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Model-based Compressor Surge Avoidance Algorithm for IC Engines Utilizing Cylinder Deactivation During Motoring Conditions

Model-based logic coordinates cylinder deactivation to prevent turbo surge during motoring and load changes.

Researchers at Purdue University have developed a new method for detecting the risk of compressor surge in turbocharged diesel engines and avoiding it by delaying cylinder deactivation. Cylinder deactivation provides benefits for exhaust thermal management and fuel savings, but it can also cause compressor surge. Compressor surge occurs when air flows in from the compressor outlet due to high inlet manifold pressure (compressor outlet pressure) and low airflow through the compressor. In this invention, the cylinder deactivation controller (a memory device) may detect when engine load (data from engine control module), gas pedal position (easily detectable), or intake manifold pressures (calculated with an equation) change. The controller then uses the data to determine whether a cylinder can be deactivated without causing compressor surge. This cycle can be continuously repeated to determine whether additional cylinders should be deactivated.

Technology Validation: The researchers' model used to predict inlet manifold pressures closely approximates experimental data, thus allowing the cylinder deactivation controller equipped with this model to make correct decisions. In two tests of a 6-cylinder engine during low and high load followed by motoring (0% accelerator position), surge was avoided.

Advantages:

- Avoids compressor surge

- Accurate prediction of inlet manifold pressure

Applications:

- Turbocharged diesel, gasoline engines

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Category
Automotive & Mobility Tech/Internal Combustion Engine Optimization
Semiconductors/Packaging & Integration
Materials Science & Nanotechnology/Thermal Management Materials & Solutions

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Intellectual Property:

EP-Patent, N/A, France

EP-Patent, N/A, United Kingdom

DIV-Patent, N/A, Europe

EP-Patent, N/A, Germany

EP-Patent, N/A, Switzerland

Provisional-Patent, 2018-02-26, United States

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