Study of fuel economic environmental injection control strategy for Multi-...

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ABSTRACT

The subject of this research is to design and make the forward first-order fuel injection compensating controller. The object-oriented dynamical simulation programs were integrated to establish the SI engine fuel injection system performance evaluation methodology. The amount of fuel injected is controlled by the PI controller which combined the forward first-order compensating controller output, so that the specified Air-Fuel ratio (A/F) goal can be maintained. The effects on engine of fuel injection quantity and its timing from the developed controller output were simulated so that engine A/F can be maintained within the specified range. For lowering the engine fuel consumption and emission, this compensating controller gave better performance even under different operating conditions. This study also developed an adaptive forward first-order fuel injection controller, by using forward voltage signal from the throttle position sensor to the controller to adjust the fuel injection duration from the fuel injection system to control the engine A/F. This forward feedback compensating controller also integrated with the original feedback oxygen sensor signal to modify the PI control parameters in a closed-loop form. The A/F ratio predicting module for SI engine established in this research help the related fuel injection controller designer to compare effects from the different setup fuel injection maps on engine performance. The fuel controller parameters were implemented then into the hardware to realize the fuel injection controller for this specific SI engine. Three different engine operating conditions at different constantspeed, throttle step response were being tested. Results of simulation and the corresponding actual engine experiment data of A/F from fuel controller hardware outputs were compared. The new developed fuel compensator gave better performance in A/F in the specified range while keep the engine output torque still maintained as the original baseline engine values.

Keywords : SI Engine Fuel Injection Control, Forward First-Order Fuel Injection Compensating Controller, Air-Fuel Ratio Control

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