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Firing Pattern for Diesel Engine Dynamic Cylinder Activation

An algorithm selects cycle-by-cycle firing patterns that suppress driveline vibration without heavy calibration.

Diesel engine cylinder deactivation (CDA) has been demonstrated to provide significant efficiency and after treatment thermal management benefits, enabling fuel-efficient emissions reduction from modern diesel engines at low load engine operation. Dynamic cylinder activation (DCA) is a variant of CDA where the set of deactivated cylinders vary on a cycle-by-cycle basis to enable greater control over the driveline torsional vibration while maintaining the fuel efficiency and thermal management benefits shown by fixed CDA. Many conventional DCA approaches require extensive calibration for a given engine configuration and are not applicable for different families of engines. Researchers at Purdue University have developed an algorithmic approach to designing firing patterns during DCA to minimize driveline torsional vibration in a user-defined frequency range given firing density, engine speed and maximum length of firing pattern is described in this article. The optimized firing pattern completely eliminates vibration content in the range of undesirable frequencies (3.8Hz â€“ 7.6Hz, 12Hz â€“ 24Hz). Furthermore, this algorithm is generalizable to any piston-cylinder layout and number of cylinders.

Advantages:

-Generalizable

-Optimal firing pattern

-Eliminates undesirable frequency

Potential Applications:

-Dynamic cylinder activation

TRL: 3

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Semiconductors/Packaging & Integration
Materials Science & Nanotechnology/Thermal Management Materials & Solutions

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