



Injector Position

In Gasoline Direct Injection engines, the fuel is injected directly into the cylinder from *either* – the intake side – OR – the centre of the combustion chamber.

Original direct injection systems were side mounted. But in recent years, the industry has seen a move toward central injector combustion systems, and Ricardo expect this trend to continue. This is because central injection can give benefits for both particulate emissions and fuel-in-oil dilution. European car manufacturers have largely moved to central injector layouts, whereas Japanese and Korean manufacturers have developed more side injection applications, partly due to the higher number of naturally-aspirated engines in these markets.

Side mounted injectors are generally located between the inlet valves at the side of the combustion chamber. This means a poor spray pattern caused by deposits can lead to increased exhaust particulates, which is a key concern for air quality. This can happen either by mis-guided fuel hitting and condensing on cool cylinder walls, then burning incompletely, or simply by poor fuel atomisation giving rise to large, difficult to burn droplets.

Additionally, injectors with deposits could potentially increase the risk of Low-Speed Pre-Ignition, known as LSPI. This damaging abnormal combustion can arise either from droplets of fuel and oil acting as ignition sources. Or by injector deposits flaking off and creating 'hot-spots' for LSPI to start.

A central injector position is advantageous in that its downward spray direction reduces the risk of the fuel coming into contact with cylinder walls. However, due to their location, centrally mounted injectors are more difficult to cool than side-mounted ones. This hotter environment can lead to accelerated deposit formation around nozzle holes, and this in turn impacts the spray pattern.

So in both instances of central or side mounted injectors it is essential to minimise deposits. Good quality fuel with deposit control additives optimises combustion, fuel economy, emissions and performance.

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