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Investigation of Transient Characteristics for Performance Improvement and Health Monitoring for a CI Engine Running on Biodiesel

B. Tesfa, R. Mishra, F. Gu and J. Fieldhouse

Introduction

Many researchers have reported that biodiesel has comparable performance and better emission over diesel fuel during steady state process. However, the performance and emission of biodiesel under transient conditions, for example engine start, warm up, acceleration and deceleration are less reported. It is there fore very important to understand the performance and emission of biodiesel under the transient conditions. In addition, the performance and emission variation parameters under transient condition can be used to develop a fault diagnostic model for transient system.

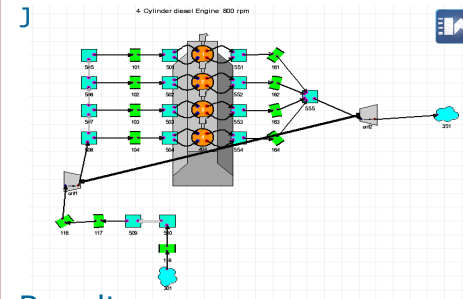
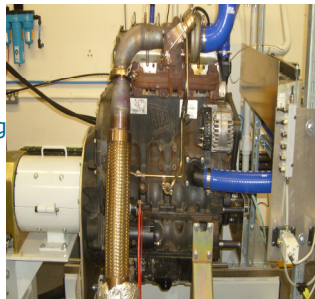
Aims

To investigate both experimentally and numerically the performance and emission characteristics of CI engine running on biodiesel and its blends during transient operation as well as to develop condition monitoring tools for such engine system.

Methodology

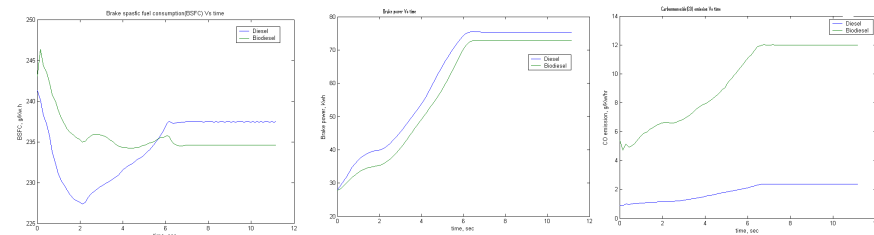
To attain the designed objectives the following methods will be applied:

- Developing a wave model for CI engine running on biodiesel during transient process;
- Doing repeated engine test using biodiesel fuel for different set up during transient process
- Comparing the performance and emission of diesel and biodiesel on selected parameters
- Developing mathematical model for analysis of emission and performance of CI engine during transient process.
- Developing fault diagnostic tools using emission characteristics of biodiesel at transient process integrating with Matlab.



- 4 cylinder, 4 stroke, turbo charged diesel engine
- Diesel-Wibe combustion model
- Woschni heat transfer model
- Biodiesel and diesel fuel
- Transient process
- Acceleration 850 – 1200 rpm, for 4 sec
- Map based Turbocharger model

Results



- The BSFC of biodiesel is higher than diesel by 13 %
- The brake power of biodiesel is lower than diesel by 10% on working engine speed due to the lower heating value of biodiesel
- The emission of CO in biodiesel lower than diesel

Future Work

- Effectiveness of Biodiesel in Brake power, BSFC, and thermal efficiency during transient process comparing with diesel
- Effectiveness of Biodiesel in emission during transient process comparing with diesel
- Developing mathematical models for performance and emission of biodiesel fuel during transient process
- Developing engine system fault diagnostic tools using emission characteristics at transient state