

## عنوان مقاله:

Fluid Dynamics Investigation of a GDI Fuel Spray by Particle Image Velocimetry

## محل انتشار:

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## خلاصه مقاله:

In this work, result of experimental investigation on interaction of fuel spray generated by a swirled type injector, with air motion in a prototype cylinder are presented. Experiments were carried out by planar imaging and particle image velocimetry (PIV) techniques in order to provide information about the spray structure evolution and instantaneous velocity distribution of air motion and fuel spray at different operating condition. The experimental setup includes an engine head and a prototype cylinder with optical access suitable to stabilize conditions of tumble flow close to the real SIDI engines. A common rail injection system was used with a swirled type injector of a nominal cone angle  $50^\circ$  and a nozzle diameter  $0.55$  mm. A blower, under steady state condition, supplies a suitable intake flow rate to simulate that one evolves in real engines at different operating conditions. Tests were carried out by setting the pressure drop between the intake manifold and cylinder of  $350$  mm H<sub>2</sub>O, valve lifts and  $9$  mm and injection pressure  $10$  MPa. The measurement, have been done on a plane across the cylinder and injector axis with a field of view of  $47$  mm in diameter. PIV of air motion shows a fluid dynamics structure clockwise rotating with homogenous structure. The velocity profiles show  $30\%$  increasing of maximum velocity at operating condition of mm with respect to mm. At the first stage of injection, results of planar imaging show a fuel spray that depicts a solid structure with a penetration axis primarily controlled by the fuel momentum at later time the fuel spray depicts a less cone angle with respect to those obtained by analyzing the spray under air flow quiescent condition. Then, because of tumble motion, the fuel spray is distorted and disintegrated. Images show the formation of large clusters of fuel which are transferred in wide region within the cylinder. At the first stage of injection, PIV results of instantaneous velocity distribution of fuel spray show a strong exchange of momentum with air motion evolving inside the cylinder. At later time, velocity profiles of fuel droplets indicate a strong correlation with tumble motion that becomes the parameter regulating breaking, dispersion and transferring liquid fuel in the periphery cylinder.

## کلمات کلیدی:

GDI, Fluid dynamic, Fuel spray, PIV, Velocimetry, GDI, Fluid dynamic, Fuel spray, PIV, Velocimetry

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