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Estimation of In-Cylinder Pressure and Combustion Variables from Non-Intrusive External Sensors in a Diesel Engine

Non-intrusive estimation of in-cylinder pressure in diesel engines by using a differential equation algorithm.

Technology No. 2022-199

IP Status: Provisional Patent Application Filed

Applications

- Unmanned Aerial vehicles (UAVs/Drones)
- Passenger and Commercial Automobiles
- Railroad Locomotives
- Watercraft and Marine vehicles
- Electricity generation
- Power generation in pumps and compressors
- Construction and Farming Equipment

Technology Overview

Estimation of in-cylinder pressure and other variables related to combustion in a diesel engine is important for real-time combustion control, improvement of engine efficiency, reduction of harmful engine emissions, and fault diagnostics. However, the high temperature and harsh conditions inside an engine cylinder result in internal pressure sensors having a limited lifetime and the sensors add to the cost of the propulsion as well. Additionally, a fault diagnostic system that can monitor the functionality and health of the in-cylinder sensors would be valuable in planning and maintenance activities which would reduce cost.

Researchers at the University of Minnesota have developed a technology that makes use of a differential equation model specifically relating the combustion component of measured acceleration signal to the combustion component of in-cylinder pressure. It estimates the in-cylinder pressure and other combustion variables using a non-intrusive vibration/acoustic sensor located on the engine block. Estimation of the combustion variables would enable

better closed-loop fuel injector control, leading to better fuel economy and reduced emissions. Additionally, fault diagnostics for simultaneous real-time health monitoring of fuel injectors, in-cylinder pressure sensors, and the non-intrusive vibration sensor could be another important application of this technology. The algorithm has been shown to work using experimental data.

Phase of Development

TRL: 4-5 The algorithm has been shown to work using experimental data

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

Please contact our office to share your business' needs and learn more.

Researchers

- **Rajesh Rajamani** Professor, Department of Mechanical Engineering

Licensing Terms

MN-IP Try and Buy

Center for Compact and Efficient Fluid Power (CCEFP) Try and Buy – Available to CCEFP member companies

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- No US patent fees during Try period[1]

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