New Diesel Feedstocks and Future Fuels

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First and Second Generation Biodiesel

- Today's Fatty Acid Methyl Ester (FAME) diesel fuel blends are considered first generation biodiesel
  - Variation in Feedstocks
  - Specifications
- Second Generation Biodiesel based on Fischer-Tropsch type fuels, via high pressure hydrogenation of fatty acids, or thermolysis
  - Choren Energy "Sun Diesel"
  - Neste NexBTL
  - Changing World Technologies

Feedstocks for FAME-Based Biodiesel

- Chrysler Group, in cooperation with Next Energy, Bosch, Delphi, Biodiesel Energy Industries, TACOM, DoE, WSU, and MSU is evaluating the impact of feedstock type on various biodiesel parameters.
- Feedstocks can include:
  - Rapeseed, Canola
  - Soy
  - Palm Oil
  - Sunflower Seed
  - Jatropha
  - Tallow
- Feedstock can impact:
  - Stability
  - Cetane
  - Cold flow properties
  - NOx emissions
  - Boiling range
  - ……..

Next Generation Biodiesel -- BTL

- Biomass to Liquids via Gasification and Fischer-Tropsch
  - Feedstock can be forest waste, purpose-grown crops, municipal waste
  - Low to zero sulfur, aromatics
  - High cetane
  - Lubricity, cold flow need adjustment
  - Example – Choren Energy
- High Pressure Hydrogenation of Fatty Acids
  - Saturate double bonds
  - De-esterification
  - Low or zero sulfur, aromatics
  - High cetane
  - Cold flow, lubricity?
  - Example -- Neste NexBTL
- **Thermolysis**
  - Feedstock can be anything from turkey processing waste to auto shredder residue
  - More questions than answers about product properties

Specifications

- FAME-Based Biodiesel
  - Specifications are in place in Europe and U.S. for 100% Biodiesel as a blendstock
    - The U.S. specification needs improvements -- Work is underway
    - There is no recognized specification for B20, which is a major EPACT fuel
    - Developing data for support of a strong B20 specification is a major focus of the Next Energy program
    - Specifications should be performance-based. e.g. Iodine number is a surrogate for stability, but can exclude some feedstocks. True measures of stability are preferred
  - Second Generation Biodiesels should meet existing commercial specifications

“XTL Fuels”

- Generally are fuels based on conversion of carbon to syn-gas and Fischer-Tropsch
  - GTL
  - CTL
  - BTL
  - Should meet existing commercial diesel fuel specifications
  - High cetane
  - Low or near zero aromatics, sulfur
  - Lubricity and cold flow concerns
  - High CapEx

Ethanol in Diesel

- The blending of ethanol in diesel fuel, “E-Diesel” has been explored
  - Concerns have been expressed regarding the low flashpoints of these blends. Current diesel product has not been developed in anticipation of fuel with flashpoints below ASTM standards
  - Fuel economy, peak power, lubricity, and wear/corrosion issues need to be examined
  - There is no consensus specification for “E-Diesel”

Fuels for HCCI and "Low Temperature Combustion"

- Viable HCCI and "Low Temperature Combustion" systems have yet to be clearly defined
  - Definition of an appropriate fuel ahead of definition of the combustion regime may not be a good use of resources
  - Viable deployment of advanced combustion regimes demands that they operate on currently available fuels

Conclusions

- The Chrysler Group supports the use of alternative and renewable feedstocks for diesel fuel
- There is an urgent need for a specification for FAME-Based B20
- Further R&D is needed to reduce the processing cost for GTL, CTL, BTL and other processes
- Attempts to “optimize” HCCI fuel may be premature
- Safety issues around E-Diesel may limit its application