

# TPC6 – Artigo sobre GDI

Grupo - TP13

Vasco Sotomaio

Carlos Rangel

Ricardo Soares

Nuno Curral

Afonso Lopes

## Design of the Electrical Drive for the High-Pressure GDI Injector in a 500cc Motorbike Engine

The main target of Gasoline Direct Injection engines is to achieve CO<sub>2</sub> emissions reduction, fuel economy and high dynamic A/F ratio accuracy.

Generally, fuel flow volumes can be controlled by adjusting the fuel injection driving pulse time. The fuel injection system consists in the fuel supply system, electronic control unit (ECU), electrical driving circuit and an injector.

The injector is controlled by reference current waveforms according to the injector characteristics. It uses the solenoid valve as electricity-fluid conversion element and controls the injection parameters precisely through the reference current waveforms.

The electronic controlled unit (ECU) is developed to precisely control the A/F ratio according to the requirements of various engine operating conditions.

For heavy/medium load conditions, the GDI engine operates under stoichiometry (14.7) in order to satisfy power output performance. For light load conditions it operates under the lean burn mode in considerations of fuel economy and emissions.

The injection pulse width and throttle angle are adjusted by the ECU to ensure proper A/F ratio and stable power output requirements.

The ECU processes various signals brought by sensors which provide information from the engine like speed, TDC, throttle position, air flow.

After the signal processing, the pulse-width injection driving pulse, as well as the PWM control for the injector driving circuit switches is achieved, according to the requirements of A/F ratio control determined by the engine operating condition.

The injection pulse signal from ECU is fed into the electrical driving circuit to generate a pulse-

width current waveform that controls the injector.

The driving current waveform includes two constant pulse times and subsequent an adjustable pulse duration PWM switching operation of several 50%~80% duty periods depending the GDI injector characteristics.

<http://www.aicit.org/ijej/ppl/09-IJEI8-082002JE.pdf>