



Direct Injection for fueling Gas and Diesel Motors



The advantages + Disadvantages of direct injection

Direct injection is a new technology that is finding its way onto many of the new **gasoline and diesel engines** that are coming to market. Many of us do not understand how this type of injection differs to what we have always had on [EFI fuel systems](#). The goal of this article is to explain the difference between standard port fuel injection and direct injection.

What is Direct Injection?

Direct injection is just as the name implies. It's fuel that's **DIRECTLY INJECTED** into the combustion chamber. This is made possible by [fuel injectors](#) that work at injection pressures of around 2,000 psi. Sounds unreal right? Remember that while you may have a [static cylinder pressure](#) between 100 psi and 300 psi, depending on the compression of the motor, during actual combustion cylinder pressures spike to much higher levels. To be able to then inject fuel into this high-pressure environment, an even higher-pressure [fuel injector](#) must be used. This gives us the ability to inject fuel directly into the cylinders high-pressure environment at any time during the engine cycle.



What is Port Injection?

Port injection is when the fuel is injected prior to entering the cylinder in the [intake manifold](#) ports. This type of injection relies on an injection of fuel at pressures between 40 psi and 80 psi. The [fuel pressure regulator](#) controls the pressure of the fuel injector. The [velocity of the intake port air](#) as well as port shape and spray pattern of the fuel injector are all very important in making a port injection system function properly.

What are the benefits of Direct Injection on Diesel and Gasoline motors?

There are many benefits to direct injection, but we will just focus on the more important ones:

1. Cooling of combustion temperatures. Because the fuel can be directly injected into the combustion chamber you get a far greater cooling effect as the fuel atomizes and changes from a liquid to a gas under the forces of compression.
2. The ability to control the injection during the combustion cycle. While all of the fuel used in the combustion process is injected in a port injection type setup, Direct Injection can inject measured amounts of fuel DURING the combustion cycle to aid in the burn cycle and flame propagation through the firing stroke.
3. Greater control of avoiding [detonation and pre-ignition](#). Because of the ability to control the timing of the injection of fuel into the combustion chamber, like we talked about in number two above, we can also use that control to avoid pre-ignition and detonation. On current EFI equipped set-ups we have always used [ignition timing](#) to control the burn sequence, but with direct injection we now have another option of control.

Now this is not the entire list of benefits that can be had from direct injection, but it is a good start at the major ones. Getting into the other benefits about emissions and quieter diesel operation we will not get into.

Downsides to direct injection

Like any new technology, it's expensive. Hopefully you will never have to replace one of these injectors because they can be 5X-10X the cost of a standard fuel injector. While this price discrepancy will slowly disappear as this technology becomes more and more common, for now it needs to be addressed. Other than the cost, there are no real downsides. What will be interesting to see is if some short falls are discovered as the aftermarket scene will start to push these direct injection motors and injectors past there limits.