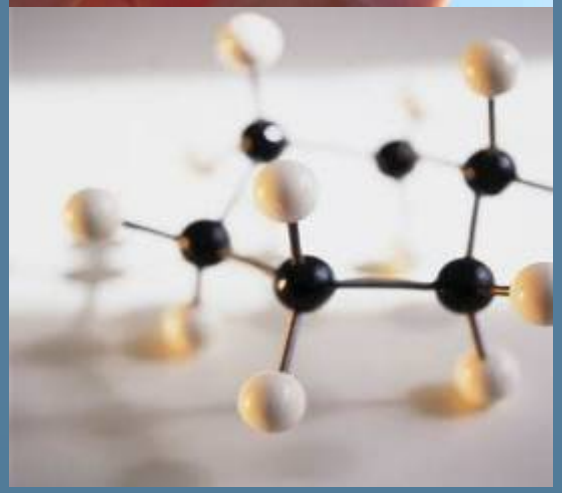

Intermediate Ethanol Blends Test Program

SAE Government / Industry Meeting

February 5 2009

Presented by: Kevin Stork

Agenda

- Background
- Meeting the EISA Renewable Fuels Challenge with Ethanol – RFS
- Intermediate Ethanol Blends Test Program
  - Overview
  - Project descriptions & status
  - Sample results from small engines
- Information Resources

Legislation

December 2007 – Congress Passes and President Signs the Energy Independence and Security Act of 2007 (EISA, P.L. 110-140)

- **Key elements**
  - **Increased Corporate Average Fuel Economy (CAFE) Standard**
  - **Expanded Renewable Fuel Standard (RFS)**
    - **Requires 36 billion gallons by 2022**
    - **21 billion gallons of advanced biofuels**

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Challenges Across Entire Supply Chain

Feedstock Production → Feedstock Logistics → Biofuels Production → Biofuels Distribution → Biofuels End Use

Cellulosic Ethanol: Primary focus of the DOE biofuels program.

Alternative Light-Duty and Diesel Replacement Fuels: A scoping study is underway to help prioritize future work on additional alternate fuels that require governmental support and can significantly contribute to achieving the President's goal.

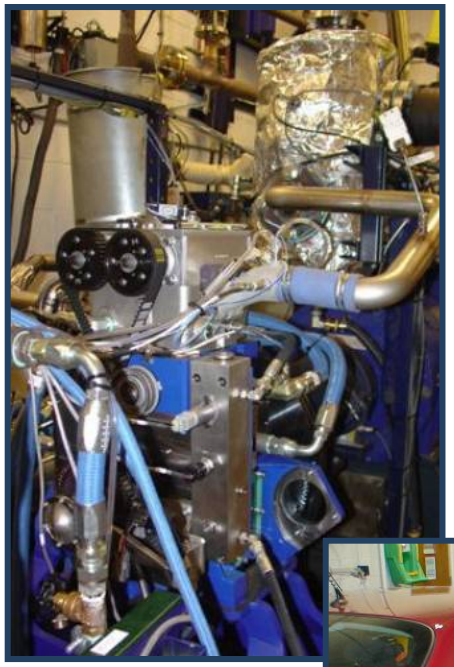
Best short-term option would be to use ethanol blends greater than 10% - only if it makes sense

Developing A Ready End-Use Market for Ethanol

- An estimated 9 billion gallons of ethanol was used in the U.S. in 2008
  - More than 99% is used in the form of E10
  - E10 market will be saturated at about 14 billion gallons
- DOE strategy for expanding ethanol use
  - Expand E85
  - Determine feasibility of using intermediate ethanol blends (e.g., E15, E20) in conventional vehicles (non-flex fuel vehicles)
- EPA has authority to issue a "substantially similar" waiver to allow alternative fuels to be used in place of gasoline
  - Evaluated in terms of effects on durability, driveability, materials, and emissions

Expanded FFV Usage

- Support expanded use for FFVs for markets in which they make sense
- Five awards to industry teams to increase efficiency and fuel economy of next-generation FFVs
  - Teams led by Delphi, Ford, GM, Mahle, Bosch
- National Lab projects
  - Delphi-ORNL
  - St. of CO E85 emissions speciation, NREL
  - Lean-burn study, Saab BioPower benchmarking, ORNL



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I-Blends Overview

Sponsored by DOE:

- Office of Vehicle Technologies (Kevin Stork)
- Office of the Biomass Program (Joan Glickman)

DOE initiated study ~ 18 months ago

Established leveraging with CRC, EPA, and API

Small, non-road engines (SNRE) given priority in summer 2007 at EPA request

Vehicle evaluations underway late CY 2007

Completed Testing

Vehicles

Emissions and Catalyst Temperature Pilot Study (DOE) (16 vehicles)

- Tests of 13 vehicles completed last year – Report #1 published October 7, 2008
- Final 3 vehicles completed December 2008 – to be reported in February 2009 in a Revised Report #1

Tailpipe Emissions (EPA and DOE) (22 vehicles, 31 different fuels)

- Phase 1 (75°F) and Phase 2 (50°F) of EPAct project completed.

Cold Start and Driveability (CRC and DOE) (6 vehicles)

- Sub-50°F testing completed - CRC Report No. 652 issued Oct 2008

Small Non-Road Engines (lawn equipment, generators)

Emissions and Exhaust Temperature Pilot Study (DOE) (6 engines)

- Testing completed May 2008 – Report #1 published October 7, 2008

Full Useful Life Emissions and Durability (DOE) (17 / 22 engines aged to full life)

- Testing completed May 2008 – Report #1 published October 7, 2008

Evaporative Emissions (CRC, DOE, EPA) (8 vehicles)

- E-77-2 testing complete, CRC report expected 2nd Quarter 2009

FY09 Funded Vehicle Testing

Tailpipe Emissions (EPA and DOE) (22 vehicles, 31 different fuels)

- Phase 3 (additional E15 and E20 fuels) beginning Feb. 2009

Evaporative Emissions (CRC, DOE, EPA) (8 vehicles)

- E-77-2b in initial stages, expect CRC Report 2010

Full Useful Life Emissions Study (DOE and CRC)

- Results expected 2010-2011

Cold Start and Driveability (CRC and DOE) (6 vehicles)

- High temperature testing, Summer 2009

Fuel System Materials Compatibility (CRC and DOE)

- Testing underway – results expected by October 2009

Recent and Upcoming Milestones

October 7, 2008:

NREL/ORNL issue Technical Memorandum on Quick Look Study (Report #1)

October 2008:

CRC Report #652 on driveability issued

January 28, 2009:

DOE, labs, and equipment manufacturers participated in second meeting of API-organized ‘Coordination Committee on Intermediate Ethanol Blends R&D’

February 2009:

NREL/ORNL will issue revision to Report #1 including results from 3 additional vehicles

Questions