WEBINAR
Biodiesel B5 and B10 Studies

July 1, 2014
Industrial Strategies Division
California Air Resources Board
Agenda

- Background
- Study Overview
- Results
- Conclusions
- Next Steps
Webinar Purpose

- Follow up on April 15, 2014 workshop comments
- Release all rulemaking NOx data
- Share initial CARB thoughts on newest dataset
Biodiesel Characterization and NOx Mitigation Study 2011

- B5: wide statistical variance with no demonstrable NOx emissions impact
- B10: data points were limited
- Identified need for supplemental NOx emission study at B5
- Need for emissions comparison of Cummins ISM vs. DDC series 60
Stakeholder feedback from 2011 Durbin study informed supplemental B5 and B10 study

Feedback on test sequence led to use of back-to-back replicates for increased statistical confidence

Questions about similarity of results for Cummins and DDC led to use of DDC in the study

No cruise cycles included due to issues within 2011 Durbin study
Study Overview-Fuels

* Baseline Commercial CARB diesel

* Two biodiesel feedstocks
  * Soy
  * Animal

* Two biodiesel blends
  * B5
  * B10
Two engines
- 2006 Cummins ISM
- 1991 DDC series 60

Three duty cycles
- Urban Dynamometer Drive Schedule (UDDS)
- Federal Test Procedure (FTP)
- Supplemental Emissions Test (SET)
Study Overview-Cycles

* UDDS
Study Overview-Cycles

* FTP

![Graph showing torque and speed variations over time](image.png)
Study Overview-Cycles

* SET

![Diagram showing engine speed and load percentages with additional modes determined by certification personnel.]
Test cycle pattern RCCR-RCCR, where R is reference fuel (CARB diesel) and C is candidate biodiesel blend (e.g. B5, B10)

- Eliminates diurnal variability
- 8 replicates on FTP and UDDS
- 4 replicates on SET
Results

* Study generated 24 distinct average data points based on differences in blend, feedstock, engine, and cycle

* More detail in next presentation
Literature on B5 soy:
- Number of average data points increased from 8 to 14
- Number of total replicates on BD increased 40 to 78

Literature NOx results range from -1.77% to +3.17%

Strong clustering between 0.5% and 1.5% increase
NOx Impact of Soy Biodiesel Blended in High Cetane Base Fuel

\[ y = 0.0019x \]
NTDE Discussion

- NTDEs with SCR have no fuel based NOx difference at higher biodiesel blends
  - Presumably no NOx increase at lower levels

- Technological justification supports no NOx increase
Differences in base fuels, duty cycles, and engines exist within the HD truck fleet.

Studies in literature examined differing base fuels. Percent difference was largely similar regardless of differences in base CARB diesel.

Studies covered newer and older legacy vehicles, and found directionally similar results.

Duty cycles vary in magnitude of response, but directionally similar.
Next Steps

* Solicit stakeholder feedback on data and need for biodiesel use NOx mitigation
* Internal evaluation of data ongoing, and new external statistical analysis
* Public workshop tentatively scheduled for July 31
* Board hearing scheduled for November 2014
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Alternative Diesel Fuel Website:  
http://www.arb.ca.gov/fuels/diesel/altdiesel/biodiesel.htm