



Mercedes-Benz



Biodiesel 2014: FAME and Misfortune?

William Woebkenberg - US Fuels Technical and Regulatory Affairs

Mercedes-Benz Research & Development North America

July 10, 2014



Mercedes-Benz

Daimler and Diesel: A Tradition over 75 Years in the Making

Diesel passenger cars are a part of the Daimler heritage dating back to 1936, with the introduction of the 260D.

There have been Mercedes-Benz diesel passenger cars in every decade since.

Diesel is not just a powertrain option, it is tradition.





Daimler Supports US National B5 Blend

Diesel fuels

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Main Grade	B5 (5 %v/v max for reliable vehicle operation)										
Ext. Main Grade	B5 + X; X additional HVO or BTL 5% up to 15% depending on availability										



B6-B20: A Drop-in Fuel?



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Not Every OEM Agrees...



For Cummins engines in Ram trucks, B20 may be used in municipal, government and commercial fleets only. This applies to selected model-year vehicles. Please consult an authorized Ram service center for specific requirements and approved vehicle models.



Cummins Inc.
Box 3005
Columbus, IN 47202-3005
U.S.A.

Phone: 1-800-DIESELS™ (1-800-343-7357)
Fax: 1-800-232-6303
Internet: cumminsengines.com

[Twitter.com/CumminsEngines](https://twitter.com/CumminsEngines)
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Bulletin 4071136 Printed in U.S.A. Rev. 7/12
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Not Every OEM Agrees...



Oil Change Interval	10,000 miles (\leq B5 diesel fuel), 8,000 miles (B6 \rightarrow B20 diesel fuel)
Additional features include: <ul style="list-style-type: none">• Chain-driven Dual Overhead Cam (DOHC) valvetrain with roller followers and hydraulic adjusters• Oil jet cooled pistons• Swirl intake ports• Water-cooled Exhaust Gas Recirculation (EGR) with integral bypass valve• Engine oil cooler	



DISCLAIMERS

For Training Purposes Only: All product information is current at the time of production approval, April 2013. All product information is subject to change.

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Not Every OEM Agrees...



Volkswagen of America, Inc.
3800 Hamlin Road
Auburn Hills, MI 48326

<MONTH YEAR>

<CUSTOMER NAME>
<CUSTOMER ADDRESS>

<CUSTOMER CITY STATE ZIPCODE>

Vehicle Identification Number (VIN): <VIN>

Subject: 2009-2013 Model Year Volkswagen TDI® Clean Diesel Vehicles Registered in Illinois
Using Biodiesel Blend Fuels

Dear Volkswagen TDI Clean Diesel Owner,

As a valued Volkswagen customer, your satisfaction is our utmost priority. Because we support the development and use of renewable fuels (such as biodiesel fuel blends) we are writing to customers who have Volkswagen TDI® Clean Diesel engine vehicles registered in the State of Illinois in order to share some important information about using biodiesel fuel blends in these vehicles.

What is biodiesel?

Biodiesel is a domestically produced, clean-burning and renewable partial substitute for conventional (petroleum) diesel fuel.

Why is it important for me to know about biodiesel fuel blends?

Your vehicle was originally designed to run on "ULSD" - Ultra Low Sulfur Diesel No. 2 - fuel that complies with ASTM D-075 specifications and permits up to a maximum blend of 5% biodiesel (B5).

Due to Illinois state tax incentives for biofuels, biodiesel blends of B5 or less may not be available in Illinois. *However, we want to assure you that Volkswagen will continue to honor the terms and conditions of the Volkswagen Limited Warranties that came with your vehicle.*

Biodiesel blends (up to B20) may be used in your Illinois-registered TDI® Clean Diesel vehicle; however please be aware that biodiesel has characteristics that are different from other kinds of fuel, especially petroleum-based fuels.

How does biodiesel differ from ULSD diesel fuel?

Biodiesel can attract water and also deteriorate with age. Small amounts of biodiesel can get into the engine oil, but unlike petroleum diesel, it does not evaporate over time. This can cause the oil level in the engine to rise and can affect the quality of the oil.

When I use biodiesel blends in my Illinois-registered Volkswagen TDI® Clean Diesel vehicle, what should I remember?

- Routinely check the engine oil level. A good time to do this is when you refuel, especially if you regularly do a lot of short distance or stop-and-go driving. This will help you see if the engine oil level is getting **higher**. (A rising oil level beyond the maximum indicator means an oil change is needed due to the dilution of the oil in the system; a potential characteristic of biodiesel use.) See your Owner's Manual for additional information on checking the engine oil level in your vehicle.
- If you ever notice that the engine oil level has risen or is above the maximum indicator, contact your authorized Volkswagen dealer or Volkswagen Customer CARE to schedule an oil change - regardless of the time or mileage that has elapsed since you last had an oil change performed.
- Continue to follow the oil change intervals found in the maintenance booklet that came with your vehicle, and use only engine oil that expressly complies with Volkswagen quality standard VW 507 00.
- Refuel only at trusted, commercial fueling stations that are located near main highways. These stations are more likely to have "fresh" biodiesel fuels that have not aged significantly.
- When your vehicle will be in storage (or not driven) for several weeks or months, please completely fill the fuel tank. If possible, fill the tank with Ultra Low Sulfur Diesel fuel (ASTM D975 standard Grade No. 2 D S15).

Can we assist you further?

If you have additional questions about your Illinois-registered TDI® Clean Diesel vehicle, please call or write to us at:

Volkswagen of America, Inc.
Attn: Customer CARE
3800 Hamlin Road, Auburn Hills, MI 48326
1-800-444-8962

Please keep this letter with your Warranty booklet for future reference, and deliver it to any new owner, along with the owner's manual.

We hope you are enjoying the exceptional performance and fuel economy of your TDI® Clean Diesel vehicle, and we wish you many more miles of driving pleasure. Thank you for driving a Volkswagen!


Sincerely,

Volkswagen Service & Quality



Mercedes-Benz

Worldwide OEMs Desire B5...



Fifth Edition

WORLDWIDE FUEL CHARTER

SEPTEMBER 2013

ACEA
European Automobile
Manufacturers Association
Avenue des Nerviens 55
B-1040 Brussels, Belgium
Tel: +32 2 732 55 50
Fax: +32 2 732 73 10
www.acea.be

ALLIANCE
Alliance of
Automobile Manufacturers
803 7th Street, N.W., Suite 300
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Tel: +1 (202) 336-5500
Fax: +1 (202) 336-5547
www.alliance.org

EMA
Truck and Engine
Manufacturers Association
333 West Wacker Drive, Suite 810
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Tel: +1 (312) 926-1970
Fax: +1 (312) 926-1975
www.truckandenginemanufacturers.org

JAMA
Japan Automobile
Manufacturers Association
Jidoka Kaikan
1-30, Shiba Daimon 1-Chome
Minato-ku, Tokyo 105-0012 Japan
Tel: +81-3-5405-6125
Fax: +81-3-5405-6136
www.jipma.or.jp

For copies, please contact ACEA, Alliance, EMA or JAMA or visit their websites.

CATEGORY 4 DIESEL FUEL

Markets with advanced requirements for emission control. Enables sophisticated NOx and PM after-treatment technologies.

PROPERTIES	UNITS	LIMIT	
		Min.	Max.
Cetane Number		55.0	
Cetane Index ⁽¹⁾		55.0 (52.0) ⁽¹⁾	
Density @ 15°C	kg/m ³	820 ⁽²⁾	840
Viscosity @ 40°C	mm ² /s	2.0 ⁽³⁾	4.0
Sulphur	mg/kg ⁽⁴⁾		10
Trace metal ⁽⁵⁾	mg/kg		1 or non-detectable, whichever is lower
Total aromatics	% m/m		15
PAH (di+, tri+)	% m/m		2.0
T90 ⁽⁶⁾	°C		320
T95 ⁽⁶⁾	°C		340
Final Boiling Point	°C		350
Flash point	°C	55	--
Carbon residue	% m/m		0.20
CFPP or LTFT or CP ⁽⁷⁾	°C		Equal to or lower than the lowest expected ambient temperature
Water	mg/kg		200
Oxidation Stability			
Method 1	g/m ³		25
Method 2a (Rancimat, modified) ⁽⁸⁾ , or	hours	35	
Method 2b (Delta TAN) ⁽⁸⁾ , or	mg KOH/g		0.12
Method 2c (PetroOxy) ⁽⁸⁾	minutes	65	
Foam volume	ml		100
Foam vanishing time	sec.		15
Biological growth ⁽⁹⁾			no growth
FAME ⁽¹⁰⁾	% v/v		5 ⁽¹⁰⁾ ←
Other biofuels ⁽¹¹⁾	% v/v		⁽¹¹⁾
Ethanol/Methanol	% v/v		Non-detectable ⁽¹²⁾
Total acid number	mg KOH/g		0.08
Excess corrosion			Light rusting

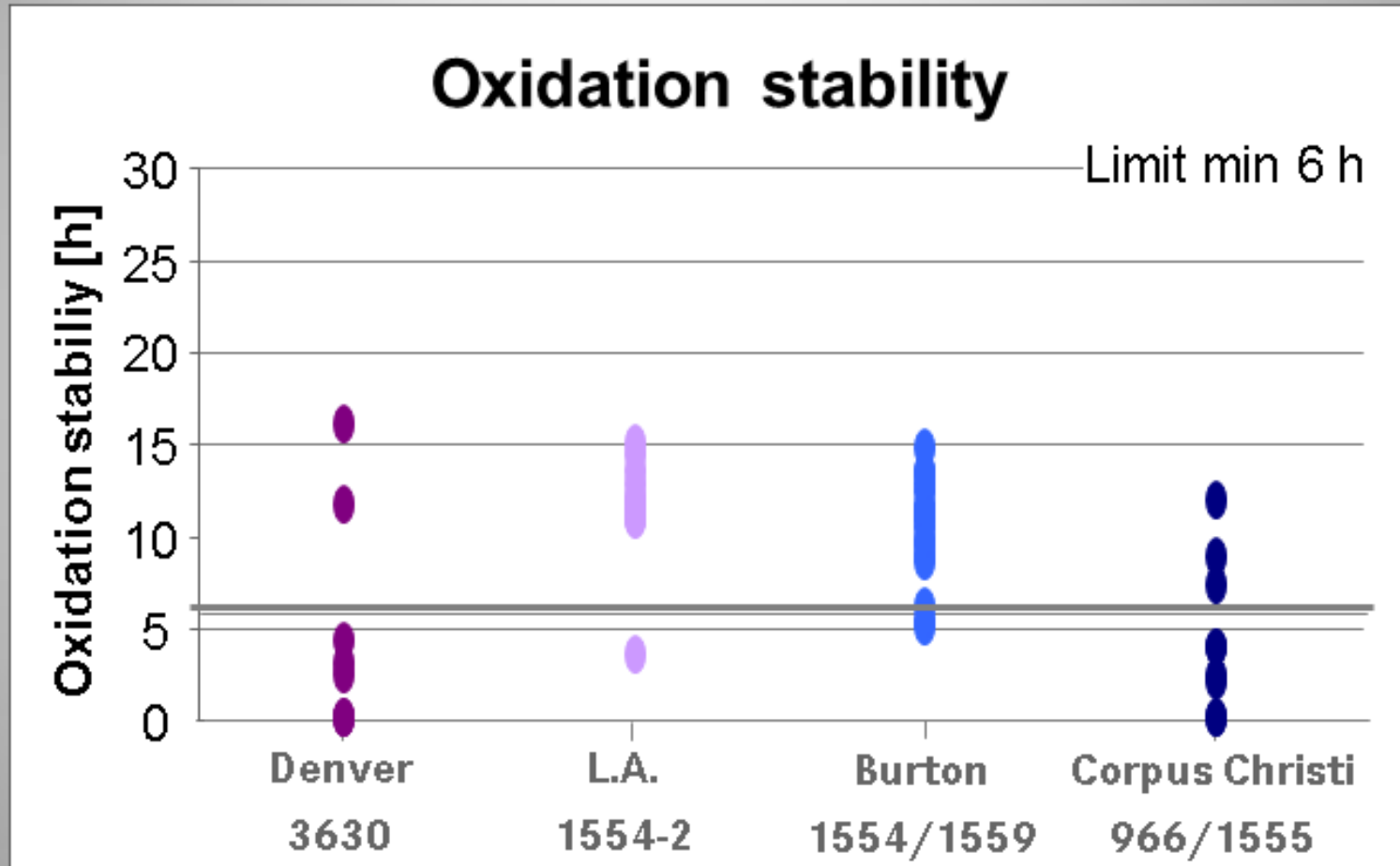


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Poor Retail Fuel Quality



In 2011, Mercedes-Benz Found B6-B20 Oxidation Stability Issues in US...





GM Has Determined Things Haven't Changed Much Since...



Review of 2013 U.S. Retail Biodiesel Blends Quality Survey

2014-01-1379

Published 04/01/2014

Shailesh Martin Lopes and Pat Geng

General Motors Co.

Anke Konzack

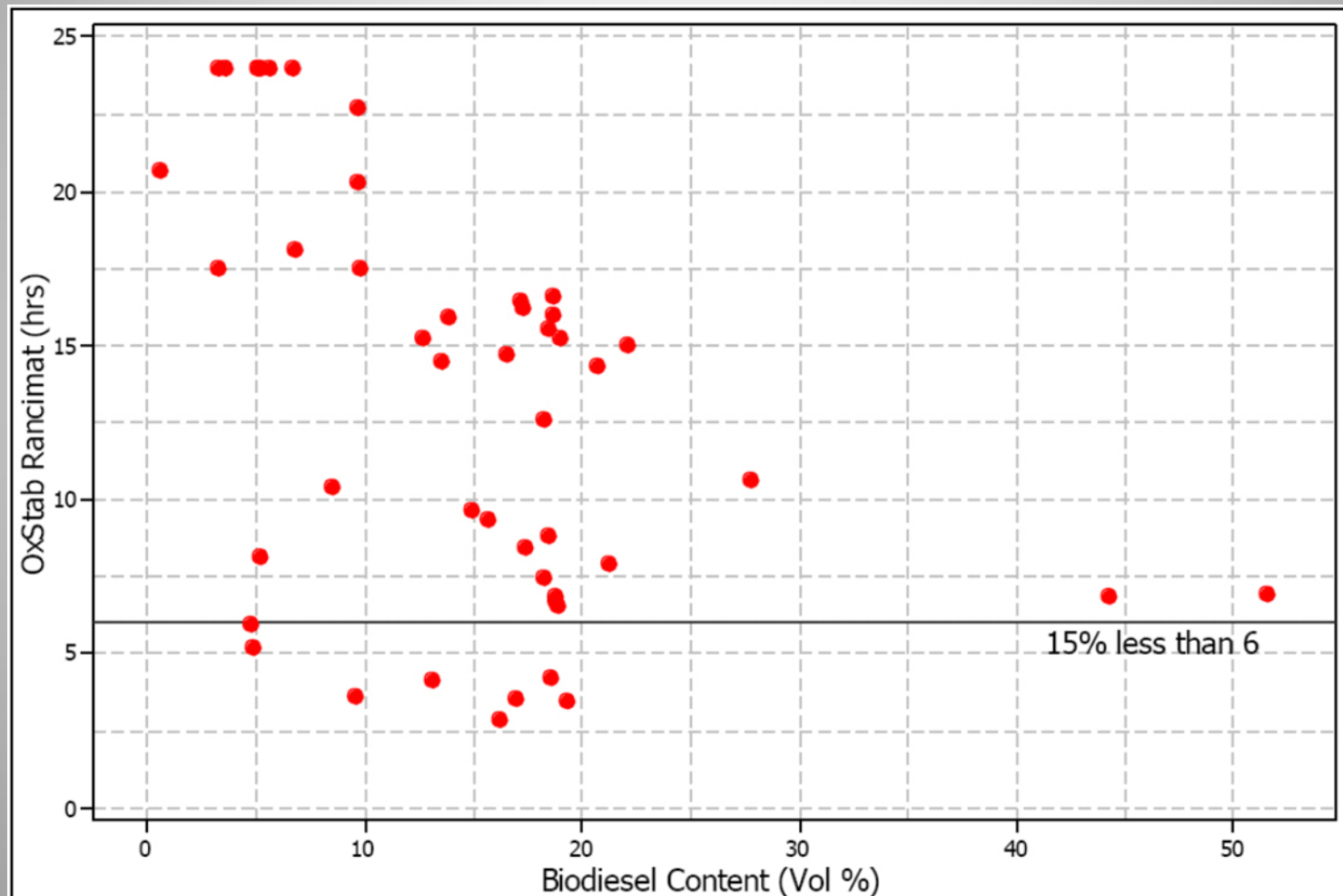
SGS

CITATION: Lopes, S., Geng, P., and Konzack, A., "Review of 2013 U.S. Retail Biodiesel Blends Quality Survey," SAE Technical Paper 2014-01-1379, 2014, doi:10.4271/2014-01-1379.

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15% of Retail Fuel Sampled has Out-of-Spec Oxidation Stability!





GM Conclusion in SAE Paper on Biodiesel Stability:

“Overall, the results for 2013 U.S. biodiesel blend samples were consistent with previously published surveys and showed that **biodiesel fuel stability remains a concerns from OEMs and end users perspective.**”



What this means to your vehicle:

- With higher Biodiesel content, the risk of micro-organism growth increases due to less chemical stability and higher water solubility in Biodiesel
- Depending on the type of micro-organisms, acids or bacteria sludge is formed
- This can lead to heavy corrosion or filter / component plugging





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Fuel Filter Clogging due to Effects of Biodiesel Blends >B5





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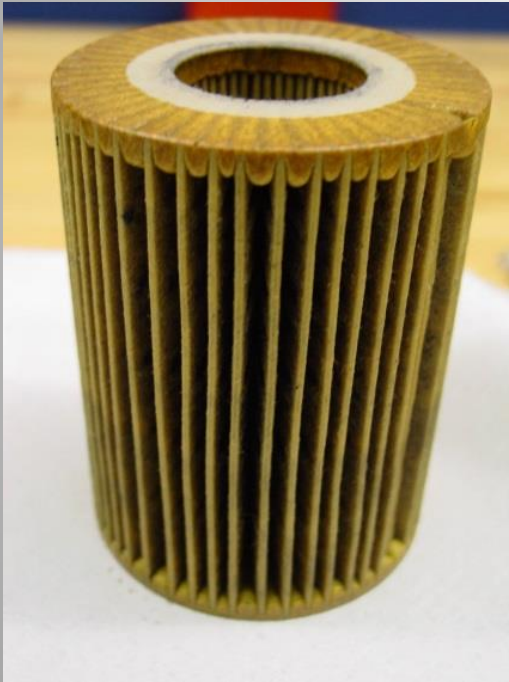
Deposit Formation in the High Pressure Fuel Pump due to Degraded Biodiesel Causes Low Power, Stalling





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Oil Filters Can Clog with Deposits due to Biodiesel Degradation



New



10K miles

Biodiesel \leq B5

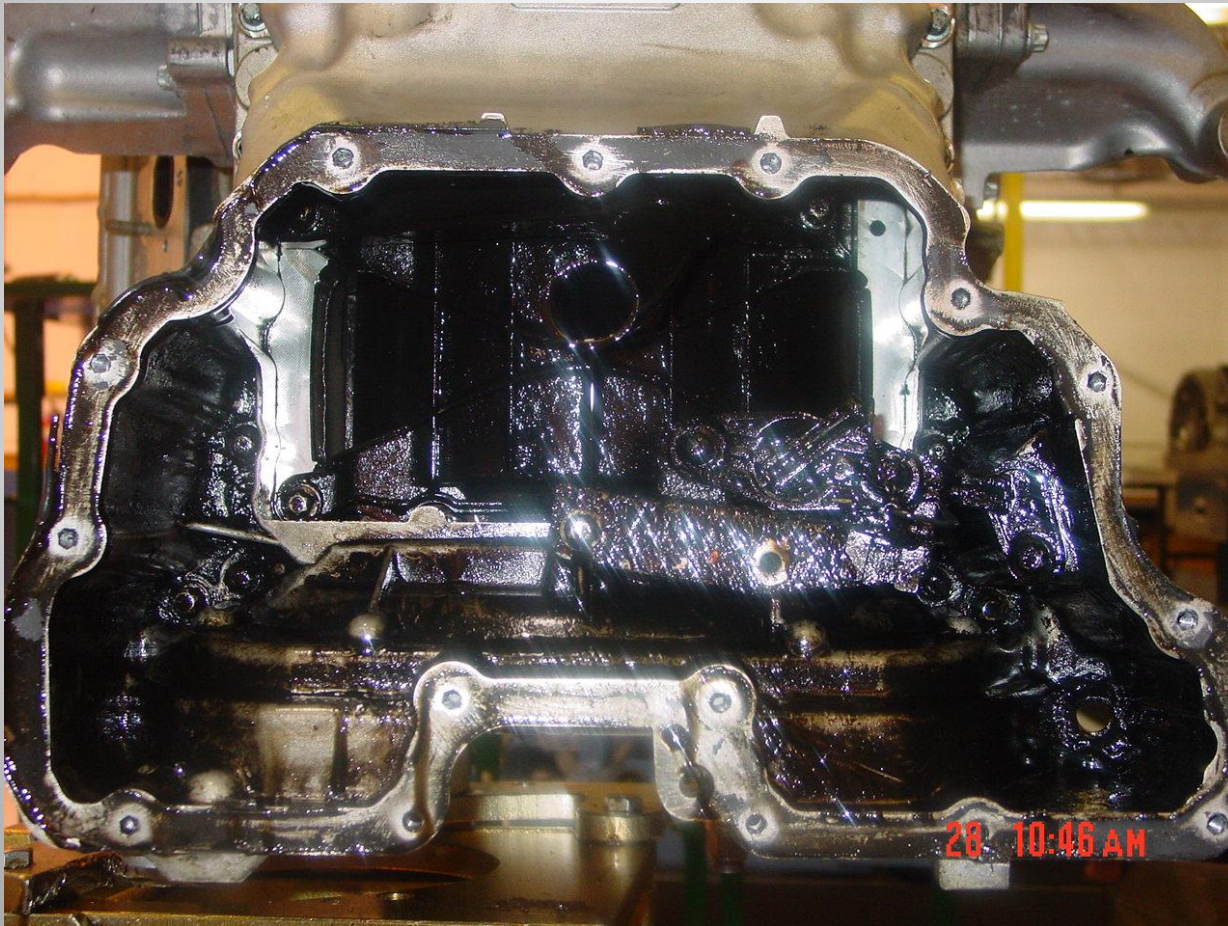


9K miles

Biodiesel $>$ B5



Oil Sludging and Engine Failure Due to Biodiesel Contamination in Engine Oil





HC, CO, Particulates Down
But....



ARB Says NOx Gets Worse with Higher Blends...

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Thursday, July 10, 2014 **KEY ISSUES:** Selenium CWA Jurisdiction ESPS FY15 Budget

Inside Cal/EPA - 12/13/2013

ARB Delays New Biodiesel Rules To Address South Coast NOx Concerns

Posted: December 12, 2013

State air board officials this week postponed until March the possible adoption of new rules for biodiesel and other "alternative diesel" fuel blends, in order to consider last-minute concerns raised by South Coast air district officials that the rules could increase nitrogen oxide (NOx) emissions in the region, according to sources. Board officials also want to further discuss regional compliance approaches to the rules, sources say.

The potential changes to the rules to address the South Coast concerns could trigger a backlash from the biodiesel industry, which has argued that the fuel does not generate higher NOx emissions than conventional diesel fuel.

How California regulates biodiesel and renewable diesel fuel is being closely tracked by numerous stakeholders, including engine makers, biofuel producers, the oil industry and environmentalists, in part because it will affect greenhouse gas (GHG) and other pollutant emission reductions, and will influence how companies comply with the state's low-carbon fuel standard (LCFS) and federal renewable fuel standard (RFS).



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No Choice?



Legally Required Misfueling... Minnesota B10 Mandate Removes Customer Choice



- Effective July 1- September 30 this year.
- April 1-September 30 starting 2015
- B20 mandate slated for 2018

“A lot of other states are watching Minnesota to see if the move to B10 would happen. They’re thinking that if it we can do it, they can, too.” — Ron Marr, biodiesel marketing director for Minnesota Soybean Processors



The takeaway...

- Biodiesel standards require significant improvement in oxidation stability and purity to increase the quality of higher biodiesel blends. The fuel standards have to be valid for the point of sale
- Higher biodiesel blends require the introduction of a satisfactory quality management system to avoid the sale of low quality fuels
- Higher biodiesel blends require customer interaction such as increased service frequency and cost when higher biodiesel blends are utilized
- OEMs have stated in WorldWide Fuel Charter and other forums that FAME is not a desirable component in transport diesel fuel in blends greater than 5%
- Mandates force customers to misfuel vehicles against manufacturer recommendations
- Increasing NOx emissions result from increasing biodiesel blends



The solutions...

- US retail quality biodiesel quality on par with EU
- ASTM fuel standards equivalent to EN specifications in EU
- National B5 blend standard to ensure quality

High quality HVO or 2nd generation BTL are sensible alternatives to biodiesel



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Waste Not, Want Not: E20 Vehicle Test Program with Clariant and Haltermann

William Woebkenberg - US Fuels Technical and Regulatory Affairs

Mercedes-Benz Research & Development North America



Position of Daimler concerning Biofuels

Gasoline fuel

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Main Grade	E10							E20/E25			
Protection Grade (legacy fleet)	E10							E10			

All current series-production gasoline vehicles of Mercedes-Benz are already applicable for E20/E25, under the precondition that an adequate fuel quality is available based on an adequate fuel standard.

An adequate share of E20/E25 capable vehicles in the legacy fleet is expected not before 2017.

Midblend ethanol fuel **should not contain more than 20-25 %v/v ethanol** as this offers the best compromise in terms of fuel economy and high octane possibility.



Mercedes-Benz fueled by petrol made from agricultural waste

Press Information

Waste not, want not

29. January 2014

Stuttgart – The vision of extracting fuels from renewable resources is getting closer: Mercedes-Benz is collaborating with speciality chemical companies Clariant and Haltermann to bring second generation bioethanol in a fleet test on the road.

The pilot project fills tanks with a new biofuel: sunliquid20 is super-grade fuel with 20 percent cellulosic ethanol. Special attribute: The fuel is produced using agricultural waste such as straw. For the next twelve months the vehicles of the Mercedes-Benz test fleet can be refilled with the new fuel at an internal petrol station in Stuttgart-Untertürkheim which was put up especially for this project. With an octane rating (RON) of more than 100, the fuel guarantees a high level of efficiency.



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Mercedes-Benz, Clariant and Haltermann to Test E20 Fuel in Vehicle Fleet



Creates high quality cellulosic ethanol from
agriculture waste such
as wheat straw



Blends ethanol with petroleum base for test
fuel

Sunliquid20

100

MINIMUM OCTANE
RESEARCH METHOD



Mercedes-Benz BlueDIRECT Engines: The Future is NOW.

“Petrol with 20 percent ethanol can already be used in our latest Mercedes-Benz BlueDIRECT petrol engines. This offers ideal potential for best efficiency and high greenhouse gas savings.”

Peter Lueckert – Daimler AG Director for Engines, Powertrains and Fuel Injection



Something from Nothing...

**“The production of cellulosic ethanol is virtually CO₂-neutral,
saving almost 100% of CO₂ emissions when compared to
gasoline.”**

Jim Lane — Editor, Biofuelsdigest.com



Mercedes-Benz: Leading Through Innovation.

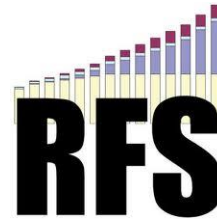
“Our main task is to shape solutions for sustainable mobility of the future. We see great potential in second generation biofuels with regards to sustainability and reduction of greenhouse gases.”

Peter Lueckert – Daimler AG Director for Engines, Powertrains and Fuel Injection



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What about Rules and Regulations?





EPA hints at opportunities for higher ethanol blends in its Tier 3 proposal:

“An alternative certification fuel such as a high-octane... ..ethanol blend for vehicles which [OEMs] might design or optimize for use on such a fuel...”

This could help manufacturers that wish to raise compression ratios to improve efficiency, as a step towards complying with the 2017 and later light duty greenhouse gas and CAFE standards.”

78 Fed. Reg at 29825





EPA rethinks its RFS volume rollback...

February 03, 2014

MCCARTHY: RFS WILL PROMOTE BIOFUELS

Published in [POLITICO Pro Whiteboard](#)

EPA Administrator Gina McCarthy hinted this morning that the agency is considerably revising its proposed 2014 Renewable Fuel Standard to encourage greater production of biofuels.

McCarthy told a gathering of more than 100 people at the National Association of State Departments of Agriculture's winter conference in Reston, Va., this morning that the agency is taking into account concerns from states that the RFS could hurt the fledgling biofuels industry.

"I have heard loud and clear that you don't think we hit that right," McCarthy said. The administration considers biofuels a priority for energy policy and as a result has sought more information for a final rule.

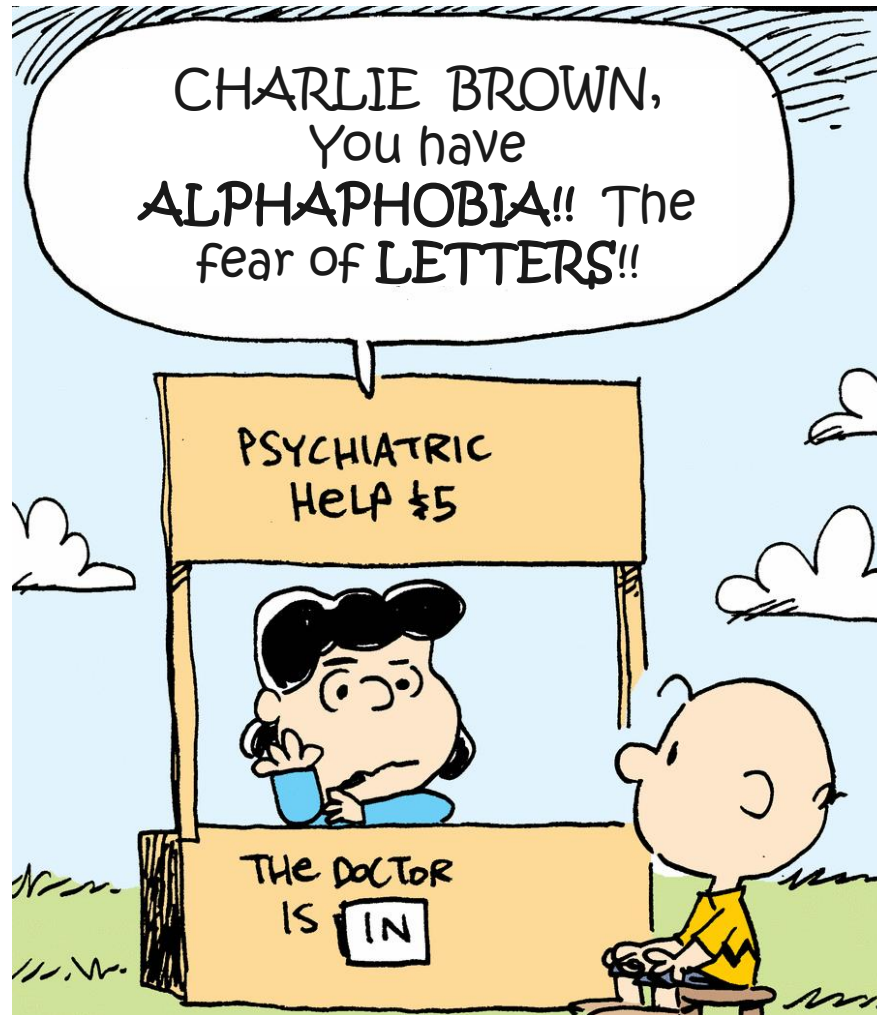
Given all the feedback, the final rule when released will be "in a shape that you will see that we have listened to your comments" and will continue to move the biofuels industry forward, McCarthy said.

[← Return to previous page](#)





Not so fast,
though...





Well, I *am* worried
about certain ones...

E P A...





Clear guidance for future applicability of midblend ethanol fuels will promote the development of vehicles optimized on such fuels



Mercedes-Benz *Leading through Innovation*



For us, firsts are just second nature.



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The best or nothing.