

Blenders, E85, and Fuel Quality Issues

Central Weights and Measures Association
Minneapolis, Minnesota
May 1, 2007

Ronald G. Hayes

Missouri Department of Agriculture

Fuel Quality Program

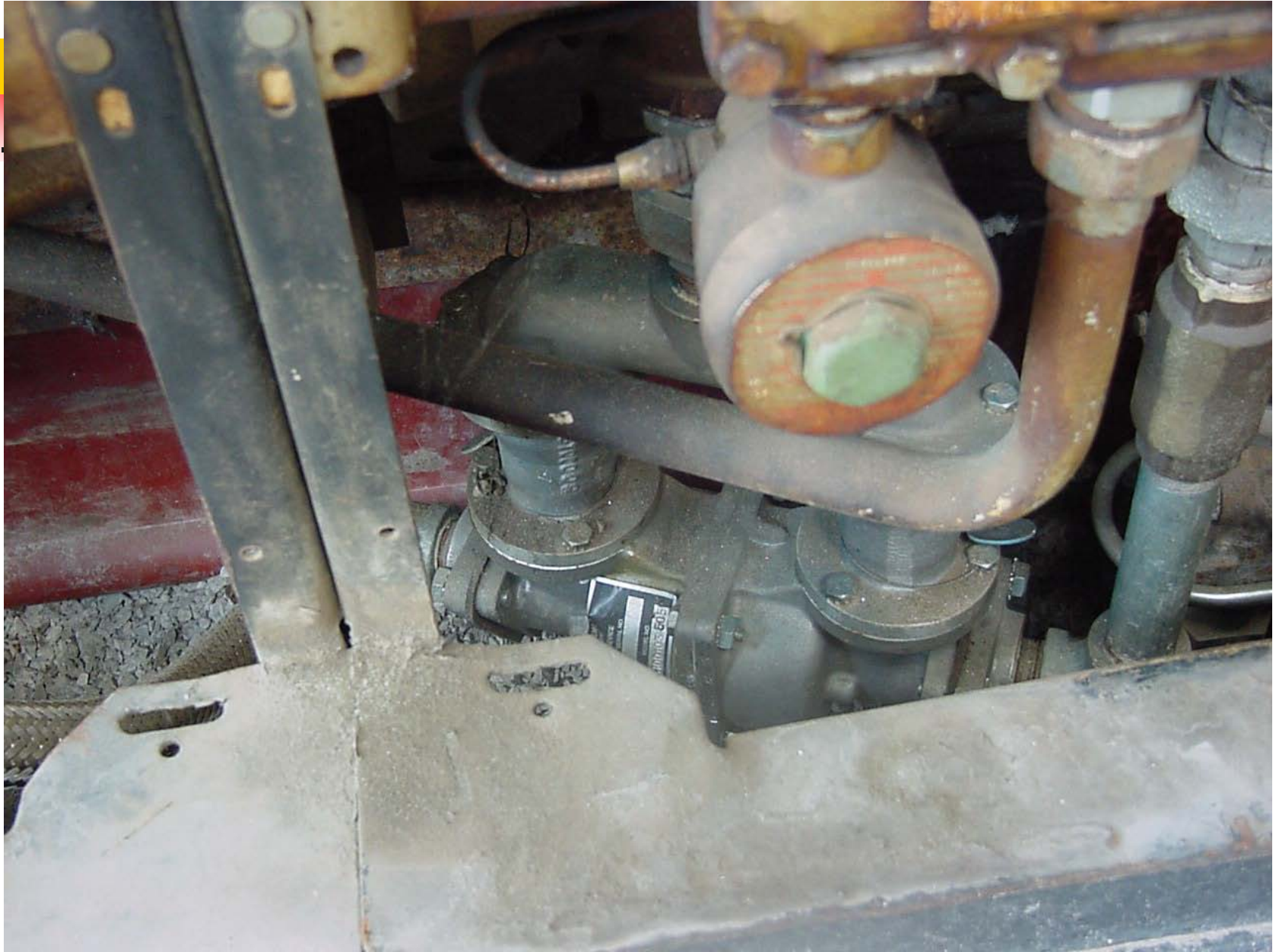




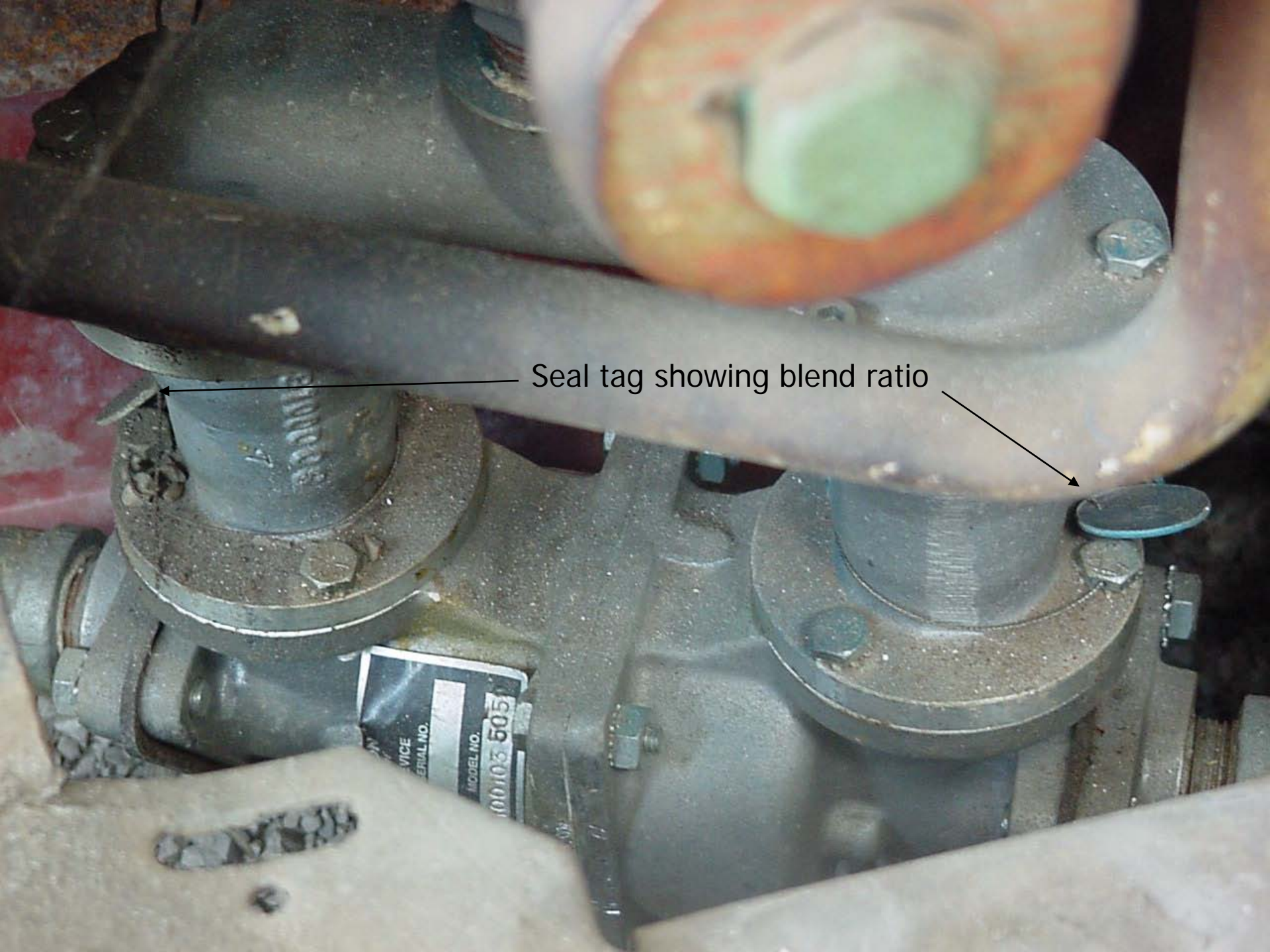
Outline

- Blending dispensers
 - Mechanical
 - Electronic
- E85 dispensers
 - Labeling
 - Issues with blenders
- Other fuel issues

Mechanical Blender



Seal tag showing blend ratio



SERVICE SERIAL NO.
MODEL NO.
100103 5051

WELCOME TO 24/7
THANK YOU FOR CHOOSING
LIFETIME VALUE
THANK YOU

0.00

THIS SALE \$

0.000

GALLONS

27.99

PRICE PER GALLON \$

ALL TAXES INCLUDED

FUEL TAXES

35.4¢

41.4¢

1

INSTRUCTIONS

1

2 Lit
Lever

3 Operate
Handle

4 Return
Nozzle



TURBO OFF ENGINE NO SMOKING

Regular

PRICE PER GALLON \$

27.99

ALL TAXES INCLUDED

Plus

PRICE PER GALLON \$

27.99

ALL TAXES INCLUDED

Premium

PRICE PER GALLON \$

27.99

ALL TAXES INCLUDED

89

93

26 8:34 AM

0.00

THIS SALE \$

0.000

GALLONS

2.799

PRICE PER GALLON \$
ALL TAXES INCLUDED

FUEL TAXES

In Missouri, consumers pay:

35.4¢

for diesel fuel per gallon (18.4¢ Federal & 17¢ Missouri)

41.4¢

for gasoline per gallon (18.4¢ Federal & 17¢ Missouri)

The amount is shown to you on the receipt.
Missouri Fuel Tax Subsidies are
available for certain uses.
Phone: 800-888-7111, www.dnr.mo.gov

Please remember to Buckle Up.

1	2	3	F1
4	5	6	F2
7	8	9	ENTER
CLEAR	0	ENTER	END TOTAL

2-2

Plus

PRICE PER GALLON \$

2.899

ALL TAXES INCLUDED

Premium

PRICE PER GALLON \$

3.049

ALL TAXES INCLUDED

26

8:35 AM

Welcome to Shell
Insert card to start
Use keypad to pay
Press for help

P 0002

THIS SALE \$

0003

GALLONS

0004

PRICE PER GALLON \$
ALL TAXES INCLUDED

1

FUEL TAXES
In Missouri, independent gas
taxes are 35.4¢ per gallon
(28¢ Federal & 7.4¢ Missouri)
and
41.4¢ per gallon of diesel
(24¢ Federal & 17¢ Missouri)
Please remember to Buckle Up!

Regular

PRICE PER GALLON \$

2.169

ALL TAXES INCLUDED

Plus

PRICE PER GALLON \$

50

ALL TAXES INCLUDED

Premium

PRICE PER GALLON \$

01

ALL TAXES INCLUDED

89

26 8:36 AM

NO SMOKING TURN OFF ENGINE

Sale \$

blEnd

Gallons

rAt 105

\$ Price Per Gallon (Including Tax)

0

Regular

50

Plus

100

Premium

1	Blend Ratio Worksheet for Blender Pumps			Business ID#	1234
2	(Enter data in yellow fields only)			Today's Date	5/1/2007
3		Pump Type	electronic	Pump Serial No.	xc2121254ss
4	Pump Number	1	MU posted octane	89	
5	PU posted	93	Regular (87)		Total gals
6	Totalizer Start	1000	Totalizer Start	9000	dispensed
7	Totalizer End	1000.67	Totalizer End	9001.33	(PU+RU)
8	Difference	0.67		1.33	2.00
9	Percent	33.5%		66.5%	

11	Pump Number		MU posted octane	90	
12	Premium		Regular (87)		Total gals
13	Totalizer Start		Totalizer Start		dispensed
14	Totalizer End		Totalizer End		(PU+RU)
15	Difference	0.00		0.00	0.00
16	Percent	#DIV/0!		#DIV/0!	

18	Pump Number		MU posted octane	91	
19	Premium		Regular (87)		Total gals
20	Totalizer Start		Totalizer Start		dispensed
21	Totalizer End		Totalizer End		(PU+RU)
22	Difference	0.00		0.00	0.00
23	Percent	#DIV/0!		#DIV/0!	

24	Minimum Blend Percentages						
25		Posted	PU(94)	PU(93)	PU(92)	PU(91)	PU(90)
26		93	85.7	100.0			
27		92	71.4	83.3	100.0		
28		91	57.1	66.7	80.0	100.0	
29		90	42.8	50.0	60.0	75.0	100.0
30		89	28.6	33.3	40.0	50.0	66.7
31		88	14.3	16.7	20.0	25.0	33.3
32		87	0.0	0.0	0.0	0.0	0.0



Handbook for Handling, Storing, and Dispensing E85



U.S. Department of Energy

**Energy Efficiency
and Renewable Energy**

Bringing you a prosperous future where energy
is clean, abundant, reliable, and affordable.



FTC RULE - § 306.5 Automotive fuel rating.

If you are a refiner, importer, or producer, you must determine the automotive fuel rating of all automotive fuel before you transfer it. You can do that yourself or through a testing lab.

To determine the automotive fuel rating of gasoline, add the research octane number and the motor octane number and divide by two, as explained by the American Society for Testing and Materials ("ASTM") in ASTM D4814-92c, entitled "Standard Specifications for Automotive Spark-Ignition Engine Fuel." To determine the research octane number, use ASTM standard test method D2699-92, and to determine the motor octane number, use ASTM standard test method D2700-92.

To determine automotive fuel ratings for alternative liquid automotive fuels, you must possess a reasonable basis, consisting of competent and reliable evidence, for the **percentage by volume of the principal component of the alternative liquid automotive fuel** that you must disclose. You also must have a reasonable basis, consisting of competent and reliable evidence, for the minimum percentages by volume of other components that you choose to disclose.



Federal Trade Commission

16 CFR Part 306-Automotive Fuel Ratings, Certification, and Posting

- Octane decal – yellow background
 - Used for gasoline
 - Gasoline-Ethanol blends (10% max)
- Alternative Fuel rating decal – Orange background
 - E85, E80, & E75 – minimum 70% ethanol
- Gray area – $>10\%$ to $<70\%$ ethanol not covered



E-85

MINIMUM

70%

ETHANOL



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

NOV 28 2006

OFFICE OF
AIR AND RADIATION

Ms. Dawna Leitzke
Executive Director
South Dakota Petroleum and Propane Marketers Association/
South Dakota Association of Convenience Stores
P.O. Box 1058
Pierre, South Dakota 57501

Dear Ms. Leitzke:

Thank you for your October 31, 2006, letter concerning the legality of selling ethanol-gasoline blends to motorists at retail outlets.

As you note in your letter, it is legal to sell gasoline containing up to 10 percent ethanol (E10) for use in any gasoline-fueled vehicle in the United States. Gasoline containing more than 10 percent ethanol may only be sold for use in flexible-fueled vehicles (FFVs) that are certified to meet emission standards on E85 (85 percent ethanol and 15 percent gasoline), gasoline without ethanol (E0), and any intermediate combination of gasoline and ethanol. Most vehicles are certified to emission standards for gasoline only, and thus are limited to no more than E10.

You asked for our position on marketers selling ethanol blends other than E10 and E85 through blender pumps for use in FFVs. You also asked if there are any prohibitions under the Clean Air Act or other federal laws that would prohibit a fuel marketer from selling E20 or E30 to consumers for use in FFVs.

With respect to the sale of blends such as E20 and E30 for use in FFVs, such blends are covered under the emissions certification for an E85 FFV, and thus are not prohibited under the Clean Air Act. I am not aware of any federal law that prohibits sale of such blends for use in FFVs.

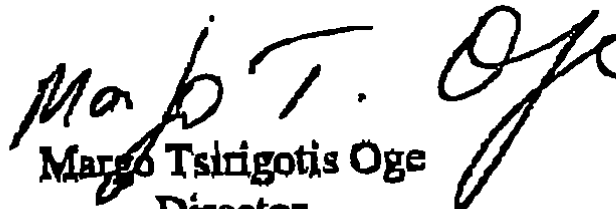
However, the use of such blends in gasoline-only vehicles is prohibited under the Clean Air Act. Use of gasoline containing ethanol amounts greater than E10 in a gasoline-only vehicle could cause emissions from the vehicle to increase. Section 203(a)(3)(A) of the Clean Air Act (the Act), 42 U.S.C. § 7522(a)(3)(A) prohibits any person from rendering inoperative emission control devices or elements of design. In addition, Section 203(a) prohibits any person from causing a violation of Section 203(a)(3)(A). Mis-fueling a motor vehicle in this manner may

violates this provision of the Act. The retailer who has variable ethanol percentage pumps may be liable for causing such violation, whether the mis-fueling occurs at self-serve or full-serve pumps.

Our understanding is that current industry practice is to dispense E85 from pumps that are separate from normal gasoline pumps and clearly marked as being appropriate for use only by ethanol FFVs. Variable ethanol percentage pumps that are installed in this manner, stand-alone and clearly marked as being available only for ethanol FFVs, may reduce the risk of such a violation.

Again, thank you for your letter. If you have further questions, please contact me or Jim Caldwell of my staff, at (202) 343-9303.

Sincerely,


Margo Tsigotis Oge
Director

Office of Transportation and Air Quality

Blender 87, E10, E20, E30, & E85



Wait for computer to
reset to zero.

MINIMUM OCTANE RATING
(R+M) 2 METHOD

105

\$ 1.669

Price per gallon
All taxes included

MINIMUM OCTANE RATING
(R+M) 2 METHOD

95

\$ 2.069

Price per gallon
All taxes included

MINIMUM OCTANE RATING
(R+M) 2 METHOD

92

\$ 2.119

Price per gallon
All taxes included

MINIMUM OCTANE RATING
(R+M) 2 METHOD

89

\$ 2.169

Price per gallon
All taxes included

E85

RECOMMENDED
FOR FLEX FUEL
VEHICLES ONLY

PRESS

E-30

CONTAINS 30%
ETHANOL
RECOMMENDED
FOR FLEX FUEL
VEHICLES ONLY

PRESS

E-20

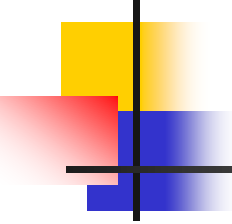
CONTAINS 20%
ETHANOL
RECOMMENDED
FOR FLEX FUEL
VEHICLES ONLY

PRESS

**SUPER
UNLEADED
CONTAINS 10%
ETHANOL**

PRESS

A sta
can o
port
sitt
liners,
vehic
floor m
This sp
explosi
a gasoli
fire and
SERIOUS
or DEATH



3-Product 1-hose dispenser

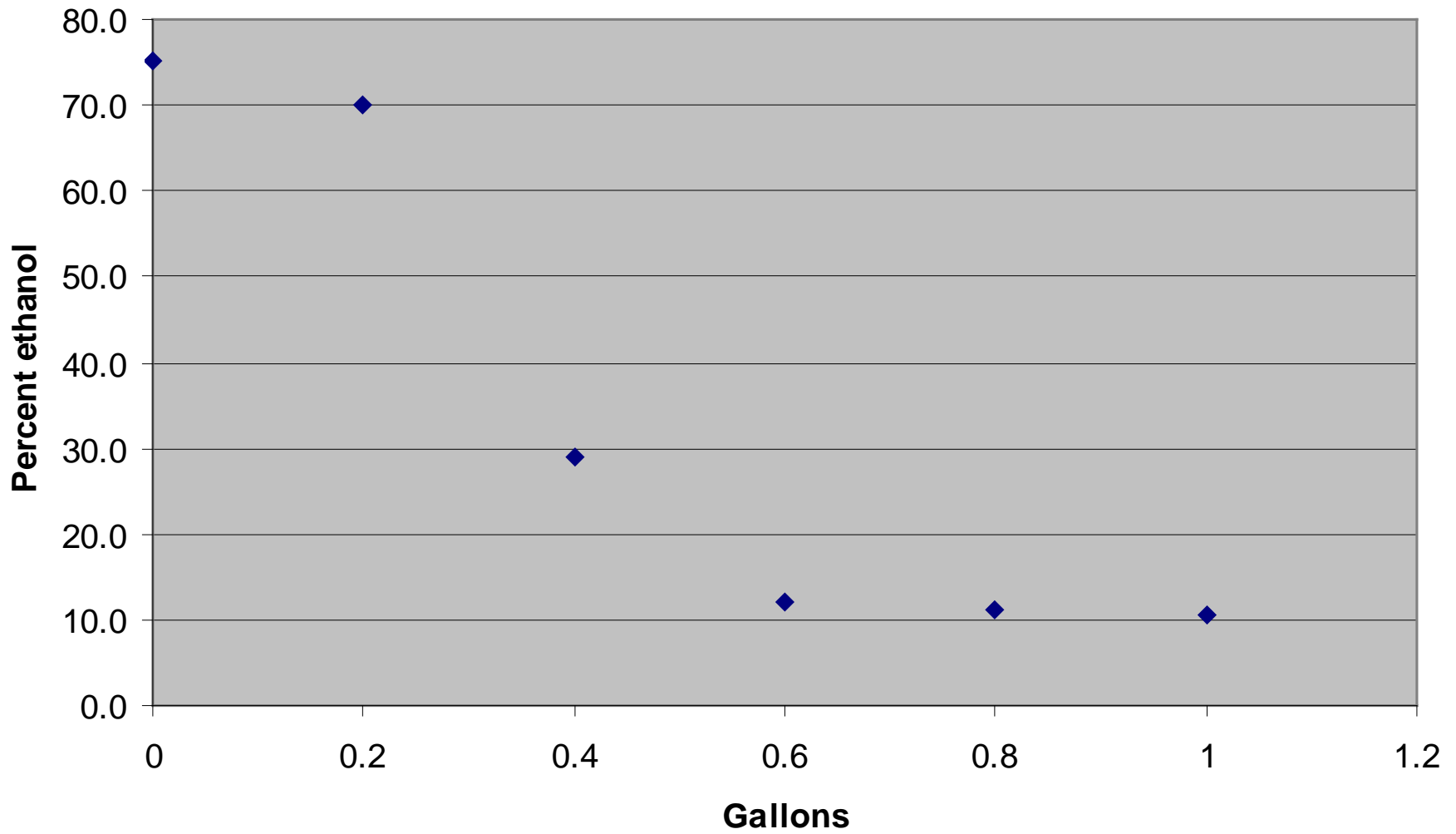
Unblended gasoline, E10, and E85

Sample	Product	Purge	Sample Qty	% ethanol
7135	E85	2	0.2	75.2
7136	E10	0	0.2	70.1
7137	E10	0	0.2	29.0
7138	E10	0	0.2	12.1
7139	E10	0	0.2	11.1
7140	E10	0	0.2	10.5

one gallon delivery

26.6

E85 residual in single hose dispenser



Endothermic Reaction of Gasoline and Ethanol

January 14, 2005

This project illustrates how chemical reaction can absorb heat (endothermic) when gasoline and ethanol are combined.

Procedure: 450-ml of oxygenate free (#2005-69 regular unleaded) gasoline is placed in an Erlenmeyer flask and the temperature of the gasoline is measured. A magnetic stirring bar is used to ensure uniformity in temperature. 50-ml of fuel ethanol (E95) (sample 2004-91537) is then added to the flask and the temperature is observed on 15 second intervals.

Beginning temperatures: Gasoline in flask 70.61°F, Ethanol in bottle 71.10°F.

<u>Time</u>	<u>Temperature, °F</u>
0	70.61
15	65.51
30	65.85
45	66.00
60	66.01
75	66.02
90	66.08
105	66.11
.	
300	66.53

Conclusion: More than 5°F of heat is absorbed when combining 10% ethanol with 90% gasoline. The volume change due to temperature for this gasoline sample ($SG_{60/60} = 0.742$) is 0.069%/°F based API tables. Therefore, there is an immediate net volume change of approximately minus 0.352% ($5.1^{\circ}\text{F} \times 0.069$) immediately from combining the two materials. Other types of gasoline may have slightly different results. Heat absorbed in glassware was not calculated in these results.

Ronald G. Hayes
Missouri Department of Agriculture
Fuel Quality Program



Volume Change of Mixtures of Alcohols and Gasoline

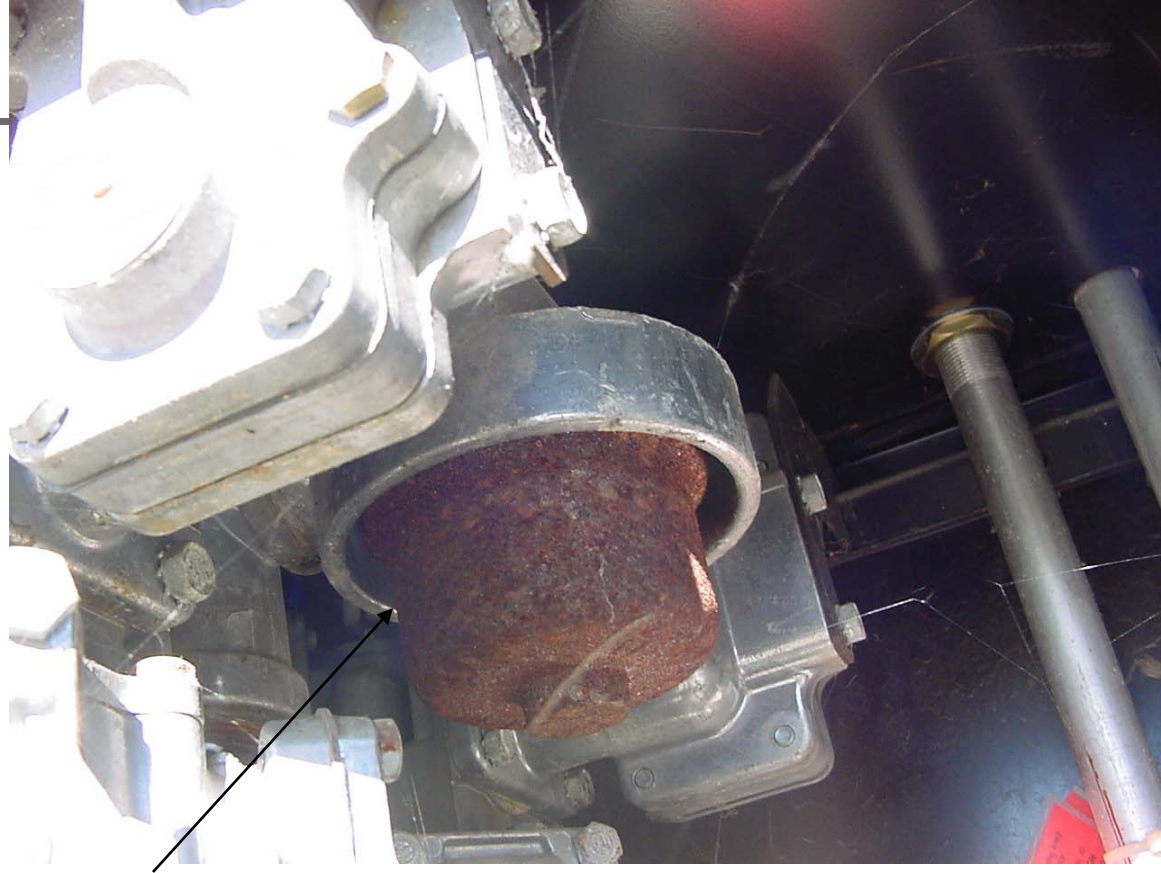
- A small but measurable volume expansion effect occurs when alcohols, particularly methanol and ethanol, are added to gasoline.
- The volume expansion is affected by the density of gasoline.
- ~ +0.1% (avg) @ 10% ethanol
- ~ +0.2% @ 20% ethanol
- +0.55% @ 12.5% ethanol has been observed

Other items



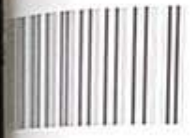
- Federal ULSD requirements
- Water in tanks, use water detecting paste
- Fuel systems (interstitial space)
- Microbial contamination of ULSD may become higher
- ULSD stability issues
- Biodiesel
- Storage of biodiesel blends above ground
- Filters

Dummy Filter Plug installed in dispenser filter housing



This plug has been showing up in many locations that require a 10-micron filter for ethanol blends. This plug does not have any filter media inside nor does it protect vehicles and meter device from debris dislodged or suspended in the fuel.

AMMADLE



VIS COL GC



