EPAct Light Duty Vehicle Fuel Effects Program

March 3, 2008

ED_000545A_00002026-00001

EPAct Fuel Matrix

Phase 3:
Base Program (EPA)
(Fuels 1-16) →

Phases 1 and 2:
RFS 2 Subset (EPA/NREL)
(Fuels 17-19) →

Phase 3:
Additional Fuels (NREL)
(Fuels 20-29) →

E85 (NREL) →

Fuel #	T50 °F	T90 °F	ETOH %	RVP psi	ARO %
1	150	300	10	10	15
2	240	340	0	10	15
3	220	300	10	7	15
4	220	340	10	10	15
5	240	300	0	7	40
6	190	340	10	7	15
7	190	300	0	7	15
8	220	300	0	10	15
9	190	340	0	10	40
10	220	340	10	7	40
11	190	300	10	10	40
12	150	340	10	10	40
13	220	340	0	7	40
14	190	340	0	7	15
15	190	300	0	10	40
16	220	300	10	7	40
17	215	325	0	9	30
18	202	325	10	9	25
19	195	325	15	9	23
20	150	340	15	10	15
21	150	300	15	10	40
22	160	300	20	7	40
23	160	300	20	10	15
24	160	340	20	10	40
25	160	340	20	7	15
26	190	300	15	7	40
27	190	340	15	10	40
28	190	300	15	10	15
29	TBD	TBD	85	TBD	TBD

3

ED_000545A_00002026-00003

To: CN=Aron Butler/OU=AA/O=USEPA/C=US@EPA[]
Cc: []
From: CN=CarlR Fulper/OU=AA/O=USEPA/C=US
Sent: Mon 4/14/2008 2:34:49 PM
Subject: RE: Need Help w/ information for CRC Meeting at EPA on April 16
Carl Fulper
Aron Butler
Michael Christianson
Carl Fulper
Carl Fulper

I'll talk with Connie Hart about this..... you still might be on the hook.

Carl F

Aron Butler/AA/USEPA/US
EPA-OAR,OTAQ,ASD
Received Date:
04/14/2008 10:10 AM
Transmission Date:
04/14/2008 10:10:36 AM
To Michael Christianson/AA/USEPA/US@EPA
cc CarlR Fulper/AA/USEPA/US@EPA, John Koupal/AA/USEPA/US@EPA, Connie Hart/AA/USEPA/US@EPA
Subject RE: Need Help w/ information for CRC Meeting at EPA on April 16

Did this ever get squared away? Are we on the hook to talk about E74b or not? Isn't Connie the lead on this work?

Michael Christianson/AA/USEPA/US
EPA-OAR,OTAQ,ASD
Received Date:
04/11/2008 03:08 PM
Transmission Date:
04/11/2008 03:08:57 PM
To CarlR Fulper/AA/USEPA/US@EPA
cc Aron Butler/AA/USEPA/US@EPA, John Koupal/AA/USEPA/US@EPA
Subject RE: Need Help w/ information for CRC Meeting at EPA on April 16

Carl,

In terms of E-74b, there is nothing that we here at EPA could present. This was a CRC program that we requested at the last minute that they add 2 fuels for us. We have not been involved in the testing since then, although I've seen the ongoing progress reports. If anything, I would think that CRC would be walking us through some slides, not the other way around.

Please let me know if this is what you meant - the way I read it, I thought you were looking for us to put something together.

****
Michael G. Christianson
Office of Transportation and Air Quality
U.S. Environmental Protection Agency
2000 Traverwood Drive, Ann Arbor, MI 48105
Phone (734) 214-4624 / Fax (734) 214-4050
christianson.michael@epa.gov
****

CarlR Fulper/AA/USEPA/US
04/11/2008 10:15 AM
To CarlR Fulper/AA/USEPA/US@EPA
cc Antonio Fernandez/AA/USEPA/US@EPA, Connie Hart/AA/USEPA/US@EPA, Ed Nam/AA/USEPA/US@EPA, James Warila/AA/USEPA/US@EPA, John Koupal/AA/USEPA/US@EPA, Joseph Somers/AA/USEPA/US@EPA, Kathryn Sargeant/AA/USEPA/US@EPA, Marion Hoyer/AA/USEPA/US@EPA, Michael Christianson/AA/USEPA/US@EPA, Paul Machiele/AA/USEPA/US@EPA, Rafal Sobotowski/AA/USEPA/US@EPA
Subject RE: Need Help w/ informaton for CRC Meeting at EPA on April 16

Corrections:

CarlR Fulper/AA/USEPA/US
EPA-OAR,OTAQ,ASD
Received Date:
04/11/2008 10:10 AM
Transmission Date:
04/11/2008 10:10:13 AM
To John Koupal/AA/USEPA/US
cc Antonio Fernandez/AA/USEPA/US@EPA, Connie Hart/AA/USEPA/US@EPA, Ed Nam/AA/USEPA/US@EPA, James Warila/AA/USEPA/US@EPA, John Koupal/AA/USEPA/US@EPA, Joseph Somers/AA/USEPA/US@EPA, Kathryn Sargeant/AA/USEPA/US@EPA, Marion Hoyer/AA/USEPA/US@EPA, Michael Christianson/AA/USEPA/US@EPA, Paul Machiele/AA/USEPA/US@EPA, Rafal Sobotowski/AA/USEPA/US@EPA
Subject RE: Need Help w/ informaton for CRC Meeting at EPA on April 16

I need your help,

CRC will be visiting on April 16 to establish or continue its communications between EPA and CRC.
CRC is looking for a status on our test programs, a quick overview, timeline, issues or preliminary results. Nothing big but some general PDF slides on the test programs

I need to know who will be able to talk about it and provide the information. It would be nice to have a copy of the presentation by Tuesday morning (April 15).

10:00 AM	Kansas City (E-69)	Carl Fulper/Ed Nam/Jim Warila
10:30 AM	Nonroad Pilot (E-70)	Carl Fulper, Connie Hart, Jim Warila
11:00 AM	E-74b - Evaporative	Mike Christianson/Aaron Bulter
11:30 AM	E-77 - Evaporative	Connie Hart/David Brzenzski/Carl Fulper
12:00 - 1PM	Working Lunch (??)	
12:30 PM	ACES -	Joe Somers/Chris Laroo
1:00 PM	EPAct work (missing anything?)	Carl Scarbro/Connie Hart/Tony Fernadez/Rafal Sobotowski/Mike Christianson
1:30 PM	HDIU Status	Rick Wilcox/Chris Laroo
2:00 PM	MOVES Evaluation	John Koupal/Megan Bearsdley/Ed Nam
2:30 PM	EPA Future Projects	John Koupal/Carl Fulper/Ed Nam (E-23 Future Work?)
3:00 PM	Measurement Panel (December meeeting)	

Lab Tour (??)
Other Topics??

Thanks,

Carl Fulper

John Koupal/AA/USEPA/US
EPA-OAR,OTAQ,ASD
Received Date:
04/07/2008 03:39 PM
Transmission Date:
04/07/2008 03:39:52 PM
To John Koupal/AA/USEPA/US@EPA
cc Antonio Fernandez/AA/USEPA/US@EPA, CarlR Fulper/AA/USEPA/US@EPA, Connie Hart/AA/USEPA/US@EPA, Ed Nam/AA/USEPA/US@EPA, James Warila/AA/USEPA/US@EPA, Joseph Somers/AA/USEPA/US@EPA, Kathryn Sargeant/AA/USEPA/US@EPA, Marion Hoyer/AA/USEPA/US@EPA, Michael Christianson/AA/USEPA/US@EPA, Paul Machiele/AA/USEPA/US@EPA, Rafal Sobotowski/AA/USEPA/US@EPA
Subject Friday 4/18?

Still working out dates - how many do we lose if we met with CRC Friday 4/18? please let me know if that is your

flex day

John Koupal
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Assessment & Standards Division
U.S. EPA Office of Transportation & Air Quality
2000 Traverwood Drive Ann Arbor, MI 48105
(734) 214-4942 koupal.john@epa.gov

John Koupal/AA/USEPA/US
EPA-OAR,OTAQ,ASD
Sent by: John Koupal
Received Date:
04/07/2008 11:53 AM
Transmission Date:
04/07/2008 11:53:20 AM
To Rafal Sobotowski/AA/USEPA/US, Connie Hart/AA/USEPA/US, Antonio Fernandez/AA/USEPA/US, Ed Nam/AA/USEPA/US, James Warila/AA/USEPA/US, CarlR Fulper/AA/USEPA/US, Joseph Somers/AA/USEPA/US, Michael Christianson/AA/USEPA/US, Marion Hoyer/AA/USEPA/US
cc Kathryn Sargeant/AA/USEPA/US@EPA, Paul Machiele/AA/USEPA/US@EPA
Subject CHECK SCHEDULES: meet with Chris/Brent of CRC 4/16?

Chris Tennant and Brent Bailey of CRC would like to visit the lab next week to coordinate on our various projects, including E-69, E-70, E-74b, E-77, ACES and our EPAct work (missing anything?). I am proposing we block off 10am - 3pm next Wednesday 4/16 to cover all of these. We can shuffle the agenda so that you only need to be there for discussion of your project, but if you cannot make it at all during this time please let me know ASAP so I can get back to Chris - also let me know if Thursday the 17th would then be an option.

John Koupal
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(734) 214-4942 koupal.john@epa.gov

To: CN=Paul Machiele/OU=AA/O=USEPA/C=US@EPA;CN=Ed Nam/OU=AA/O=USEPA/C=US@EPA;CN=Antonio Fernandez/OU=AA/O=USEPA/C=US@EPA;CN=Aron Butler/OU=AA/O=USEPA/C=US@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA[]; N=Ed Nam/OU=AA/O=USEPA/C=US@EPA;CN=Antonio Fernandez/OU=AA/O=USEPA/C=US@EPA;CN=Aron Butler/OU=AA/O=USEPA/C=US@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA[]; N=Antonio Fernandez/OU=AA/O=USEPA/C=US@EPA;CN=Aron Butler/OU=AA/O=USEPA/C=US@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA[]; N=Aron Butler/OU=AA/O=USEPA/C=US@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA[]; N=Michael Christianson/OU=AA/O=USEPA/C=US@EPA[]
Cc: CN=Connie Hart/OU=AA/O=USEPA/C=US@EPA;CN=Carl Scarbro/OU=AA/O=USEPA/C=US@EPA[]; N=Carl Scarbro/OU=AA/O=USEPA/C=US@EPA[]
From: CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US
Sent: Tue 5/13/2008 8:34:55 PM
Subject: Communications with NREL on EPAct

FYI, email exchange below.

In addition, NREL has just received additional funds for use in the EPAct Program, in addition to the $2M they already have. It looks like the additional amount is of the order of $1M. However, a part of it will be used to fund several smaller, alternative fuel related projects.

Best regards.....Rafal

Rafal A. Sobotowski
Assessment and Standards Division
U.S. Environmental Protection Agency
2000 Traverwood Drive
Ann Arbor, MI 48105
sobotowski.rafal@epa.gov
734/214-4228 fax 734/214-4050
----- Forwarded by Rafal Sobotowski/AA/USEPA/US on 05/13/2008 01:56 PM -----

"Lawson, Doug" <Doug_Lawson@nrel.gov>
Sent by: "Lawson, Doug" <Doug_Lawson@nrel.gov>
Received Date:
05/13/2008 01:11 PM
Transmission Date:
05/13/2008 01:11:36 PM
To Rafal Sobotowski/AA/USEPA/US@EPA
cc "Clark, Wendy" <wendy_clark@nrel.gov>, Connie Hart/AA/USEPA/US@EPA, Carl Scarbro/AA/USEPA/US@EPA, "Lawson, Doug" <doug_lawson@nrel.gov>
Subject RE: Fuels 18 and 19_ An Update

Rafal, I just heard back from Wendy, and she concurs with the current path. If she concurs, so do I! --

Doug

From: Sobotowski.Rafal@epamail.epa.gov [mailto:Sobotowski.Rafal@epamail.epa.gov]
Sent: Wednesday, May 07, 2008 11:40 AM
To: Lawson, Doug
Cc: Clark, Wendy; Hart.Connie@epamail.epa.gov; Scarbro.Carl@epamail.epa.gov
Subject: Fuels 18 and 19_ An Update

Wendy and Doug,

As you know, back in March we had requested that Haltermann modify the recipes of fuels 18 and 19 to bring the T60 - T90 segments of their distillation curves in line with Fuel 17 (E0). During several weeks that followed, the attempts to alter these distillation curves failed, so in the past two weeks we (EPA) have used the distillation curve prediction model provided to us by the "oil company" to achieve the desired results. Attached below is a plot which shows the distillation curves of Fuels 17 (bulk blend), 18 (Adj C hand blend) and 19 (Adj R hand blend).

Fuel 17 is currently being tested by SWRI, Fuel 18 being blended and Fuel 19 is awaiting approval for bulk blending.
Fuel 17 meets all requirements of the original specification.
T50, T90 and aromatic content of Fuel 18 Adj C are slightly out of spec (by 2 deg. F (T50 and T90) and by 1.1% (aromatics)).
T50 of Fuel 19 Adj R is out of spec by 12 deg.F, its T90 by 5 deg.F and its aromatic content by 2.5%.

We believe that the distillation curves of Fuel 18 Adj C and Fuel !9 Adj R now have the desired shape and are positioned correctly relative to Fuel 17. See attached Chevron data for splash blended fuels. We do not attach too much importance to the T50 target for Fuel 19 as it was a linear extrapolation of E0 and E10 data into nonlinear space. In addition, the distillation curve prediction model provided by the "oil company" does not predict the effect of ethanol and any further redesigns would be very time consuming.

In summary, we support bulk blending of Fuels 18 Adj C and 19 Adj R, especially because SWRI is getting ready to test them.

Please let us know if you concur with our current path.

We are also working with the "oil company" to obtain access to a commercially available fuel blending model which will enable us to design EPAct test fuels much more accurately than the tools which are available to us right now. We should have the model loaded onto one of our computers within a week and start designing the remaining 26 fuels shortly thereafter. For those fuels we will strictly stick to the original EPAct specification.

Please confine the information contained in this note to its recipients.

Best regards,

Rafal A. Sobotowski
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Ann Arbor, MI 48105
sobotowski.rafal@epa.gov
734/214-4228 fax 734/214-4050

To: CN=Paul Machiele/OU=AA/O=USEPA/C=US@EPA;CN=Ed Nam/OU=AA/O=USEPA/C=US@EPA;CN=Antonio Fernandez/OU=AA/O=USEPA/C=US@EPA;CN=Aron Butler/OU=AA/O=USEPA/C=US@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA[]; N=Ed Nam/OU=AA/O=USEPA/C=US@EPA;CN=Antonio Fernandez/OU=AA/O=USEPA/C=US@EPA;CN=Aron Butler/OU=AA/O=USEPA/C=US@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA[]; N=Antonio Fernandez/OU=AA/O=USEPA/C=US@EPA;CN=Aron Butler/OU=AA/O=USEPA/C=US@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA[]; N=Aron Butler/OU=AA/O=USEPA/C=US@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA[]; N=Michael Christianson/OU=AA/O=USEPA/C=US@EPA[]
Cc: CN=Connie Hart/OU=AA/O=USEPA/C=US@EPA;CN=Carl Scarbro/OU=AA/O=USEPA/C=US@EPA[]; N=Carl Scarbro/OU=AA/O=USEPA/C=US@EPA[]
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Sent by: "Lawson, Doug" <Doug_Lawson@nrel.gov>
Received Date:
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To Rafal Sobotowski/AA/USEPA/US@EPA
cc "Clark, Wendy" <wendy_clark@nrel.gov>, Connie Hart/AA/USEPA/US@EPA, Carl Scarbro/AA/USEPA/US@EPA, "Lawson, Doug" <doug_lawson@nrel.gov>
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Sent: Wednesday, May 07, 2008 11:40 AM
To: Lawson, Doug
Cc: Clark, Wendy; Hart.Connie@epamail.epa.gov; Scarbro.Carl@epamail.epa.gov
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Please confine the information contained in this note to its recipients.

Best regards,

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Ann Arbor, MI 48105
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734/214-4228 fax 734/214-4050

Proposed CRC Addition to EPA Fuel Effects Study

CRC Emissions Committee Meeting
May 22, 2008

ED_000545A_00002242-00001

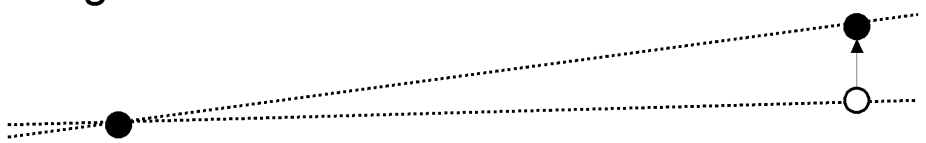
Concern About Extreme Combination of T50 and T90

- 190 degree difference between T50 and T90
- Potential maldistribution across distillation curve
- Not clear what constitutes a “representative” distribution

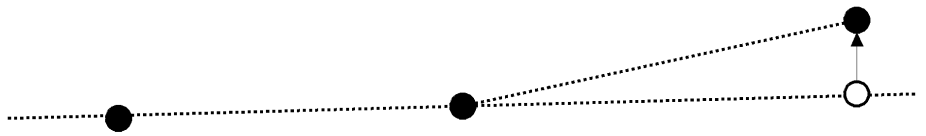
ED_000545A_00002242-00005

Experimental Design Impact

- Linear model
  - Relationship completely determined by extreme points
  - Abnormal responses are distributed across the entire range



- Non-linear model
  - Limits impact of abnormal response
  - Increases confidence in representation of effect



ED_000545A_00002242-00006

CRC Addition

- Evaluated addition of one or two fuels within the existing matrix
  - Goal is to enable the addition of a nonlinear (squared) T90 effect to the model
  - Takes advantage of the three EPA RFS2 fuels
- Fuels chosen to maximize G-efficiency of the total matrix for model that includes T90 squared

ED_000545A_00002242-00008

To: "Kevin Whitney" [kwhitney@swri.org]
Cc: CN=Connie Hart/OU=AA/O=USEPA/C=US@EPA;CN=Antonio Fernandez/OU=AA/O=USEPA/C=US@EPA;"Lawson, Doug" [Doug_Lawson@nrel.gov]; N=Antonio Fernandez/OU=AA/O=USEPA/C=US@EPA;"Lawson, Doug" [Doug_Lawson@nrel.gov]; Lawson, Doug" [Doug_Lawson@nrel.gov]; N=Aron Butler/OU=AA/O=USEPA/C=US@EPA[]
From: CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US
Sent: Wed 11/12/2008 8:57:05 PM
Subject: Updated EPAct Fuel Development Protocol
EPAct Fuel Development Protocol.doc
Appendix 1 to EPAct Fuel Development Protocol_Detailed Test Fuel Specification_Version 9-22-2008.xls

Kevin, Doug and others,

Please review and comment by COB on Thursday, 11/13.

Best regards.....Rafal

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Appendix 1 to EPAct Fuel Development Protocol
Test Fuel Specification

November 12, 2008

E0/E10 Fuels

PROPERTY	UNIT	METHOD	BLENDING TOLERANCE	TEST FUELS												
				1	2	3	4	5	6	7	8	9	10	11	12	13
Relative Density, 60/60ºF	-	D4052	NA	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
API Gravity, 60ºF	ºAPI	D4052	NA	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
Ethanol Content	**vol. %**	**D5599**	**E0: < 0.1; E10: ± 0.5; E15: ± 0.5; E20: ±0.5; E85: ±2**	**10**	**0**	**10**	**10**	**0**	**10**	**0**	**0**	**0**	**10**	**10**	**10**	**0**
Total Content of Oxygenates Other than Ethanol	vol. %	D5599	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
T10	ºF	D86	-	<158	<158	<158	<158	<158	<158	<158	<158	<158	<158	<158	<158	<158
T50	**ºF**	**D86**	**± 4**	**150**	**240**	**220**	**220**	**240**	**190**	**190**	**220**	**190**	**220**	**190**	**150**	**220**
T90	**ºF**	**D86**	**± 5**	**300**	**340**	**300**	**340**	**300**	**340**	**300**	**300**	**340**	**340**	**300**	**340**	**340**
FBP	ºF	D86	-	<437	<437	<437	<437	<437	<437	<437	<437	<437	<437	<437	<437	<437
DVPE	**psi**	**D5191**	**± 0.15**	**10.0**	**10.0**	**6.65**	**10.0**	**6.65**	**6.65**	**6.65**	**10.0**	**10.0**	**6.65**	**10.0**	**10.0**	**6.65**
Aromatics	**vol. %**	**D1319**	**± 1.5**	**15**	**15**	**15**	**15**	**35**	**15**	**15**	**15**	**35**	**35**	**35**	**35**	**35**
Olefins	vol. %	D1319	± 1.5	7	7	7	7	7	7	7	7	7	7	7	7	7
Benzene	vol. %	D3606	± 0.15	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62
S	mg/kg	D5453	± 5	25	25	25	25	25	25	25	25	25	25	25	25	25
(R + M)/2	-	Calc.	-	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0
C (Part of D4809)	mass %	D5291	-	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
H (Part of D4809)	mass %	D5291	-	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
O	mass %	D5599	-	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
Water Content	mg/kg	E1064	-	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
Net Heat of Combustion	MJ/kg	D4809	-	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
Oxidation Stability	minute	D525	-	>240	>240	>240	>240	>240	>240	>240	>240	>240	>240	>240	>240	>240
Copper Strip Corrosion, 3h at 122ºF	-	D130	-	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1
Solvent-Washed Gum Content	mg/100 ml	D381	-	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5

* Fuel No. 29 must be blended using "typical" US gasoline, e.g. fuel No. 17. Its RVP may be adjusted using butane. The properties of the gasoline component must be approved by EPA WAM

This specification is identical to file Detailed Test Fuel Specification Version 9-22-2008.xls/Expanded EPAct Feul Matrix, except for aromatics (changed from 40 to 35), RON and MON (eliminated), octane index (specification changed to ≥ 87.0), and the addition of C and H content by D5291 which are measured as a part of D4809.

	E15/E20 Fuels											E85	CRC Fuels	
TEST FUELS														
14	15	16	20	21	22	23	24	25	26	27	28	29*	30	31
Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
0	**0**	**10**	**20**	**20**	**20**	**20**	**20**	**20**	**15**	**15**	**15**	**81**	**10**	**20**
<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.15	<0.15	<0.15	<2.0	<0.1	<0.2
<158	<158	<158	<158	<158	<158	<158	<158	<158	<158	<158	<158	Report	<158	<158
190	**190**	**220**	**160**	**160**	**160**	**160**	**160**	**160**	**150**	**190**	**190**	Report	**150**	**160**
340	**300**	**300**	**300**	**300**	**300**	**340**	**340**	**340**	**340**	**340**	**300**	Report	**325**	**325**
<437	<437	<437	<437	<437	<437	<437	<437	<437	<437	<437	<437	Report	<437	<437
6.65	**10.0**	**6.65**	**6.65**	**6.65**	**10.0**	**6.65**	**10.0**	**10.0**	**10.0**	**6.65**	**6.65**	**6.65**	**10.0**	**6.65**
15	**35**	**35**	**15**	**35**	**15**	**15**	**15**	**35**	**35**	**15**	**35**	Report	**35**	**35**
7	7	7	7	7	7	7	7	7	7	7	7	Report	7	7
0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	Report	0.62	0.62
25	25	25	25	25	25	25	25	25	25	25	25	15	25	25
≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	≥ 87.0	Report	≥ 87.0	≥ 87.0
Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	<10,000	Report	Report
Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
>240	>240	>240	>240	>240	>240	>240	>240	>240	>240	>240	>240	-	>240	>240
<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	<No. 1	-	<No. 1	<No. 1
< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5

To: CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA[]
Cc: CN=John Koupal/OU=AA/O=USEPA/C=US@EPA;CN=Paul Machiele/OU=AA/O=USEPA/C=US@EPA;CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US@EPA;CN=Richard Rykowski/OU=AA/O=USEPA/C=US@EPA;CN=Robin Moran/OU=AA/O=USEPA/C=US@EPA[]; N=Paul Machiele/OU=AA/O=USEPA/C=US@EPA;CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US@EPA;CN=Richard Rykowski/OU=AA/O=USEPA/C=US@EPA;CN=Robin Moran/OU=AA/O=USEPA/C=US@EPA[]; N=Rafal Sobotowski/OU=AA/O=USEPA/C=US@EPA;CN=Richard Rykowski/OU=AA/O=USEPA/C=US@EPA;CN=Robin Moran/OU=AA/O=USEPA/C=US@EPA[]; N=Richard Rykowski/OU=AA/O=USEPA/C=US@EPA;CN=Robin Moran/OU=AA/O=USEPA/C=US@EPA[]; N=Robin Moran/OU=AA/O=USEPA/C=US@EPA[]
Bcc: []
From: CN=Aron Butler/OU=AA/O=USEPA/C=US
Sent: Mon 6/4/2007 10:02:22 PM
Subject: Re: Draft Slides (n=6) for EPAct testing plans
Slides on testing for DOE day - MGC 6-4b.ppt

Here is an updated version with some changes in the fuel matrix reflecting the removal of olefins as a parameter. This has passed cursory review by Paul, though I know we all are looking forward to some feedback from CRC folks for possible tweaks, and thus this should still be considered tentative.

It might be interesting to include a butanol fuel here, but it didn't seem important to work it into the matrix at this point, since it would likely be a one-point branch someplace.

Michael Christianson/AA/USEPA/US
EPA-OAR,OTAQ,ASD
Sent by: Michael Christianson
Received Date:
06/04/2007 04:21 PM
Transmission Date:
06/04/2007 04:21:10 PM
To John Koupal/AA/USEPA/US@EPA, Robin Moran/AA/USEPA/US@EPA, Aron Butler/AA/USEPA/US@EPA, Paul Machiele/AA/USEPA/US@EPA, Rafal Sobotowski/AA/USEPA/US@EPA
cc Richard Rykowski/AA/USEPA/US@EPA
Subject Draft Slides (n=6) for EPAct testing plans

Attached is a scaled down version of our EPAct testing plans that Aron, Rafal, and I have edited for Wednesday's EPA/DOE meeting. We wanted to send it around to make sure it hits the points it needs to without going into too much detail. Your comments/ edits are appreciated.

Thanks
-Mike

[attachment "Slides on testing for DOE day - MGC 6-4.ppt" deleted by Aron Butler/AA/USEPA/US]

EPA Perspective on Fuel Effects Data Needs

John Koupal & Rick Rykowski
Assessment and Standards Division
U.S. EPA Office of Transportation & Air Quality

Briefing for CRC Board
September 28, 2006

ED_000545B_00000054-00001

Four Main Drivers for Data Needs

1. Boutique Fuels – Harmonization Study due in 2008
2. State Fuel Programs
3. Other EPAct Requirements
   4. Ethanol Permeation Study (was due in 2006)
   5. Health Effects of Oxygenates (Due in 2007)
   6. Complex Model Update (Due in 2009)
   7. Anti-Backsliding Analysis (Due in 2009)

- 2013+ RFS Standard

- The same fuel effects data is required for all these purposes
- This briefing focuses only on fuel effects – there are many other data needs to respond to other aspects of EPAct

Why Do We Need New Data?

- Country is spending over $1 Billion on fuel control
  - States will be looking for more control in response to O_3 and PM NAAQS
  - Are these controls cost effective?
- Large uncertainties in fuel effects for the future on-road and off-road fleets
- Almost no data on PM effects
- These uncertainties have major policy implications (even if effects are shown to be small)
- In the absence of data, assumptions will fill the void

Why Would This Interest CRC?

- Results generated will be critical to future policy decisions affecting numerous stakeholders
  - Updated Complex model relied upon heavily for fuels related programs and regulations
- Boutique fuels consolidation potential
- Results will help fill existing data gaps
  - Nonroad, Tier 2, FFVs, Biofuel effects
  - Last comprehensive effort was Auto/Oil
- Newest vehicles and fuels examined
  - Little data on Tier 2 vehicle fuel effects
  - Future Biofuel use expected to grow significantly

Highlighting the uncertainties

- On-road
  - Oxygenate and RVP effects based on 1990 vehicles
    - ✓ 1990 effects assumed to apply to all future model years!
  - More recent analyses suggest significant differences…
    - ✓ California Oxy Waiver (2000) (~20 Tier 1 / LEV)
    - ✓ Coordinating Research Council (~12 LEV / ULEV)
  - But, data deemed insufficient to conclusively determine the effect on newer technology vehicles
  - Little data on PM effects
- Off-road
  - Oxygenate effects based on 13 engines tested in mid 1990's
  - No data on RVP, aromatics, olefins
  - Little data on toxics

Potential Refinements

- Potential for in-kind vehicles, testing, fuels
- Pilot program(s) to determine importance of fuel parameters (e.g. olefins and aromatics)
- Adjustment to the fuel matrix
- Assess recent and planned CRC/EPA/ARB work
  - To see where the gaps can be filled with existing data
  - To assess if planned programs should be modified to address specific needs identified here
- Would like to engage CRC in the details of this process

ED_000545B_00000054-00011

Proposal for Approaching Work

- We recognize the preferred program is beyond the scope of what CRC can currently address
  - CRC itself may consider funding specific aspects
- EPA would like to have higher level discussions with member companies and/or trade associations
  - Summit meeting this Fall with Margo Oge
  - It would be helpful for CRC members to lay groundwork
- We propose to form a collaboration with other stakeholders as well (e.g. ARB, EMA, RFA, NBB, DOE)
- Would propose that CRC be the central mechanism for pooling money and coordinating work
  - Recent example: E-55/59

Summarizing Potential Roles for CRC

- Assist in refining testing proposal
- Provide funding and resources for specific aspects of test program, within current CRC system
- Administer program if scope expands with additional resources from other parties
- Lay groundwork for higher level discussions

ED_000545B_00000054-00014

Boutique Fuel Harmonization Study

- 2006 study is pointing forward to the analysis necessary to complete the 2008 Harmonization Study
- Required to assess emissions and air quality impacts, supply and distribution impacts
- Emission impacts are dependent on knowing the impacts of fuel changes on emissions
  - Gasoline: RVP, Aromatics, Ethanol – and its impact on T50, T90, Olefins, etc.
  - Diesel: Aromatics, cetane, density, biodiesel
- EPA is to provide legislative and administrative recommendations
  - Have no technical basis for providing such recommendations
  - Any recommendations we made could later be proven ineffective or even detrimental
- Needed to have started data collection already to complete in time
  - But any data collected will help

State Fuel Programs

- State Fuel Programs
  - New or expanded boutique fuel programs
  - Potential state requests to rescind the ethanol RVP waiver
  - State biofuel mandates
- OTAQ must approve any changes in their SIPs
  - E.g. by June 2007, 32 states must submit SIPs to address the 8 hr ozone standard
  - Never know when new requests will come, but they will
- Current information may significantly overestimate or underestimate the emissions impact, and may even be directionally incorrect → incorrect policy

Other EPAct Requirements

- Ethanol Permeation Study (was due in 2006)
- Health Effects of Oxygenates (Due in 2007)
  - Very broad study – air quality, water quality, etc.
  - Air quality impacts will be a function of fuel quality impacts on emissions
- Complex Model Update (Due in 2009)
  - Required to update fuel effects model to reflect the 2007 fleet
  - Essentially no data on 1994 and later vehicles for most fuel effects
- Anti-Backsliding Analysis Report to Congress (Due in 2009)
  - Required to assess the emission impacts of all of the fuel changes resulting from the implementation of EPAct
    - ✓ RFS
    - ✓ MSAT
    - ✓ Oxy mandate removal
    - ✓ Boutique fuel list
    - ✓ ???
  - Serve as the basis for future fuel decisions by legislators and policy makers

2013+ RFS

- OTAQ will need to process another RFS rule
  - Applicable for 2013+
  - Set new standard taking into account…
    - ✓ Air Quality & other environment factors
    - ✓ Energy Security
    - ✓ Economics
- Rulemaking will need to commence in 2008/9 timeframe to provide lead time
  - Same fuel effects data needed for other purposes will be key to this rulemaking

EPA's Gasoline Fuel Effects Testing Plans

CRC Real World Group
June 6th, 2007

ED_000545B_00000084-00001

Fuel Testing: Light Duty Exhaust

- Funded for FY07 – planning to pursue immediately
- Would like CRC input, esp. on fuel matrix, i.e.:
  - Can all the fuels on the matrix be blended?
  - "half factorial" design
- Fill data gap on effects of select fuel parameters on Tier 2 vehicles
  - Compliments recent and ongoing testing by CRC and EPA/AAM
    - ✓ **EPA/AAM MSAT test program:** RVP, benzene, sulfur effects on 9 Tier 2 vehicles
    - ✓ **CRC E-67**: Ethanol, T50, T90 effects on 12 LEV/ULEV vehicles
    - ✓ **CRC E-74b**: Ethanol, RVP, and test temp (50 and 75ºF) effects on 15 Tier 1, NLEV, and Tier 2 vehicles
- The Scope of the EPA's program
  - 18 vehicles, mostly Tier 2, includes some FFVs
  - 18 fuels examining effects and interactions of ethanol, RVP, aromatics, and T50/T90
  - Collect PM and toxics data, also some tests at 50 deg F
- Limitations of this program
  - No sulfur effects
  - No cold temperature testing (20 deg)
  - May not resolve nonlinear effects for all fuel parameters

To: Robert.Mason@swri.org[]
Cc: CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US@EPA;CN=Aron Butler/OU=AA/O=USEPA/C=US@EPA[]; N=Aron Butler/OU=AA/O=USEPA/C=US@EPA[]
From: CN=Michael Christianson/OU=AA/O=USEPA/C=US
Sent: Mon 6/25/2007 7:43:57 PM
Subject: CRC E-67 dataset and mixed model analysis
CO_NOx.rtf
MixedModelNMHC.rtf
E-67 data set original.xls
E-67%20Final%20Report.pdf

Bob,

Attached you'll find the CRC E-67 report and the data set used to perform the study. The second sheet of the workbook contains the relevant data for the study fuels that were used (also located at the end of the report). Page 3 of the report has a particularly useful diagram of the fuel matrix used in this study, and I refer to it constantly!

You can also access this data on-line at http://www.crcao.com/ (click on recent reports and study results on the left hand side).

Also attached are the results from our own internal analysis of the CRC data - the mixed model analysis performed by George Hoffman.

I'll also send you (in a second email) the original SAS code that the CRC statistician used to develop their mixed model from the dataset. I imagine this might cut to the chase and save you a bit of time. Look for that email shortly.

Thanks,
-Mike

****
Michael G. Christianson
Office of Transportation and Air Quality
U.S. Environmental Protection Agency
2000 Traverwood Drive, Ann Arbor, MI 48105
Phone (734) 214-4624 / Fax (734) 214-4050
****

To: Robert.Mason@swri.org[]
Cc: CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US@EPA;CN=Aron Butler/OU=AA/O=USEPA/C=US@EPA[]; N=Aron Butler/OU=AA/O=USEPA/C=US@EPA[]
From: CN=Michael Christianson/OU=AA/O=USEPA/C=US
Sent: Mon 6/25/2007 7:46:29 PM
Subject: Fw: EPA request for CRC E-67 report data
E-67 data set 101905.xls
CRC_E67EffectsFinal inv1.sas
CRC_E67EffectsFinal lnco1.sas
CRC_E67EffectsFinal lnco21.sas
CRC_E67EffectsFinal lnnmhc 6 17 05.sas
CRC_E67EffectsFinal lnnmhc glm student.sas
CRC_E67EffectsFinal lnnmhc1.sas
CRC_E67EffectsFinal lnnox1.sas
CRC_E67EffectsFinal lnthc1.sas
Link
http://www.crcao.org/

Bob,

See the note at the very bottom of this long string of emails for some details that are relevant to this SAS code.

-Mike

----- Forwarded by Michael Christianson/AA/USEPA/US on 06/25/2007 03:45 PM -----

Chris Tennant <ctennant@crcao.org>
03/22/2006 06:57 PM
To Michael Christianson/AA/USEPA/US@EPA
cc Brent Bailey <bkbailey@crcao.org>, George Hoffman/AA/USEPA/US@EPA, Richard Rykowski/AA/USEPA/US@EPA
Subject RE: EPA request for CRC E-67 report data

Michael,

A message with the SAS Code embedded is attached.

More to come…

- Chris

Chris Tennant
Coordinating Research Council
(678) 795-0506 ext. 105

From: Christianson.Michael@epamail.epa.gov [mailto:Christianson.Michael@epamail.epa.gov]
Sent: Wednesday, March 22, 2006 4:18 PM

To: Chris Tennant
Cc: Brent Bailey; Hoffman.George@epamail.epa.gov; Rykowski.Richard@epamail.epa.gov
Subject: RE: EPA request for CRC E-67 report data

Chris,

I just wanted to follow up since I have yet to hear back from you since my previous email last Friday. Brent, if Chris is out of the office or otherwise unavailable, would you be able to field my questions pertaining to the E-67 report? Please see below.

Thank you for you time,

Michael G. Christianson
Assessment and Standards Division
US EPA National Vehicle and Fuel Emissions Laboratory
2000 Traverwood Drive, Ann Arbor, MI 48105
Phone (734) 214-4624 / Fax (734) 214-4050

Michael Christianson/AA/USEPA/US
03/17/2006 03:19 PM

To Chris Tennant <ctennant@crcao.org>
cc Richard Rykowski/AA/USEPA/US@EPA, George Hoffman/AA/USEPA/US@EPA
Subject RE: EPA request for CRC E-67 report dataLink

Chris,

Following up on my original request for data (thanks again for pointing me in the right direction), I would like to obtain a few pieces of information specific to the CRC E-67 report. If at all possible, I am interested in the following items in order to better understand the results of your study and the details of the model:

1. A copy of the SAS code used to generate the E-67 model

2. An explicit identification or list of outliers and the procedure / criteria used in this determination

I'm also curious as to why the T50 x T90 interaction was not considered in this study. Appendix D of the report states that "previous studies had not found [this interaction] significant" and I would like a more detailed explanation or reference for this statement if possible. Thanks in advance for any assistance you're able to offer!

Best Regards,

Michael G. Christianson
Assessment and Standards Division
US EPA National Vehicle and Fuel Emissions Laboratory

2000 Traverwood Drive, Ann Arbor, MI 48105
Phone (734) 214-4624 / Fax (734) 214-4050

Chris Tennant <ctennant@crcao.org>
02/22/2006 01:16 PM

To Michael Christianson/AA/USEPA/US@EPA
cc Richard Rykowski/AA/USEPA/US@EPA, Ed Nam/AA/USEPA/US@EPA, Brent Bailey <bkbailey@crcao.com>, "Ingham, Michael (MCIN)" <MCIN@chevron.com>
Subject RE: EPA request for CRC E-67 report data

Michael,

The data set for this project has been released to the public, and is available on our website, http://www.crcao.org/

To access the data, go to that website and click on the "Recent Reports and Study Results", on the left side of the page. That will bring up a page that has the Final Report and the associated data set near the top, as the latest report from 2006. The data are in an Excel spreadsheet format.

If I have misunderstood your request or if you need anything else, please let me know.

Thanks,
- Chris

Chris Tennant
Coordinating Research Council
(678) 795-0506 ext. 105

From: Christianson.Michael@epamail.epa.gov [mailto:Christianson.Michael@epamail.epa.gov]
Sent: Wednesday, February 22, 2006 12:42 PM
To: Chris Tennant
Cc: Rykowski.Richard@epamail.epa.gov; Nam.Ed@epamail.epa.gov
Subject: EPA request for CRC E-67 report data

Dear Chris,

I've been given your name as someone at CRC to contact with regards to the E-67 report, "Effects of Ethanol and Volatility Parameters on Exhaust Emissions." I'm interested in looking at the actual data from the E-67 study, namely, the average emissions for each CRC test fuel. What I'm trying to do is investigate the emissions impacts of the fuels used in CRC's study using EPA models, and see how our results compare with the E-67 model's results. Would it be possible to obtain this data? Of course, we will seek CRC approval before distributing anything outside

of EPA - this is for our own informational purposes only. Please let me know if this is a possibility, and thank you for your time.

Best Regards,

Michael G. Christianson
Assessment and Standards Division
US EPA National Vehicle and Fuel Emissions Laboratory
2000 Traverwood Drive, Ann Arbor, MI 48105
Phone (734) 214-4624 / Fax (734) 214-4050
----- Message from "Tom Durbin" <durbin@cert.ucr.edu> on Fri, 24 Feb 2006 14:20:22 -0500 -----
To: <sbrisby@arb.ca.gov>
cc: "Chris Tennant" <ctennant@crcao.org>, <wsetiawa@arb.ca.gov>, <tyoung@ucr.edu>, "Uihlein, James P" <James.Uihlein@bp.com>, "Ingham, Michael \(MCIN\)" <MCIN@chevron.com>, "Jane Beck" <jbeck@crcao.org>, "Brent Bailey" <bkbailey@crcao.org>, "Rutherford, Jim A. " <jaru@chevrontexaco.com>
Subject: Fwd: Re: SAS code
Steve,

Please find enclosed the E-67 SAS code and dataset. Ted Younglove (UCR stats department - author of code) and Jim Uihlein of CRC are the most familiar with the code if any questions come. Here are just a few notes on the code from CRC:

Regards,
Tom

1) The SAS programs require modification to run on another computer than Ted's (unless one sets up a directory structure on their own computer that matches Ted's). Not really a big deal, but worth noting.

2) The SAS programs are set up to read in the data in two parts: vehicle and emissions data from the "Data" sheet in a worbook named E-67data2_1_05.xls and fuel data from the "Fuel" sheet in that same workbook. Since the E-67 Data.xls file contains vehicle, emissions, and fuel data on the same sheet, only one "import" operation is required - thus, the SAS program must also be modified again.

3) The SAS programs run all three models, even though only "model 3" is presented in the body of the report (note that I only checked the "model 3" results for this reason).

4) Obviously, the SAS programs don't address Toxics and NMOG.

5) THC was not analyzed in the report.

To: Robert.Mason@swri.org[]
Cc: CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US@EPA;CN=Aron Butler/OU=AA/O=USEPA/C=US@EPA[]; N=Aron Butler/OU=AA/O=USEPA/C=US@EPA[]
From: CN=Michael Christianson/OU=AA/O=USEPA/C=US
Sent: Tue 6/26/2007 9:06:51 PM
Subject: CRC E-67 model spreadsheet analysis
E-67 data set 053006.xls
CRC E-67 model predicted vs actual emissions.xls

Bob,

Thanks for the call this afternoon. Attached you'll find the spreadsheet used to generate those plots comparing the E-67 model predicted emissions to the observed values. I've also included the dataset with average emissions calculated for each fuel (across all vehicles) which are the values used for comparison to the model predictions. Please feel free to call me for any clarification, or if I've missed something.

-Mike

****
Michael G. Christianson
Office of Transportation and Air Quality
U.S. Environmental Protection Agency
2000 Traverwood Drive, Ann Arbor, MI 48105
Phone (734) 214-4624 / Fax (734) 214-4050
****

To: CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US@EPA[]
Cc: []
From: CN=Michael Christianson/OU=AA/O=USEPA/C=US
Sent: Wed 6/27/2007 7:20:01 PM
Subject: CRC E-74 b data - NOT FOR PUBLIC RELEASE
CRC 74b Fuels 1-7.xls
CRC E-74 Weekly Status Report 6.24.07.pdf
E-74b FTP Test Summary 6-22-07.xls

The status report document lists the vehicles and target fuel properties - and the fuels spreadsheet has the detailed results.

-Mike

****
Michael G. Christianson
Office of Transportation and Air Quality
U.S. Environmental Protection Agency
2000 Traverwood Drive, Ann Arbor, MI 48105
Phone (734) 214-4624 / Fax (734) 214-4050
****

CRC's E-74b Weekly Status Report[1]

Fuel VP and Temperature Effects on CO Emissions
Report Number 21 June 24, 2007

Greetings,

This is the 21st in a series of weekly status reports that will be generated during the execution of the CRC E-74b project. Distribution is limited to the CRC Staff and Steering Committee and HH&A staff members.

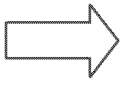
- Vehicles currently on test are:

  01 1994 Chevrolet Lumina
  03 1995 Jeep Cherokee
  12 1996 Ford Taurus
  14 2004 Ford Escape

- Vehicle 01, the Chevrolet Lumina, completed the 75°F on 13 psi fuel 2.

- Vehicle 03, the 1995 Jeep Cherokee, completed Fuel 3 @ 50°F

- Vehicle #12, the 2004 Ford Taurus, turned on the check engine light during the 75°F FTP test with the 13 psi Fuel 5. The codes were # 0191 – "Fuel-rail pressure sensor," and #1233 – "Fuel pump driver module off-line." We believe that the CEL was caused by the high RVP fuel, and have included the test data in the record. This vehicle runs very low numbers, and the CO was 0.273 g/mile [yes]. The codes have been erased and the vehicle will prep on Monday for the next test in the sequence.



Your support for including the data in the record is requested.

- Vehicle #14, the Ford Escape, completed the 75°F test on Fuel 4.

[1] This report is issued weekly to the CRC Steering Committee members, and contains un-reviewed data and opinions. As such, it is reserved in it's entirety for the CRC and its members. Nothing in this report is to be discussed outside of the CRC membership

E-74b Test Fleet

Emission Standards and As-Received Emission Performance

Veh	Vehicle Year/Make/Model	Engine Size	Type	Exhaust	Odo		grams/mile NMHC	NMOG	CO	Nox	Info based on:
1	1994 Chevy Lumina	3.1 Liter	LDV	Tier 1		Std	0.31		4.2	0.6	100K/10 years
					82K	As Rec'd	0.288		5.03	0.88	
2	1996 Ford Taurus	3.0 Liter	LDV	Tier 1		Std	0.31		4.2	0.6	100K/10 years
					87K	As Rec'd	0.133		2.132	0.453	
3	1995 Jeep Cherokee	4.0 Liter	LDV	Tier 1		Std	0.31		4.2	0.6	100K/10 years
					99K	As Rec'd	0.653		8.96	2.446	
4	1999 Honda Accord	Any	LDV	NLEV		Std		0.156	4.2	0.6	100K/10 years
					100K	As Rec'd	0.054	0.056	1.34	0.105	
5	2001 Toyota Corolla	1.8L L4	LDV	NLEV		Std		0.156	4.2	0.6	100K/10 years
					92K	As Rec'd	0.099	0.103	1.449	0.159	
6	2002 Nissan Altima	2.5L L4	LDV	NLEV		Std		0.156	4.2	0.6	100K/10 years
					105K	As Rec'd	0.046	0.048	1.403	0.122	
7	2001 Dodge Caravan	3.3 Liter	LDT1	NLEV		Std		0.156	4.2	0.6	100K/10 years
					93K	As Rec'd	0.064	0.067	0.829	0.255	
8	2002 Chevy Trailblazer/Envoy	2.4 or V6	LDT1	NLEV		Std		0.156	4.2	0.6	100K/10 years
						As Rec'd					
9	2004 Chry. Sebring/Stratus		LDV	Tier 2, TLEV		Std		0.125	3.4	0.4	50K/5 years
						As Rec'd					
10	2004 Chevy Impala	3.4 V6	LDV	Tier 2, TLEV		Std		0.125	3.4	0.4	50K/5 years
					58K	As Rec'd	0.056	0.058	0.681	0.036	
11	2004 Toyota Camry	2.4L or V6	LDV	Tier 2, TLEV		Std		0.075	3.4	0.2	50K/5 years
						As Rec'd					
12	2006 Ford Taurus		LDV	Tier 2, TLEV		Std		0.075	3.4	0.2	50K/5 years
					28K	As Rec'd		0.036	0.19	0.04	
13	2004 Dodge Ram Truck		LDT2	Tier 2 Bin 8, TLEV		Std		0.16	4.4	0.7	50K/5 years
						As Rec'd					
14	2004 Ford Escape		LDT1	Tier 2/ULEV		Std		0.4	1.7	0.2	50K/5 years
					40K	As Rec'd	0.039	0.041	0.27	0.082	
15	2004 Toyota Sienna/Highlander		LDT1	Tier 2 Bin 5, LEV		Std		0.075	3.4	0.2	50K/5 years
						As Rec'd					

Note: Vehicles 02, 05, 06, 07 and 10 have completed the test sequence. Vehicle 04 is on loan to E-77-2.

To: CN=George Hoffman/OU=AA/O=USEPA/C=US@EPA[]
Cc: []
Bcc: []
From: CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US
Sent: Fri 6/29/2007 3:54:55 PM
Subject: Data from Ongoing CRC Project
Ongoing CRC Program Test Summary 6-22-07 to George.xls
Ongoing CRC Test Program Fuels 1-7 to George.xls

George,

Attached are emissions and fuel property data we discussed. Please create NMHC and NOx models using Reid Vapor Pressure (RVP), Oxygen Content and Olefins as independent variables.

Best regards,

Rafal A. Sobotowski
Assessment and Standards Division
U.S. Environmental Protection Agency
2000 Traverwood Drive
Ann Arbor, MI 48105
sobotowski.rafal@epa.gov
734/214-4228 fax 734/214-4050

Chris Tennant

From: Chris Tennant
Sent: Wednesday, December 20, 2006 5:09 PM
To: 'Christianson.Michael@epamail.epa.gov'
Cc: Brent Bailey; Koupal.John@epa.gov; marie.valentine@tema.toyota.com; mcin@chevron.com
Subject: RE: CRC E-74b priorities / EPA's EPAct literature review?

Michael, et al,

The Committee approved the following additions to the E-74b test program:

- Single tests at 50°F and 75°F for the 5th fuel – E0, 13 psi RVP using Committee funds.
- Duplicate tests at 75°F for the 6th (E0, 7 psi RVP) and 7th (E10, 7 psi RVP) fuels, also using Committee funds but with the understanding that EPA will commit a like amount of funds to another project, and we'll mutually recognize each other as co-sponsors of the effort.

On a related topic, if memory serves me accurately you or one of your colleagues was working on a literature relevant to the overall EPAct data needs discussion, and you were going to share that when it was further developed? Is there something that you can share with us yet?

Thanks, and Merry Christmas / Happy New Year!

- Chris

Chris Tennant
Coordinating Research Council
(678) 795-0506 ext. 105

From: Christianson.Michael@epamail.epa.gov [mailto:Christianson.Michael@epamail.epa.gov]
Sent: Monday, December 18, 2006 10:32 AM
To: Chris Tennant
Cc: Brent Bailey; Koupal.John@epa.gov; marie.valentine@tema.toyota.com; mcin@chevron.com
Subject: RE: CRC E-74b priorities

Chris,

It was nice to see you, Marie, and Brent at last week's E-77 planning meeting here in Ann Arbor. Unfortunately I wasn't able to stay after the meeting to discuss E-74b with you folks, so I just wanted to email you for a brief status report on the next steps decided upon by the emissions committee. Thanks, and happy holidays!

-Mike

Michael G. Christianson
Office of Transportation and Air Quality
U.S. Environmental Protection Agency
2000 Traverwood Drive, Ann Arbor, MI 48105
Phone (734) 214-4624 / Fax (734) 214-4050

Chris Tennant <ctennant@crcao.org>

To John Koupal/AA/USEPA/US@EPA
cc Brent Bailey <bkbailey@crcao.org>, marie.valentine@tema.toyota.com, mcin@chevron.com,

To: CN=Greg Janssen/OU=AA/O=USEPA/C=US@EPA;CN=George Hoffman/OU=AA/O=USEPA/C=US@EPA[]; N=George Hoffman/OU=AA/O=USEPA/C=US@EPA[]
Cc: []
Bcc: []
From: CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US
Sent: Tue 11/6/2007 7:51:43 PM
Subject: Support from George Hoffman - Number of Vehicles for EPAct GHG Tests
E-74b Data for Use in Estimating Number of Vehicles in 50 deg Tests and PM Toxics Tests.xls

Greg,

Pls authorize the work request shown in blue as a continuation of the one below it.

Thank you.....Rafal

George,

Pls determine how many Tier 2 test vehicles would be needed o create models that would be able to resolve the differences between HC and NOx emissions measured on E0, E10 and E20.

The information about ethanol effects on HC (or NMHC) emissions of four Tier 2 vehicles is contained in the attached Excel file. It comes from the CRC E-74b Program. Fuels 3,1 and 4 are E0, E10 and E20 fuels, respectively.

The second data set which can be used to estimate ethanol effects on HC and NOx emissions is the CRC E-67 Program. Five near-Tier 2 vehicles were used there:

02 Ford Taurus
03 Chevy Cavalier
02 Toyota Camry LE
01 VW Jetta
03 Honda Accord LX

You had actually created emissions models using E-67 data for these vehicles. You also have in recent months made estimates of test repeatability for Tier 2 vehicles. You may assume that COV will be the same for E10 and E20 as for E0, unless E0 and E10 data tell you otherwise.

Pls let me know if you have any questions.

Best regards,

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734/214-4228 fax 734/214-4050
----- Forwarded by Rafal Sobotowski/AA/USEPA/US on 11/06/2007 02:42 PM -----

Rafal Sobotowski/AA/USEPA/US
06/25/2007 05:04 PM
To Robert Johnson/AA/USEPA/US
cc
Subject Support from George Hoffman

Bob,

Please authorize statistical analysis support for EPAct Program by George Hoffman. The first task would be to analyze available test data and define criteria which must be met for NOx emission models which will be developed in the EPAct Program to be predictive. CRC E-67 Program completed in 2006 failed to achieve this goal and we feel that the EPAct Program should not be launched until this issue is resolved. Other areas of statistical analysis may be added later on.

Pls contact me with any questions related to this request.

Best regards.....Rafal

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To: "Gibbs, Lew (LMGI)" [LMGI@chevron.com]
Cc: []
Bcc: []
From: CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US
Sent: Wed 9/12/2007 3:02:25 PM
Subject: Re: Ethanol Information
lmgi@chevron.com

Lew,

I truly appreciate your feedback. It has been very helpful in the design of the EPAct Program.

Thank you,

Rafal A. Sobotowski
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"Gibbs, Lew (LMGI)" <LMGI@chevron.com>
09/11/2007 04:28 PM
To Rafal Sobotowski/AA/USEPA/US@EPA
cc
Subject Ethanol Information

Hi,

Chart 1 shows a series of distillation curves for various concentrations from 0 to 85 vol %. It shows how the "dogleg" in the curve stretches out as the concentration of ethanol increases.

Chart 2 shows the effect of the gasoline component vapor pressure on the final vapor pressure of E85. The resulting E85 vapor pressure can vary from this curve depending on the amount and vapor pressure of the hydrocarbon denaturant. Shown on the chart are the minimum vapor pressure limits for volatility Classes 1 and 2 from ASTM D 5798. It illustrates the difficulty of meeting the minimum vapor pressure when a CARBOB of 5.7 psi is used in California and as Class 2 requirements are specified for the fall while EPA still requires summertime vapor pressure limits.

Chart 3 shows the correlation between vapor pressure and the 10% evaporated point for E85.

Table 1 shows a small study where I attempted to increase the 50% evaporated point of E20 by adding additional refinery components. As I stated in our telephone call, I didn't have much success.

Table 2 is from a CRC volatility program where Chevron Phillips attempted to meet the 170°F minimum 50% evaporated point in D 4814 for E20. Just like my experience, they were unable to even though they

had more components to try.

These are the charts and tables I could readily find. If you have any further questions, please feel free to call me.

Lew Gibbs, Chevron Fellow
Senior Consulting Engineer
Fuels Technology Team
Product Engineering, Regulations, and Technology
Chevron Products Company
100 Chevron Way
Richmond, CA 94802
lmgi@chevron.com
510-242-2606 Fax 510-242-2390
[attachment "EPA EtOH.xls" deleted by Rafal Sobotowski/AA/USEPA/US]

To: CN=John Koupal/OU=AA/O=USEPA/C=US@EPA[]
Cc: []
Bcc: []
From: CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US
Sent: Wed 10/17/2007 4:22:16 PM
Subject: Feasibility of Generating E0 and E10 EPAct Data by Fall of 2008

John,

The main EPAct fuel matrix consists of 25 fuels, 16 of which are E0 and E10 fuels. The matrix is designed in such a way that its E0/E10 portion can be treated as a separate entity.

Testing of E0/E10 fuels ahead of E20 fuels is possible (albeit not advisable from the statistical point of view), but would take at least 60 weeks to complete. The test matrix is designed in such a way that testing of all fuels must be completed before the emission models can be developed. Assuming that E0 and E10 fuels will be blended by April 2008 (up to six months required to blend all fuels; 4 months required to blend E0 and E10 fuels), the E0/E10 test program could be completed in March 2009. The schedule could be accelerated and I have left a message with SWRI to find out what options are available.

In addition to the main program, we will test three fuels (E0, E10 and E20) in a reduced number of vehicles (~10, instead of 19), at 50 and 75 deg. F. The 75 Deg. F tests are aimed mainly at measuring PM toxics. The three fuels will be blended to represent "typical" E0, E10 and E20 market fuels.

This short program was originally scheduled to be executed at the end of the EPAct study, but could be launched in May 2008 and completed in August. The 75 deg. F test data could be available in July 2008.

I will let you know about opportunities to accelerate the main program as soon as I hear from SWRI.

Let me know if you need any additional feedback.

Best regards,

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sobotowski.rafal@epa.gov
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To: Rafal Sobotowski/AA/USEPA/US@EPA;"Clark, Wendy" [Wendy_Clark@nrel.gov]; Clark, Wendy" [Wendy_Clark@nrel.gov]; Lawson, Doug" [doug_lawson@nrel.gov]
Cc: "Gibbs, Lew (LMGI)" [LMGI@chevron.com]; Ingham, Michael (MCIN)" [MCIN@chevron.com]; Simnick, James J" [James.Simnick@bp.com]
From: "UIHLEIN, JAMES P"
Sent: Fri 2/22/2008 1:23:47 AM
Subject: RE: EPAct Fuel Matrix Options

In the interest of documenting the trade-offs involved in selecting the fuels matrix, I've put together the following summary of a discussion between Rafal and myself. The focus was on options short of completely re-doing the matrix. There was agreement that whatever fuel matrix is selected, there will be compromises involved. However, this makes it essential that the trade-offs are understood upfront.

Concern 1:
The E20 fuels do not align with the other T50 levels.

Alternative 1a:
Align the E20 fuel with the lowest T50 level of the other fuels; i.e., 150 degrees.
Pro: Eliminates colinearity concerns while preserving the T50 level agreed to with the Autos.
Con: Not likely that all four E20s could be blended at 150 (it was agreed that all four must be at the same nominal T50 level).

Alternative 1b:
Align the other fuels with the lowest feasible E20 level; i.e., 160 degrees.
Pro: Eliminates colinearity concerns while accommodating the difficulty in changing the E20 T50 value.
Con: Does not preserve the low T50 level agreed to with the Autos.

Concern 2:
The T90 level of 350 is not consistent with the very low T50 values (150-160) - these would be "dumbbell" fuels that would have hollow spots in their distillation curves. In reality, the combination of T50=190 and T90=350 is even a stretch.

Alternative 2a:
Add a third level of T90 in order to determine non-linear T90 effects.
Pro: Limits the impact of spurious emissions results for fuels that have highly unusual distillation profiles.
Con: Requires either additional fuels (i.e., $) or another reworking of the fuel matrix in order to keep the same number of fuels (i.e., time).

Alternative 2b:
Reduce the high level of T90.
Pro: Makes the high T90 level for the experiment more consistent with those observed for extremely low T50 fuels.
Con: Makes the high T90 level for the experiment closer to the average observed T90s than to the higher observed T90s for higher T50 fuels.

Concern 3:
A T50 of 190 may be difficult to blend for the E15.

Alternative 3a:

Not clearly resolvable within the current matrix. Plan is to have Haltermann blend these fuels first in order to determine feasibility and if a problem becomes apparent regroup at that point.

I hope this helps. Rafal: if any of this is inconsistent with your understanding of our discussion, please let me know.

Thanks,
Jim

To: Rafal Sobotowski/AA/USEPA/US@EPA[]
From: rsobotowski@aim.com
Sent: Sun 2/24/2008 12:22:23 AM
Subject:
Response to Uihlein.doc

Your note below restates the arguments you made in an earlier email message and in the course of our telephone conversation last Thursday. I do not agree with them. Here is why:

T50 of 150F and 160F

As you know from presentations we did for CRC in the past several months, we assumed early on that it would be necessary for the EPAct Program to establish non-linear effects of T50 on emissions. The number of T50 levels in the fuel matrix was therefore initially set at three. As E15 and E20 levels were added to the matrix and a reduction of the lower of T50 limit requested by the Autos, the design of the fuel matrix became significantly more complicated, especially if considered in ethanol content/T50 coordinates. As shown in the attached figure, the addition of ethanol to gasoline causes enormous shifts in T50.

How did we set the T50 limits of 150F and 160F?

The T50 level of 150 F for E10 fuels was agreed upon in the course of discussions between the EPA and AAM. It is well justified by recent survey data which show significant numbers of E10 fuels with T50 at 150F and RVP~= 10 psi.

The T50 level of 160F is fixed for E20. Attempts to move it around, including those by Chevron, have not been successful, so we are stuck.

Blending of E15 fuels with T50 of 190F

Haltermann has blended some E15 fuels in recent months and does not see a problem in achieving T50 of 190F.

T90 of 350F

As we designed the EPAct fuel matrix, we strove to improve our ability to resolve fuel effects by expanding the range of each fuel parameter investigated. Our original assumption was to cover roughly the 5-95 percentile range seen in fuel surveys for each parameter.

The combination of T90=350F and T50=150F at 10 psi RVP (which is the only RVP level in T50=150F fuels) is rare, but can be found in E10 fuels according to recent fuel surveys. Therefore we feel that the T90 limit of 350F is justified. However, to allay your concerns, we reduced this limit to 340F per decisions reached during the conference call with Wendy last Friday morning.

Following that telephone conference, the updated version of the EPAct fuel matrix was immediately submitted to Haltermann for blending, so that we would not lose our spot in their fuel production schedule.

To: Rafal Sobotowski/AA/USEPA/US@EPA[]
From: "Robert Mason"
Sent: Wed 2/13/2008 1:11:10 PM
Subject: 2 new fuel matrices
Sobotowski Version 4b test matrix 2-12-08.xls

Rafal,

Attached are 2 fuel matrices in the same spreadsheet. Both started with the 16-run design (sent yesterday) and were augmented to form 24 fuel combinations covering the 3 'roof' points.

Note that in both of these final designs all 8 combinations at the (160, 20) were included. The only additional point was at (150,15). The G-efficiency for both of these is near 67%.

The optimization program either chose a fuel at (150,15) or at (190,15), but no runs could be generated that selected both of these points (since the program determined that both were not needed). If you want both of them in the fuel matrix, let me know and we will try to manipulate the program to accept both of them. One way to possibly do this is to initially add a cubic term for EtOH in the model, which might cause both points to be selected. We could then remove the cubic term, but keep both points and measure the G-efficiency of the result using the quadratic model.

Bob.

Example #1

Original 16-Run Design
3x2x2x2x2 Model

T50
T90
ETOH
RVP
ARO
T50^2
ETOH*T50
ETOH*T90
ETOH*RVP
ETOH*ARO

G-eff = 80.7

n=16 unique trials

Augmented 25-Run Design
3x2x3x2x2 Model

T50
T90
ETOH
RVP
ARO
T50^2
ETOH^2
ETOH*T50
ETOH*T90
ETOH*RVP
ETOH*ARO

G-eff = 67.5

n=25 unique trials

Trial	T50	T90	ETOH	RVP	ARO	BLOCK
1	190	350	0	7	40	Original
2	220	300	0	10	40	Original
3	150	350	10	10	15	Original
4	220	350	10	7	15	Original
5	240	300	0	7	40	Original
6	150	300	10	7	40	Original
7	190	300	0	7	15	Original
8	220	350	0	7	15	Original
9	190	350	0	10	40	Original
10	190	350	10	10	40	Original
11	190	300	10	7	15	Original
12	240	350	0	10	15	Original
13	220	300	10	10	40	Original
14	190	300	0	10	15	Original
15	150	350	10	7	40	Original

Example #2

Original 16-Run Design
3x2x2x2x2 Model

T50
T90
ETOH
RVP
ARO
T50^2
ETOH*T50
ETOH*T90
ETOH*RVP
ETOH*ARO

Trial	T50
1	190
2	220
3	150
4	220
5	240
6	150
7	190
8	220
9	190
10	190
11	190
12	240
13	220
14	190
15	150

16	150	300	10	10	15	Original					16	150
17	160	300	20	7	15	Augment					17	160
18	160	300	20	7	40	Augment					18	160
19	160	350	20	7	15	Augment					19	160
20	160	300	20	10	15	Augment					20	160
21	160	350	20	7	40	Augment					21	160
22	160	350	20	10	15	Augment					22	160
23	160	300	20	10	40	Augment					23	150
24	150	350	15	7	40	Augment					24	160
25	160	350	20	10	40	Augment					25	160

			Augmented 25-Run Design			
			3x2x3x2x2 Model			
G-eff = 80.7			T50	G-eff = 67.4		
			T90			
n=16 unique trials			ETOH	n=25 unique trials		
			RVP			
			ARO			
			T50^2			
			ETOH^2			
			ETOH*T50			
			ETOH*T90			
			ETOH*RVP			
			ETOH*ARO			

T90	ETOH	RVP	ARO	BLOCK
350	0	7	40	Original
300	0	10	40	Original
350	10	10	15	Original
350	10	7	15	Original
300	0	7	40	Original
300	10	7	40	Original
300	0	7	15	Original
350	0	7	15	Original
350	0	10	40	Original
350	10	10	40	Original
300	10	7	15	Original
350	0	10	15	Original
300	10	10	40	Original
300	0	10	15	Original
350	10	7	40	Original

300	10	10	15	Original		
300	20	7	40	Augment		
350	20	10	15	Augment		
300	20	10	40	Augment		
350	20	7	15	Augment		
300	20	10	15	Augment		
350	20	10	40	Augment		
350	15	10	15	Augment		
350	20	7	40	Augment		
300	20	7	15	Augment		

To: Rafal Sobotowski/AA/USEPA/US@EPA;"Gerry, Frank S" [Frank.Gerry@bp.com]; Gerry, Frank S" [Frank.Gerry@bp.com]; wendy_clark@nrel.gov>[]
Cc: Connie Hart/AA/USEPA/US@EPA;Carl Scarbro/AA/USEPA/US@EPA;Michael Christianson/AA/USEPA/US@EPA;Antonio Fernandez/AA/USEPA/US@EPA;"McGetrick, James E" [James.Mcgetrick@bp.com]; arl Scarbro/AA/USEPA/US@EPA;Michael Christianson/AA/USEPA/US@EPA;Antonio Fernandez/AA/USEPA/US@EPA;"McGetrick, James E" [James.Mcgetrick@bp.com]; ichael Christianson/AA/USEPA/US@EPA;Antonio Fernandez/AA/USEPA/US@EPA;"McGetrick, James E" [James.Mcgetrick@bp.com]; ntonio Fernandez/AA/USEPA/US@EPA;"McGetrick, James E" [James.Mcgetrick@bp.com]; McGetrick, James E" [James.Mcgetrick@bp.com]
From: "Simnick, James J"
Sent: Wed 2/13/2008 2:20:49 PM
Subject: RE: EPAct Fuel Matrix

Rafal
Sorry I was out of town at a DOE H2 meeting yesterday and stuck in the Baltimore airport.
Today is open for a teleconference, except for 11:30 - 12:30 CT . I would also recommend that we include Lew Gibbs, who leads our CRC Volatility Programs.
Jim

From: Sobotowski.Rafal@epamail.epa.gov [mailto:Sobotowski.Rafal@epamail.epa.gov]
Sent: Tuesday, February 12, 2008 3:54 PM
To: Gerry, Frank S; wendy_clark@nrel.gov; Simnick, James J
Cc: Hart.Connie@epamail.epa.gov; Scarbro.Carl@epamail.epa.gov; Christianson.Michael@epamail.epa.gov; Fernandez.Antonio@epamail.epa.gov
Subject: EPAct Fuel Matrix

Frank, Wendy and Jim,

As a follow-up to our recent discussions concerning the EPAct fuel matrix, the EPA EPAct team has reviewed fuel survey data and modified the design of the matrix to accommodate T50 of 150F at E10 and E15 levels. This necessitated the expansion of RVP range in the matrix from 6.65-9 psi to 6.65-10 psi.

As you certainly realize, we are breaking new ground with this matrix at E10, E15 and E20 ethanol content levels, while trying to cover the broadest possible ranges of all five fuel parameters which are being investigated (T50, T90, ethanol, RVP and aromatics). Slide #1 in the attached PowerPoint file illustrates the ranges of ethanol content and T50 in the latest design of the matrix. Slide #2 shows approximate ranges of RVP which, in our view, one would find in the respective market fuels. You will notice that at T50 level of 150F, the RVP will likely be limited to a narrow range around 10 psi. That range will probably be similar for E15 at T50 of 150F. For E15 at T50 of 190F as well as for E20, we assumed RVP range of 6.65-10 psi.

In order to resolve several outstanding issues related to this fuel matrix, we would like to propose a conference call between fuel experts from EPA, BP and NREL to discuss the following:

T50 ranges at the different ethanol content levels

RVP ranges at ethanol content /T50 combinations selected for the test fuels

To help us with the discussion, Slide #3 illustrates what we think is the shape of T50/RVP distribution in E10 gasolines.

In order to keep the program timeline on track, we need to resolve these issues as soon as possible. and would appreciate your participation in the conference call tomorrow afternoon (Wed, 2/13). We are available from noon till 5 pm EST.

Please advise.

Best regards.....Rafal

Rafal A. Sobotowski
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734/214-4228 fax 734/214-4050

To: "Gibbs, Lew (LMGI)" [LMGI@chevron.com]
Cc: CN=Connie Hart/OU=AA/O=USEPA/C=US@EPA;james.simnick@bp.com;wendy_clark@nrel.gov;frank.gerry@bp.com;CN=Carl Scarbro/OU=AA/O=USEPA/C=US@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA;CN=Antonio Fernandez/OU=AA/O=USEPA/C=US@EPA;"McGetrick, James E" [James.Mcgetrick@bp.com]; ames.simnick@bp.com;wendy_clark@nrel.gov;frank.gerry@bp.com;CN=Carl Scarbro/OU=AA/O=USEPA/C=US@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA;CN=Antonio Fernandez/OU=AA/O=USEPA/C=US@EPA;"McGetrick, James E" [James.Mcgetrick@bp.com]; endy_clark@nrel.gov;frank.gerry@bp.com;CN=Carl Scarbro/OU=AA/O=USEPA/C=US@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA;CN=Antonio Fernandez/OU=AA/O=USEPA/C=US@EPA;"McGetrick, James E" [James.Mcgetrick@bp.com]; rank.gerry@bp.com;CN=Carl Scarbro/OU=AA/O=USEPA/C=US@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA;CN=Antonio Fernandez/OU=AA/O=USEPA/C=US@EPA;"McGetrick, James E" [James.Mcgetrick@bp.com]; N=Carl Scarbro/OU=AA/O=USEPA/C=US@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA;CN=Antonio Fernandez/OU=AA/O=USEPA/C=US@EPA;"McGetrick, James E" [James.Mcgetrick@bp.com]; N=Michael Christianson/OU=AA/O=USEPA/C=US@EPA;CN=Antonio Fernandez/OU=AA/O=USEPA/C=US@EPA;"McGetrick, James E" [James.Mcgetrick@bp.com]; N=Antonio Fernandez/OU=AA/O=USEPA/C=US@EPA;"McGetrick, James E" [James.Mcgetrick@bp.com]; McGetrick, James E" [James.Mcgetrick@bp.com]
Bcc: []
From: CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US
Sent: Wed 2/13/2008 2:51:08 PM
Subject: Fw: EPAct Fuel Matrix
EPAct Matrix Options EPA_BP_NREL Conf Call_ 2-13-08.ppt
Lawson USCAR Jan_30_2008.ppt

Lew,

I would like to extend an invitation to you to participate in the conference call to discuss the EPAct fuel matrix. The objective of the call is defined below. Informational materials are attached.

Hope you can find about an hour between 1:30 and 5 PM EST today to participate.

Best regards,

Rafal A. Sobotowski
Assessment and Standards Division
U.S. Environmental Protection Agency
2000 Traverwood Drive
Ann Arbor, MI 48105
sobotowski.rafal@epa.gov
734/214-4228 fax 734/214-4050
----- Forwarded by Rafal Sobotowski/AA/USEPA/US on 02/13/2008 09:39 AM -----

Rafal Sobotowski/AA/USEPA/US
EPA-OAR,OTAQ,ASD
Sent by: Rafal Sobotowski
Received Date:
02/12/2008 04:53 PM
Transmission Date:

02/12/2008 04:53:33 PM
To frank.gerry@bp.com, wendy_clark@nrel.gov, james.simnick@bp.com
cc Connie Hart/AA/USEPA/US@EPA, Carl Scarbro/AA/USEPA/US@EPA, Michael Christianson/AA/USEPA/US@EPA, Antonio Fernandez/AA/USEPA/US@EPA
Subject EPAct Fuel Matrix

Frank, Wendy and Jim,

As a follow-up to our recent discussions concerning the EPAct fuel matrix, the EPA EPAct team has reviewed fuel survey data and modified the design of the matrix to accommodate T50 of 150F at E10 and E15 levels. This necessitated the expansion of RVP range in the matrix from 6.65-9 psi to 6.65-10 psi.

As you certainly realize, we are breaking new ground with this matrix at E10, E15 and E20 ethanol content levels, while trying to cover the broadest possible ranges of all five fuel parameters which are being investigated (T50, T90, ethanol, RVP and aromatics). Slide #1 in the attached PowerPoint file illustrates the ranges of ethanol content and T50 in the latest design of the matrix. Slide #2 shows approximate ranges of RVP which, in our view, one would find in the respective market fuels. You will notice that at T50 level of 150F, the RVP will likely be limited to a narrow range around 10 psi. That range will probably be similar for E15 at T50 of 150F. For E15 at T50 of 190F as well as for E20, we assumed RVP range of 6.65-10 psi.

In order to resolve several outstanding issues related to this fuel matrix, we would like to propose a conference call between fuel experts from EPA, BP and NREL to discuss the following:

T50 ranges at the different ethanol content levels

RVP ranges at ethanol content /T50 combinations selected for the test fuels

To help us with the discussion, Slide #3 illustrates what we think is the shape of T50/RVP distribution in E10 gasolines.

In order to keep the program timeline on track, we need to resolve these issues as soon as possible. and would appreciate your participation in the conference call tomorrow afternoon (Wed, 2/13). We are available from noon till 5 pm EST.

Please advise.

Best regards.....Rafal

Rafal A. Sobotowski
Assessment and Standards Division
U.S. Environmental Protection Agency
2000 Traverwood Drive
Ann Arbor, MI 48105
sobotowski.rafal@epa.gov
734/214-4228 fax 734/214-4050

To: JUIH@chevron.com[JUIH@chevron.com]
Cc: Rafal Sobotowski/AA/USEPA/US@EPA[]
From: "Gerry, Frank S"
Sent: Wed 2/13/2008 4:04:59 PM
Subject: FW: EPAct Fuel Matrix

Jim

If you can join us - here are the details

Frank

From: Sobotowski.Rafal@epamail.epa.gov [mailto:Sobotowski.Rafal@epamail.epa.gov]
Sent: Wednesday, February 13, 2008 10:01 AM
To: Gerry, Frank S; wendy_clark@nrel.gov; Simnick, James J; McGetrick, James E; Nicholas, Jim J; Steury, John H
Subject: RE: EPAct Fuel Matrix

The EPAct Fuel Matrix conference call will take place today from 3:00 to 4:00 PM EST. Following is the call-in information:

Your conference is scheduled for 02/13/2008
Your conference is scheduled to begin at 03:00PM
It is scheduled to end at 04:30PM
You will be able to call in 3 minutes before the schedule conference.
You have a total of 7 lines.
Your main conference number is 734-214-4069
No password.
As chairperson your phone number is 734-214-4068
No password.

Frank, could you please forward this message to Jim Uihlein? I do not have his email address.

Best regards,

Rafal A. Sobotowski
Assessment and Standards Division
U.S. Environmental Protection Agency
2000 Traverwood Drive
Ann Arbor, MI 48105
sobotowski.rafal@epa.gov
734/214-4228 fax 734/214-4050

"Simnick, James J" <James.Simnick@bp.com>
Sent by: "Simnick, James J" <James.Simnick@bp.com>

Received Date:
02/13/2008 09:20 AM
Transmission Date:

02/13/2008 09:20:49 AM
To Rafal Sobotowski/AA/USEPA/US@EPA, "Gerry, Frank S" <Frank.Gerry@bp.com>, <wendy_clark@nrel.gov>
cc Connie Hart/AA/USEPA/US@EPA, Carl Scarbro/AA/USEPA/US@EPA, Michael Christianson/AA/USEPA/US@EPA, Antonio Fernandez/AA/USEPA/US@EPA, "McGetrick, James E" <James.Mcgetrick@bp.com>
Subject RE: EPAct Fuel Matrix

Rafal
Sorry I was out of town at a DOE H2 meeting yesterday and stuck in the Baltimore airport.
Today is open for a teleconference, except for 11:30 - 12:30 CT . I would also recommend that we include Lew Gibbs, who leads our CRC Volatility Programs.
Jim

From: Sobotowski.Rafal@epamail.epa.gov [mailto:Sobotowski.Rafal@epamail.epa.gov]
Sent: Tuesday, February 12, 2008 3:54 PM
To: Gerry, Frank S; wendy_clark@nrel.gov; Simnick, James J
Cc: Hart.Connie@epamail.epa.gov; Scarbro.Carl@epamail.epa.gov; Christianson.Michael@epamail.epa.gov; Fernandez.Antonio@epamail.epa.gov
Subject: EPAct Fuel Matrix

Frank, Wendy and Jim,

As a follow-up to our recent discussions concerning the EPAct fuel matrix, the EPA EPAct team has reviewed fuel survey data and modified the design of the matrix to accommodate T50 of 150F at E10 and E15 levels. This necessitated the expansion of RVP range in the matrix from 6.65-9 psi to 6.65-10 psi.

As you certainly realize, we are breaking new ground with this matrix at E10, E15 and E20 ethanol content levels, while trying to cover the broadest possible ranges of all five fuel parameters which are being investigated (T50, T90, ethanol, RVP and aromatics). Slide #1 in the attached PowerPoint file illustrates the ranges of ethanol content and T50 in the latest design of the matrix. Slide #2 shows approximate ranges of RVP which, in our view, one would find in the respective market fuels. You will notice that at T50 level of 150F, the RVP will likely be limited to a narrow range around 10 psi. That range will probably be similar for E15 at T50 of 150F. For E15 at T50 of 190F as well as for E20, we assumed RVP range of 6.65-10 psi.

In order to resolve several outstanding issues related to this fuel matrix, we would like to propose a conference call between fuel experts from EPA, BP and NREL to discuss the following:

T50 ranges at the different ethanol content levels
RVP ranges at ethanol content /T50 combinations selected for the test fuels

To help us with the discussion, Slide #3 illustrates what we think is the shape of T50/RVP distribution in E10 gasolines.

In order to keep the program timeline on track, we need to resolve these issues as soon as possible. and would

appreciate your participation in the conference call tomorrow afternoon (Wed, 2/13). We are available from noon till 5 pm EST.

Please advise.

Best regards.....Rafal

Rafal A. Sobotowski
Assessment and Standards Division
U.S. Environmental Protection Agency
2000 Traverwood Drive
Ann Arbor, MI 48105
sobotowski.rafal@epa.gov
734/214-4228 fax 734/214-4050

To: Rafal Sobotowski/AA/USEPA/US@EPA[]
From: "Robert Mason"
Sent: Fri 2/15/2008 3:57:37 PM
Subject: matrix #2
25-trial matrix 2-14-08.xls

Rafal,

See the second matrix in the attached file. We tried about 20 random seeds and only found one matrix better than the n=25 matrix I sent you yesterday.

The g-efficiency = 68.1% but it has 3 fuels at (190, 15) instead of 2.

Let me know what you want to do: stop here or continue the search.

Bob

G-eff=65.6n=25

trial	t50	t90	etoh	rvp	aro		G-eff=68.1, n=25 trial
1	150	300	10	10	15	original	1
2	240	350	0	10	15	original	2
3	220	300	10	7	15	original	3
4	220	350	10	10	15	original	4
5	240	300	0	7	40	original	5
6	190	350	10	7	15	original	6
7	190	300	0	7	15	original	7
8	220	300	0	10	15	original	8
9	190	350	0	10	40	original	9
10	220	350	10	7	40	original	10
11	190	300	10	10	40	original	11
12	150	350	10	10	40	original	12
13	220	350	0	7	40	original	13
14	190	350	0	7	15	original	14
15	190	300	0	10	40	original	15
16	220	300	10	7	40	original	16
17	190	300	15	10	40	augment	17
18	190	350	15	7	15	augment	23
20	150	300	15	10	15	augment	18
21	150	350	15	10	40	augment	19
19	160	350	20	7	15	augment	20
22	160	300	20	7	40	augment	24
23	160	350	20	10	40	augment	21
24	160	300	20	10	15	augment	22
25	160	350	20	10	15	augment	25

t50	t90	etoh	rvp	aro	
150	300	10	10	15	original
240	350	0	10	15	original
220	300	10	7	15	original
220	350	10	10	15	original
240	300	0	7	40	original
190	350	10	7	15	original
190	300	0	7	15	original
220	300	0	10	15	original
190	350	0	10	40	original
220	350	10	7	40	original
190	300	10	10	40	original
150	350	10	10	40	original
220	350	0	7	40	original
190	350	0	7	15	original
190	300	0	10	40	original
220	300	10	7	40	original
150	350	15	10	15	augment
150	300	15	10	40	augment
160	300	20	7	40	augment
160	300	20	10	15	augment
160	350	20	10	40	augment
160	350	20	7	15	augment
190	300	15	7	40	augment
190	350	15	10	40	augment
190	300	15	10	15	augment

To: Rafal Sobotowski/AA/USEPA/US@EPA[]
From: "Robert Mason"
Sent: Fri 2/15/2008 7:53:30 PM
Subject: Matrix #3
25-trial matrix 2-14-08.xls

Rafal,

We tried 40 more runs and came up with Matrix #3. It only improved the G-efficiency from 68.1% to 68.3%. Choose either one since they are so close together.

Bob

G-eff=65.6n=25

trial	t50	t90	etoh	rvp	aro		G-eff=68.1, n=25 trial
1	150	300	10	10	15	original	1
2	240	350	0	10	15	original	2
3	220	300	10	7	15	original	3
4	220	350	10	10	15	original	4
5	240	300	0	7	40	original	5
6	190	350	10	7	15	original	6
7	190	300	0	7	15	original	7
8	220	300	0	10	15	original	8
9	190	350	0	10	40	original	9
10	220	350	10	7	40	original	10
11	190	300	10	10	40	original	11
12	150	350	10	10	40	original	12
13	220	350	0	7	40	original	13
14	190	350	0	7	15	original	14
15	190	300	0	10	40	original	15
16	220	300	10	7	40	original	16
17	190	300	15	10	40	augment	17
18	190	350	15	7	15	augment	23
20	150	300	15	10	15	augment	18
21	150	350	15	10	40	augment	19
19	160	350	20	7	15	augment	20
22	160	300	20	7	40	augment	24
23	160	350	20	10	40	augment	21
24	160	300	20	10	15	augment	22
25	160	350	20	10	15	augment	25

t50	t90	etoh	rvp	aro	
150	300	10	10	15	original
240	350	0	10	15	original
220	300	10	7	15	original
220	350	10	10	15	original
240	300	0	7	40	original
190	350	10	7	15	original
190	300	0	7	15	original
220	300	0	10	15	original
190	350	0	10	40	original
220	350	10	7	40	original
190	300	10	10	40	original
150	350	10	10	40	original
220	350	0	7	40	original
190	350	0	7	15	original
190	300	0	10	40	original
220	300	10	7	40	original
150	350	15	10	15	augment
150	300	15	10	40	augment
160	300	20	7	40	augment
160	300	20	10	15	augment
160	350	20	10	40	augment
160	350	20	7	15	augment
190	300	15	7	40	augment
190	350	15	10	40	augment
190	300	15	10	15	augment

G-eff=68.3, n=25

trial	t50	t90
1	150	300
2	240	350
3	220	300
4	220	350
5	240	300
6	190	350
7	190	300
8	220	300
9	190	350
10	220	350
11	190	300
12	150	350
13	220	350
14	190	350
15	190	300
16	220	300
18	150	300
22	150	350
21	160	350
24	160	350
19	160	300
25	160	300
23	190	350
17	190	350
20	190	300

etoh	rvp	aro	
10	10	15	original
0	10	15	original
10	7	15	original
10	10	15	original
0	7	40	original
10	7	15	original
0	7	15	original
0	10	15	original
0	10	40	original
10	7	40	original
10	10	40	original
10	10	40	original
0	7	40	original
0	7	15	original
0	10	40	original
10	7	40	original
15	10	15	augment
15	10	40	augment
20	10	15	augment
20	7	40	augment
20	7	15	augment
20	10	40	augment
15	10	40	augment
15	7	15	augment
15	7	40	augment

To: Rafal Sobotowski/AA/USEPA/US@EPA;"Clark, Wendy" [Wendy_Clark@nrel.gov]; Clark, Wendy" [Wendy_Clark@nrel.gov]; Lawson, Doug" [doug_lawson@nrel.gov]; Simnick, James J" [James.Simnick@bp.com]
Cc: Aron Butler/AA/USEPA/US@EPA;Carl Scarbro/AA/USEPA/US@EPA;Connie Hart/AA/USEPA/US@EPA;Michael Christianson/AA/USEPA/US@EPA;"Gibbs, Lew (LMGI)" [LMGI@chevron.com]; arl Scarbro/AA/USEPA/US@EPA;Connie Hart/AA/USEPA/US@EPA;Michael Christianson/AA/USEPA/US@EPA;"Gibbs, Lew (LMGI)" [LMGI@chevron.com]; onnie Hart/AA/USEPA/US@EPA;Michael Christianson/AA/USEPA/US@EPA;"Gibbs, Lew (LMGI)" [LMGI@chevron.com]; ichael Christianson/AA/USEPA/US@EPA;"Gibbs, Lew (LMGI)" [LMGI@chevron.com]; Gibbs, Lew (LMGI)" [LMGI@chevron.com]; Ingham, Michael (MCIN)" [MCIN@chevron.com]
From: "UIHLEIN, JAMES P"
Sent: Wed 2/20/2008 4:17:09 PM
Subject: RE: EPAct Fuel Matrix Options
Link

There are three main concerns about all of the proposed matrices:
1) The E20 fuels do no align with the other T50 levels
2) The T90 level of 350 is not consistent with the very low T50 values (150-160) - these would be "dumbbell" fuels that would have hollow spots in their distillation curves. In reality, the combination of T50=190 and T90=350 is even a stretch.
3) A T50 of 190 may be difficult to blend for the E15

Concerns 2 and 3 result from the gymnastics involved in attempting to physically blend such fuels. The first concern is based on confounding of the E20 effect with T50 in the possible presence of nonlinearities.

A re-thinking of the "add-on" fuels should be considered. In T50/T90/ethanol space, the basis for the fuels should be:

150 300 E15
150 300 E20
150 3xx E15
150 3xx E20
190 3xx E10
(150 3xx E10)

Where xx < 50. A recommendation can be provided given a little more time.

The above basis would be expanded to include the necessary variation in RVP and aromatics (note that the parenthetical combination would be included if both it and the need for RVP/aromatics variation could be accommodated). Note that the last (two) combination(s) listed is(are) included to provide a tie to the "main" fuel matrix.

This proposal admittedly sacrifices T50 as a variable in the >E10 range, but based on limited blending experience to date it appears that T50s for such fuels may vary over a narrower range anyway - the limits of that range are not yet well understood.

Sorry for the late response and less than thorough analysis, as I am currently traveling.

Thanks,
Jim

From: Sobotowski.Rafal@epamail.epa.gov [mailto:Sobotowski.Rafal@epamail.epa.gov]
Sent: Tuesday, February 19, 2008 9:40 AM
To: Clark, Wendy; Lawson, Doug; Simnick, James J; UIHLEIN, JAMES P
Cc: Butler.Aron@epamail.epa.gov; Scarbro.Carl@epamail.epa.gov; Hart.Connie@epamail.epa.gov; Christianson.Michael@epamail.epa.gov
Subject: EPAct Fuel Matrix Options

Based on the feedback from our conference call last Thursday, Bob Mason has defined three candidate fuel matrices for the EPAct Program. See attachment.

You will notice that we are down to T50 of 150 at ethanol content levels of 10 and 15%. There are only two fuels each at those locations as RVP is kept at one level (10 psi).

There are four E15 fuels in fuel matrix #1 (G-eff = 65.6) and five in fuel matrices #2 (G-eff = 68.1) and #3 (G-eff = 68.2) .

The number of EPA fuels (16) and DOE fuels (9) has not changed relative to the pre Feb. 1 design.

Bob Mason's recommendation is to choose either matrix #2 or #3.

Pls let me know asap which matrix you 'd prefer to see tested in EPAct Program, by COB EST today, if possible.

Best regards,

Rafal A. Sobotowski
Assessment and Standards Division
U.S. Environmental Protection Agency
2000 Traverwood Drive
Ann Arbor, MI 48105
sobotowski.rafal@epa.gov
734/214-4228 fax 734/214-4050

Rafal Sobotowski/AA/USEPA/US
EPA-OAR,OTAQ,ASD

Received Date:
02/15/2008 09:32 AM
Transmission Date:
02/15/2008 09:32:24 AM
To "Clark, Wendy" <Wendy_Clark@nrel.gov>, "Lawson, Doug" <doug_lawson@nrel.gov>
cc Carl Scarbro/AA/USEPA/US@EPA, Connie Hart/AA/USEPA/US@EPA, Michael Christianson/AA/USEPA/US@EPA, Aron Butler/AA/USEPA/US@EPA
Subject Feb. 15 Version of EPAct Fuel MatrixLink

Wendy and Doug,

Attached below is the latest version of the fuel matrix.

You will notice that we are down to T50 of 150 at ethanol content levels of 10 and 15%. There are only two fuels each at those locations as RVP is kept at one level (10 psi).

Per your request there are four E15 fuels in the matrix and the number of EPA fuels (16) and DOE fuels (9) has not changed relative to the pre Feb. 1 design. The G-efficiency of this matrix equals 65.6% and Bob Mason will spend the rest of this morning trying to boost this number.

Pls review the attached design and let me know if it meets your requirements. If we are to introduce any changes, this is the time.

[attachment "25-trial matrix 2-14-08.xls" deleted by Rafal Sobotowski/AA/USEPA/US]

Best regards,

Rafal A. Sobotowski
Assessment and Standards Division
U.S. Environmental Protection Agency
2000 Traverwood Drive
Ann Arbor, MI 48105
sobotowski.rafal@epa.gov
734/214-4228 fax 734/214-4050

To: "Chris Tennant" [CTennant@crcao.org]
Cc: "Brent Bailey" [bkbailey@crcao.org]; N=Connie Hart/OU=AA/O=USEPA/C=US@EPA;"Jane Beck" [JBeck@crcao.org]; Jane Beck" [JBeck@crcao.org]; N=John Koupal/OU=AA/O=USEPA/C=US@EPA;"Uihlein, Jim" [JUIH@chevron.com]; Uihlein, Jim" [JUIH@chevron.com]; Valentine, Marie" [marie.valentine@tema.toyota.com]; Ingham, Michael" [MCIN@chevron.com]
Bcc: []
From: CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US
Sent: Fri 4/25/2008 11:07:48 AM
Subject: Re: Scheduling a conference call to discuss CRC interest in adding 1-2 fuels to the EPAct fuel matrix
WWW.CRCAO.ORG

Chris,

My availability is indicated below.

Best regards,

Rafal A. Sobotowski
Assessment and Standards Division
U.S. Environmental Protection Agency
2000 Traverwood Drive
Ann Arbor, MI 48105
sobotowski.rafal@epa.gov
734/214-4228 fax 734/214-4050

"Chris Tennant" <CTennant@crcao.org>
Sent by: "Chris Tennant" <CTennant@crcao.org>
Received Date:
04/24/2008 03:57 PM
Transmission Date:
04/24/2008 03:57:01 PM
To John Koupal/AA/USEPA/US@EPA, Rafal Sobotowski/AA/USEPA/US@EPA, "Ingham, Michael" <MCIN@chevron.com>, "Valentine, Marie" <marie.valentine@tema.toyota.com>, "Uihlein, Jim" <JUIH@chevron.com>, Connie Hart/AA/USEPA/US@EPA
cc "Jane Beck" <JBeck@crcao.org>, "Brent Bailey" <bkbailey@crcao.org>
Subject Scheduling a conference call to discuss CRC interest in adding 1-2 fuels to the EPAct fuel matrix

John, Rafal, Connie, Mike, Marie and Jim,

Many of us have talked individually about this project and our interest in participating with some additions to the fuel matrix; after Brent and I visited with some of you in Ann Arbor last week, it sounds like we should try and speak collectively very soon.

Please indicate when you'd be able to participate in a conference call to discuss this opportunity to work together.

Friday, April 25 AM _____
Friday. April 25 PM _____

…

Thursday, May 1 AM ____x_____
Thursday, May 1 PM ____x_____

Friday, May 2 AM _____
Friday, May 2 PM _____

Monday, May 5 AM _____
Monday, May 5 PM_____x_____

Tuesday, May 6 AM_____

Thanks!
- Chris

Dr. Christopher J. Tennant - Deputy Director
CRC Correspondence (not for public distribution)
COORDINATING RESEARCH COUNCIL, INC.
3650 MANSELL ROAD, SUITE 140
ALPHARETTA, GA 30022
TEL: 678/795-0506 FAX: 678/795-0509
WWW.CRCAO.ORG

To: CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA;CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US@EPA;Carl Scarbro@EPA[]; N=Rafal Sobotowski/OU=AA/O=USEPA/C=US@EPA;Carl Scarbro@EPA[]; arl Scarbro@EPA[]
Cc: John Koupal@EPA;Marion Hoyer@EPA[]; arion Hoyer@EPA[]
From: CN=Joseph Somers/OU=AA/O=USEPA/C=US
Sent: Wed 12/5/2007 3:58:01 PM
Subject: DOE NREL money for EPACT testing

Mike, Rafal, Carl –

As you know, Wendy Clark of NREL (National Renewable Energy Lab) is considering funding part of the EPACT work. I talked with Doug Lawson (who may be the main person here – he worked with ASD on the Kansas City project) on some other issues and he mentioned EPACT.

NREL currently has $900,000 for biofuels work which could go into this testing. Also, Wendy Clark is currently meeting with DOE (Kevin Stork, Steve Gogon) to obtain an additional $1,100,000 for this work. That money will probably come.

Doug asked who here he should coordinate with. I gave him your names, Mike/Rafal, as technical contacts.

Let me know if there is more I should do. And, I will see each of you on this for some other ideas I have.

To: CN=Joseph Somers/OU=AA/O=USEPA/C=US@EPA[]
Cc: Carl Scarbro@EPA;John Koupal@EPA;Marion Hoyer@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA[]; ohn Koupal@EPA;Marion Hoyer@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA[]; arion Hoyer@EPA;CN=Michael Christianson/OU=AA/O=USEPA/C=US@EPA[]; N=Michael Christianson/OU=AA/O=USEPA/C=US@EPA[]
From: CN=Rafal Sobotowski/OU=AA/O=USEPA/C=US
Sent: Wed 12/5/2007 5:57:01 PM
Subject: Re: DOE NREL money for EPACT testing

Joe,

I have been coordinating with Wendy Clark on this issue for at least six months. She has been a great champion of DOE's involvement in the EPAct Program. When necessary, she gets other people, like Kevin Stork or Steve Gaugen, involved.

Today she will find out how close the DOE can come to the $2M we told her the add-on DOE portion of the program would cost. Based on that information, we will need to update our views of what the expanded program should look like.

DOE wants to meet with us shortly to iron out the details of the expanded program. It looks like Wendy will be their point person in those discussions.

I will let you know as additional information comes in.

Best regards,

Rafal A. Sobotowski
Assessment and Standards Division
U.S. Environmental Protection Agency
2000 Traverwood Drive
Ann Arbor, MI 48105
sobotowski.rafal@epa.gov
734/214-4228 fax 734/214-4050

Joseph Somers/AA/USEPA/US
12/05/2007 10:58 AM
To Michael Christianson/AA/USEPA/US@EPA, Rafal Sobotowski/AA/USEPA/US@EPA, Carl Scarbro@EPA
cc John Koupal@EPA, Marion Hoyer@EPA
Subject DOE NREL money for EPACT testing

Mike, Rafal, Carl –

As you know, Wendy Clark of NREL (National Renewable Energy Lab) is considering funding part of the EPACT work. I talked with Doug Lawson (who may be the main person here – he worked with ASD on the Kansas City project) on some other issues and he mentioned EPACT.

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Let me know if there is more I should do. And, I will see each of you on this for some other ideas I have.

E0-E10-E15 Results from Phase 1 of EPAct Program

Sept 4, 2008

Preliminary information – not for release outside EPA

EPAct Program Overview

- EPA/DOE collaboration
- Objective: Establish effects of RVP,T50,T90, aromatic content and EtOH on exhaust emissions from Tier 2 vehicles
- Fuel matrix includes 29 fuels + 2 added by CRC: total of 31
- Test Program Design
  - Phase 1: RFS 2 Pilot at 75°F
    - 3 fuels (E0, E10 and E15) tested in 19 vehicles
    - Test results to be available for RFS 2 NPRM
  - Phase 2: RFS 2 Pilot at 50°F
    - Same as Phase 1, except temperature
  - Phase 3: Main Program
    - 25 fuels tested in 19 Tier 2 vehicles, E85 tested in 4 FFVs
- LA92 test cycle used throughout the program
- Species measured: Regulated emissions, CO_2, NO_2, VOCs, ethanol, carbonyl compounds
  - N_2O, NH_3 and HCN by FTIR
  - Some PM and SVOC speciation

Test Fuel Properties

PROPERTY	UNIT	METHOD	FUEL		
			E0	E10	E15
Ethanol Content	vol. %	D5599	<0.1	9.35	14.5
T50	ºF	D86	215	209	182
T90	ºF	D86	324	319	310
RVP	psi	D5191	9.17	9.05	8.91
Aromatics	vol. %	D1319	29.3	22.9	18.7
Olefins	vol. %	D1319	6.4	5.7	5.6
Benzene	vol. %	D3606	0.48	0.49	0.46
S	mg/kg	D5453	23	23	21
RON	-	D2699	93.4	93.7	93.9
MON	-	D2700	83.5	84.9	84.6
(R + M)/2	-	Calc.	88.5	89.3	89.2

Conclusions

- CO, HC, and PM all have significant decreases in emissions as ethanol levels increase from E0 to E10
- CO, HC and PM have insignificant changes from E10 to E15 (PM may even increase)
- NOx has significant decrease from E0 to E10 only for starts; over entire cycle composite, Tier 2 NOx seems to be insensitive to ethanol levels
  - This may be due to large variability (overwhelming effect) or insensitivity to fuel

Next steps

- Continue testing phase 2 (50°F)
- If we continue seeing no NOx effect, should we continue the program as is?
- Should we consider changing the program midstream (or even now)? Options?
  - Find/add some ethanol “sensitive” vehicles
  - Add some tests with fuels that have exactly same properties except for ethanol
  - Add FTP tests, which may magnify cold start impact
- If we continue as designed or expand, we will need to supplement with additional ’09 funds

E10 Impacts on Emissions from Tier 2 Vehicles

CRC E-74b Program (7 Vehicles, Mixed Models, p<0.05)

Pollutant	Percent Change vs. E0			
	Weighted	Bag 1	Bag 2	Bag 3
NOx	-	-	-	-
NMHC	-12.9 (0.1<p<0.05)	-	-	-
CO	-22.4	-22.4	-	-
CO_2	-	-	-	-

Initial Conclusions:

- How the fuel system reacts to each fuel affects how the catalyst "lights off"
  - A system w/lean bias on E10, will have quicker HC lightoff, which may also improve NOx lightoff
  - System with identical air-fuel ratio (AFR) traces on each fuel tend to have identical, or similar, lightoff behavior
- Fuel system control strategies are not uniform amongst the OEMs
  - Ford F150 … AFR traces separate at idle (even when engine is warm), and may/may not converge under load
  - Chevrolet Impala … little separation in AFR traces initially, but some separation when engine is warm
  - Toyota Corolla … as close to "line-for-line" as you can get
  - Dodge Caravan … little separation in AFR traces initially, but separation between fuels when warm is sometimes "rich" and sometimes "lean"
- Fuel effect on Bag1 NOx emissions is manufacturer-dependent – those with "tight" fuel control (regardless of ethanol content) show a small NOx effect, while those with "separation" show a larger NOx effect

E0/E10 Results from Phase 1 of EPAct Program

Preliminary

June 30, 2008

EPAct Program Timeline

ORIGINAL EPAct PROGRAM TIMELINE DEFINED BY SWRI ON FEBRUARY 20, 2008

		JAN 2008				FEB 2008				MAR 2008					APR 2008				MAY 2008					JUN 2008					JUL 2008					AUG 2008				SEP 2008					OCT 2008					NOV 2008					DEC 2008				
		7	14	21	28	4	11	18	25	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29
Phase 1[2]	6 weeks														1	2	3	4	5	6																																				
50F setup	3 weeks																				1	2	3																																	
Phase 2[2]	9 weeks																							1	2	3	4	5	6	7	8	9																							
50F teardown	2 weeks																																1	2																					
NREL high emitters	3 weeks																																		1	2	3																	
Phase 3[2]	26 weeks																																					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
NREL fuels[3]	17 weeks																																																					
draft final report	6 weeks																																																				
EPA/NREL review	4 weeks																																																				
final report	4 weeks																																																				

		JAN 2009				FEB 2009				MAR 2009					APR 2009				MAY 2009					JUN 2009					JUL 2009					AUG 2009				SEP 2009					OCT 2009					NOV 2009					DEC 2009				
		5	12	19	26	2	9	16	23	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28
Phase 1[2]	6 weeks																																																					
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EPA/NREL review	4 weeks																																		1	2	3	4															
final report	4 weeks																																						1	2	3	4												

EPAct PROGRAM TIMELINE MODIFIED BY Rafal Sobotowski ON JUNE19, 2008

INCLUDES E20 TESTS FOR DOE and TWO CRC FUELS		JAN 2008				FEB 2008				MAR 2008					APR 2008				MAY 2008					JUN 2008					JUL 2008					AUG 2008				SEP 2008					OCT 2008					NOV 2008					DEC 2008				
		7	14	21	28	4	11	18	25	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29
Phase 1[2]	14 weeks														1	2	3	4	5	6	7	8	9	10	11	12	13	14																														
50F setup	3 weeks																												1	2	3																								
Phase 2[2]	9 weeks																																1	2	3	4	5	6	7	8	9												
Blending of Phase 3 fuels	19 weeks																											1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20							
DOE E20 tests at 50F	2 weeks																																								1	2	3												
50F teardown	2 weeks																																										1	2									
DOE E20 tests at 75F	2 weeks																																											1	2								
Phase 3[2]	26 weeks																																													1	2	3	4	5	6	
NREL fuels[3]	17 weeks																																																				
draft final report	6 weeks																																																				
EPA/NREL review	4 weeks																																																				
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		JAN 2009				FEB 2009				MAR 2009					APR 2009				MAY 2009					JUN 2009					JUL 2009					AUG 2009				SEP 2009					OCT 2009					NOV 2009					DEC 2009				
		5	12	19	26	2	9	16	23	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28
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CRC fuels	4 weeks																																						1	2	3	4												
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final report	4 weeks																																																1	2	3	4	

8/21
RAFAL OUT [redacted] - 9/7
TONY OUT 8/16 - 9/1

EPAct bi-weekly update mtg. 8-12-2008

1) Light-duty exhaust program (Sobotowski, Hart)
- -Fuel blending status for phase 3 fuels → PAUL SAYS START W/ WHATEVER HANDFUL OF FUELS WE HAVE ON 11/1, THEN RE-RANDOMIZE ORDER AS NEW FUELS ARRIVE.
- -Testing status fuel 19 (E15) - completed
- -E0/E10/E15 data analysis status
  - -regulated pollutants GEORGE STARTING TO PROCESS FUEL 19
  - -toxics
- -Vehicle downtime/non-intrusive testing options
  - -Evaporative testing in phase 3
  - -FTPs or US06
  - -95F LA92 – DOE to pursue
  - -PM studies
  - -Sulfur
- -OBD data clean-up → OBD DATA REVIEW SHOWS FUEL ADJ PARAMETER FOR E10 (3-4%) AS EXPECTED
- -Other issues

2) Oil study (Christianson, Sobotowski, Fernandez)
- -Ethanol portion
  - -E20 testing completed
- -Aging portion
  - -Mileage accumulation for oil aging and results
- -Meeting with Lubrizol

NOTHING NEW HERE; MIKE CLEANING UP DATA FOR LUBRIZOL'S ANALYSIS, INVESTIGATING E10 STATUS OF BP FUEL

3) PM speciation (Christianson, Hoyer)
- -ORD – main program
  - -number of vehicles
  - -temperatures

NRMRL DOESN'T QUITE MEET 1065 SPECS; WE'RE A FEW MONTHS AWAY FROM ROUND ROBIN; [redacted] LOD IS TRYING TO CONFIGURE 329 TO DO GASOLINE PM

- -NVFEL to do round robin – some PM work – E85

4) Nonroad exhaust program (Caffrey)
- -Fuel 18 received and being tested
- -Testing and aging (1/2 FUL) status
  - -Completed engines
- -Additional testing in conjunction with ARB program
  - -SOW
  - -speciated data on ARB program

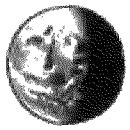
- BEGINING TO SHARE DATA W/ARB
- WANT TO SPECIATE EVAP TO PEAK W/ ETOH (CONSIDER USING INNOVA)

5) Evap testing (Hart)
- -E77-2
  - -data results
- -E77-2b
  - -work statement completed
- -E77-3
  - -approved by OMB

- USE EXTRA FUEL 19 FROM [redacted] PM SPEC. PGRM; SPLASH BLEND W/ ETOH TO MAKE E20

Deliverable dates for data:
- -EPAct exhaust
- -EPAct Evaporative
- -Non-road

RFS2 PM 519 JUN '09
NOTHING FOR AQ
EPAct E10 study → DATA IN APRIL?



"Bain, Sonia S."
<ssbain@marathonoil.com>
Sent by: "Bain, Sonia S."
<ssbain@marathonoil.com>

Received Date:
07/15/2008 01:38 PM
Transmission Date:
07/15/2008 01:38:28 PM

To Rafal Sobotowski/AA/USEPA/US@EPA
cc
bcc
Subject FW: D86-07b Reproducibility Values

Rafal,

As requested, attached is the D86 reproducibility data.

Best Regards,

Sonia Bain
Marathon Petroleum Company
Refining Analytical and Development (RAD)
Analytical Services Supervisor
Main Office Building
Catlettsburg, KY 41129
Phone: (606) 921-6369

<<CompareD86 (7).xls>>

-----Original Message-----
From: rey.g.montemayor@esso.ca [mailto:rey.g.montemayor@esso.ca]
Sent: Thursday, June 26, 2008 8:51 AM
To: alex.t.lau@exxonmobil.com
Cc: Michael.Collier@paclp.com; michael.palmer@ametek.com; Bain, Sonia S.
Subject: Fw: D86-07b Reproducibility Values

Alex:

At the Sub 8 meeting, we did indicate that we will consult with you regarding the T50 reproducibility concern that Sonia has indicated in her negative and in this note. Kindly take a second look at the D86 ILS that we

did in 2005 to see if there is any unusual or contributing data that led to a fairly low T50 R compared to

T10 and T90 R values. Your help is greatly appreciated in this one since T50 is a critical specification parameter for spark ignition engine fuels. Thanks in advance.

Congratulations, again on your Award of Merit! Well deserved.

Rey G. Montemayor, Ph.D.
Chief Chemist, Quality Assurance Laboratory
Imperial Oil Ltd., 453 Christina St. S.,
Sarnia, Ontario N7T 8C8, CANADA
Tel. No.: (519) 339 4483 Fax No.: (519) 339 5945
Email: rey.g.montemayor@esso.ca

.----- Forwarded by Rey G Montemayor/Canada/ExxonMobil on 26/06/2008 08:45 AM -----

"Bain, Sonia S." <ssbain@marathonoil.com>
17/06/2008 10:19 AM

To: "Collier, Michael" <Michael.Collier@paclp.com>
cc: <rey.g.montemayor@esso.ca>, <alex.t.lau@exxonmobil.com>
Subject: FW: D86-07b Reproducibility Values

Michael,

I have discussed the D86 reproducibility concerns with Alex Lau yesterday. Statistics didn't appear to be the problem. I would like to present the data in the attached spreadsheet at the D2.08 meeting.

Regards,

Sonia

From: Bain, Sonia S.
Sent: Friday, June 06, 2008 2:59 PM
To: 'McGetrick, James E'
Cc: ron.hayes@mda.mo.gov; 'MHerman697@aol.com'; 'Gibbs, Lew (LMGI)'; Simnick, James J
Subject: D86-07b Reproducibility Values

Jim,

Thanks for your phone call, as we briefly discussed, I cast a negative on a D2.08 research report related to D86 specification temperature precision last week. The negative may not be entirely relevant to balloted item, but I am hoping that ASTM Sub 08 will review the round robin data used in the determination of the current reproducibility values in D86-07b. The negative text is posted in the ASTM website but the attached spreadsheet with the comparative D86 data is missing from posted ballot report. Attached is the spreadsheet comparing the D86 reproducibilities from various sources. The D86-07b reproducibility value for T50, 1.88°C, seems unrealistically too low according to ASTM RFG and Motor Gasoline crosscheck data. A quick assessment of the T50 data suggest:

1. The reproducibility values of previous D86 test method versions for gasoline samples ranged from 4.9°C to 12.3 °C.

2. ASTM cross check reproducibility for gasoline samples ranged from 1.5° C to 7.9°C.
3. The new reproducibly value of 1.88°C (independent of slope) would only be met one in 25 instances.

The T10 and T90 reproducibilities for gasoline are more realistic than the new (D97-07b) T50 value. Additionally, the D86-07b reproducibility values for ASTM diesel and jet fuel samples (2.97°C) are more reasonable than 1.88°C, the gasoline reproducibility value.

ASTM D2.08 has great leadership (Rey Montemayor) and Alex Lau, a renowned and savvy statistician is very familiar with the D86-07b data and he will probably recheck the round robin data. We all know that the T50 distillation point is an important gasoline property, I am hopeful that ASTM Sub 08 will review the round robin data to determine the cause of discrepancies between the D86 reproducibilities.

Regards,

"Robert Mason"
<Robert.Mason@swri.org>
Sent by: "Robert Mason"
<Robert.Mason@swri.org>

Received Date:
08/28/2008 12:43 PM
Transmission Date:
08/28/2008 12:43:32 PM

To Rafal Sobotowski/AA/USEPA/US@EPA
cc
bcc
Subject FW: Revised set of fuels

FYI

From: Robert Mason [mailto:Robert.Mason@swri.org]
Sent: Thursday, August 28, 2008 11:43 AM
To: 'UIHLEIN, JAMES P'
Subject: Revised set of fuels

Jim,

See my answers to your questions below.

Bob

From: UIHLEIN, JAMES P [mailto:JUIH@chevron.com]
Sent: Wednesday, August 27, 2008 3:43 PM
To: Robert Mason
Subject: RE: Revised set of fuels

Thanks! A question and a request:

Is the difference between G-efficiencies of 64 and 53 substantial? Another way to phrase the question might be: once you're over 50, is it a big deal how much higher you go? Or is it more a case of diminishing returns?

It is useful to have a higher efficiency because this indicates the design is closer to having orthogonal effects. However, the efficiency is connected to the candidate set of fuels being considered so we need to be careful to compare efficiencies of designs that used the same candidate set of fuels in their construction. The value of 50% efficiency is a lower bound by many users on what is acceptable. Increasing to 64% efficiency is a good return, but probably increasing beyond 80% or 90% is not that great of an improvement.

Could you send to me a dump of the results for all fuel pairs evaluated, rather than just the top five? Alternatively, if I give you a set of criteria could you tell me the highest G-efficiency fuel pair that satisfies them?

Attached is an Excel file with a list of all the two-fuel pairs (with g-efficiencies) that we ran for you. I'm not sure what set of criteria that you intend to use so I cannot answer the second part of your question.

One last thing: for the evaluation of a model with an aromatics squared term, I was actually thinking of allowing an intermediate aromatics level for the potential CRC fuels. Do you have any funds left to do something like that?

We do not have any remaining funds to run this set. If we did the work, we would need is to run the new model starting with the 25-fuel matrix, adding the 3 CRC fuels and then adding one or two fuels from a different set of potential candidates (so that they include an intermediate aromatics value). This would essentially be the same effort we just did, but with a different set of candidates.

Thanks,
Jim

CRC Additional TWO Fuels Matrix 8_25_08 G-Eff.xls

Add two fuels to the 28-fuel matrix

Fuel #1					Fuel #2					G-eff
t50	t90	etoh	rvp	aro	t50	t90	etoh	rvp	aro	w/T90^2
150	325	10	10	15	150	325	10	10	40	48.60
150	325	10	10	15	150	325	15	10	15	44.80
150	325	10	10	15	150	325	15	10	40	50.70
[illegible]	325	10	10	15	160	325	10	10	15	44.50
[illegible]	325	10	10	15	160	325	10	10	40	47.00
150	325	10	10	15	160	325	15	10	15	44.30
150	325	10	10	15	160	325	15	10	40	49.00
150	325	10	10	15	160	325	20	7	15	54.90
150	325	10	10	15	160	325	20	7	40	63.90
150	325	10	10	15	160	325	20	10	15	45.70
150	325	10	10	15	160	325	20	10	40	56.20
150	325	10	10	40	150	325	15	10	15	48.20
150	325	10	10	40	150	325	15	10	40	53.10
150	325	10	10	40	160	325	10	10	15	47.90
150	325	10	10	40	160	325	10	10	40	49.60
150	325	10	10	40	160	325	15	10	15	47.80
150	325	10	10	40	160	325	15	10	40	51.80
150	325	10	10	40	160	325	20	7	15	58.40
150	325	10	10	40	160	325	20	7	40	64.10
150	325	10	10	40	160	325	20	10	15	49.30
150	325	10	10	40	160	325	20	10	40	59.10
150	325	15	10	15	150	325	15	10	40	49.60
150	325	15	10	15	160	325	10	10	15	43.40
150	325	15	10	15	160	325	10	10	40	46.00
150	325	15	10	15	160	325	15	10	15	42.80
150	325	15	10	15	160	325	15	10	40	47.50
150	325	15	10	15	160	325	20	7	15	55.10
150	325	15	10	15	160	325	20	7	40	64.10
150	325	15	10	15	160	325	20	10	15	44.10
150	325	15	10	15	160	325	20	10	40	54.30
150	325	15	10	40	160	325	10	10	15	49.50
150	325	15	10	40	160	325	10	10	40	51.20
[illegible]	325	15	10	40	160	325	15	10	15	49.10
150	325	15	10	40	160	325	15	10	40	52.40
150	325	15	10	40	160	325	20	7	15	63.20
150	325	15	10	40	160	325	20	7	40	61.00
150	325	15	10	40	160	325	20	10	15	50.50
150	325	15	10	40	160	325	20	10	40	58.30
160	325	10	10	15	160	325	10	10	40	45.60
160	325	10	10	15	160	325	15	10	15	42.40
160	325	10	10	15	160	325	15	10	40	47.30
160	325	10	10	15	160	325	20	7	15	54.10
160	325	10	10	15	160	325	20	7	40	64.10
160	325	10	10	15	160	325	20	10	15	44.00
160	325	10	10	15	160	325	20	10	40	54.30
160	325	10	10	40	160	325	15	10	15	45.20
160	325	10	10	40	160	325	15	10	40	49.20
160	325	10	10	40	160	325	20	7	15	57.50
160	325	10	10	40	160	325	20	7	40	61.90
160	325	10	10	40	160	325	20	10	15	46.90
160	325	10	10	40	160	325	20	10	40	56.50
160	325	15	10	15	160	325	15	10	40	46.60
160	325	15	10	15	160	325	20	7	15	54.40
160	325	15	10	15	160	325	20	7	40	60.10
160	325	15	10	15	160	325	20	10	15	43.10
160	325	15	10	15	160	325	20	10	40	53.00
160	325	15	10	40	160	325	20	7	15	59.20
160	325	15	10	40	160	325	20	7	40	53.60
160	325	15	10	40	160	325	20	10	15	48.10
160	325	15	10	40	160	325	20	10	40	51.60
[illegible]	325	20	7	15	160	325	20	7	40	54.40
160	325	20	7	15	160	325	20	10	15	54.70
160	325	20	7	15	160	325	20	10	40	54.40
160	325	20	7	40	160	325	20	10	15	53.40
160	325	20	7	40	160	325	20	10	40	49.30
160	325	20	10	15	160	325	20	10	40	50.60

Rafal Sobotowski/AA/USEPA/US
EPA-OAR,OTAQ,ASD
Received Date:
09/15/2008 01:05 PM
Transmission Date:
09/15/2008 01:05:44 PM

To "UIHLEIN, JAMES P" <JUIH@chevron.com>
cc
bcc
Subject RE: FW: Revised set of fuels

OK.....Rafal

Best regards,

Rafal A. Sobotowski
Assessment and Standards Division
U.S. Environmental Protection Agency
2000 Traverwood Drive
Ann Arbor, MI 48105
sobotowski.rafal@epa.gov
734/214-4228 fax 734/214-4050
"UIHLEIN, JAMES P" <JUIH@chevron.com>

"UIHLEIN, JAMES P" <JUIH@chevron.com>
Sent by: "UIHLEIN, JAMES P" <JUIH@chevron.com>
Received Date:
09/15/2008 01:02 PM
Transmission Date:
09/15/2008 01:02:20 PM

To Rafal Sobotowski/AA/USEPA/US@EPA
cc "Robert Mason" <Robert.Mason@swri.org>, "Lawson, Doug" <Doug_Lawson@nrel.gov>, Connie Hart/AA/USEPA/US@EPA, Antonio Fernandez/AA/USEPA/US@EPA, Aron Butler/AA/USEPA/US@EPA, David Hawkins/AA/USEPA/US@EPA, "Chris Tennant" <CTennant@crcao.org>
Subject RE: FW: Revised set of fuels

The preference is for Fuel Pair 1 from "Step 4" in the table. The properties are:

T50	T90	Ethanol	RVP	Aromatics
150	325	10	10	40
160	325	20	7	40

However, Pair 4 is very similar (in fact, the E20 fuel is identical and the E10 fuel differs only in the aromatics content) and produces similar G-Efficiency values. Should the contractor believe that the E10 fuel from Pair 4 would be considerably easier to blend than the E20 fuel from Pair 1, we would be willing to go with Pair 4.

For reference, Pair 4:

T50	T90	Ethanol	RVP	Aromatics
150	325	10	10	15

160 325 20 7 40

Thanks,
Jim

From: Sobotowski.Rafal@epamail.epa.gov [mailto:Sobotowski.Rafal@epamail.epa.gov]
Sent: Monday, September 15, 2008 6:32 AM
To: UIHLEIN, JAMES P
Cc: Robert Mason; Lawson, Doug; Hart.Connie@epamail.epa.gov; Fernandez.Antonio@epamail.epa.gov; Butler.Aron@epamail.epa.gov; Hawkins.David@epamail.epa.gov
Subject: Re: FW: Revised set of fuels

Jim,

Hope you are well.

Please let me know which fuel pair you have selected from the set forwarded to you by Bob Mason (See attachment below).

Best regards,

Rafal A. Sobotowski
Assessment and Standards Division
U.S. Environmental Protection Agency
2000 Traverwood Drive
Ann Arbor, MI 48105
sobotowski.rafal@epa.gov
734/214-4228 fax 734/214-4050

"Robert Mason" <Robert.Mason@swri.org>
Sent by: "Robert Mason" <Robert.Mason@swri.org>

To Rafal Sobotowski/AA/USEPA/US@EPA
cc
Subject FW: Revised set of fuels

Received Date:
08/28/2008 12:33 PM
Transmission Date:
08/28/2008 12:33:07 PM

FYI

From: Robert Mason [mailto:Robert.Mason@swri.org]
Sent: Wednesday, August 27, 2008 2:46 PM
To: 'UIHLEIN, JAMES P'
Subject: Revised set of fuels

Jim,

We have performed steps 1-5 as described below in our proposed work and attached the results in an Excel file. We did not perform step 6 (with the squared aromatics term in the model) because there would be only three fuels at the middle aromatics levels (i.e., 29.5, 24.9, and 22.6), and these are in a narrow region of the space. We believe that the G-efficiency will be very low for any created design using this model.

Bob

From: UIHLEIN, JAMES P [mailto:JUIH@chevron.com]
Sent: Thursday, August 21, 2008 10:22 AM
To: Robert Mason
Subject: RE: Description of Proposed Work

Looks good.

Thanks,
Jim

From: Robert Mason [mailto:Robert.Mason@swri.org]
Sent: Thursday, August 21, 2008 6:33 AM
To: UIHLEIN, JAMES P
Subject: Description of Proposed Work

Jim,

Below is the revised description of the proposed work for you. Please review it and let me know if it is correct.

Bob

Proposed Work for Uihlein

1. The response surface model will have the same form as the one used in developing EPA's revised 25-fuel matrix (i.e., August 2008 version), but will also include a squared term for T90.

2. Three fuels will be added to the EPA's revised 25-fuel matrix to obtain a 28-fuel matrix, and the G-efficiency of this design will be determined. The 3 additional fuels will have the following properties.

Fuel 1	Fuel 2	Fuel 3	
T50	215	202	195
T90	325	325	325
ETOH	0	9.5	14.5
RVP	9	9	9
ARO	29.5	24.9	22.6

3. The above 28 fuels will be forced into the model described in Step 1 above, and then a single additional fuel will be selected that maximizes the G-efficiency of the design. The candidate fuels for the additional fuel will be restricted to the following two regions.

Region 1:

T50, ETOH	(150, 10) (150, 15) (160, 10) (160, 15)	
T90	300, 325, 340	
RVP	10	
	ARO	15, 40

Region 2:

T50, ETOH	(160, 20)	
T90	300, 325, 340	
RVP	7, 10	
	ARO	15, 40

Taken together there are 4x3x1x2=24 candidate fuels in Region 1 and 1x3x2x2=12 candidate fuels in Region 2 for a total of 36 candidate fuels.

4. A second model will be fit using the same criteria as given in Step 3 above, but selecting two additional fuels (rather than one additional fuel) to yield a 30-fuel matrix. This will be determined by selecting the best pair of fuels to add to the 28-fuel matrix.

5. We will provide a copy of the three resulting designs to you, but no written report. This will include a listing of the chosen fuels and the G-efficiency of the corresponding design for the 28-fuel, 29-fuel, and 30-fuel matrices using the model described in Step 1. In addition, the G-efficiency of these same three fuel matrices will be determined for the original response surface model (i.e., without the squared T90 term).

6. If funds are available at the end of this study, we will repeat the above steps using a model that also contains a squared Aromatics term.

CRC Additional TWO Fuels Matrix 8_25_08 G-Eff.xls

Add two fuels to the 28-fuel matrix

Fuel #1					Fuel #2					G-eff
t50	t90	etoh	rvp	aro	t50	t90	etoh	rvp	aro	w/T90^2
150	325	10	10	40	160	325	20	7	15	58.40
160	325	10	10	40	160	325	20	7	15	57.50
150	325	10	10	15	160	325	20	7	15	54.90
160	325	20	7	15	160	325	20	10	15	54.70
160	325	10	10	15	160	325	20	7	15	54.10
150	325	10	10	40	160	325	10	10	40	49.60
150	325	10	10	40	160	325	20	10	15	49.30
150	325	10	10	15	150	325	10	10	40	48.60
150	325	10	10	40	160	325	10	10	15	47.90
150	325	10	10	15	160	325	10	10	40	47.00
160	325	10	10	40	160	325	20	10	15	46.90
150	325	10	10	15	160	325	20	10	15	45.70
160	325	10	10	15	160	325	10	10	40	45.60
150	325	10	10	15	160	325	10	10	15	44.50
160	325	10	10	15	160	325	20	10	15	44.00
160	325	20	7	15	160	325	20	7	40	54.40
160	325	20	7	15	160	325	20	10	40	54.40
150	325	10	10	15	160	325	20	7	40	63.90
150	325	10	10	15	160	325	20	10	40	56.20
150	325	10	10	40	160	325	20	7	40	64.10
150	325	10	10	40	160	325	20	10	40	59.10
160	325	10	10	15	160	325	20	7	40	64.10
160	325	10	10	15	160	325	20	10	40	54.30
160	325	10	10	40	160	325	20	7	40	61.90
160	325	10	10	40	160	325	20	10	40	56.50
160	325	20	10	15	160	325	20	10	40	50.60
150	325	15	10	15	160	325	10	10	15	43.40
150	325	15	10	15	160	325	10	10	40	46.00
150	325	15	10	40	160	325	10	10	15	49.50
150	325	15	10	40	160	325	10	10	40	51.20
150	325	15	10	15	150	325	15	10	40	49.60
150	325	15	10	15	160	325	15	10	15	42.80
150	325	15	10	15	160	325	15	10	40	47.50
150	325	15	10	40	160	325	15	10	15	49.10

150	325	15	10	40
160	325	15	10	15
150	325	15	10	15
150	325	15	10	15
150	325	15	10	15
150	325	15	10	15
150	325	15	10	40
150	325	15	10	40
150	325	15	10	40
150	325	15	10	40
160	325	15	10	15
160	325	15	10	15
160	325	15	10	15
160	325	15	10	15
160	325	15	10	40
160	325	15	10	40
160	325	15	10	40
160	325	15	10	40

160	325	15	10	40	52.40
160	325	15	10	40	46.60
160	325	20	7	15	55.10
160	325	20	7	40	64.10
160	325	20	10	15	44.10
160	325	20	10	40	54.30
160	325	20	7	15	63.20
160	325	20	7	40	61.00
160	325	20	10	15	50.50
160	325	20	10	40	58.30
160	325	20	7	15	54.40
160	325	20	7	40	60.10
160	325	20	10	15	43.10
160	325	20	10	40	53.00
160	325	20	7	15	59.20
160	325	20	7	40	53.60
160	325	20	10	15	48.10
160	325	20	10	40	51.60

150	325	10	10	15
150	325	10	10	15
150	325	10	10	15
150	325	10	10	15
150	325	10	10	40
150	325	10	10	40
150	325	10	10	40
150	325	10	10	40
160	325	10	10	15
160	325	10	10	15
160	325	10	10	40
160	325	10	10	40
160	325	20	7	40
160	325	20	7	40

150	325	15	10	15	44.80
150	325	15	10	40	50.70
160	325	15	10	15	44.30
160	325	15	10	40	49.00
150	325	15	10	15	48.20
150	325	15	10	40	53.10
160	325	15	10	15	47.80
160	325	15	10	40	51.80
160	325	15	10	15	42.40
160	325	15	10	40	47.30
160	325	15	10	15	45.20
160	325	15	10	40	49.20
160	325	20	10	15	53.40
160	325	20	10	40	49.30

Rafal Sobotowski/AA/USEPA/US
EPA-OAR,OTAQ,ASD

Received Date:
08/01/2008 04:21 PM
Transmission Date:
08/01/2008 04:21:44 PM

To "Lawson, Doug" <Doug_Lawson@nrel.gov>
cc "Przesmitzki, Steve" <Steve_Przesmitzki@nrel.gov>, Connie Hart/AA/USEPA/US@EPA, Antonio Fernandez/AA/USEPA/US@EPA, Christine
bcc
Subject Updated EPAct Fuel Matrix

Doug,

As you know, the blending of the first E15 fuel in the EPAct Program has caused a multitude of problems associated with the effect of ethanol on the shape of the distillation curve in the vicinity of T50. It took us nearly two months to prepare the bulk blend of this fuel from the time the hand blend was approved. Based on this experience and on communications with members of the ASTM Subcommittee D02.08.0A on Distillation, including the manufacturers of automatic distillation stills, we have concluded that the EPAct fuel matrix should be redesigned to make it more robust and easier to develop.

The EPAct fuel matrix was subsequently redesigned by SWRI statistician, Bob Mason. The attached Excel file shows both the previous and the updated versions of the matrix.

The total number of fuels (25) was retained in the updated version. The E0 and E10 fuels have not changed, however the matrix now includes six E20 fuels (in place of four) and three E15 fuels (in place of five). Four of the six E20 fuels and one of the three E15 have been retained the previous version of the matrix. Only four of the 25 fuels have changed and the G-efficiency of the matrix is as high as before.

The reduced number of E15 will enable timely completion of the fuel blending program by reducing the number of fuels which are the most difficult to formulate and blend in bulk. Consequently, we recommend that the updated version of the EPAct fuel matrix be implemented for use in Phase 3 of the program.

Please review the updated version of the EPAct fuel matrix with your sponsors and let us know if the DOE side concurs with our recommendation.

Designs of Feb and Aug 2008 EPAct Fuel Matrices.xls

Best regards,

Rafal A. Sobotowski
Assessment and Standards Division
U.S. Environmental Protection Agency
2000 Traverwood Drive
Ann Arbor, MI 48105
sobotowski.rafal@epa.gov
734/214-4228 fax 734/214-4050

Feb. 15, 2008 EPAct Fuel Matrix Design

Model: T50,T90,ETOH,RVP, ARO
T50^2, ETOH^2, ETOH*T50, ETOH*T90, ETOH*RVP, ETOH*ARO

trial	t50	t90	etoh	rvp	aro			
1	150	300	10	10	15	original		
2	240	350	0	10	15	original		
3	220	300	10	7	15	original		
4	220	350	10	10	15	original		
5	240	300	0	7	40	original		
6	190	350	10	7	15	original		
7	190	300	0	7	15	original		
8	220	300	0	10	15	original		
9	190	350	0	10	40	original		
10	220	350	10	7	40	original		
11	190	300	10	10	40	original		
12	150	350	10	10	40	original		
13	220	350	0	7	40	original		
14	190	350	0	7	15	original		
15	190	300	0	10	40	original		
16	220	300	10	7	40	original	G-eff=72.6%	n=16
18	160	300	20	7	40	augment		
19	160	300	20	10	15	augment		
21	160	350	20	10	40	augment		
22	160	350	20	7	15	augment		
23	150	350	15	10	15	augment		
24	150	300	15	10	40	augment		
25	190	300	15	7	40	augment		
26	190	350	15	10	40	augment		
27	190	300	15	10	15	augment	G-eff=68.1	n=25

Aug. 1, 2008 EPAct Fuel Matrix Design

Model: T50,T90,ETOH,RVP, ARO
T50^2, ETOH^2, ETOH*T50, ETOH*T90, ETOH*RVP, ETOH*ARO

trial	t50	t90	etoh	rvp	aro			
1	150	300	10	10	15	original		
2	240	340	0	10	15	original		
3	220	300	10	7	15	original		
4	220	340	10	10	15	original		
5	240	300	0	7	40	original		
6	190	340	10	7	15	original		
7	190	300	0	7	15	original		
8	220	300	0	10	15	original		
9	190	340	0	10	40	original		
10	220	340	10	7	40	original		
11	190	300	10	10	40	original		
12	150	340	10	10	40	original		
13	220	340	0	7	40	original		
14	190	340	0	7	15	original		
15	190	300	0	10	40	original		
16	220	300	10	7	40	original	G-eff=72.6%	n=16
17	160	300	20	7	15	augment		
18	160	300	20	7	40	augment		
19	160	300	20	10	15	augment		
20	160	340	20	7	15	augment		
21	160	340	20	10	15	augment		
22	160	340	20	10	40	augment	G-eff=68.3%	n=22
23	150	340	15	10	40	augment		
24	190	340	15	7	15	augment		
25	190	300	15	7	40	augment	G-eff=68.7%	n=25