PIA Powertrain Injector Application
Control Unit Simulator for Injection Valves

Key challenges in the project:

— Fully-automatic testing process
— Optimal distribution of fuel during injection (injector actuation to create and evaluate the spray pattern of an injection valve over time)
— Ensuring optimal open times and therefore the exact metering of the injection volume per cycle across all valve types (also for multiple injections)

How did we solve them?

→ Electronic control system with power output stage for injection valves (simulation of a control unit)
→ Complete remote control (via Ethernet) and parameterization based on a sequencer (TestStand)
→ Additional trigger signals to actuate external strobe light fields and image processing components (cameras)
→ Automatic calculation of the switch-on/off time of a valve through evaluation of the structure-borne noise. This evaluates the internal mechanics’ movements of the injection valve.

Purpose of the project

This test system simulates a control for endurance testing of all types of fuel injection valves for gas or diesel and function tests in the automated laboratory environment. The real ambient conditions for injection valves are created. Injector (injection valve) analysis and optimization also helps advance research and development.

Technical requirements for the test system

The system is equipped with fast, precise measuring transformers to record voltage and current curves. The data is recorded with a fast sampling rate of 500 kHz. An additional acceleration sensor detects the structure-borne noise on the test specimen fixture of an injection valve and presents it as a measurement curve graph.

Test keywords:
Powertrain Injector Application (PIA), injection valve, injector, multiple injections, simulation of a control unit, sequencer, superior control system, power output stage

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