

Measurement of the Rate of Multiple Fuel Injection with Diesel Fuel and DME

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Multiple fuel injection during the compression and expansion stroke of a Diesel engine is being tested widely using a common-rail fuel injection system in an attempt to reduce exhaust emissions and noise of Diesel engines. In studying the effects of multiple injection on combustion and emission of Diesel engines, highly accurate measurement of the injection amount in each stage of multiple injection; pilot, main and after injection is needed. However, due to the wide range of injection amount and the critical timing between each stages, it is quite difficult to measure the amount of each injection stage using conventional injection volume meters. In order to measure the rate of multiple fuel injection, a new measurement system was developed which is equipped with a constant volume pressure chamber, three pressure sensors, a temperature sensor and a signal processing system that can calculate the injection volume and injection timing as well. The fuel injection period and injection interval could be measured automatically by processing the rate-of-injection waveform using a Digital Signal Processor. The measurement of the rate of multiple fuel injection up to 4 stages per cycle were made successfully and the reliability of the system developed was demonstrated. The measurement system is also applied to the measurement of the injection rate of a new fuel; dimethyl ether (DME) which is regarded as one of the future alternative fuels for Diesel engine. As its material characteristics such as boiling temperature or bulk modulus of elasticity of volume are different from the conventional Diesel fuel, the dimensions of measuring system were modified appropriately to achieve the reliable results. The test results show that the measurement system can be applied without any trouble to DME.