

Engine Combustion Control at Low Loads with Reactivity Controlled Compression Ignition Combustion

View U.S. Patent No. 8,851,045 in PDF format.

WARF: P110092US01

Inventors: Rolf Reitz, Reed Hanson, Derek Splitter, Sage Kokjohn

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing combustion optimization methods for compression ignition engines.

Overview

Diesel engines, also known as compression ignition engines, are among the most energy-efficient engines available, with high power output per fuel consumption. Unfortunately, they are also among the "dirtiest" engines available with high production of soot and nitrogen oxides, which result in adverse effects such as smog and acid rain. The United States and many other countries have imposed emissions regulations on the use of diesel engines in vehicles, and numerous technologies have been developed to address the issue of high diesel emissions. The difficulties in complying with emissions regulations has resulted in many automotive companies shifting focus away from diesel engines to the use of gasoline engines, which have lower energy efficiency as well as concerning levels of emissions, albeit lower levels than diesel engines.

UW-Madison researchers have previously developed Reactivity-Controlled Compression Ignition (RCCI) methods, which adapt the fuel provided to the engine's combustion chamber to vary reactivity over the course of the combustion cycle and provide a stratified distribution of fuel reactivity. Fuel reactivity can be tailored by using both diesel fuel (higher reactivity) and gasoline (lower reactivity), timed to be injected at different times during the compression stroke. Appropriate tailoring of fuel reactivity, fuel amounts and proportions and the timing of fuel introduction into the combustion chamber allows combustion to be tailored to produce peak work output at the desired time with low nitrogen oxide and soot production. However, experimentation has revealed that with decreasing engine load and particularly at idle, RCCI methods do not function as well. At low loads, the engine effectively operates as a conventional diesel engine with minimal or no use of gasoline, resulting in conventional diesel performance with lower thermal efficiency and higher emissions. A need exists for adaptations to the RCCI method to allow low-load operations while using the fuel reactivity stratification strategy to achieve low emissions.

The Invention

UW-Madison researchers now have developed a compression combustion method for an internal combustion engine to enable low emissions and high thermal efficiency at low engine loads. The combustion engine has tanks containing fuel materials with differing reactivities. Fuel from the tanks is provided to the combustion chamber during an engine combustion cycle when the engine is running to obtain a stratified distribution of fuel reactivity within the combustion chamber, with regions of high reactivity spaced from regions of low reactivity. The fuels are provided to the combustion chamber at different times during the engine combustion cycle.

we like เออสเฮล ไกลาย ริเษรีย์ en กลายยางเลา experience มาตามีแอบงรายกาลาสังกาญ อี่หว่าเราะหว่างกามเห็น เออกไม่มาย เกมอย่างกามเราะ จะกามเราะ เบาออสเราะหว่าง เออกไม่ เป็นเป็น เป็นเป from the intake manifoldstockles, yotalgreeted the storing of edocties and related technologies on your device. See introduced by the intake port. The throttle is kept out of the open state during the intake stroke of the combustion cycle so that the cylinder air pressure is below ambient



pressure at the start of the compression stroke, resulting in controlled temperatures, equivalence ratios, soot and emissions and increased fuel efficiency.

Applications

Internal combustion engines utilizing reactivity controlled compression ignition combustion (RCCI)

Key Benefits

- · Maintains low emissions and low fuel consumption across a range of engine loads, including low loads and idling
- · Allows RCCI to be combined with exhaust gas recirculation, exhaust after-treatment strategies and other combustion manipulation techniques to further reduce emissions

Additional Information

For More Information About the Inventors

<u>Sage Kokjohn</u>

Related Technologies

 For more information about controlling diesel engine emissions through engine combustion control, see WARF reference number P100054US01.

Related Intellectual Property

• View Continuation Patent in PDF format.

Tech Fields

• Engineering : Engine technologies

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867

We use cookies on this site to enhance your experience and improve our marketing efforts. By continuing to browse without changing your browser settings to block or delete cookies, you agree to the storing of cookies and related technologies on your device. See our privacy policy

