

## Within-A-Cycle Control of Rate Shaping with Piezoelectric Fuel Injectors

**Track Code:** 2014-SHAV-66737

**Categories:**

- Mechanical Engineering

**Keywords:**

- Diesel
- Engines
- Fuel Injection
- Mechanical Engineering
- Piezoelectric

Fuel injection rate shaping is a strategy to improve fuel efficiency and reduce harmful emissions in diesel engines. Thanks to their fast response, piezoelectric fuel injectors are capable of rate shaping.

Researchers at Purdue University have developed a model-based, closed-loop controller of injection flow rate for a piezoelectric fuel injectors. This within-a-cycle control strategy utilizes a model-based, generalizable scheme and shows an injection flow rate tracking capability. The performance of this controller has been verified with simulation and experimental results at different rail pressures and desired injection rates, which indicate a maximum error of total fuel per one injection event of 2.5 percent.

**Advantages**

- Reduction in fuel consumption and emissions
- Dynamic surface control scheme minimizes computational effort

**Potential Applications:**

- Automobile industry

**People:**

- Shaver, Gregory Matthew (Project leader)
- Duc Le, Dat
- Pietrzak, Bradley William

**Intellectual Property:**

**Application Date:** August 1, 2014

**Type:** Utility Patent  
**Country of Filing:** United States  
**Patent Number:** 9,562,487  
**Issue Date:** February 7, 2017

**Contact OTC:**

Purdue Office of Technology Commercialization  
The Convergence Center  
101 Foundry Drive, Suite 2500  
West Lafayette, IN 47906

Phone: (765) 588-3475

Fax: (765) 463-3486

Email: [otcip@prf.org](mailto:otcip@prf.org)