COORDINATING RESEARCH COUNCIL

CRC

Advanced Vehicles Fuels and Lubricants Committee.

Biodiesel Research Efforts

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www.crcao.org

CRC Objective

- To serve as a focal point for cooperative, precompetitive research between the automobile and petroleum industries.
- To make technical information available to be used:
  - by industry to ensure compatibility and customer satisfaction
  - by industry, Government and the public to achieve clean air and other goals

The AVFL role in CRC

Goal

- Identify and coordinate research programs to define the performance of high-efficiency, low-emissions vehicle/fuel/lubricant systems.

Refinements

- Supporting development of future vehicle, fuel, and lubricant technologies.
- Focus activities on emerging technologies
- Commercial technologies are providence of other existing CRC Committees.

AVFL-2a

- Impact of Biodiesel on Fuel System Component Durability.
- Report available on the CRC website.
  - Report can be accessed at www.crcao.com
  - Published by SAE (SAE 2006-01-3279)
- Prime Contractor: Innospec Inc. (formerly the Associated Octel Company Limited.)

AVFL-2a Objective

Provide technical data on the impact of B5 and B20 blends on:

- Elastomer Integrity.
- Wear of fuel injectors.
- Wear of rotary and common rail fuel pumps.

AVFL-2a

- Testing of elastomers, fuel injectors, rotary fuel pumps, and common rail fuel pumps
  - 500 hour bench tests

- ULSD with rapeseed, soy, and highly oxidized soy biodiesels at B5 and B20.

AVFL-2a

- Fluorocarbon elastomers of medium to high fluorine content are most compatible with biodiesel blends

- Other elastomers may be acceptable in specific applications.

AVFL-2a

- Lubricity of B5 and B20 blends is adequate for protection of the components tested here
  - Exception: highly oxidized B20 blends that did not complete tests

Property	Test Method	Batch 1 Soy Biodiesel (Oxidized)	Batch 2 Soy Biodiesel (Oxidized)
Kinematic Viscosity,40°C	D445	7.276	9.837
Oxidation Stability	D2274	8.28 mg/100ml	8.38 mg/100ml
Peroxide Value	Cd 8b-90	381 meq/kg	662 meq/kg
Carbon Residue,100% sample	D189	6.24	9.4
Acid Number	D664	3.605	5.101

AVFL-2a

Sample A – Sample taken immediately after injector wear test

Sample B – Sample taken from top of sample storage drum

Sample C – Sample taken from bottom of sample storage drum

Sample D – Sample taken after 5 hours circulating through test rig

Sample E – Sample of B5 Oxidized Soy Biodiesel (for comparison)

A B C D E

- Excessively oxidized biodiesel (beyond what is likely in actual practice) can separate from diesel fuel

AVFL-2b

- Characterization of Biodiesel Oxidation and Oxidation Products.

- Scope and Objective:
  - To test the effects of realistic storage and handling conditions on biodiesel oxidation in a controlled laboratory environment.

AVFL-2b

Current Status

A literature review of basic oxidation chemistry along with environmental conditions associated with storage and handling has been completed.

AVFL-2b

Current Status

The conclusion of the literature review:

- The lack of any significant body of adequately controlled engine equipment test results makes it impossible to tie the existing understanding of biodiesel chemistry to the real world.

AVFL-2b

Current Status

An experimental test matrix was designed to measure the effect of environmental factors on biodiesel oxidation.

- Temperature
- Thermal cycling
- Residence time
- Impurities
- Fuel storage and handling surfaces/coating
- Oxygen partial pressure

AVFL-2b

Current Status

The Jet Fuel Thermal Oxidation Tester (JFTOT) is being used to examine deposit forming tendencies of biodiesel blends in diesel fuel systems.

Final report anticipated in January 2007

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