



## Does your Diesel Fuel need a Boost?

**Get the answers to what cetane is, what the benefits of higher cetane are, and the difference between diesel fuel with a "built-in" high cetane and diesel fuel whose cetane is boosted by a fuel additive.**

### Cetan numbers

As you are driving down the highway, you glance down at your instrument panel and note that you are running low on diesel fuel. Instead of just pulling into a branded truck stop to refuel, you decide to put out an inquiry out on the CB about a diesel fuel that will increase power.

An answer comes blasting through your speakers. In fact, a trucker just filled up with a diesel that the pump topper proclaims is "cetane boosted" and "up to 5 numbers." Another trucker hearing the conversation added his two cents and said to save your money on the boosted cetane fuel and buy the natural stuff. He favors fuels that have a high cetane number without having to be boosted with an additive.

After hearing these answers, you are no better off at knowing what diesel fuel to purchase than you were when you asked the question. So what is the right answer?

Getting to the answer requires a discussion of what cetane is, what the benefits of higher cetane are, and the difference between diesel fuel with a "built-in" high cetane and diesel fuel whose cetane is boosted by a fuel additive.

### What is cetane?

Cetane number is a measure of a diesel fuel's ignition quality based on ignition delay in an engine. The number is measured in accordance with standard test method D 613 of the American Society for Testing and Materials (ASTM). Ignition delay is the time it takes for the fuel to burn once it is injected into a laboratory test engine—time lag. A high cetane number fuel starts to burn shortly after it is injected into the cylinder of the engine—i.e., it has a short ignition delay. On the other hand, a fuel with a lower cetane number will resist igniting and will take longer before it starts to burn.



Determining the cetane number of a diesel fuel requires testing in a specialized single cylinder engine that is relatively expensive to maintain and operate. To reduce cost and avoid the need to use a test

engine, the industry developed two methods (ASTM D 976, D 4737) for estimating the cetane number of a fuel by utilizing the distillation temperature and fuel density in a mathematical equation. The result of applying the equation is expressed as the fuel's cetane index. One thing to keep in mind is that the cetane index derived from the equation is not changed by the addition of a cetane booster. The effect of adding a cetane booster can be measured only by using a cetane test engine.

### **Benefits of high cetane**

The benefits from using a higher cetane fuel are easier starting, reduced diesel knock or noise, and a smoother running engine.

Cold engines are hard to start. During cold starting, the cylinder walls, pistons and head initially are at ambient temperature. Therefore, before the engine obtains normal operating temperature, the metal absorbs the heat instead of assisting the combustion process by being a heat source. The compression of the air in the cylinder during cranking is the only heat available to initiate spontaneous combustion of the fuel and, because the walls are absorbing some of this heat, it takes longer to start an engine. A fuel with a higher cetane will have less ignition delay and combust more readily, which means less cranking to start the engine.

An increase in cetane number can reduce engine noise associated with the combustion process. As fuel is injected into the cylinder, there is a delay before the fuel ignites. During this delay, fuel continues to be injected. When combustion finally occurs, there is a rapid pressure rise in the cylinder, which is associated with diesel noise or diesel "knock."

A higher cetane fuel has a shorter ignition delay. Less fuel will be injected into the cylinder during the delay and a smaller pressure rise and less noise will occur. Even though the pressure rise is smaller, the work will be the same.

### **Naturally high vs. boosted**

As indicated earlier, the consumer who wants a higher cetane diesel fuel has two options: (1) a fuel that has had its cetane number enhanced to a higher level by an additive or (2) a fuel that is naturally higher in cetane due to refinery processing. From a power and fuel economy standpoint, the first option is the better one.

A recent study performed by Texaco Additives International demonstrated that, in a Cummins engine at three operating conditions: (rated power, peak power, and peak torque), a naturally high cetane fuel had less power and used more fuel compared to a lower cetane fuel boosted to an equivalent cetane rating. (Figures 1 and 2.)

Even though only one engine was involved in the study, it can be reasonably assumed that the same results would occur with other engines. This is because a naturally high cetane fuel is less dense than a lower cetane diesel fuel; a less dense fuel has less BTUs per gallon. Because BTUs are a measure of the fuel's energy content, a fuel that has less BTUs will give less power and will consume more fuel to perform at the same power as a lower cetane fuel.

The moral of the story is that, if you have to pick between a diesel fuel that has been boosted with cetane improver and a fuel that has a naturally high cetane, pick the cetane-improved fuel. Your engine will benefit from the higher cetane, and you will benefit from not suffering a fuel economy penalty in most cases.

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