HOW MUCH PRESSURE
DOES YOUR FUEL PUMP PRODUCE?
SETTING STRAIGHT AN INDUSTRY MISCONCEPTION

Do fuel pumps really create fuel pressure? Think carefully before you answer that question. It is a common misconception throughout the industry that the fuel pump creates fuel system pressure, but that is only a part of the overall story.

Flow Rate

Required fuel pressure can vary depending on your vehicle's engine and fuel system. Carbureted engines may require as little as 28 kPa (4 PSI), while modern multipoint fuel injected high-performance engines can require as much as 414 kPa (60 PSI). Achieving more horsepower means increasing the amount of air and fuel to the engine. Simply creating higher fuel pressure, with something like an aftermarket fuel pressure regulator, may not be the answer.

Selecting the optimal fuel pump to create the necessary higher fuel system pressure required for increased engine performance will depend on multiple factors, such as:

- Fuel injector, fuel rail, and fuel line size
- Naturally aspirated versus forced induction (turbocharging/supercharging)
- Fuel type
- Voltage supplied to the fuel pump

The most important thing to understand is that the fuel pump is not necessarily providing the pressure, but is instead providing the fuel flow within the system. The amount of fuel delivered by the fuel pump is known as the flow rate while the rest of the fuel system, which provides flow restriction, helps to create the measurable fuel system pressure. For example, a low flow rate fuel pump combined with a highly restrictive fuel system could technically have the same measurable fuel pressure as a higher flow rate fuel pump with less restrictive fuel system components. Simply put, higher fuel system pressure may not allow you to achieve the performance increase you're looking for, or may even lead to fuel starvation, unless other required modifications are made to the fuel system.

TI Automotive

Variable Flow Rate

Most modern OEM fuel system programs are designed to allow for a variable flow rate, which maintains the desired fuel system pressure. This is achieved through pulse-width modulation (PWM). PWM is effectively a very fast on/off electrical signal controlled by switching between the electrical supply and the load. The amount of "on" time that is provided to the pump is referred to as the duty cycle. The higher the PWM duty cycle provided by the pump, the higher the fuel pump flow rate. Conversely, the lower the PWM duty cycle, the lower the fuel pump flow rate. As a result, with modern electric fuel pumps, the fuel system is able to vary the fuel system pressure to maintain consistent fuel supply.

Diagnosing Flow Rate

Flow rate can be negatively affected by factors easily overlooked during diagnosis. Considering everything that is required to create a consistent flow rate, any of the following items can contribute to it.

- Low fuel pump voltage, poor circuit integrity, faulty connection, weak battery and defective fuel pump relay can keep the pump from operating normally. Check both the 12V supply and the ground sides of the electrical system to ensure proper function.

- Defective pressure regulator. Ensure the pressure regulator shows no signs of leakage or internal failure.

- Low fuel supply. Depending on the fuel system set-up, low fuel in the tank can cause air to be drawn into the fuel with the fuel causing fuel starvation. Keep fuel level well above the level of the fuel pump intake - minimum 1/4 full is normally a reliable estimate if measurement is difficult.

- Poorly functioning fuel filter. Fuel filters are designed to catch debris before allowing fuel to flow into the system. A dirty or even poor quality filter can decrease or even stop fuel flow.

The higher the PWM duty cycle provided by the pump, the higher the fuel pump flow rate.

- Defective fuel lines. Look for fuel line leakage or collapsed/ damaged fuel line sections.

Fuel System Restriction

Fuel system restrictions are not necessarily a bad thing. As explained in the previous paragraphs, restriction is what creates measurable fuel system pressure, but the right restrictions are what's needed. Things like line bends and diameter, filter quality, and injector size can affect the fuel system pressure. Mismatching the rest of the fuel system components with the fuel pump can either increase or decrease fuel system pressure and immediately cause a decrease in overall performance. Adding a higher flow fuel pump could also mean adding larger diameter fuel lines, high flow fuel injectors, or a high flow fuel rail, for example. Depending on how the fuel system is constructed, fuel pressure measured at the pump may differ from that measured at the fuel rail.

Properly matching the rest of the high flow fuel system components with a proper high-performance fuel pump will provide the flow rate necessary to maintain the fuel system pressure required to support the increased horsepower. While higher fuel pressure may optimize maximum fuel injector usage by providing more fuel into the combustion chamber, limitations of fuel injector size and type can still limit the flow.

TI Automotive

Limitations

Given that fuel pressure can be increased with a higher flow fuel pump and proper fuel system components supplying enough fuel for increased performance, it should also be recognized that, like all high-performance upgrades, the fuel system components do have physical limitations. While most fuel systems can be upgraded to handle upwards of 700 kPa (about 100 PSI), it should also be understood that too high fuel system pressure can easily lead to distortion or damage.

So, "Do fuel pumps really create fuel pressure?" Not in and of themselves. Fuel system pressure is a result of the combination of the type of fuel pump (low flow rate or high flow rate) with a restrictive or nonrestrictive fuel system. An electric fuel pump helps to maintain required consistent fuel pressure as long as all of the other fuel system components are properly matched and functioning as they are designed to do.

ABOUT TI AUTOMOTIVE

Fluid thinking™ shapes the mindset of TI Automotive. Global automotive manufacturers turn to TI Automotive to develop and produce industry-leading automotive fluid systems technology. Two-thirds of the world's vehicles contain technology from TI Automotive.

With 28,700 employees at more than 114 locations in 28 countries, our strength lies in our ability to creatively meet and exceed the increasing fuel economy and emissions regulations of tomorrow's auto industry.

OUR MICHIGAN MANUFACTURING SITE

The Caro, MI plant is TI Automotive's high-performance and aftermarket fuel pump and module manufacturing site. Our fuel pumps and modules are never manufactured or assembled by a third party or sourced from an outside company.