. Ultimately, through a system of gears in the powertrain, this motion drives the vehicle's wheels.

There are two kinds of internal combustion engines currently in production: the spark ignition gasoline engine and the compression ignition diesel engine. Most of these are four-stroke cycle engines, meaning four piston strokes are needed to complete a cycle. The cycle includes four distinct processes: intake, compression, combustion and power stroke, and exhaust.

Spark ignition gasoline and compression ignition diesel engines differ in how they supply and ignite the fuel. In a spark ignition engine, the fuel is mixed with air and then inducted into the cylinder during the intake process. After the piston compresses the fuel-air mixture, the spark ignites it, causing combustion. The expansion of the combustion gases pushes the piston during the power stroke. In a diesel engine, only air is inducted into the engine and then compressed. Diesel engines then spray the fuel into the hot compressed air at a suitable, measured rate, causing it to ignite.



How does octane affect engine performance?

The higher a fuel's octane rating, the more compression and heat that fuel can handle before spontaneously detonating. If you are able to increase compression (more air and more fuel), you will have a bigger explosion within the cylinder, leading to more performance.

What do octane numbers mean?

Octane is a rating for a fuel's ability to prevent pre-detonation, or combusting before being ignited by the spark plug. Fuels achieve octane in various ways, whether through latent heat of evaporation, heavy metals, or refining, all with various pros and cons. Always be sure to understand the fuel that is necessary and sustainable.

Can octane booster be as good as race fuel?

Yes, octane boosters, such as BOOSTane can offer the same octane and performance as race fuel, if used properly.

What octane to buy at the gas station?

It is always advisable to utilize AT LEAST the recommended octane that the manufacturer recommends. Many import vehicles and performance domestics are designed to run most efficiently on premium 93 octane fuel. If you are in California or places that cannot provide 93 octane, your vehicle will adapt, but performance and efficiency will be lost.

Are all octane boosters the same, how do you compare them, and what is the best on the market?

Absolutely not! 99% of octane boosters on the market provide little or no octane enhancement whatsoever. Resulting in no performance increase or even a drop in performance, with a worst-case scenario that your vehicle requires a higher octane and you rely on a poor product, and after not receiving adequate octane, damage the engine.

If it comes in a plastic bottle, simply put, it doesn't have enough active ingredients to provide any real enhancement.

BOOSTane's proprietary carrier technology and fuel stability enable an industry leading octane delivery and performance. No reliant on clever marketing tactics, just dyno and octane testing, we are committed to providing the best fuel solution on the market.

How much octane do I need?

In order to determine the octane that you need, either discuss with your tuner, and know your compression and/or boost pressure. Then follow our mixing charts provide our Calculator App, above.

To determine octane to your compression, follow our easy to use chart below.

<u>COMPRESSION RATIO CHART</u>		
Compression Ratio	<u>Engine Octane Requirements</u>	
	Minimum	Maximum
8:1	87	92
9:1	89	96
10:1	92	100
11:1	96	102
12:1	100	108

Typical requirements, some may vary...

To help determine compression if you have forced induction (supercharger, turbocharger, or procharger) follow the chart below:

Table 1: Effective Compression Ratio Chart

Static Compression Ratio	Blower Boost pressure (psi)												
	2	4	6	8	10	12	14	16	18	20	22	24	26
6.0:1	6.8:1	7.6:1	8.4:1	9.3:1	10.1:1	10.9:1	11.7:1	12.5:1	13.3:1	14.2:1	15.0:1	15.8:1	16.6:1
6.5:1	7.4:1	8.3:1	9.2:1	10.0:1	10.9:1	11.8:1	12.7:1	13.6:1	14.5:1	15.3:1	16.2:1	17.1:1	18.0:1
7.0:1	8.0:1	8.9:1	9.9:1	10.8:1	11.8:1	12.7:1	13.7:1	14.6:1	15.6:1	16.5:1	17.5:1	18.4:1	19.4:1
7.5:1	8.5:1	9.5:1	10.6:1	11.6:1	12.6:1	13.6:1	14.6:1	15.7:1	16.7:1	17.7:1	18.7:1	19.7:1	20.8:1
8.0:1	9.1:1	10.2:1	11.3:1	12.4:1	13.4:1	14.5:1	15.6:1	16.7:1	17.8:1	18.9:1	20.0:1	21.1:1	22.1:1
8.5:1	9.7:1	10.8:1	12.0:1	13.1:1	14.3:1	15.4:1	16.6:1	17.8:1	18.9:1	20.1:1	21.2:1	22.4:1	23.5:1
9.0:1	10.2:1	11.4:1	12.7:1	13.9:1	15.1:1	16.3:1	17.6:1	18.8:1	20.0:1	21.2:1	22.5:1	23.7:1	24.9:1
9.5:1	10.8:1	12.1:1	13.4:1	14.7:1	16.0:1	17.3:1	18.5:1	19.8:1	21.1:1	22.4:1	23.7:1	25.0:1	26.3:1
10.0:1	11.4:1	12.7:1	14.1:1	15.4:1	16.8:1	18.2:1	19.5:1	20.9:1	22.2:1	23.6:1	25.0:1	26.3:1	27.7:1
10.5:1	11.9:1	13.4:1	14.8:1	16.2:1	17.6:1	19.1:1	20.5:1	21.9:1	23.4:1	24.8:1	26.2:1	27.6:1	29.1:1
11.0:1	12.5:1	14.0:1	15.5:1	17.0:1	18.5:1	20.0:1	21.5:1	23.0:1	24.5:1	26.0:1	27.5:1	29.0:1	30.5:1

The above chart shows the effective compression ratio of your engine, which combines the static compression ratio with the amount of supercharger boost. Note that for most street applications with 92 octane pump gas, you should keep your effective compression ratio below about 12.0:1

Using the BOOSTane app to determine your needs.

Do I need octane booster?

If you are in need of higher octane, (using the above diagnosis charts), and do not have access to race fuel either due to cost or convenience, then an effective octane booster is your best solution. Otherwise we suggest detuning your vehicle to a lower octane to protect the engine.

I can only get 91 octane, what do I do?

The other reason that you may need octane booster is if you do not have sufficient fuel available at the gas station. This is very common on the west coast of the US and around the World. If you are in a warm area, and have a higher performing vehicle, there is a good probability that 91 octane is not sufficient to maintaining optimal engine performance and efficiency.

Octane ratings in the U.S. vs the rest of the world.

There are 2 widely used rating systems used in the world of fuel. Around the world the most common is RON (Research Octane Number), which is found by utilizing a knock engine. Here in the US we use AKI (Anti-Knock Index), while AKI is determined by taking the average of MON (Motor Octane Number) and RON. While the fuels are technically the same, the numbers at the pumps will differ. For example, 93 octane AKI, here in the US, is found by taking 88 octane MON added to 98 octane RON (used around the world) and dividing by 2.

$$93 \text{ AKI} = (88+98)/2$$

Is E85 good or bad?

E85 can be good in some cases. However, due to the fact that it is an alcohol, there are some inherent risks that people need to be aware of. That means if E85 is left for a prolonged period of time (5 or more days) there will begin to be phase separation (water sitting on top of the fuel) and subsequent corrosion. This can be catastrophic for older vehicles with carburetors or newer vehicles without the proper fuel lines or gas tank.

There are also inconsistencies with E85 that the government regulatory body has set, that can also be VERY detrimental if being used for performance applications. That being that E85 doesn't always been 85% ethanol and 15% gasoline. The truth is that 85% alcohol is the MAX, and the sad fact that a lot of consumers don't know is that there is also a minimum that the minimum required for this "E85", as of June 2011, that fuel only needs to have 51% ethanol.

"ASTM D5798-11 Standard Specification for Ethanol Fuel Blends for Flexible-Fuel Automotive Spark-Ignition Engines" we see that the 85 in E85 signifies a maximum ethanol content of 85% with the remainder being "unleaded gasoline, gasoline blendstocks for oxygenate blending (BOB), natural gasoline, or other hydrocarbons in the gasoline boiling range."

These inconsistencies in ethanol content and subsequent octane levels, coupled with a inevitable phase separation and the fact that E85 is 30% less efficient from a fuel mileage standpoint, our engineers don't see it is a viable solution.

Why can't I just make my own octane booster?

Technically you can. People have been trying to do it for decades, and there are easy ways to increase octane. The risks however far outweigh the benefits. The benefit is that you can do it cheap. However, the risks are that you never know the exact octane that you are achieving unless you send it to a certified lab (very expensive), and the biggest risk of all is that it is more than likely not sustainable. Many of the cheap and easy solutions out there have active ingredients that over time will cause harm to your engine internals.

Take ferrocene for example. Been used as an octane booster for years, but in fact it is an iron base. Thus over time, when you add oxygen, it oxidizes and rusts, and that is just 1 product, there are millions out there. Even among the octane boosters that do actually work (<1%), the absence of a proprietary carrier also lowers sustainability and puts engine internals at risk over time.

That is why we stress and tested our formula over nearly a decade of racing and laboratory testing. In our engineer's opinions, there is no substitute for real R&D and results.

Do all high compression engines need octane booster?

Yes, higher compression engines REQUIRE higher octane in order to run without damage. See below

<u>COMPRESSION RATIO CHART</u>		
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Typical requirements, some may vary...

Compression can also be increased with forced induction as well. See below.

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6.5:1	7.4:1	8.3:1	9.2:1	10.0:1	10.9:1	11.8:1	12.7:1	13.6:1	14.5:1	15.3:1	16.2:1	17.1:1	18.0:1
7.0:1	8.0:1	8.9:1	9.9:1	10.8:1	11.8:1	12.7:1	13.7:1	14.6:1	15.6:1	16.5:1	17.5:1	18.4:1	19.4:1
7.5:1	8.5:1	9.5:1	10.6:1	11.6:1	12.6:1	13.6:1	14.6:1	15.7:1	16.7:1	17.7:1	18.7:1	19.7:1	20.8:1
8.0:1	9.1:1	10.2:1	11.3:1	12.4:1	13.4:1	14.5:1	15.6:1	16.7:1	17.8:1	18.9:1	20.0:1	21.1:1	22.1:1
8.5:1	9.7:1	10.8:1	12.0:1	13.1:1	14.3:1	15.4:1	16.6:1	17.8:1	18.9:1	20.1:1	21.2:1	22.4:1	23.5:1
9.0:1	10.2:1	11.4:1	12.7:1	13.9:1	15.1:1	16.3:1	17.6:1	18.8:1	20.0:1	21.2:1	22.5:1	23.7:1	24.9:1
9.5:1	10.8:1	12.1:1	13.4:1	14.7:1	16.0:1	17.3:1	18.5:1	19.8:1	21.1:1	22.4:1	23.7:1	25.0:1	26.3:1
10.0:1	11.4:1	12.7:1	14.1:1	15.4:1	16.8:1	18.2:1	19.5:1	20.9:1	22.2:1	23.6:1	25.0:1	26.3:1	27.7:1
10.5:1	11.9:1	13.4:1	14.8:1	16.2:1	17.6:1	19.1:1	20.5:1	21.9:1	23.4:1	24.8:1	26.2:1	27.6:1	29.1:1
11.0:1	12.5:1	14.0:1	15.5:1	17.0:1	18.5:1	20.0:1	21.5:1	23.0:1	24.5:1	26.0:1	27.5:1	29.0:1	30.5:1

The above chart shows the effective compression ratio of your engine, which combines the static compression ratio with the amount of supercharger boost. Note that for most street applications with 92 octane pump gas, you should keep your effective compression ratio below about 12.0:1

Tuning my vehicle with BOOSTane vs other octane boosters.

BOOSTane's proprietary formula and mixing charts enable easy to use tuning. Our certified octane results allow our customers to tune their vehicles and have the confidence that the ratio that they tuned for will be identical for every use.

However, the issue with other octane boosters is their ability to reliably achieve the same octane on each fill up, or increase octane at all in some cases, as stated above.

How does boostane create octane like race fuel?

It is easier to think of BOOSTane as a race fuel concentrate. Essentially our engineers figured out how to take the active ingredients in the world's most popular race fuels, remove the "fillers", and develop a proprietary carrier that enables all of those varying density, active ingredients to remain suspended indefinitely in solution. Therefore, when you are blending BOOSTane with your regular pump gas, you are basically adding back in the filler, and effectively transforming your fuel to race fuel.

Why boostane is the best octane booster?

BOOSTane has been regarded as the worlds premier octane booster by SEMA (Winning Launch Pad Product of the Year) and many other prominent tuners throughout the industry. This is a direct result of the engineering, development, and constant testing that the BOOSTane team is committed to. Not sacrificing quality for price, and dedication to our customer's performance. There is no other product on the market that performs to the level of BOOSTane or provides its certified testing to the public.

Does BOOSTane contain any chemicals that can be corrosive too rubber, plastic, or metals?

A lot of corrosion that happens today to internal engine components, in our experience, comes from the supplementation of ethanol in our fuels (E10, E15, etc). This is due to its hygroscopic nature (affinity to absorb water into the gasoline). This absorption of water then causes phase separation, gumming up of components such as carburetors, and of course, the drying out and corroding of seals, rings, and other components.

BOOSTane's proprietary carrier actually works to solve these negative side effects of ethanol by stabilizing the fuel to prevent the phase separation. We are also formulated into our solution lubricating chemicals that actually help prolong the life of these various engine components.

So you should be good to go! Please let us know if you have any other questions.

The mixing chart listed on the web-site identifies the # of gallons treated per can. What size cans does this refer to? I purchased the Premium in 16 oz cans. Is the chart for 16 or 32 oz cans?

The mixing chart is actually designed to take in to account the varying size of cans that the products come in. If you are blending for Marine or Professional, "1 Can" on the mixing chart refers to 32oz. If you are blending with Premium, "1 Can" on the mixing chart refers to 16oz.

You will also notice that next to each name (in small font) there is a can size for reference.

What is the shelf life of BOOSTane? Opened vs Unopened? Recommended storage?

BOOSTane has been designed to maintain suspension in both your fuel tank and bottle. As a result, unopened, a bottle of BOOSTane will maintain a shelf life of 2 years and opened 1 year. That is as long as it is kept in a cool, dark place.

Why is Professional "Not Street Legal" and Premium "Street Legal"?

The reason why we have to put Street Legal vs Not Street Legal is pertaining to the concentration of certain active ingredients (doesn't contain lead) that the EPA deems not legal for on road use only, when blended above 103 octane.

Does BOOSTane stabilize my fuel?

All of BOOSTane's products have a proprietary chelated carrier that not only stabilizes its own formula to maintain suspension, but also has the ancillary benefit of stabilizing the gasoline that it is blended with in order to prevent phase separation from ethanol supplementation.

Is it ok if I leave BOOSTane in my tank over the winter?

Yes it is! BOOSTane Proprietary chelating carrier not only maintains the stability fo our active ingredients in solution, but will also help stabilize your Gasoline as well. Especially if you are leaving it for extended periods of time and it contains in amount of ethanol, thus preventing phase separation.