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A Nonlinear Model-Based Controller for Premixed Charge Compression Ignition Combustion Timing in Diesel Engines

A validated, nonlinear model-based closed-loop controller precisely regulates advanced diesel engine combustion phasing to reduce emissions and maintain high fuel economy.

In today's economy, engine developers are forced to find a balance between emission standards set by federal regulation and high fuel efficiency demanded by consumers. Aftertreatment systems are effective at lowering emission, but at the cost of increased fuel consumption. Advanced combustion modes such as diesel premixed charge compression ignition (PCCI), homogeneous charge compression ignition (HCCI) and low temperature combustion (LTC) offer the potential of low emission and high efficiency, but the lack of a direct combustion trigger has limited their widespread adoption.

Purdue University researchers have developed a nonlinear model-based closed-loop controller to regulate the combustion phasing of PCCI. The controller is based on a PCCI combustion timing model and the oxygen fraction dynamics for a modern diesel engine incorporating flexible intake valve actuation. The controller was experimentally validated at multiple operating conditions, demonstrating the ability to control the start of combustion to within 1 CAD (crank angle degree) and the intake manifold oxygen fraction to within 1 percent of their desired values.

Advantages:

-Reduces engine emissions while maintaining high fuel economy

-Displays high precision and control

Potential Applications:

-Engine manufacturers

-Auto industry

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Category

Automotive & Mobility Tech/Fuel Injection & Combustion Control Systems

Automotive & Mobility Tech/Internal Combustion Engine Optimization

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Intellectual Property:

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