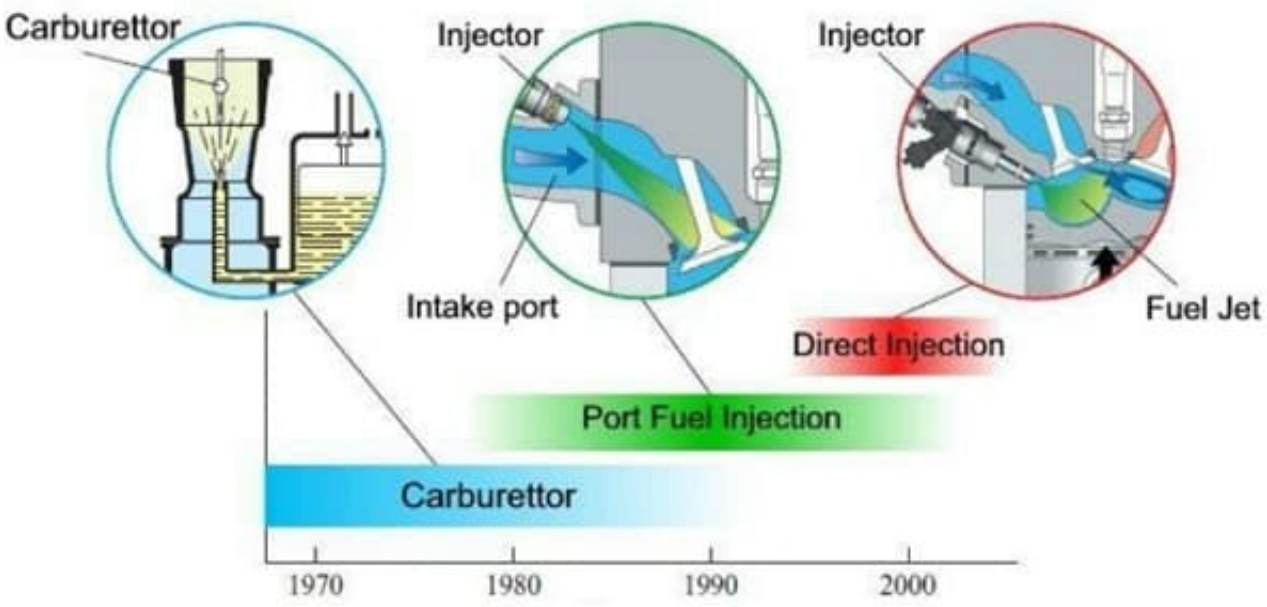
What is GDI / FSI / CGI / SIDI / Direct Injection?

A lot of innovation has taken place in the fuel injection technology and fuel delivery systems of cars. Diesels have been using the direct injection systems from long time, petrol engines however have started using them only now. You would no find a car that uses a carburettor now, so what does it use? It uses a direct injection system like diesel. So what is a direct injection system? We talk in detail about that in this article.



What is GDI in essence?

Until a few years ago, petrol engines used carburettor for fuel atomization. It worked well before the strict emission standards were put in place and the engine usually burnt rich mixture and did not have great fuel economy. In case of GDI, the fuel is injected directly into the cylinder and can be controlled precisely based on air quality, engine load and other parameters, it offers better control over pollutants and better fuel-economy. So, in essence GDI is a fuel delivery method.

What does the Acronyms GDI / FSI / SIDI mean?

GDI – Gasoline Direct Injection

FSI – Fuel Stratified Injection

SIDI – Spark Ignited Direct Injection

CGI – Charged Gasoline Injection

Is Direct Injection same as the MPFI (Multi-point

Fuel Injection)?

No. MPFI can be considered the last generation technology which offered quite precise control over fuel injection, but not as much as in case of GDI. In case of MPFI system, the fuel is injected into the intake manifold at low pressure. While in case of GDI, the fuel is injected directly into the combustion chamber and at much higher pressure.

GDI work in precisely the same way as MPFI with a difference that fuel is injected at the time of air intake and directly into the cylinder. The mix is prepared in the cylinder and ignited with a spark plug after the compression stroke. The GDI system uses strong injectors that can inject at much higher pressures but they can do so only during the intake stroke, unlike the MPFI system that can do it even during the compression stroke at the back of the intake valve, this becomes increasingly important as engine speeds increase. The injectors used in case of GDI are very capable these days and can inject with high precision even at high speeds during the entire intake stroke without any issues.

Unlike a petrol engine with an MPFI system in which the speed is controlled with a throttle body with a butterfly valve, in case of GDI the speed of an engine is controlled with injection of fuel and ignition timing which is controlled by ECU. This helps reduce the pumping losses.

How do GDI / FSI affect the car’s performance?

One direct advantage of the gasoline direct injection is the jump in fuel efficiency figures. Other is the reduction in pollutant levels. It does not affect the 0-100 figures to great extent, but since the engine can run under three different modes due to precise tuning that can be done, it makes it very dynamic. At low loads the engine can run lean (Stratified charge) and

in case of moderate loads, it can use a stoichiometric mixture. In demanding situations like hill climbing and acceleration it can even burn rich mixture. The biggest advantage that GDI offers is that the fuel can be injected multiple times during the single cycle.

Which manufacturers use these technologies?

MPFI still remains a popular choice among manufacturers as it offers good amount of control over fuel injection. However, many manufacturers use direct injection technology too under different names.

GDI – Mitsubishi, Honda, Hyundai

CGI – Mercedes-Benz

FSI – Volkswagen, AUDI

SIDI – General Motors

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