

Development of the in-cylinder fuel direct injection technology for supercharged gasoline engine for motorcycle

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Due to the mounting space of the motorcycle engine and the characteristics that the rider operates across, extremely "lightweight, compact size, high output, and agile response" are required. The authors have been conducting "development to solve problems by highly combining centrifugal supercharger and engine". Furthermore, from the recent efforts aimed at global carbon neutrality, we would like to aim for the realization of a hydrogen combustion engine. As a preliminary step, fuel efficiency was improved by using in-cylinder fuel direct injection technology. Compared to passenger car engines, motorcycle engines have the characteristics of "small displacement per cylinder, high rotation speed, and high load". Due to the small bore and stroke, the fuel injected into the cylinder collides with the cylinder wall and piston, making it easy for combustion defects and soot to occur.

We developed DI technology for a supercharged gasoline engine for motorcycles and obtained the following findings.

1. By selecting injection direction and spray characteristics suitable for short stroke and high revolution engine, generation of soot was prevented, and output and fuel consumption performance were improved. (Fig.1)
2. By adopting the tumble port, it was possible to strengthen the gas flow, and to improve the output and fuel consumption performance. (Fig.2)
3. The tumble port developed this time can suppress the decrease of volume efficiency low, and it was possible to improve the output and fuel consumption in the whole area for the base port injection engine. (Fig.3)
4. 147 kW was achieved with 1 L displacement, and high fuel consumption performance of 19.8 km/L was achieved while satisfying EURO -5 exhaust gas regulation.

As a challenge for carbon neutral realization in future, We would like to develop a hydrogen combustion engine based on this engine.

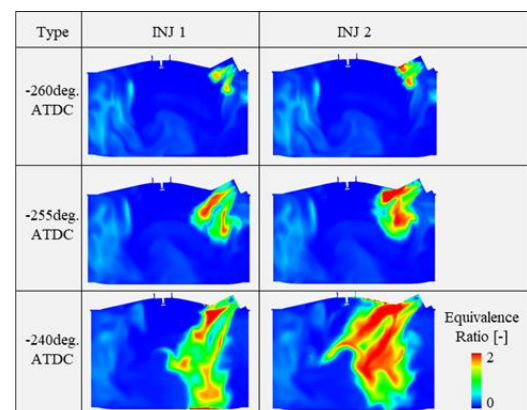


Fig.1 Fuel wall adhesion

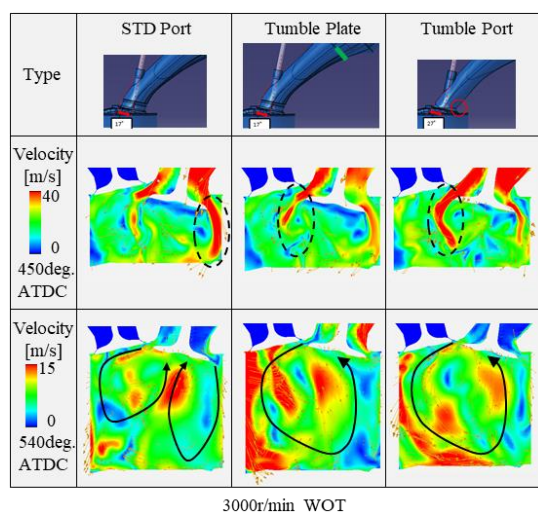


Fig.2 Strengthening flow by tumble flow

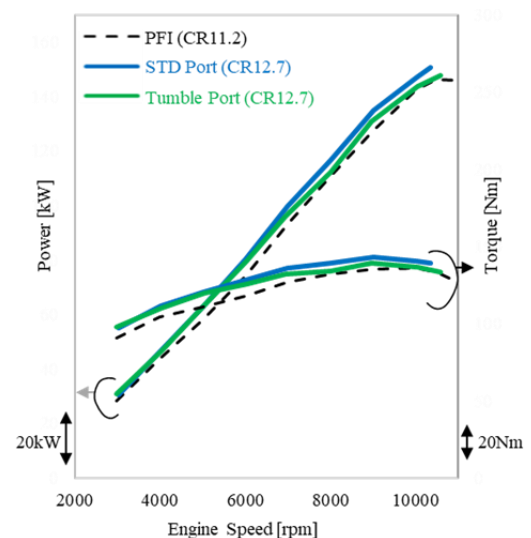


Fig.3 Engine performance