

Development of Engine Fuel System Model by Using International Standard Language

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High efficiency and low pollution are required for automobile systems, and they are becoming more complicated due to EV / HEV and autonomous driving. The introduction of MBD is being promoted and expanded for efficient development in a short period of time. This report uses the collaboration cloud for model development as an example of the use of VHDL-AMS (IEC61691-6), a modeling language based on the description of international standards that guarantees the practicality and compatibility of MBD. Now that we have verified the usefulness of its application to gasoline engines, we will introduce the results. Along with building the simulation model, we will build a simulation of fuel supply and consumption separately, focusing on the state of the energy consumption efficiency of the pump and the injection characteristics of the injector. In order to identify the simulation results, we measured the actual vehicle and built and confirmed the fuel supply pump test bench and the injection test bench. Fuel injection volumes and their characteristics are modeled with a focus on the differential pressure between the injector's primary and secondary pressures and the injector tip injection port. (Fig.1) By introducing such a solenoid response delay model and valve open operation correction model in the injector, the simulation results can be further improved. (Fig.2) In addition, the model that uses the collaborative cloud and uses the injector for verification is the 3-cylinder engine model. The intake pipe pressure information on the secondary side of the injector was acquired. It is constantly changing and complicated to predict. Using a simulation model when using the engine in transient operating conditions is an effective way to estimate the injector's fuel injection rate. (Fig.3) We constructed a simulation model on the premise of using an international standard language, and examined its usable form. It is thought that we were able to introduce an example of a model that handles fuel, and we verified and modified the fuel supply model including the fuel pump and the fuel consumption model including the injector, and obtained sufficiently usable knowledge. As MBD development is promoted and the development environment is being prepared in a non-face-to-face manner, we introduced an example that can be used in a simulation model that can be shared by using an international standard language. Furthermore, we can expect the possibility of developing effective simulations for a wide range of complications of systems including motorization and mechanical systems.

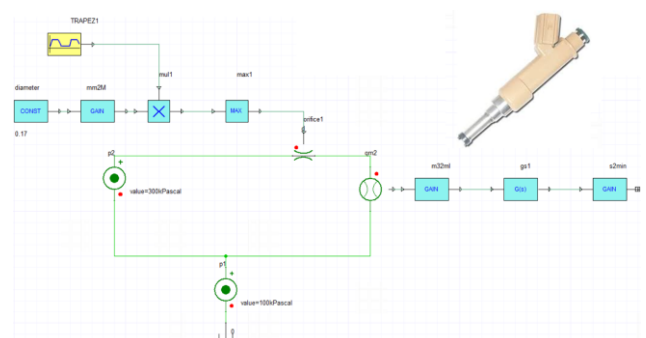


Fig.1 Injection test model

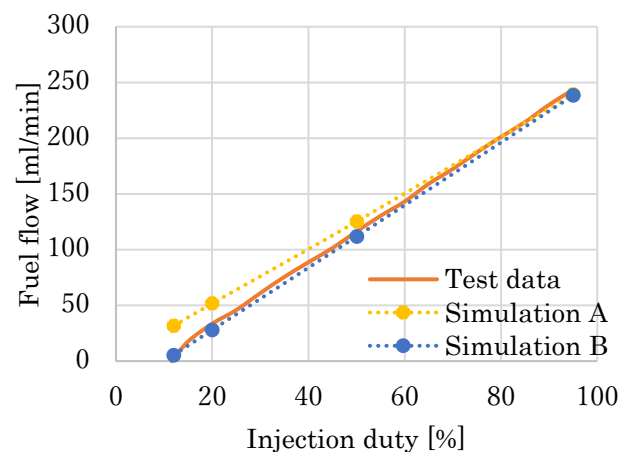


Fig.2 Specification Injection

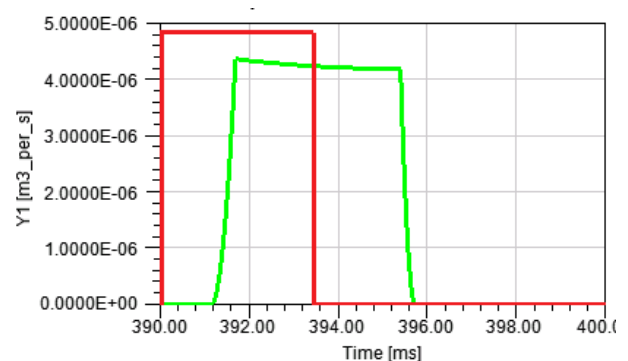


Fig.3 Injection characteristics with pressure fluctuation