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Series: Zoellick, Robert, Files
Subseries: Chronological Files

OA/ID Number: 94018
Folder ID Number: 94018-002b

Folder Title:
Ethanol [2]

Stack:	Row:	Section:	Shelf:	Position:
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THE WHITE HOUSE
WASHINGTON

September 15, 1992

MEMORANDUM FOR EDE HOLIDAY

FROM: GARY BLUMENTHAL *gbl*
TERESA GORMAN *TG*

SUBJECT: **Corn Growers' Ethanol Demands and Deadline**

Counterproductive
Legal & Env issues aren't easy, esp when we're
If they make the issue into one where we're being pushed + little gain, lower our likelihood
What expect will from BC/AG

We met this morning with the Corn Growers' leadership and photochemist Dr. Gary Whitten in what was intended to be a courtesy follow up to their September 11 science meeting with EPA. Dr. Whitten presented information on the science which indicated that at maximum, ethanol results in three parts per billion (ppb) more ozone than MTBE; the Clean Air Act standard allows 120 ppb. Whitten contends that the analysis taken a step further shows use of ethanol and MTBE could be considered equivalent relative to ozone, under a "reactivity" based assessment in the Reformulated Gasoline Program (RFG).

We checked Whitten's result with Harold Kreucher of Ford Motor Company. Kruecher had worked on the Auto-Oil study from which Whitten drew some data. He painted a better picture for ethanol than EPA but did not give it all the environmental benefit indicated by Whitten. We will host a meeting tomorrow between EPA and Whitten, although the Agency's staff believe that they already discredited Whitten on Friday in Ann Arbor.

September 18 Deadline

The Corn Growers used this morning's session to deliver an ultimatum on the ethanol issue. They provided us with a list of their demands and stated that they intend to hold a press conference in Chicago this Friday either to praise the Administration for its efforts, or criticize it for inaction. They said they have worked patiently with the Administration for over six months and that bitter feelings toward the President may be impossible to overcome if this issue is not resolved in the next few days.

We can probably forestall such a press event if by Friday, we can work through and provide assurance on most of the issues on their list. Following are the Corn Growers demands with our preliminary comments in brackets:

- 1) Implement the complex model for 1995 and scrap the simple model.
(EPA and the oil companies will likely object to scrapping the simple model altogether, but is otherwise acceptable.)

- 2) **Provide for a carbon mass equivalency on a 1990 base gasoline.**
(EPA claims that using the 1990 base gasoline would blow-up the RegNeg. Obtaining credit from a reactivity adjustment would leave us less vulnerable legally.)
- 3) **Provide the ETBE tax credit.**
(Okay but keep in mind that this policy option was developed as an alternative to the one pound waiver, not in addition to giving ethanol access to the RFG.)
- 4) **Provide research and development funding for ETBE (at least equivalent to MTBE funding).**
(Probably okay but must check with OMB; note that Congress failed to fund our request this coming year for R&D on ethanol.)
- 5) **Provide for Toxics and NOx neutrality.**
(Okay.)
- 6) **Provide pro rata tax benefit to ethanol at both lower and higher than 10 percent blends.**
(Probably okay but need to check with EPA on waiver for higher than 10 percent blends. No additional tax benefit is sought and marginal increase would be acceptable to Corn Growers.)
- 7) **Provide a one pound waiver in the Reformulated Gasoline Program (RFG).**
(Straight waiver unlikely; sufficient benefit from reactivity and/or legislative fix would be better substitute.)
- 8) **Allow states to opt-out of the RFG only if they provide science showing that ethanol hurts ozone.**
(The Clean Air Act allows states to opt-in or opt-out; Corn Growers want to require a state deciding not to use ethanol to substantiate the decision with science. EPA would probably be willing to allow states to build their own clean air plan around the use of ethanol.)

cc: Bob Zoellick
Boyden Gray
Bob Grady

THE WHITE HOUSE

WASHINGTON

September 24, 1992

MEMORANDUM FOR BOB ZOELLICK

FROM:

EDE HOLIDAY

SUBJECT:

One Pound Waiver Only Option for Illinois Group

Mark Himmelstein, an attorney for oil interests, just called me to say that a meeting he participated in earlier today in Illinois concluded that it is too late to make any decision other than the one pound or .8 pound waiver. The meeting included:

President of Illinois Corn Growers -- Scott Durbin
President of Illinois Farm Bureau -- John White
Executive Assistant to Governor Edgar -- Al Grosdollar
Dep. Dir. of Environment for Illinois -- Mitch Beaver
Pekin Energy (small ethanol producer) -- Jim Redding
Representatives from ARCo and SUN oil companies

Mark had visited me earlier this week on behalf of his oil company clients and stressed that the ETBE tax credit was the best option; he spoke to me today as a supporter of the President. He said that the group concluded that the waiver may not be the best answer to the problem and that is why they committed to continue meeting on the issue even after a waiver is announced.

Even if we announce that there is science that justifies the waiver, we should leave open the door for developing a final policy in the future that is based on more definitive research. Let me also emphasize that whenever a conclusion to this issue appears near, we need to include the following in that decision-making: Jim Watkins, Ed Madigan, Andy Card and Bill Reilly.

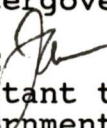
THE WHITE HOUSE

WASHINGTON

September 25, 1992

MEMORANDUM FOR ROBERT B. ZOELLICK
Assistant to the President and
Deputy Chief of Staff

FROM: BOBBIE G. KILBERG ^{BK}
Deputy Assistant to the President and Director
Office of Intergovernmental Affairs

JOHN A. CLINE 
Special Assistant to the President
for Intergovernmental Affairs

SUBJECT: ETHANOL

The following is a list of those Governors who are members of the
Governors' Ethanol Coalition:

Governor Ben Nelson (D-NE) - Chair
Governor Jim Edgar (R-IL) - Vice Chair

Governor Terry Branstad (R-IA)
Governor Arne Carlson (R-MN)
Governor John Ashcroft (R-MO)
Governor Stan Stephens (R-MT)
Governor George Voinovich (R-OH)
Governor George Mickelson (R-SD)
Governor Tommy Thompson (R-WI)

Governor Roy Romer (D-CO)
Governor Evan Bayh (D-IN)
Governor Joan Finney (D-KS)
Governor Bruce King (D-NM)
Governor George Sinner (D-ND)
Governor Anne Richards (D-TX)
Governor Bill Clinton (D-AR)

We would recommend that the Republican Governors be notified
prior to any major announcement concerning the issue of ethanol.
We have also attached copies of any recent correspondence
regarding ethanol.

Attachments



File - 1L
Ethanol

STATE OF ILLINOIS
WASHINGTON OFFICE
444 NORTH CAPITOL STREET, N.W.
SUITE 210
WASHINGTON, D.C. 20001

JIM EDGAR
GOVERNOR

202-624-7760

FACSIMILE COVER SHEET

NAME: Margaret Jones

DEPARTMENT: WH Intergovernmental

PHONE & FAX#: 456-2362

FROM: Terri Moreland

DATE: 9/3 # OF PAGES INCLUDING COVER: 4

NOTES:

Per our discussion - letter for
Bob Zoellick.

Thanks for your help -
TM

SENT BY: Xerox Telecopier 7020 ; 8- 2-92 ; 7:13 ;

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State of Illinois

ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

217/782-3397

August 31, 1992

The Honorable Jim Edgar
207 Statehouse
Springfield, Illinois 62706

Dear Governor Edgar:

In response to your request, IEPA staff have reviewed a number of documents addressing the use of ethanol as a fuel blend and its impact on ozone air quality. Our review included the following pertinent documents: the SAI Chicago ethanol study ("Comparison of the Air Quality Effects of Ethanol and MTBE in Reformulated Gasoline in the Chicago Region in 1995"), an excerpt from the Auto/Oil study ("Summary of Air Quality Modeling Results for Ethanol and RVP Fuels"), and portions of the "Five-City Study" ("A Low-Cost Application of the Urban Airshed Model to the New York Metropolitan Area and the City of St. Louis").

Based on these studies, our conclusion is that the difference in ozone air quality impact between the use of ethanol blended fuel and lower volatility gasolines will be statistically insignificant in future years. The SAI study for Chicago indicated that the difference in ozone air quality impact between the use of ethanol blended fuel and MTBE fuel was 0.3 parts per billion (ppb). The "Five-City Study" which included St. Louis, showed an air quality difference of only 1 ppb. Relative to the ozone air quality standard of 120 ppb this is a difference of less than 1 percent, which is significantly below the margin of error allowed by USEPA for such modeling demonstrations.

The Auto/Oil study, funded by the automobile and oil industries, and which evaluated the impact on air quality in New York, Dallas/Fort Worth and Los Angeles indicated an ozone air quality difference between ethanol blended fuel and low RVP gasoline in the range of 1 to 3 ppb. Even this study, which could be expected to have a bias, if any, in favor of these industries indicated small differences which are also statistically insignificant.

In the next several years Illinois, as well as other states with ozone air quality problems, will be developing and implementing several major programs to combat the high ozone ambient levels. The Clean Air Act mandates provisions such as the enhanced inspection/maintenance program, Stage II vapor recovery controls on gasoline dispensing facilities and the low Reid vapor pressure (RVP) of fuels. Whether ethanol blended fuel or low RVP gasoline is utilized, these control measures will further assist to eliminate any differences between the two fuels. The dramatic impact of these and other programs must be taken into account in assessing ozone air quality over the next few years.

We believe that USEPA recognizes the statistically insignificant difference in impact between ethanol blended fuel and low RVP gasoline on ozone air quality. They, however, continue to interpret the provisions of the Clean Air Act Amendments to require actual 15% reduction in the emissions of hydrocarbons relative to the 1990 baseline gasoline. It is our opinion that the emphasis should be placed not on the amount of emissions, which is merely an indicator, but rather on their potential to reduce ozone, which is the ultimate goal. Consequently, improvements in ozone air quality should be the primary focus regarding the use of ethanol blended fuels.

In conclusion, all of the studies reviewed indicate there will be significant improvement in air quality with the use of either ethanol blends or lower RVP gasoline. Any difference in hydrocarbon emissions attributed to ethanol does not result in statistically significant differences in ozone air quality. Studies of this nature typically contain assumptions and technical procedures that could be challenged. However, we do not believe that these assumptions and procedures, even if reasonably revised, would produce statistically different results. Even if the difference in ozone air quality is slightly higher than originally predicted by the models, we believe these increases can be compensated by reductions in other source categories. Further, USEPA must also realize that ethanol blended fuels significantly reduce carbon monoxide (CO) emissions. Besides providing obvious improvements in CO air quality, it is documented that CO emission reductions mitigate ozone formation.

For many years now, both USEPA and IEPA have accepted ethanol as a clean burning fuel. We in Illinois continue to believe that ethanol can play a significant role in our overall air pollution control strategies.

We will be happy to provide you with more detailed information and discussion regarding our review of these studies.

Sincerely,

Mary A. Gade / BM

Mary A. Gade
Director

cc: Allen Grosboll, Executive Assistant
Terry Moreland, Washington Office
Kirk Dillard, Chief of Staff

THE WHITE HOUSE
CORRESPONDENCE TRACKING WORKSHEET

INCOMING

DATE RECEIVED: JULY 31, 1992

NAME OF CORRESPONDENT: THE HONORABLE GEORGE S. MICKELSON

SUBJECT: EXPRESSES SUPPORT FOR THE GOVERNOR 'S ETHANOL
COALITION AND URGES FAVORABLE CONSIDERATION
FROM ADMINISTRATION

		ACTION		DISPOSITION	
ROUTE TO: OFFICE/AGENCY	(STAFF NAME)	ACT CODE	DATE YY/MM/DD	TYPE RESP	C COMPLETED D YY/MM/DD
JOHN CLINE		ORG	92/07/31		
	REFERRAL NOTE:				
	REFERRAL NOTE:				
	REFERRAL NOTE:				
	REFERRAL NOTE:				
	REFERRAL NOTE:				

COMMENTS: SEE ID 338424

ADDITIONAL CORRESPONDENTS: MEDIA:L INDIVIDUAL CODES: 2110 _____

IG MAIL USER CODES: (A) _____ (B) _____ (C) _____

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*ACTION CODES:          *DISPOSITION          *OUTGOING          *
*                      *                      *CORRESPONDENCE:   *
*A-APPROPRIATE ACTION  *A-ANSWERED          *TYPE RESP=INITIALS *
*C-COMMENT/RECOM       *B-NON-SPEC-REFERRAL  *          OF SIGNER *
*D-DRAFT RESPONSE      *C-COMPLETED          *          CODE = A   *
*F-FURNISH FACT SHEET  *S-SUSPENDED          *COMPLETED = DATE OF *
*I-INFO COPY/NO ACT NEC*                      *          OUTGOING  *
*R-DIRECT REPLY W/COPY *                      *                      *
*S-FOR-SIGNATURE       *                      *                      *
*X-INTERIM REPLY       *                      *                      *
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REFER QUESTIONS AND ROUTING UPDATES TO CENTRAL REFERENCE
(ROOM 75, OEOB) EXT-2590
KEEP THIS WORKSHEET ATTACHED TO THE ORIGINAL INCOMING
LETTER AT ALL TIMES AND SEND COMPLETED RECORD TO RECORDS
MANAGEMENT.

Re ID 337424

346279



STATE OF SOUTH DAKOTA

GEORGE S. MICKELSON
GOVERNOR

EXECUTIVE OFFICE
STATE CAPITOL, 500 EAST CAPITOL
PIERRE, SOUTH DAKOTA
57501-5070
(605) 773-3212

July 27, 1992

The President
The White House
1600 Pennsylvania Avenue
Washington, D.C. 20500-0002

Dear Mr. President:

Earlier this month you received a letter from the Governor's Ethanol Coalition. The letter was dated July 14, 1992, and requested your assistance with getting a more favorable interpretation from EPA on the use of ethanol in meeting the requirements of the Reformulated Gasoline Program.

The purpose of this letter is to let you know I support the efforts of the coalition and urge you to give our request favorable consideration. I believe the request is good for agriculture, the environment and your administration.

Very truly yours,


GEORGE S. MICKELSON

GSM:jhl

THE WHITE HOUSE
CORRESPONDENCE TRACKING WORKSHEET

INCOMING

DATE RECEIVED: JULY 15, 1992

NAME OF CORRESPONDENT: THE HONORABLE E. BENJAMIN NELSON

SUBJECT: ASKS THE PRESIDENT TO SUPPORT A REGULATORY OR
LEGISLATIVE INITIATIVE THAT BY 1995 50% OF
OXYGEN REQUIRED TO BE INCLUDED IN GASOLINE
BE DERIVED FROM DOMESTIC RENEWABLE FEEDSTOCKS

		ACTION		DISPOSITION	
ROUTE TO:	(STAFF NAME)	ACT CODE	DATE YY/MM/DD	TYPE RESP	C COMPLETED D YY/MM/DD
JOHN CLINE		ORG	92/07/15		
	REFERRAL NOTE:				
	REFERRAL NOTE:				
	REFERRAL NOTE:				
	REFERRAL NOTE:				
	REFERRAL NOTE:				

COMMENTS: SEE ID 329862
WRITERS ARE ALSO GOVERNORS OF THE STATES OF
NEBRASKA AND ILLINOIS RESPECTIVELY

ADDITIONAL CORRESPONDENTS: 1 MEDIA:F INDIVIDUAL CODES: 4900 2100 2110

IG MAIL USER CODES: (A) (B) (C)

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*ACTION CODES:          *DISPOSITION          *OUTGOING          *
*                      *                      *CORRESPONDENCE:   *
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*C-COMMENT/RECOM       *B-NON-SPEC-REFERRAL  *          OF SIGNER *
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*I-INFO COPY/NO ACT NEC*                      *          OUTGOING  *
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*S-FOR-SIGNATURE        *                      *                      *
*X-INTERIM REPLY        *                      *                      *
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REFER QUESTIONS AND ROUTING UPDATES TO CENTRAL REFERENCE
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LETTER AT ALL TIMES AND SEND COMPLETED RECORD TO RECORDS
MANAGEMENT.

8
Nebraska Gov. E. Benjamin Nelson, Chair ✓
Illinois Gov. Jim Edgar, Vice Chair ✓
Arkansas Gov. Bill Clinton
Colorado Gov. Roy Romer
Indiana Gov. Evan Bayh
Iowa Gov. Terry Branstad
Kansas Gov. Joan Finney
Michigan Gov. John Engler
Minnesota Gov. Arne Carlson
Missouri Gov. John Ashcroft
Montana Gov. Stan Stephens
New Mexico Gov. Bruce King
North Dakota Gov. George Sinner
Ohio Gov. George Voinovich
South Dakota Gov. George Mickelson
Texas Gov. Ann W. Richards
Wisconsin Gov. Tommy G. Thompson

GOVERNORS' ETHANOL COALITION

John Kling
same - 11-24-92
re: ethanol
July 14, 1992

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Mitch Beaver
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Todd Sneller
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Ohio
Fred L. Dailey
(614) 466-2732

South Dakota
Ron Reed
(605) 773-3603

Texas
Carol Tombari
(512) 463-1931

Wisconsin
Jeffery Knight
(608) 267-7693

Honorable George Bush
The White House
1600 Pennsylvania Avenue
Washington, D.C. 20500

Dear President Bush:

Several months ago, we shared with you our concern over ethanol's role in the Reformulated Gasoline Program (RFG) under the 1990 amendments to the Clean Air Act. You responded that you shared our concern and were prepared to assist where possible. Since our letter, we have been studying this and other related issues, and have evaluated the outcome of the U.S. Environmental Protection Agency's (USEPA) hearing on the proposed final regulations for the RFG program held in Chicago last month. Two distinct problems have emerged from our review which we would like to raise.

First, it is clear that the agriculture community, ethanol producers, and Congress believed that the 1990 amendments would allow 10% ethanol blends to be used in reformulated gasoline all year. A 10% ethanol blend cannot be readily used in reformulated gasoline during summer months because it increases the evaporative emissions of the gasoline. To date, the USEPA has declined to take into account the offsetting benefits of ethanol's ultra clean tailpipe emissions and reduced chemical reactivity.

Second, the USEPA's interpretation of the Clean Air Act oxygenate requirements raises the specter of significantly increased dependence on methanol imported from OPEC countries. It is estimated that by the end of the century more than half the gasoline in the nation will be reformulated with oxygenates. Multi-national oil and chemical companies are building offshore methanol plants to supply the nation's Clean Air Act markets. The locations of these new plants include Saudi Arabia, Libya, Iran, Oman, Qatar, Indonesia, Chile, Venezuela, Canada, and Mexico--areas where natural gas, which is the raw material for methanol, can be obtained cheaply.

The trend toward the use of foreign methanol is ominous for several reasons. First, it will add to the nation's trade deficit and increase our dependence on foreign energy sources. In fact, it will be more damaging than having the country import an equal amount of crude oil, because the value-adding work is done in foreign countries. Second, it will mean that most of the infrastructure of methanol production will be abroad, and the U.S. will assume a secondary position in the development of ethanol and methanol as replacements for gasoline in the decades ahead. Third, domestic oxygenate producers are disadvantaged by the import trend. Finally, foreign methanol production does nothing to help the nation's natural gas industry, which is in a prolonged slump.

Because the reformulated gasoline requirement takes effect on January 1, 1995, the investment community is making decisions now. Despite some activity in the United States, there is a reluctance to expand capacity or make new investments in domestic methanol or ethanol production because of the uncertainty surrounding their role in the RFG program.

The uncertainty which exists over ethanol's role in the RFG program and the projected role which foreign produced methanol could play in the nation's energy future, will create a significant backlash in both the agricultural and investment communities. Without a prompt corrective regulatory or legislative initiative, ethanol's use will be curtailed and imported methanol will dominate the market.

We would like you to consider announcing the following regulatory or legislative initiative or announcing your support for this proposal:

- By 1995, 50% of the oxygen required to be included in gasoline by sections 211(k) and 211(m) of the Clean Air Act must be derived from domestic feedstocks, and 30% must be derived from domestic renewable feedstocks. By 1997, 80% of the oxygen required to be included in gasoline by sections 211(k) and 211(m) of the Clean Air Act must be derived from domestic feedstocks, and 50% must be derived from domestic renewable feedstocks.

We believe this proposal can be implemented in the context of the current rulemaking process which USEPA is conducting under Section 211(k) of the Clean Air Act. Section 211(k) provides strong statutory support for the proposal. It requires that USEPA consider cost, air quality and non-air quality health and environmental impacts, and energy requirements in achieving reductions in ozone forming emissions in reformulated gasoline.

Honorable George Bush

July 14, 1992

Page 3 of 3

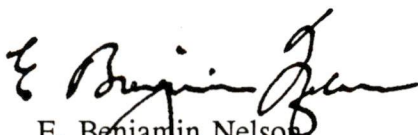
As you know, one of the key components of reformulated gasoline is increased oxygen content, which is mandated under the act. Use of domestic oxygenates, especially renewable domestic oxygenates, puts money back into the American economy and improves the nation's balance of trade. Domestic oxygenates reduce the problem of foreign energy dependence by providing essential energy supplies in the United States. Renewable domestic oxygenates have no adverse impact on ozone formation and recycle atmospheric carbon dioxide, rather than releasing new carbon dioxide into the air. Thus our proposal is supported by all the factors which USEPA is required to consider in its ongoing rulemaking.

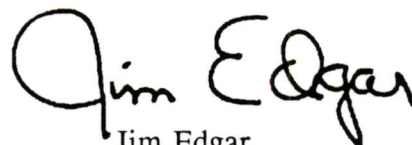
One other factor that should also be considered is research being conducted by Dr. Michael S. Graboski, in cooperation with the U.S. Department of Agriculture. This study provides new evidence which seems to quantitatively substantiate supporters' arguments that ethanol should be eligible for participation in the RFG Program. We urge you to ensure that this and any other new information be given the most thorough and timely review by USEPA so it can be incorporated into their final rulemaking.

As things stand now, OPEC will benefit more from the Clean Air Act amendments than American farmers, ethanol producers, and the domestic natural gas industry. No one ever intended this to happen, but if we do not take strong action immediately, this is exactly what will happen. This initiative would help regain the support of the agricultural community, environmental interests, and ethanol producers.

It is critical that we work together, quickly, to solve the problems currently associated with implementation of the Clean Air Act amendments in a way that is environmentally sound and assures domestic sources for clean fuels. As you said when you introduced your proposed Clean Air amendments, "We need secure, reliable sources of energy right here at home. Alternative fuels are an American answer." We would welcome your support for this proposal, and hope that we can count on your leadership to ensure that our concerns are addressed.

Sincerely,


E. Benjamin Nelson
Chairman


Jim Edgar
Vice Chairman

SEARCH - QUERY
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338424 DOCUMENT= 1 OF 2

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DOCDATE 920714
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MEDIA F
STAFF PRESIDENT BUSH
 PRBUSH
NAME THE HONORABLE E. BENJAMIN NELSON
TITLE CHAIRMAN
ORG GOVERNORS' ETHANOL COALITION
STREET POST OFFICE BOX 95085
ADDR LINCOLN NE 68509
ADDNAME THE HONORABLE JIM EDGAR
 U.S. HOUSE OF REPRESENTATIVES
SUBJECT ASKS THE PRESIDENT TO SUPPORT A REGULATORY OR
 LEGISLATIVE INITIATIVE THAT BY 1995 50% OF
 OXYGEN REQUIRED TO BE INCLUDED IN GASOLINE
 BE DERIVED FROM DOMESTIC RENEWABLE FEEDSTOCKS
SUBCODE CM010
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INDCODE 4900 2100 2110
RPTCODE IG
ACTION IGCLIN ORG 920715
COMMENTS SEE ID 329862
 WRITERS ARE ALSO GOVERNORS OF THE STATES OF
 NEBRASKA AND ILLINOIS RESPECTIVELY

I0607 * End of document.

THE WHITE HOUSE

WASHINGTON

June 29, 1992

Dear Governor Nelson:

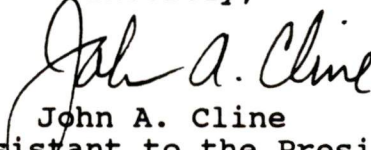
On behalf of the President, I want to thank you for your recent correspondence requesting assistance in urging the Office of Management and Budget (OMB) to release two documents containing important ethanol-related provisions.

Considering the impact these documents could have on the ethanol industry, your concerns over their release are extremely valid and duly noted.

I have spoken with the appropriate officials at OMB and forwarded your letter to them for further review and information. I have asked that they check into the status of these documents and respond directly to you.

Again, thank you for letting us know of your concerns on behalf of the Governors' Ethanol Coalition. If I can be of further assistance, please don't hesitate to contact me.

Sincerely,



John A. Cline
Special Assistant to the President for
Intergovernmental Affairs

The Honorable E. Benjamin Nelson
Governor of Nebraska and Chairman
of the Governors' Ethanol Coalition
P.O. Box 95085
Lincoln, Nebraska 68509

THE WHITE HOUSE
CORRESPONDENCE TRACKING WORKSHEET

INCOMING

DATE RECEIVED: MAY 26, 1992

NAME OF CORRESPONDENT: THE HONORABLE E. BENJAMIN NELSON

SUBJECT: FOLLOW-UP ON ETHANOL'S PARTICIPATION IN THE
REFORMULATED GASOLINE PROGRAM; URGES THE EPA
REPORT AND PROPOSED REGULATIONS BE RELEASED
ON THE ENHANCED MOTOR VEHICLE INSPECTION AND

ROUTE TO: OFFICE/AGENCY (STAFF NAME)		ACTION ACT CODE	DATE YY/MM/DD	DISPOSITION TYPE RESP	C D	COMPLETED YY/MM/DD
JOHN CLINE		ORG	92/05/26	JC	A	92/6/29
REFERRAL NOTE: PD GORM		I	92/6/29			
REFERRAL NOTE: 99 EPA		I	92/6/29			
REFERRAL NOTE: 99 om B: Attn - Nelson Rockefeller		R	92/6/29			
REFERRAL NOTE:						
REFERRAL NOTE:						

COMMENTS: WRITER IS ALSO GOVERNOR OF NEBRASKA
SEE ID 322395, 314343CU, 313758

ADDITIONAL CORRESPONDENTS: MEDIA: L INDIVIDUAL CODES: 4900 2100
IG MAIL USER CODES: (A) (B) (C)

*ACTION CODES:	*DISPOSITION	*OUTGOING	*
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*C-COMMENT/RECOM	*B-NON-SPEC-REFERRAL	* OF SIGNER	*
*D-DRAFT RESPONSE	*C-COMPLETED	* CODE = A	*
*F-FURNISH FACT SHEET	*S-SUSPENDED	*COMPLETED = DATE OF	*
I-INFO COPY/NO ACT NEC		* OUTGOING	*
*R-DIRECT REPLY W/COPY *			*
*S-FOR-SIGNATURE *			*
*X-INTERIM REPLY *			*

REFER QUESTIONS AND ROUTING UPDATES TO CENTRAL REFERENCE
(ROOM 75, OEOb) EXT-2590
KEEP THIS WORKSHEET ATTACHED TO THE ORIGINAL INCOMING
LETTER AT ALL TIMES AND SEND COMPLETED RECORD TO RECORDS
MANAGEMENT.

8 12 21 31 3 75 8 329862

Nebraska Gov. E. Benjamin Nelson, Chair
Illinois Gov. Jim Edgar, Vice Chair
Arkansas Gov. Bill Clinton
Colorado Gov. Roy Romer
Indiana Gov. Evan Bayh
Iowa Gov. Terry Branstad
Kansas Gov. Joan Finney
Minnesota Gov. Arne Carlson
Missouri Gov. John Ashcroft
Montana Gov. Stan Stephens
New Mexico Gov. Bruce King
North Dakota Gov. George Sinner
Ohio Gov. George Voinovich
South Dakota Gov. George Mickelson
Texas Gov. Ann W. Richards
Wisconsin Gov. Tommy G. Thompson

GOVERNORS' ETHANOL COALITION

John Cline
May 20, 1992

STATE REPRESENTATIVES

Arkansas

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(501) 575-3251

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Steve Horn
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Al Grosboll
(217) 524-1395
Mitch Beaver
(217) 785-2009

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Amy Stewart
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John Morelock
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Ralph Groschen
(612) 297-2223

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(614) 466-2732

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Ron Reed
(605) 773-3603

Texas

Carol Tombari
(512) 463-1931

Wisconsin

Jeffery Knight
(608) 267-7693

Honorable George Bush
The White House
1600 Pennsylvania Avenue
Washington, D.C. 20500

Dear President Bush:

On behalf of the Governors' Ethanol Coalition, please accept my thanks for your recent letter addressing our concerns regarding ethanol's participation in the reformulated gasoline program. It was thoughtful of you to reassure the coalition members of your willingness to work with us to resolve the industry's concerns over the role of ethanol in this and other regulatory programs.

We would welcome your assistance with two other matters: the Office of Management and Budget's release of an important Environmental Protection Agency (EPA) report and EPA's proposed regulations regarding the Enhanced Motor Vehicle Inspection and Maintenance program. Both documents contain important ethanol-related provisions.

Under the *Alternative Motor Fuels Act of 1988*, EPA is required to prepare and to submit an independent environmental study to Congress. This study must analyze the "air quality, global climate change, and other environmental impacts" of "a variety of reasonable scenarios concerning the market penetration of alternative fuels." The study is also to include "an assessment of the economic costs and benefits" of alternative fuels including ethanol. EPA's first report to Congress was due in December 1990. It is our understanding that the report was completed some time ago but that the Office of Management and Budget has held up the report for several months now.

There are several important ethanol-related provisions in this report. Not only is the report important to the coalition, but it is also important for Congress to review the report before it takes final action on the *Comprehensive National Energy Policy Act* (H.R. 776) and the *National Energy Security Act of 1992* (S. 2166).

Honorable George Bush
May 20, 1992
Page 2 of 2

In addition, the Office of Management and Budget has also not yet released EPA's proposed rules regarding the Enhanced Motor Vehicle Inspection and Maintenance program. The EPA has determined that evaporative emissions represent more than 65% of automobile volatile organic compound (VOC) emissions. Cleaner fuels, cleaner new cars, and inspection and maintenance will all help reduce these emissions. Current inspection and maintenance testing conducted in most states, however, only targets vehicle exhaust emissions. Testing for evaporative emissions problems including a check of a car's ability to purge the vapors from the control system, as well as more accurate identification of vehicles with high exhaust emissions, will require a transient test procedure. **EPA's proposed regulations address these test procedures. Strong measures to control evaporative emissions will facilitate consideration of ethanol blends to reduce exhaust emissions.**

It is our understanding that the Office of Management and Budget has reviewed EPA's proposed regulations but has not yet released them. It is important that the Office of Management and Budget release these proposed regulations so that inspection and maintenance programs in states where they are required can be implemented as quickly as possible.

Your support for the release of these documents would be extremely helpful and beneficial to the current national discussion of alternative fuel issues. On behalf of the coalition, please accept our thanks for your pledge to work closely with the coalition on issues concerning the industry. Your leadership and willingness to assist with these and other ethanol-related issues are deeply appreciated by all of us.

Sincerely,



E. Benjamin Nelson
Chair

3022
2002

THE WHITE HOUSE

WASHINGTON

April 1, 1992

Dear Governor Nelson:

On behalf of President Bush, I want to thank you for your recent correspondence as Chairman of the Governor's Ethanol Coalition regarding the use of ethanol in reformulated gasoline.

I want to reiterate the President's firm support for ethanol and its contributions to clean air, energy independence and the economic well-being of American farmers. The Administration will continue to acknowledge the opportunities and concerns of the ethanol industry under the Clean Air Act.

Under President Bush's leadership, the U.S. Department of Agriculture (USDA) and the Environmental Protection Agency (EPA) and the Department of Energy will work together with the Congress, states, corn growers, the ethanol industry and other interested parties to ensure a strong and growing role for ethanol under upcoming programs to improve air quality in our cities.

In particular, USDA and EPA have been working with the ethanol industry to facilitate state implementation of the oxygenated fuels program scheduled to start in November of this year. This program will reduce unhealthy levels of carbon monoxide in 39 metropolitan areas of the country and offers a tremendous new market for ethanol. In regard to the reformulated gasoline program that begins in 1995, EPA will ask for public comment on a concept recently put forward by the ethanol industry to enhance the role of ethanol in achieving the air quality benefits of reformulated gasoline.

I appreciate your sharing your concerns with the Administration on this important matter. Please let me know if we can be of assistance to you in the future.

Sincerely,



David J. Beightol

Special Assistant to the President for
Intergovernmental Affairs

The Honorable E. Benjamin Nelson
Chairman, Governors' Ethanol Coalition
P.O. Box 95085
Lincoln, Nebraska 68509-5085

THE WHITE HOUSE
CORRESPONDENCE TRACKING WORKSHEET

INCOMING

DATE RECEIVED: MARCH 10, 1992

NAME OF CORRESPONDENT: THE HONORABLE E. BENJAMIN NELSON

SUBJECT: REQUESTS SUPPORT IN ENSURING THAT EPA'S
REGULATIONS SUPPORT THE NATION'S ETHANOL
INDUSTRY

ROUTE TO: OFFICE/AGENCY (STAFF NAME)		ACTION		DISPOSITION	
		ACT CODE	DATE YY/MM/DD	TYPE RESP	C COMPLETED D YY/MM/DD
DAVID BEIGHTOL		ORG	92/03/10	DB	C 92/04/01
REFERRAL NOTE:					
REFERRAL NOTE:					
REFERRAL NOTE:					
REFERRAL NOTE:					
REFERRAL NOTE:					

COMMENTS: WRITER IS ALSO GOVERNOR OF THE STATE OF
NEBRASKA

ADDITIONAL CORRESPONDENTS: MEDIA:L INDIVIDUAL CODES: 1140 2100
IG MAIL USER CODES: (A) (B) (C)

*ACTION CODES:	*DISPOSITION	*OUTGOING	*
*	*	*CORRESPONDENCE:	*
*A-APPROPRIATE ACTION	*A-ANSWERED	*TYPE RESP=INITIALS	*
*C-COMMENT/RECOM	*B-NON-SPEC-REFERRAL	*OF SIGNER	*
*D-DRAFT RESPONSE	*C-COMPLETED	*CODE = A	*
*F-FURNISH FACT SHEET	*S-SUSPENDED	*COMPLETED = DATE OF	*
I-INFO COPY/NO ACT NEC		*OUTGOING	*
*R-DIRECT REPLY W/COPY *			*
*S-FOR-SIGNATURE *			*
*X-INTERIM REPLY *			*

REFER QUESTIONS AND ROUTING UPDATES TO CENTRAL REFERENCE
(ROOM 75,OEOb) EXT-2590
KEEP THIS WORKSHEET ATTACHED TO THE ORIGINAL INCOMING
LETTER AT ALL TIMES AND SEND COMPLETED RECORD TO RECORDS
MANAGEMENT.

David Deigler

313-750

✓ Nebraska Gov. E. Benjamin Nelson, Chair
Illinois Gov. Jim Edgar, Vice Chair
Colorado Gov. Roy Romer
Indiana Gov. Evan Bayh
Iowa Gov. Terry Branstad
Minnesota Gov. Arne Carlson
Missouri Gov. John Ashcroft
Montana Gov. Stan Stephens
New Mexico Gov. Bruce King
North Dakota Gov. George Sinner
South Dakota Gov. George Mickelson
Texas Gov. Ann W. Richards
Wisconsin Gov. Tommy G. Thompson

GOVERNORS' ETHANOL COALITION

March 6, 1992

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Wisconsin
Jeffery Knight
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Honorable George Bush
The White House
1600 Pennsylvania Avenue
Washington, D.C. 20500

Dear President Bush:

During your visit to Lincoln three years ago when you announced your proposed amendments to the Clean Air Act, you described an exciting future for ethanol fuels in meeting important environmental and energy security objectives. However, the EPA's recent interpretation of the Clean Air Act amendments creates a serious obstacle to ethanol's use, thereby jeopardizing these objectives.

As we understand EPA's position, the current one pound volatility tolerance for ethanol blends sold in ozone nonattainment areas does not extend to reformulated gasoline. That conclusion by EPA is inconsistent with related provisions of the Clean Air Act. If EPA's interpretation prevails, ethanol use will be precluded from the reformulated gasoline program scheduled to begin in 1995. As a result, the most cost effective and environmentally beneficial approach to improved air quality in urban areas will not be used. We believe that this is not your intent nor the intent of Congress.

We are very concerned that several of the nation's largest ethanol producers have now announced that they are postponing expansion plans until this issue is satisfactorily resolved. These announcements will have a serious impact on every state in the coalition. It is critical for the future of the ethanol industry that the ethanol option be preserved. However, EPA's current interpretation will preclude the full benefit of ethanol fuels from being realized.

Honorable George Bush
March 6, 1992
Page 2 of 2

It is essential that EPA's regulations permit the use of ethanol in reformulated gasoline. We continue to share your vision of ethanol's role in the nation's future, and would welcome your assistance in ensuring that EPA's regulations support the nation's ethanol industry. Your leadership on this important issue is deeply appreciated.

Sincerely,

A handwritten signature in black ink, appearing to read "E. Benjamin Nelson", written over the printed name.

E. Benjamin Nelson
Chairman

cc: Hon. Jim Edgar, Vice Chair
Hon. Edward R. Madigan
Hon. James D. Watkins
Hon. William K. Reilly
Hon. Samuel K. Skinner
Hon. Clayton Yeutter
Hon. Boyden Gray



STATE OF ILLINOIS
OFFICE OF THE GOVERNOR
SPRINGFIELD 62706

JIM EDGAR
GOVERNOR

March 9, 1992

The Honorable George Bush
President of the United States
The White House
Washington, D.C. 20500

Dear Mr. President:

I am writing to respectfully request that the use of ethanol blended fuels in ozone nonattainment areas not be precluded by USEPA guidelines and that the guidelines for oxygenated fuels be expedited. Specifically, I request USEPA to extend the one pound volatility exemption for ethanol blended fuels to reformulated gasoline, thereby retaining ethanol as an option for achieving ozone reductions.

Failure to do so threatens both the viability of the Illinois ethanol industry and the continued growth of the agricultural economy of Illinois. Illinois produces over one-half of the nation's ethanol and uses more ethanol than any other state. The continued growth of the domestic ethanol industry is vital to this state and its economy. Fully 17 percent of the state's corn crop goes to ethanol production in the state. Loss of this market could be devastating to Illinois farmers.

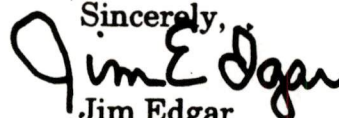
Since the passage of the Clean Air Act Amendments (CAAA), our expectations that ethanol would play a significant role in the cleanup of our nation's air have been frustrated. First, the guidelines have not been promulgated. Second, I understand that USEPA is interpreting the law to mean that the existing one pound volatility exemption for ethanol blends does not apply to reformulated gasoline. This interpretation runs counter to Congressional intent. The original exemption was provided in the CAAA because Congress recognized that mandating ethanol blends to meet the volatility standard would require the production of a lower volatility fuel for blending with ethanol and this would be cost prohibitive.

President George Bush
March 9, 1992
Page 2

Ethanol has already proven its worth to the environment by reducing carbon monoxide levels by 25 percent in cities such as Denver and Phoenix where it was used as an oxygenate. Further research is underway in the Lake Michigan airshed, including Chicago, to substantiate ethanol's benefits in reducing ozone. The emissions from ethanol are less reactive than most of the components in gasoline, and there is substantial reason to believe that the reduction in carbon monoxide attributable to ethanol blended gasoline will help reduce ozone.

National policy must not close the door on ethanol before these studies are complete. To do so would eliminate a renewable, domestically produced, clean transportation fuel. The nation's two largest ethanol producers are located in Illinois. This debate in Washington has created an uncertainty about the future of ethanol in U.S. energy policy and has caused these two Illinois corporations to postpone expansion plans.

I hope you will take action to support the continued growth and well-being of the ethanol industry and the agricultural economy of Illinois. Thank you for your consideration.

Sincerely,

Jim Edgar
GOVERNOR

GOVERNORS' ETHANOL COALITION

March 6, 1992

Lincoln Nelson, Chair
Vice Chair
Romer
Bayh
Branstad
Gov. Arne Carlson
Gov. John Ashcroft
Gov. Stan Stephens
New Mexico Gov. Bruce King
North Dakota Gov. George Sinner
South Dakota Gov. George Mickelson
Texas Gov. Ann W. Richards
Wisconsin Gov. Tommy G. Thompson

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Texas
Carol Tombari
(512) 463-1931

Wisconsin
Jeffery Knight
(608) 267-7693

Honorable George Bush
The White House
1600 Pennsylvania Avenue
Washington, D.C. 20500

Dear President Bush:

During your visit to Lincoln three years ago when you announced your proposed amendments to the Clean Air Act, you described an exciting future for ethanol fuels in meeting important environmental and energy security objectives. However, the EPA's recent interpretation of the Clean Air Act amendments creates a serious obstacle to ethanol's use, thereby jeopardizing these objectives.

As we understand EPA's position, the current one pound volatility tolerance for ethanol blends sold in ozone nonattainment areas does not extend to reformulated gasoline. That conclusion by EPA is inconsistent with related provisions of the Clean Air Act. If EPA's interpretation prevails, ethanol use will be precluded from the reformulated gasoline program scheduled to begin in 1995. As a result, the most cost effective and environmentally beneficial approach to improved air quality in urban areas will not be used. We believe that this is not your intent nor the intent of Congress.

We are very concerned that several of the nation's largest ethanol producers have now announced that they are postponing expansion plans until this issue is satisfactorily resolved. These announcements will have a serious impact on every state in the coalition. It is critical for the future of the ethanol industry that the ethanol option be preserved. However, EPA's current interpretation will preclude the full benefit of ethanol fuels from being realized.

Honorable George Bush
March 6, 1992
Page 2 of 2

It is essential that EPA's regulations permit the use of ethanol in reformulated gasoline. We continue to share your vision of ethanol's role in the nation's future, and would welcome your assistance in ensuring that EPA's regulations support the nation's ethanol industry. Your leadership on this important issue is deeply appreciated.

Sincerely,


E. Benjamin Nelson
Chairman

cc: Hon. Jim Edgar, Vice Chair
Hon. Edward R. Madigan
Hon. James D. Watkins
Hon. William K. Reilly
Hon. Samuel K. Skinner
Hon. Clayton Yeutter
Hon. Boyden Gray

THE WHITE HOUSE

WASHINGTON

July 16, 1992

Dear Governor Carlson:

Thank you for your recent letter to President Bush, on behalf of the Minnesota farmers, in which you raise concerns over the future role of ethanol in reformulated gasoline under the Clean Air Act Amendments of 1990.

The Administration believes that the development of renewable motor fuels, such as ethanol, methanol, and natural gas, will be important to achieving a secure domestic fuel supply that can improve air quality. The recently enacted Clean Air Act Amendments of 1990 provide opportunities to expand the use of these fuels as a cost-effective means for many cities to reduce urban levels of ozone and carbon monoxide pollution.

The new statute calls for the implementation of two clean fuels programs -- a wintertime oxygenated gasoline program and a reformulated gasoline program. The oxygenated program will require gasoline in 39 urban areas to contain a minimum of 2.7 percent oxygen by weight during the winter months beginning November 1, 1992. EPA projects that the oxygenated gasoline program will account for about 35 percent of the national gasoline demand during the winter months.

The reformulated gasoline program will require a minimum oxygen content of 2.0 percent by weight in all gasoline sold in nine cities with high levels of ozone beginning January 1, 1995. These include Baltimore, Chicago, Hartford, Houston, Los Angeles, Milwaukee, New York, Philadelphia, and San Diego. Approximately 87 other urban areas have the option of joining the program, potentially involving up to 55 percent of all fuel sold in the U.S.

While the requirements of the Clean Air Act call for a "fuel neutral" approach, EPA is taking several actions to ensure that ethanol can compete effectively with other oxygenates in meeting the new demand created under these two programs. With regard to the wintertime oxygenate program, EPA has encouraged States to adopt programs that allow the unrestricted averaging of oxygen levels in gasoline. This will enhance ethanol's role because of its high oxygen content and its effectiveness in reducing carbon monoxide emissions.

EPA is also examining ways to encourage the greater use of ethanol in the formulated gasoline program. Adding any alcohol to gasoline, such as ethanol or methanol, can potentially raise the evaporative rate of the gasoline. Because fuel evaporation accounts for roughly half of the emissions resulting from vehicles in ozone nonattainment areas, EPA is examining steps which can be taken to reduce the extra emissions caused by the higher evaporative rate in order to allow ethanol to be used effectively.

First, EPA believes that limits on the volatility of reformulated gasoline is only relevant during the four and a half months of the year that comprise the summer season. Because volatility is not an issue during the rest of the year, there should be no difficulty using ethanol. During the summer months, ethanol can continue to be used if steps are taken to offset any increase in potential emissions. This can be accomplished by using a base gasoline which has lower volatility, such as will be produced for southern states.

In response to the volatility issue, EPA is also initiating two research programs. One will study the effects of fuel composition and cosolvents on lowering the volatility increases that may occur with 10 percent ethanol. The second will test exhaust emissions from a sample of cars using ethanol blended at volumes greater than 10 percent. In addition, EPA also included in its April 16th proposed regulation for reformulated gasoline, a request for public comments on the concept of developing a mass-based equivalency index which would account for reductions in CO tailpipe emissions caused by oxygenates. A public workshop was held on Monday, April 27, 1992, to discuss this proposal and to seek public input from interested parties.

Finally, it is important to note that the Administration has also taken other steps to encourage the use of ethanol. The Department of Treasury extended the applicability of the ethanol blenders Federal income tax credit to ethanol used in the production of ethyl tertiary-butyl ether (ETBE), thus establishing an additional market for ethanol. Furthermore, the Departments of Energy and Agriculture have expanded their existing research and development efforts aimed at reducing the cost of ethanol production. The success of these programs could dramatically enhance the ability of ethanol to compete effectively in the fuels market.

Again, thank you for sharing your concerns with the Administration on this very important issue. The Administration is taking these actions because it believes that ethanol has an important role to play in our future transportation fuel supply. Considerable care, however, must be taken to ensure its most effective use. Please let me know if we can be of further assistance to you.

Sincerely,

A handwritten signature in dark ink, appearing to read "John A. Cline". The signature is fluid and cursive, with the first name "John" and last name "Cline" clearly distinguishable.

John A. Cline
Special Assistant to the President for
Intergovernmental Affairs

The Honorable Arne H. Carlson
Governor of Minnesota
State Capitol
St. Paul, MN 55155

THE WHITE HOUSE
CORRESPONDENCE TRACKING WORKSHEET

INCOMING

DATE RECEIVED: JULY 13, 1992

NAME OF CORRESPONDENT: THE HONORABLE ARNE H. CARLSON

SUBJECT: FORWARDS LETTERS HE RECEIVED FROM MINNESOTA
FARMERS CONCERNING THE EPA INTERPRETATION OF
THE 90 CLEAN AIR ACT AMENDMENTS REGARDING THE
USE OF ETHANOL IN REFORMULATED GASOLINE

ACTION

DISPOSITION

ROUTE TO: OFFICE/AGENCY	(STAFF NAME)	ACT CODE	DATE YY/MM/DD	TYPE RESP	C D	COMPLETED YY/MM/DD
JOHN CLINE		ORG	92/07/13	JC	A	92/07/20
99 DOE	REFERRAL NOTE: _____	I	92/07/20			/ /
99 EPA	REFERRAL NOTE: _____	I	92/07/20			/ /
	REFERRAL NOTE: _____		/ /			/ /
	REFERRAL NOTE: _____		/ /			/ /
	REFERRAL NOTE: _____		/ /			/ /

COMMENTS: _____

ADDITIONAL CORRESPONDENTS: MEDIA:L INDIVIDUAL CODES: 2110 _____

IG MAIL USER CODES: (A) _____ (B) _____ (C) _____

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*ACTION CODES:          *DISPOSITION          *OUTGOING          *
*                      *                      *CORRESPONDENCE:  *
*A-APPROPRIATE ACTION  *A-ANSWERED          *TYPE RESP=INITIALS *
*C-COMMENT/RECOM       *B-NON-SPEC-REFERRAL  *          OF SIGNER *
*D-DRAFT RESPONSE      *C-COMPLETED          *          CODE = A   *
*F-FURNISH FACT SHEET  *S-SUSPENDED          *COMPLETED = DATE OF *
*I-INFO COPY/NO ACT NEC*                      *          OUTGOING  *
*R-DIRECT REPLY W/COPY *                      *                      *
*S-FOR-SIGNATURE       *                      *                      *
*X-INTERIM REPLY       *                      *                      *
*****

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REFER QUESTIONS AND ROUTING UPDATES TO CENTRAL REFERENCE
(ROOM 75,OEOb) EXT-2590
KEEP THIS WORKSHEET ATTACHED TO THE ORIGINAL INCOMING
LETTER AT ALL TIMES AND SEND COMPLETED RECORD TO RECORDS
MANAGEMENT.



STATE OF MINNESOTA

OFFICE OF THE GOVERNOR

SAINT PAUL 55155

612-296-3391

ARNE H. CARLSON
GOVERNOR

July 9, 1992

The Honorable George Bush
The White House
1600 Pennsylvania Avenue
Washington, D.C. 20500

Dear President Bush:

During the past few weeks I have received over 80 personal letters from Minnesota farmers expressing concern with the EPA interpretation of the 1990 Clean Air Act Amendments regarding the use of ethanol in reformulated gasoline. I share their dismay and concern that the rulemaking process may reverse the intent of Congress, and therefore jeopardize the future of the domestic ethanol industry.

There are two metropolitan areas in Minnesota that are in non-attainment for carbon monoxide. Both Duluth and the Twin Cities will offer only oxygenated gasoline for sale beginning November 1 of this year, and it is likely that ethanol will be the oxygenate of choice. As a result, environmental interests are excited about improved air quality, and our agricultural interests are excited about new domestic markets for corn.

Minnesota does not have any oil wells, so we import over \$2 billion worth of petroleum products each year. We are also the fourth largest corn producing state in the nation. Our ethanol production capability has increased from one million gallons to nearly 40 million gallons annually in just the past five years. As a result of the current ruling, as much as 80 million gallons of new ethanol production capacity in Minnesota may not be built.



President George Bush
July 9, 1992
Page 2

The extension of the excise tax exemption and the passage of the Clean Air Act by Congress sent a signal to us that we were finally moving away from our dangerous reliance on imported oil for much of our energy supplies. A reversal of congressional intent by the EPA will not only impede the expansion of the ethanol industry, but add refined gasoline products to our list of imports as well.

I ask you to review these letters that represent the thoughts of thousands of Minnesotans. Please urge the EPA to review new information and reconsider their position on the use of ethanol in reformulated gasoline. Certainly there is a way to clean our nation's air without eliminating the use of the only renewable liquid fuel available today.

Warmest regards,


ARNE H. CARLSON
Governor

THE WHITE HOUSE
WASHINGTON

April 14, 1992

Dear Secretary Cochran:

On behalf of President Bush, I want to thank you for your recent correspondence regarding a National Agricultural Summit and the use of ethanol in reformulated gasolines. You were kind to write.

First, I want to reiterate the President's firm support for ethanol and its contributions to clean air, energy independence and the economic well-being of American farmers. The Administration will continue to acknowledge the opportunities and concerns of the ethanol industry under the Clean Air Act.

In regards to convening an Agricultural Summit, I have taken the liberty of forwarding your letter to the U.S. Department of Agriculture so that they will know of your concerns and ideas. I have asked that they respond directly to you.

I appreciate your sharing your concerns with the Administration on this important issue. Please let me know if we can be of assistance to you in the future.

Sincerely,



David J. Beightol
Special Assistant to the President for
Intergovernmental Affairs

The Honorable Dale M. Cochran
Secretary of Agriculture
Iowa Department of Agriculture
and Land Stewardship
Henry A. Wallace Building
Des Moines, Iowa 50319

THE WHITE HOUSE
CORRESPONDENCE TRACKING WORKSHEET

INCOMING

DATE RECEIVED: APRIL 08, 1992

NAME OF CORRESPONDENT: THE HONORABLE DALE M. COCHRAN

SUBJECT: URGES THE PRESIDENT TO CONVENE A NATIONAL
AGRICULTURAL SUMMIT TO GIVE AGRICULTURE
AN OPPORTUNITY TO BE HEARD AND COMPETE WITH
OTHER INTERESTS

ROUTE TO: OFFICE/AGENCY	(STAFF NAME)	ACTION		DISPOSITION	
		ACT CODE	DATE YY/MM/DD	TYPE RESP	C COMPLETED D YY/MM/DD
DAVID BEIGHTOL		ORG	92/04/08	DB	C 22/04/14
99 USDA	REFERRAL NOTE: _____	AR	22/04/14		
	REFERRAL NOTE: _____				
	REFERRAL NOTE: _____				
	REFERRAL NOTE: _____				
	REFERRAL NOTE: _____				

COMMENTS: _____

ADDITIONAL CORRESPONDENTS: MEDIA:L INDIVIDUAL CODES: 2200 _____

IG MAIL USER CODES: (A) _____ (B) _____ (C) _____

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*ACTION CODES:          *DISPOSITION          *OUTGOING          *
*                      *                      *CORRESPONDENCE:  *
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*F-FURNISH FACT SHEET  *S-SUSPENDED          *COMPLETED = DATE OF *
*I-INFO COPY/NO ACT NEC*                      *          OUTGOING  *
*R-DIRECT REPLY W/COPY *                      *                      *
*S-FOR-SIGNATURE        *                      *                      *
*X-INTERIM REPLY        *                      *                      *
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320626
D. Bush

Iowa Department of Agriculture and Land Stewardship

DALE M. COCHRAN
SECRETARY OF AGRICULTURE



SHIRLEY DANSKIN-WHITE
DEPUTY SECRETARY OF AGRICULTURE

HENRY A. WALLACE BUILDING
DES MOINES, IOWA 50319

April 3, 1992

The Honorable George Bush
The White House
1600 Pennsylvania Avenue
Washington, D.C. 20600

Dear President Bush:

During your visits to the Midwest in 1988, you pledged that agriculture would be a high priority of the Bush Administration. However, recent actions by federal agencies have raised serious concerns about the extent of your commitment to and support for American agriculture and agribusiness.

The Environmental Protection Agency's delay in issuing regulations to implement the Clean Air Act Amendments has eroded the potential market for ethanol-blended fuel. Several major ethanol producers have abandoned plans to step up production in response to the EPA's inaction. It has affected the corn market.

A decision blocking the sale of 30,000 metric tons of U.S. pork to the Commonwealth of Independent States also has taken a toll on farmers. This decision is denying our farmers and processors an opportunity to compete, thereby handing over this potentially lucrative market to the European Community.

I urge you to convene a national agriculture summit, so that you and your key agency heads may sit down with commodity, farm organization and agribusiness leaders, as well as key members of Congress to examine how government may assist U.S. agriculture, rather than hinder it.

A key function of this summit could be to clarify national agricultural policy and to see to it that all federal agencies that support and regulate agriculture coordinate their activities to pursue that policy. It would also give agriculture an opportunity to be heard and compete with other interests.

I look forward to your response.

Sincerely,

Dale M. Cochran
Dale M. Cochran
Secretary of Agriculture

THE WHITE HOUSE

WASHINGTON

April 1, 1992

Dear Governor Edgar:

On behalf of President Bush, I want to thank you for your recent correspondence regarding the use of ethanol in reformulated gasoline.

I want to reiterate the President's firm support for ethanol and its contributions to clean air, energy independence and the economic well-being of American farmers. The Administration will continue to acknowledge the opportunities and concerns of the ethanol industry under the Clean Air Act.

Under President Bush's leadership, the U.S. Department of Agriculture (USDA) and the Environmental Protection Agency (EPA) and the Department of Energy will work together with the Congress, states, corn growers, the ethanol industry and other interested parties to ensure a strong and growing role for ethanol under upcoming programs to improve air quality in our cities.

In particular, USDA and EPA have been working with the ethanol industry to facilitate state implementation of the oxygenated fuels program scheduled to start in November of this year. This program will reduce unhealthy levels of carbon monoxide in 39 metropolitan areas of the country and offers a tremendous new market for ethanol. In regard to the reformulated gasoline program that begins in 1995, EPA will ask for public comment on a concept recently put forward by the ethanol industry to enhance the role of ethanol in achieving the air quality benefits of reformulated gasoline.

I appreciate your sharing your concerns with the Administration on this important matter. Please let me know if we can be of assistance to you in the future.

Sincerely,



David J. Beightol
Special Assistant to the President for
Intergovernmental Affairs

The Honorable Jim Edgar
Governor of Illinois
Office of the Governor
Springfield, Illinois 62706

THE WHITE HOUSE
CORRESPONDENCE TRACKING WORKSHEET

INCOMING

DATE RECEIVED: MARCH 11, 1992

NAME OF CORRESPONDENT: THE HONORABLE JIM EDGAR

SUBJECT: REQUESTS THAT THE USE OF ETHANOL BLENDED
FUELS IN OZONE NONATTAINMENT AREAS NOT BE
SHUT OUT BY EPA GUIDELINES AND THAT THE
GUIDELINES FOR OXYGENATED FUELS BE EXPEDITED

ROUTE TO:		ACTION		DISPOSITION	
OFFICE/AGENCY	(STAFF NAME)	ACT CODE	DATE YY/MM/DD	TYPE RESP	C COMPLETED D YY/MM/DD
DAVID BEIGHTOL		ORG	92/03/11	DB	C 92/04/01
REFERRAL NOTE:					
REFERRAL NOTE:					
REFERRAL NOTE:					
REFERRAL NOTE:					
REFERRAL NOTE:					

COMMENTS: HAND-DELIVERED; REC'D IN CORRESPONDENCE FROM
IG FOR TRACKING; COPY OF ID 313758 IS
ATTACHED

ADDITIONAL CORRESPONDENTS: MEDIA:L INDIVIDUAL CODES: 2110 _____
IG MAIL USER CODES: (A) _____ (B) _____ (C) _____

*ACTION CODES: *DISPOSITION *OUTGOING *
* * *CORRESPONDENCE: *
*A-APPROPRIATE ACTION *A-ANSWERED *TYPE RESP=INITIALS *
*C-COMMENT/RECOM *B-NON-SPEC-REFERRAL * OF SIGNER *
*D-DRAFT RESPONSE *C-COMPLETED * CODE = A *
*F-FURNISH FACT SHEET *S-SUSPENDED *COMPLETED = DATE OF *
I-INFO COPY/NO ACT NEC * * OUTGOING *
*R-DIRECT REPLY W/COPY * * * * *
*S-FOR-SIGNATURE * * * *
*X-INTERIM REPLY * * * *

REFER QUESTIONS AND ROUTING UPDATES TO CENTRAL REFERENCE
(ROOM 75, OEOB) EXT-2590
KEEP THIS WORKSHEET ATTACHED TO THE ORIGINAL INCOMING
LETTER AT ALL TIMES AND SEND COMPLETED RECORD TO RECORDS
MANAGEMENT.

SEP 25 1992

MEMORANDUM FOR ROBERT E. GRADY

FROM:

Arthur Fraas *AF*

SUBJECT:

EPA's Docket for Reform Gasoline

Key points from review of docket materials:

- (1) The Environmental Protection Agency's (EPA) docket is still open (although the comment period is over) and EPA has not yet placed all the materials submitted to it in the docket. EPA staff provided roughly 10 "key" documents that have not been placed in the docket; EPA staff assured me that these documents will eventually be placed in the record. Further, it is EPA's practice to add material to the record--even after the comment period has closed--up to the time of the Administrator's signature of the rule. As a result, material submitted next week (or next month) could arguably serve as the basis for EPA's decision. [On occasion, EPA's General Counsel has required the "notice" in the Federal Register of significant materials submitted after the close of the comment period.]
- (2) The Corn Growers Association comments provide an extensive discussion on the basis for using Organic Material Hydrocarbon Equivalent (OMHCE) and Carbon Mass Equivalent (i.e., carbon monoxide) measures as offsets for the increase in VOCs associated with a one pound increase Reid Vapor Pressure (RVP). However, I have not found any calculation/basis that would support a specific RVP credit for OMHCE or carbon mass equivalent in the comments provided by the Corn Growers.
- (3) There is material from other sources that support a credit based on the carbon mass equivalent measure (i.e., reduced carbon monoxide emissions). A comment from the Renewable Fuels Association would appear to support a credit using the carbon mass equivalent approach of 0.2 lb RVP. EPA documents appear to support a credit ranging from 0.05 lb. to 0.2 lb RVP.

-2-

- (4) EPA would argue that an offset "credit" based on carbon mass equivalents is flawed because:
- (a) carbon monoxide is substantially less reactive than VOC and the carbon mass equivalent measure fails to reflect this difference.
 - (b) other factors should also be considered -- for example, the increased emissions associated with mixing of various brands by consumers over time.
- (5) I have not been able to identify any separate discussion based on adjustments for oxygen.

cc: Official File - NRB

NRB Chron

Jim MacRae

NRB:AFraas:mrm:09/25/92 - BobGrady.Mem

A-91-02

IV-D-172

PRESENTATION BY THE RENEWABLE FUELS ASSOCIATION

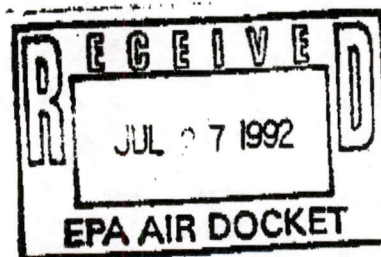
OFFICE OF MOBILE SOURCES WORKSHOP

U.S. ENVIRONMENTAL PROTECTION AGENCY

APRIL 27, 1992

ANN ARBOR, MICHIGAN

**"APPLYING A CARBON MASS EQUIVALENT TO THE EVAPORATIVE
EMISSIONS FROM AN ETHANOL-BLENDED REFORMULATED GASOLINE"**



- 2 -

"Directionally, CO emission reductions from alternative fuels will assist in attaining the ozone NAAQS, but the strength of this effect has not yet been documented for the range of local conditions which affect ozone formation."

"Guidance on Estimating Motor Vehicle Emission Reductions From the Use of Alternative Fuels and Fuel Blends," 29 January 1988; Emission Control Technology Division, Office of Mobile Sources

- 3 -

As part of EPA's fuel volatility rulemaking, the Renewable Fuels Association submitted a modeling study utilizing the Empirical Kinetic Modeling Approach (EKMA), with Carbon-Bond IV, which modeled the impact on ozone formation of splash-blended, 10-percent ethanol blends (base gasoline at 10.5 RVP), at 100-percent market penetration in seven cities (Chicago, Boston, Washington, St. Louis, Nashville, Tulsa, and Phoenix)

"Reductions in CO emissions resulting from automobiles using ethanol blends always mitigate and often reverse any increases in urban ozone that might result from the evaporative emission increases identified with the use of ethanol blends."

"Evaluation of the Impact of Ethanol/Gasoline Blends on Urban Ozone Formation," Revised Final Report, 12 February 1988; Systems Applications Inc., San Rafael, California

- 4 -

"The other major area of comment related to the environmental impact of permitting gasohol to be sold at a higher RVP than gasoline. Ultimately, the issue is to what extent ozone levels are affected. Gasohol interests claim that several phenomena reduce the ozone impact of higher RVP gasohol relative to gasoline of similar higher RVP (e.g., the lesser tendency of ethanol emissions to produce ozone (reactivity) compared to hydrocarbons, and a reduction in carbon monoxide emissions and thus a reduction in CO's role in ozone production).

"As detailed in the Final RIA, recent studies have indicated that the ozone impact of gasohol at 1.0 RVP higher than gasoline is less than we earlier believed (i.e., a range of about zero to 1 percent increase in ozone levels based on the analysis referenced in the Final RIA).... The 1.0 psi RVP allowance for gasohol adopted in this final rule thus reflects the moderation in EPA's concern about negative air quality impact...."

"Volatility Regulations for Gasoline and Alcohol Blends Sold in Calendar Years 1992 and Beyond," 55 Fed. Reg. 23658, 23665-23666; June 11, 1990.

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"EPA recently commissioned a study by SAI which in addition to other fuel scenarios, attempted to quantify the ozone impact of oxygenated blends, taking into consideration both VOC and CO impacts. To combine all of the exhaust, evaporative, and running loss emission effects into a net effect, EPA provided SAI with MOBILE 3.9 based emissions.... [T]here is virtually no change in peak ozone levels for any oxygenated blend scenario when the urban airshed model is used.... Therefore, it appears that allowing a 1 psi RVP allowance for ethanol blends would not contribute to as significant of a change in ozone levels as EPA previously thought."

"Final Regulatory Impact Analysis
and Summary and Analysis of
Comments, Phase II Gasoline
Volatility Regulations, May 1990;
Office of Mobile Sources.

The EPA-commissioned study referred to in the FRIA is entitled "A Low-Cost Application of the Urban Airshed Model To the New York Metropolitan Area and the City of St. Louis (Five Cities UAM Study Phase I)," 15 May 1989, Systems Applications, Inc.

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MOBILE 4.1 RESULTS

1995 Fleet Mix Emissions, g/mi

<u>Category</u>	<u>Base Gasoline, 7.2 RVP</u>	<u>Ethanol Blend, 8.2 RVP</u>
Exhaust	1.04	1.04
Evaporative	0.24	0.34
Running	0.17	0.29
Resting	0.11	0.11
Refueling	0.06	0.07
CO	12.92	9.01
NOx	0.93	0.95
TOTAL VOC	1.62	1.85

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CARBON MASS EQUIVALENT

The "carbon mass equivalent" removes the weight of the molecular oxygen in the reduced carbon monoxide emissions due to 10-percent ethanol, and credits the remaining carbon against the VOC's increased by the 1.0 psi RVP volatility increase.

The molecular weight of carbon = 12

The molecular weight of oxygen = 16

Therefore, the carbon fraction of carbon monoxide is $12/(12+16)$, or, 0.4286 percent.

Carbon monoxide emissions of base gasoline from MOBILE 4.1 results = 12.92 g/mi.

Carbon monoxide emissions of 10-percent blend from MOBILE 4.1 results = 9.01 g/mi.

Carbon mass equivalent = $(12.92-9.01) \times 0.4286$
or, 1.68 g/mi VOC credit for the ethanol blend.

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**EPA'S METHANOL-FUELED VEHICLE RULEMAKING
A TECHNICAL PRECEDENT FOR THE CARBON MASS EQUIVALENT**

EPA included in this rulemaking an "organic material hydrocarbon equivalent," which eliminates the mass of inert molecular oxygen from the overall mass of methanol exhaust emissions. The regulation dictates that an "organic material hydrocarbon equivalent" is to be used to calculate the mass exhaust emissions from methanol-fueled vehicles. EPA stated the environmental rationale for utilizing a "carbon-based standard" to determine the methanol mass exhaust emissions is that, "the photochemical oxidation process leading to ozone production is carbon dependent."

"Standards For Emissions From
Methanol-Fueled Motor Vehicles and
Motor Vehicle Engines," (54 Fed.
Reg. 14426, 14432; April 11, 1989)

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PROVIDING A "GENERIC HYDROCARBON UNIT DEBIT"
TO THE CARBON MASS EQUIVALENT

In the methanol-fueled vehicle rulemaking, the "organic material hydrocarbon equivalent" deleted the oxygen mass from the methanol mass, still leaving a "hydrocarbon" for purposes of determining mass emissions. EPA promulgated various emission factors to be utilized in determining the respective exhaust emission fraction and evaporative emission fraction from methanol-fueled vehicles.

Emission factors, designated in terms of molecular weight, are applied to exhaust hydrocarbon emissions (a factor of 13.87), and evaporative hydrocarbon emissions (a factor of 14.23). (These fractions are codified at 54 Fed. Reg. 14535 and 14571, respectively.) In essence, these factors reflect the view that hydrocarbons emitted from motor vehicles are comprised of "generic" units made up of one carbon molecule and two hydrogen molecules.

The carbon mass equivalent is derived from carbon monoxide, not a true hydrocarbon. The molecular weight difference between carbon and hydrogen is a factor of 6. As the photochemical importance of carbon and hydrogen is equal in the atmosphere, it is necessary to apply a "generic hydrocarbon unit debit" to the carbon mass equivalent; i.e., reduce it by a factor of 6 (0.1667).

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MOBILE 4.1 RESULTS APPLYING THE CARBON MASS EQUIVALENT
1995 Fleet Mix Emissions, g/mi

<u>Category</u>	<u>Base Gasoline, 7.2 RVP</u>	<u>Ethanol Blend, 8.2 RVP</u>
Exhaust	1.04	1.04
Evaporative	0.24	0.34
Running	0.17	0.29
Resting	0.11	0.11
Refueling	0.06	0.07
CO	12.92	9.01
TOTAL VOC	1.62	1.85

Carbon Mass Equivalent Calculation:

1. $12.92 \text{ g/mi CO} - 9.01 \text{ g/mi CO} = 3.91 \text{ g/mi CO}$
2. $3.91 \text{ g/mi} \times 0.4286 = 1.68 \text{ g/mi VOC credit (w/o debit)}$
3. $1.68 \text{ g/mi credit} \times 0.1667 = 0.28 \text{ g/mi VOC credit}$
4. $1.85 \text{ g/mi VOC (ethanol blend)} - 0.28 \text{ g/mi "CME"}$
 $= 1.57 \text{ g/mi VOC}$

Vehicle Emissions: VOC & CO

Mass Emissions in Grams per Mile

	<u>CO</u>	<u>VOC</u>	<u>TOTAL</u>	<u>%REDUCTION</u>
Baseline gasoline	5.53	0.88	6.41	-
10% Ethanol blend	4.14	1.03	5.17	19%
5.7% Ethanol blend	4.74	1.02	5.76	10%
11% MTBE blend	4.74	0.84	5.58	13%
13% ETBE blend	4.74	0.79	5.53	14%

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SEP 22 1992

Attached is a slight redraft of the Ethanol Fact Sheet that the White House working group had developed. Most importantly, it includes two options concerning the one psi waiver, either of which I can support. President Bush could announce this package when he is in Illinois at the end of this week, or, if you prefer, I could announce it this Friday during a speech I am giving in California.

The first option (page 2, item 1a) would be to propose legislation that would authorize states to grant a one psi waiver to ethanol blends if they adopt additional air pollution control measures sufficient to offset any increase in ozone formation resulting from the waiver.

The second option (page 2, item 1b) would not need a legislative change. It would allow a state to impose more stringent performance standards than those in the federal reformulated gasoline program. Ethanol blends would receive a one psi waiver from these state standards. Emissions reductions from these more stringent standards would offset the extra emissions from ethanol blends.

Either option allows us to support a one psi waiver since they are drafted in a way that is environmentally neutral. Option 1a provides states maximum flexibility in coming up with offsets, i.e., all sources are eligible. It does require legislation. Option 1b could be done administratively but is much narrower. Offsets can only be obtained through tighter fuel standards. The oil industry would likely oppose Option 1b as putting all the burden on them and causing them fuel distribution problems. Both options shift the consideration of offsets and ozone impact to the state level where specific local conditions and factors can best be identified.

Attachment

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Promotion of Ethanol to Help Achieve the Environmental Goals of the Clean Air Act

FACT SHEET

The President today announced several new steps designed to eliminate unnecessary regulatory barriers and encourage expansion of market opportunities for ethanol. Although the Federal Government has historically provided strong support to this environmentally beneficial fuel made from renewable farm products, President Bush has been a particularly active leader in opening up markets for ethanol. In fact, it was because of President Bush's leadership on clean fuels that the 1990 amendments to the Clean Air Act require the use of oxygenates such as ethanol in both the reformulated and oxygenated fuels programs. The President also proposed to substantially increase the use of alternative fuels in the transportation sector as part of his National Energy Strategy.

The steps announced today represent a critical milestone in the Administration's implementation of these important Clean Air Act and energy security programs.

Between 1985 and 1991, ethanol consumption in the U. S. remained roughly stable at about 750 to 800 million gallons per year. Due in large part to the steps announced today, however, U. S. ethanol consumption is conservatively expected to increase by 75 percent by the year 1997. In fact, some industry analysts have projected that ethanol consumption could reach 2 billion gallons annually by the year 2000.

	1991	1992 Projected	1997
Total Gallons (in billions)	0.8	0.9	1.4
Increase over 1991	---	+12%	+75%

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INITIATIVES TO ASSIST ETHANOL

A. REFORMULATED GASOLINE

1a. Legislative one PSI Waiver. The Administration will propose legislation to Congress that would authorize states participating in the reformulated gasoline (RFG) program to allow gasoline containing up to 10% ethanol to exceed any volatility limit applicable to RFG by up to 1 psi. To do so a state would need to demonstrate to EPA that it has adopted and submitted as a SIP revision enforceable VOC control measures (not otherwise required under the Clean Air Act) sufficient to offset any increase in ozone formation that would result from allowing ethanol-blended RFG to meet the higher volatility limit.

-or-

1b. Administrative one PSI Waiver. States could establish volatility standards that are more stringent than those in the federal reformulated gasoline program. Ethanol blends would have a one psi waiver above the more stringent state volatility standards. The stricter state standards must provide sufficient RVP credits to offset the RVP impact of ethanol blends. Such state programs would be submitted to EPA under the waiver provisions of Section 211(c)(4) concerning waivers of federal preemption. In addition, a state could adopt a more stringent Inspection/Maintenance program than otherwise required ("super enhanced" I/M). Upon approval for such program, EPA would adjust the RFG complex model as applied to that state to account for this increased stringency.

2. National Academy of Sciences (NAS) review of the impact of ethanol and other oxygenate blends on ozone formation. Conflicting scientific information has been presented regarding the level of environmental benefits derived from ethanol. To assist states in their consideration of waivers from the RFG program (as described in #1 above) the Administration will ask the NAS to provide an independent evaluation of the ozone forming potential of different oxygenates based on the reactivity of their emissions and based on urban air shed modeling.

3. Non-Taxable (ETBE) Blender Tax Credit. The President announced today that he will seek legislation making the benefits of the blender tax credit non-taxable for ETBE and other ethers derived from ethanol. ETBE currently receives treatment equivalent to ethanol in the form of a tax credit. Ethanol in an ether form provides additional emission reductions that enable it to meet the summertime reformulated gasoline

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requirements. The effect of this action will be to increase the market value of ethanol enabling ETBE to better compete with other oxygenates.

4. Administration support for pro-rating the excise tax for ethanol. The Administration strongly supports current Senate legislation that would prorate the existing excise tax for ethanol blends of 10 percent to blends of 7.7 and 5.7 percent. The lower percentage ethanol blends correspond to the oxygenate levels required under the Clean Air Act and provide gasoline distributors wishing to use ethanol with additional blending options.

5. Expediting the development and the unrestricted optional use of the complex model by 1995. EPA will issue a proposed RFG rule by November 1992 to provide refiners with the option of using the complex model in meeting the requirements of the Clean Air Act. The final rule will be published in March 1993. The complex model will provide gasoline marketers with a full range of options for meeting the pollution reduction requirements of the Act.

6. Recognizing the benefits from ethanol use. In the development of the RFG complex model, EPA will take into account all of the positive benefits of ethanol. The model will be developed through a public process, including workshops and rigorous technical peer review. Through this process, the benefits of ethanol will be fully credited to the maximum extent scientifically justifiable and legally allowable under the provisions of the Clean Air Act.

7. Establishing toxics and NOx neutrality. The final rule will contain toxics and NOx standards that are oxygenate neutral. With respect to NOx, this step is warranted because recent data indicate that all oxygenates, such as MTBE and ethanol, have a comparable effect on NOx emissions. Moreover, because the proposed rule would have established toxics performance standards based on the use of MTBE, it would have disadvantaged other oxygenates such as ethanol. Therefore, EPA will ensure toxics and NOx neutrality for all RFG complex model provisions.

8. Establishing a trading program for Volatile Organic Compounds (VOCs). In order to provide incentives for gasoline marketers to furnish low RVP gasoline blend stock, EPA will establish -- to the extent legally allowable -- a trading program for emission reduction credits to be earned by producing reformulated gasoline that is cleaner than legally required, including VOC trading among mobile and stationary sources, and providing for trading within each affected geographic area.

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9. Establishing a trading program for volatility (RVP) credits. In order to provide greater flexibility for gasoline marketers to blend ethanol into RFG, EPA will establish a trading program for RVP credits within each affected geographic area.

B. OXYGENATE PROGRAM FOR CO AREAS

1. Releasing the oxy-fuel regulations. EPA will immediately issue guidelines for establishing the oxygenate program in CO nonattainment areas. By issuing these rules, the agency will help ensure that cities will be ready to begin the program by this Fall.

2. Providing for participation by 39 cities. After intensive review of the air quality data, EPA has determined that the wintertime oxygenate program will apply to 39 cities. This will greatly boost demand for ethanol beginning this Fall.

3. Restricting State Waivers from the 2.7 percent oxygenate standard. Because of concerns over potential increases in NOx emissions from the use of oxygenates, several states are examining the option of establishing caps on the amount of oxygenate that can be blended into gasoline. Because ethanol has higher levels of oxygenate compared to MTBE and other oxygenates, such caps will discourage blenders from using ethanol. EPA expects to find that oxygenate caps are unnecessary and thereby preclude states from establishing such caps. EPA also intends to reject states' petitions to override the preclusion and to establish oxygenate caps in their State Implementation Plans unless the state can show that there will be an adverse environmental effect. EPA has also clarified its view that any increase in NOx emissions caused by oxygenates will be offset many times over by the overall decrease in motor vehicle NOx emissions as a result of increasingly stringent NOx tailpipe standards.

4. Restricting Unsubstantiated Waiver Requests. On April 8, 1992, EPA issued guidelines establishing specific requirements that must be met by anyone wishing to petition EPA to delay the start of the wintertime oxygenated fuels program beyond November 1, 1992. These guidelines are desired to ensure that EPA will not receive unsubstantiated petitions to delay the start of the program, thereby assuring new markets for ethanol by November 1992.

C. OTHER

1. Presidential Biofuels Initiative. The President has launched a biofuels research and development initiative to expand the use of ethanol and other biofuels. For FY 1993, he has proposed doubling the

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research budget for ethanol-related research to \$40 million. Today the President directed the Secretaries of Energy and Agriculture and the Administrator of EPA to report back in 60 days with a strategy better focusing the initiative on reducing the cost of the fuels and developing engine technology to optimize the technical and environmental characteristics of biofuels.

2. Biodiesel tax incentive. The Administration will seek legislation expanding the application of existing alcohol fuel tax credits to include vegetable oils used in motor fuels such as biodiesel blends. This action will encourage the production of these renewable, domestically-produced, clean burning fuels.



American Biofuels Association

1120 Connecticut Avenue, N.W. • Suite 400
Washington, D.C. 20036

Tel: (202) 466-8213 • Fax (202) 833-1808

Memorandum

17 September 1992

For: Boyden Gray, Counsel to the President
Bob Grady, Special Assistant to the President for Domestic Policy
Bob Zoellick, Deputy White House Chief of Staff
Bill Rosenberg, Assistant Administrator for Air Programs, EPA
Gary Blumenthal, Special Assistant to the President for Agriculture and Trade
Bill O'Connor, Chief of Staff to the Secretary of Agriculture
Mark Dungan, Executive Assistant to the Secretary of Agriculture
Dick Wilson, Director, Office of Mobile Sources, EPA

From: Bill Holmberg 

Re: The Fuel Ethanol Industry

Ongoing reviews of available science increasingly indicates that the full waiver for E10 won't fly.

However, E10's verified environmental benefits could be incorporated into the "Complex Model" in time to ensure its full availability as a reformulated gasoline component in 1995.

The Administration's "package" is the only answer in meeting the need to expand the ethanol industry over the long term.

In finalizing the package and to strengthen its position in the Congress, the Administration should also propose extending the blender's tax credit to SoyDiesel/Biodiesel (a high quality diesel additive that improves emissions, toxicity and biodegradability, and is made from surplus vegetable oils and animal fats). Other benefits available to alternative and renewable fuels should also be extended to SoyDiesel/Biodiesel. This is a visible, popular but emerging industry with sales this year approaching 100,000 gallons. The loss to the Treasury will be minimal.

If properly orchestrated, the President's package will be solidly embraced by all farm organization. By including SoyDiesel/Biodiesel, the soybean, peanut, cotton, sunflower growers etc., will join with cattlemen, pork and chicken producers and others involved in biological oils and fats, in support of the President's package and its legislative agenda.

The President and the country can win big on this issue. If this issue is allowed to fizzle into a "pre-doomed waiver," almost everybody would lose. We are now at the point where every hour counts in bringing this issue to closure to the benefit of farmers, the nation and the President.

Attached is a paper being circulated to farm, ethanol and environmental groups.

FUEL ETHANOL AND THE ENVIRONMENT

There is a major public policy battle raging between the major sector of the ethanol industry and the National Corn Growers Association (NCGA) on one front, and the U.S. Environmental Protection Agency (EPA), the environmental community, oil companies and most states on the other. The fight is over the volatility of splash-blended 10% ethanol blends (E10), and whether these blends can be sold as reformulated gasoline (RFG) in severe ozone nonattainment areas (9 major cities) during the summer months starting in 1995. The fight also involves the President, White House staff, three cabinet secretaries, the administrator of EPA, scores of members in both the Senate and the House of Representatives and much of the farm community.

What are the facts?

Fuel ethanol made from agricultural products has several major benefits:

- o Stimulates the rural economy by providing farmers with higher income, and by creating jobs while reducing farm subsidies;
- o Increases energy security by reducing dependence on imported oil;
- o Reduces trade deficits because less oil is imported; and,
- o Enhances the environment;

What are the environmental benefits?

- o Fuel ethanol contains 35% oxygen, therefore E10 has 3.5 weight % oxygen, the highest level authorized by the EPA. This oxygen content reduces motor vehicle emissions of carbon monoxide (CO) by 12 - 34%, depending on the engine and its emission control system.
- o Because of ethanol's precise chemical characteristics, it burns cleaner than gasoline. Use of E10 reduces unburned hydrocarbons by 2 - 8%, again depending on the engine as well as the quality of the gasoline into which the ethanol is blended;
- o Ethanol contains no sulfur and no aromatic hydrocarbons. By diluting these unwanted compounds contained in gasoline by 10%, E10 further improves combustion as well as reducing toxics and emissions contributing to ozone formation; and,

- o Converting renewable agricultural products (which extract carbon dioxide from the atmosphere their growth) into ethanol, is part of the natural carbon cycle. The only added CO₂ is a result of the fossil fuel and petroleum-based products used as farm chemicals or fuel to grow and convert crops to ethanol.

What are the environmental disadvantages?

- o While ethanol has a low vapor pressure (about 2 pounds per square inch -- 2 psi), it has a relatively high blending vapor pressure (about 18 psi). This boosts the volatility of E10, causing an increase in evaporative emissions. In newer cars, evaporative emissions represent about 65% of a car's total emissions. Consequently, this increase offsets the benefits of E10's reduced tailpipe emissions. The extent of this offset is at the heart struggle. The carbon fraction of these evaporative and tailpipe emissions are the troublesome parts of VOC (volatile organic compounds). The VOCs combine with oxides of nitrogen (NOx) in the presence of sunlight to form ozone;
- o While E10's oxygen is an advantage in reducing CO and unburned hydrocarbons, it is a disadvantage in controlling NOx emissions -- more notably at levels above 2.7 wt % oxygen (again, E10 has 3.5 wt.% oxygen). NOx emissions are related to the oxygen content in fuels burned in engines not designed for high levels of oxygen; and
- o These two factors, increases in evaporative emissions and the potential NOx impact, combine to generate a position strongly held by EPA and the environmental community, namely that non-volatility controlled E10 will not meet the Clean Air Act's RFG requirement to reduce ozone-forming VOCs by 15% in ozone nonattainment areas during the summer months. Segments of the ethanol industry and NCGA contend that reduced tailpipe emissions and other E10 benefits offset the negative effects, allowing the fuel to meet the VOC reduction requirements. Hence, the fight -- a real battle.

How can this battle be resolved and can ethanol's alleged disadvantage be overcome?

There are six opportunities:

1. Scientifically verify and quantify the benefits of E10 in reducing ozone-forming emissions, and give E10 full credit for these benefits in determining its

acceptability in ozone nonattainment areas. These benefits will be incorporated into the "Complex Model" that will be available for use in 1995 when RFG is required in the 9 cities.

2. The oil companies should be encouraged to provide a low-vapor pressure gasoline for blending with ethanol. This alone would solve the volatility problem for E10.
3. An additive could be developed to reduce the blending vapor pressure of ethanol and reduce volatility.
4. The level of ethanol permitted in gasoline could be increased to 25% and above. At these levels, fuel volatility is reduced. The flexible-fuel vehicle (FFV) is designed to accommodate blends up to 85% ethanol. At this level, evaporative emissions are not a problem and NOx can be controlled.
5. High performance engines are being developed to run efficiently with ultra-low emissions on 95% ethanol (E95).
6. Convert ethanol into its derivative ethers: Ethyl tertiary butyl ether (ETBE) and tertiary amyl ethyl ether (TAE). These ethers have exceptionally low blending vapor pressures (ETBE, 4; TAE, 1). In addition, production of these ethers requires isobutylene and isoamylene made from chemicals (butane and C-4 olefins) which are not being added to or are being removed from gasoline to reduce unwanted emissions. Converting these compounds into environmentally superior ethers represents a double environmental benefit.
7. Require that a certain percentage of the oxygen specified in the RFG program come from a renewable resource. This would address growing concern that imported methanol processed into MTBE and TAME will dominate the domestic oxygenate market to the disadvantage of ethanol, ETBE and TAE.

All seven of these options are being pursued. Options 1, 4, 5 and 6 (especially), hold high promise for an expanding ethanol industry.

Until the ethanol industry ventures forth from the "E10 fortress" (which is defended mightily by the NCGA) in active pursuit of the above options, they will be locked in conflict with the EPA, the environmental community, the oil industry and most states.

Because of the complexities involved, many farmers (particularly those in Illinois) have concluded that EPA has teamed up with environmentalists and the oil industry to deny E10 a market (9 ozone nonattainment cities during summer months starting in 1995) provided by the 1990 Clean Air Act.

Consequently, part of the ethanol industry and the NCGA have made statements implying that unless the President allows E10 to be sold without restrictions in the 9 cities he will lose Illinois' farm support which could have a negative impact on his chances for reelection.

The President has responded with a package of benefits covering options 1 through 6 outlined above, as well as other provisions to benefit renewable transportation fuels, in a move designed to increase the market for ethanol and to advance the industry in the best interest of the nation.

So far, the response from part of the ethanol industry and NCGA has been a resounding no. They have said that "unlimited access to the 9 city market is the only acceptable solution."

The President may approve this option. If that happens, environmentalists, oil companies and key states will sue EPA, in a move that, at minimum, will delay ethanol's acceptance as an RFG. Many believe the ethanol industry may well "win the battle, but lose the war" in pursuit of future markets.

The decision will end up in court and the gray clouds now over fuel ethanol will likely turn black -- investments needed to expand the ethanol industry will not materialize. Meanwhile, ethanol's powerful competitors in the oxygenate market -- methyl tertiary butyl ether (MTBE) and tertiary amyl methyl ether (TAME) will dominate the 9-city market as well as other regions seeking to opt into RFG in order to speed the clean up of their environment.

At the end of the day, options being offered by the President look far more promising for the ethanol industry than its chances in court and with aggravated environmentalists at the federal, state and local levels.

In the meantime, the President's offer is quickly losing viability with the passage of time since congressional action on the National Comprehensive Energy Policy Act is needed. Senate and House conferees are finalizing action on that legislation now. The ethanol industry and the corn growers could team up with the Administration, the environmentalists, producers of other biofuels like SoyDiesel/Biodiesel and farm organizations to bring the bacon home in the next few days/weeks. Every lost hour weakens the position of ethanol in favor of methanol that is rapidly moving into a position of dominance in the oxygenate market

BOB DOLE
KANSAS

United States Senate

OFFICE OF THE REPUBLICAN LEADER

WASHINGTON, DC 20510-7020

M E M O R A N D U M

September 1, 1992

TO: BOB ZOELLICK
FROM: JIM WHITTINGHILL
SUBJECT: ETHANOL

Two short points:

1) I failed to mention something to you yesterday about this issue in general -- anytime you hear the word "model" keep in mind you can substitute the term "scientific theory." There are no facts as you might understand that term. The Clean Air Act is premised in its near entirety on theories, and decisions on people's jobs, etc. are made under this Act on theory.

2) I appreciate your concern that other industries (oil in particular) not be harmed by any decision with respect to ethanol. Senator Dole shares that concern and his solution holds other industries harmless. To that end we will arrange a meeting in the Senator's Office between representatives of the oil and ethanol industries in an effort to get them to agree on the solution. That would leave EPA and the environmental groups as the only opposition. Keep in mind the environmentalists will have no place in Congress to turn, since Senator Mitchell's primary goal is to keep from opening the Clean Air Act to amendment (he is concerned other areas would also be amended).

Please let me know if you require any specific individual from either the oil or ethanol industries to be in attendance. Additionally, if you or someone from the Administration (other than EPA) wished to attend, we could probably arrange that as well.



Renewable Fuels Association

One Massachusetts Avenue, N.W.
Suite 920
Washington, D.C. 20001
(202) 289-3835
TELEFAX: (202) 289-7519

K. Randall Pearson
General Counsel

June 1, 1992

Richard D. Wilson, Director
Office of Mobile Sources
Office of Air and Radiation
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

Dear Dick:

Thank you for attending the meeting today at the Old Executive Office Building at which several important issues were discussed pertaining to ethanol and reformulated gasoline. The expertise, competence, and civility which you bring to these meetings always makes it a pleasure to participate with you present. I believe the meeting was constructive, and I express my appreciation for the cooperation and commitment on behalf of EPA to the successful implementation of the reformulated gasoline program.

To the best of my recollection, and subject, of course, to your clarification, you made a statement at the meeting to the effect that, "All studies we have reviewed have indicated a significant increase in ozone with ethanol blends." The Renewable Fuels Association (RFA) is not in possession of any studies that reach such a conclusion, and, obviously, we are most desirous of obtaining them. At your earliest convenience, please transmit these studies to my attention at the RFA.

As always, if you have any questions regarding my request, please do not hesitate to call me.

Sincerely,

Kim R. Pearson

Kim R. Pearson
General Counsel

CC: Teresa A. Gorman
Gary R. Blumenthal

Post-it™ brand fax transmittal memo 7671 # of pages 1

To: <i>Howard Baker</i>	From: <i>Kim</i>
Co.	Co.
Dept.	Phone #
Fax #	Fax #

Ed M. tells me they EPA won't give scientists the studies to anyone

We
~~The National Corn Growers Association~~
request that EPA adopt the ^{*consistence*} ~~same~~ science with
regard to ethanol that they have supported for
the past ten years.

Standard Test Method for Vapor Pressure of Petroleum Products (Micromethod)

This method covers the determination of the total pressure exerted *in vacuo* by air-containing, volatile, nonviscous petroleum products at preselected vapor-to-liquid ratios and temperatures. The method is applicable within the range from 0.5 to 17 psi (3.4 to 117 kPa). Vapor pressure equivalent to Reid vapor pressure, covered in Method D 323 is obtained by the use of a correlation.

Formerly under the jurisdiction of Committee D-2 on Petroleum Products and Lubricants.

This test method was discontinued in 1989.



1. Scope

1.1 This test method covers the determination of the total pressure exerted *in vacuo* by air-containing, volatile, nonviscous petroleum products at preselected vapor-to-liquid ratios and temperatures. The method is applicable within the range from 0.5 to 17 psi (3.4 to 117 kPa). Vapor pressure equivalent to Reid vapor pressure, covered in Method D 323 is obtained by the use of a correlation.

NOTE 1—
calibrated
cooperative
NOTE 2—
and other C

1.2 This test method covers the determination of the total pressure exerted *in vacuo* by air-containing, volatile, nonviscous petroleum products at preselected vapor-to-liquid ratios and temperatures. The method is applicable within the range from 0.5 to 17 psi (3.4 to 117 kPa). Vapor pressure equivalent to Reid vapor pressure, covered in Method D 323 is obtained by the use of a correlation.

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Standard Test Method for VAPOR PRESSURE OF PETROLEUM PRODUCTS (MICROMETHOD)¹

This standard is issued under the fixed designation D 2551; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

1. Scope

1.1 This method covers the determination of the total pressure exerted *in vacuo* by air-containing, volatile, nonviscous petroleum products at preselected vapor-to-liquid ratios and temperatures. The method is applicable within the range from 0.5 to 17 psi (3.4 to 117 kPa). Vapor pressure equivalent to Reid vapor pressure, covered in Method D 323 is obtained by the use of a correlation.

NOTE 1—Correlation constants must be determined for each micro vapor pressure test apparatus. Refer to Annex A1 for determination.

2. Applicable Documents

2.1 ASTM Standards:

D 270 Sampling Petroleum and Petroleum Products²

D 323 Test for Vapor Pressure of Petroleum Products (Reid Method)³

E 1 Specifications for ASTM Thermometers⁴

3. Summary of Method

3.1 A sample of known volume is introduced into an evacuated, temperature-controlled bulk of known volume. The relative volumes are chosen to give the desired vapor-to-liquid ratio (*V/L*). The rise in pressure in the bulb, resulting from the sample introduction, is equivalent to the sum of the vapor pressure of the sample and the partial pressure of dissolved air, practically all of which comes out of solution. The rise in pressure is measured with a mercury manometer or equivalent pressure-measuring device. Conversion to Reid vapor pressure is made through the use of a correlation.

4. Significance

4.1 Vapor pressure is one measure of the

volatility characteristics of a fuel. Fuels are used in many types of engines with large variations in operating conditions and over a wide range of operating temperatures. These variations impose limitations on the fuel volatility if it is to give satisfactory performance. Fuels having high vapor pressures may vaporize too readily in the fuel-handling systems, resulting in decreased flow to the engine and possible stoppage by vapor lock. Conversely, fuels of low vapor pressure may not vaporize readily enough, resulting in hard starting, and poor warm-up and acceleration.

5. Apparatus

5.1 Apparatus for this method may be a metal or glass system⁵ or commercially manufactured equipment.^{6,7} Schematic diagrams for two types of apparatus are shown in Figs. A1 and A4. In the case of Fig. A1, a modification incorporating a single-bulb design is acceptable. Basically, the apparatus consists of bulb assemblies and valve blocks connected to pressure-measuring devices and vacuum systems. The apparatus shall conform to the requirements and be operated as prescribed in Annex A2 or A3.

¹ This method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants.

Current edition approved Aug. 29, 1980. Published October 1980. Originally published as D 2551-66 T. Last previous edition D 2551-71 (1976).

² Annual Book of ASTM Standards, Part 23.

³ Annual Book of ASTM Standards, Parts 25 and 44.

⁴ Analytical Chemistry, ANCHA, Vol. 29, 1957, pp. 1196, 1202.

⁵ The apparatus of Fig. A1 is currently being manufactured by Stanhope-Seta, Ltd., Station Road, Chertsey, Surrey, England.

⁶ The apparatus of Fig. A4 is currently being manufactured by Manufacturing Engineering and Equipment Corp., Warrington, Pa.

5.2 *Fundamental Requirements*—To be acceptable for the micromethod an apparatus must be capable of measuring the vapor pressure of small samples of petroleum products over a range from 1 to 770 mm Hg with a sensitivity within 1 % or 1 mm Hg, whichever is larger, at a *V/L* value of 4 and a temperature of 100°F (37.8°C). Other temperatures and *V/L* values may be provided for if desired.

5.3 *Manometer*—The manometer scale shall have a range from 0 to 1000 mm and shall be such that it can readily and reproducibly be read to within 1 mm. The manometer system shall have a leveling bulb or other suitable leveling device connected to its lowest point. The leveling bulb shall be so mounted that it is capable of vertical movement over the entire range of the manometer scale and shall incorporate a micrometer screw for fine vertical adjustment.

5.4 *Vacuum System*—The system shall incorporate the following:

5.4.1 A drainable trap for collecting mercury or sample from the bulb, or both.

5.4.2 A vacuum gage with maximum sensitivity in the range from 1000 to 10 μ m Hg (133 to 1 Pa).⁸

5.4.3 A two-stage, gas-ballasted, mechanical vacuum pump capable of reducing the pressure in the clean system, including bulb or bulbs, below 100 μ m Hg (13 Pa) with the gas ballast valve open, and

5.4.4 A cold trap may be placed between the sample bulb and the vacuum gage and pump to prevent hydrocarbons and mercury vapors from reaching these components.

5.5 *Constant-Temperature Water System*—The constant-temperature system shall include the following:

5.5.1 A constant-temperature circulating bath capable of maintaining the water circulating through the bulb jackets at $100 \pm 0.1^\circ\text{F}$ ($37.8 \pm 0.05^\circ\text{C}$) and

5.5.2 A standardized kinematic viscosity thermometer, having a range from 97.5 to 102.5°F and conforming to the requirements for Thermometer 28F as prescribed in Specification E 1.

5.6 Auxiliary Equipment:

5.6.1 Ice bath for chilling samples, and

5.6.2 Apparatus for cleaning dirty mercury.

6. Handling of Samples

6.1 The general provisions given in 6.2 to

6.6 shall apply to all samples for vapor pressure determinations. The extreme sensitivity of vapor pressure measurements to losses through evaporation and to slight changes in composition is such as to require the utmost precaution and the most meticulous care in handling of samples.

6.2 Sampling shall be carried out in accordance with Method D 270.

6.3 *Sample Container Size*—The size of the sample container from which the vapor pressure sample is taken shall be not less than 1 qt (1 L) nor more than 2 gal (8 L).

NOTE 2—It is possible and practical by this method to measure successfully the vapor pressures of samples in volumes as small as a few millilitres. However, it should be remembered that the possibilities of serious vapor loss greatly increase as the sample size diminishes.

6.4 *Sample-Handling Temperature*—In all cases, cool the sample container and its contents in an ice bath to 32 to 40°F (0 to 4.4°C) before the container is opened.

NOTE 3—Solid carbon dioxide is appreciably soluble in hydrocarbons and shall at no time be used to cool samples prior to testing.

6.5 *Order of Tests on a Single Sample*—Determine the vapor pressure as the first test on a sample. One or two repeat determinations on the same sample may be performed without serious loss in vapor pressure provided the sample is kept in the ice bath with a tightly closed cap between runs. The sample shall not be shaken between the repeat runs.

6.6 *Care of Samples*—Place samples in a cool area as soon as possible after they have been obtained and hold them there until the test has been completed. Samples in leaky containers shall not be considered for test but shall be discarded and new samples obtained.

7. Sample Preparation

7.1 With the sample at a temperature of 32 to 40°F (0 to 4.4°C), take the container from the ice bath, unseal it, and examine it for its liquid content which shall be between 70 and 80 % of the container capacity. After the correct liquid content has been assured, reseal the container, shake it vigorously, and return it to the ice bath.

⁸ A thermocouple gage is most practical for this purpose.

8. Procedure

8.1 When the apparatus is first assembled and at every start-up thereafter, degas the apparatus in accordance with the degassing procedure described in A2.5.1 through A2.5.3 in Annex A2 or A3.2.1.1 through A3.2.1.4 in Annex A3. Continue the degassing procedure until the lowest steady pressure of less than 500 μ m (67 Pa) is obtained. If a steady pressure below 500 μ m cannot be obtained, clean the vacuum system and inspect for leaks.

NOTE 4—Be constantly aware of the possibility of leaks and the importance of detecting them. A small leak can cause gross errors in the determination. Leaks may be indicated by: (1) Any sudden increase in the minimum pressure normally obtained in the vacuum system suggests a leak in the system or a vacuum pump that requires service; (2) in the equipment shown in Fig. A1, a leak in the bulb bottom is noticeable as bubbles rising through the mercury. In either equipment, Fig. A1 or A4, such a leak can be caused by a faulty connection to the valve block or leaking O-rings in the valves; (3) a leak in the manometer side arm is noticeable as bubbles rising through the mercury. This type of leak most often occurs as a result of faulty needle valve packing or from a faulty connection to the valve block; and (4) an improperly degassed system will have an occasional bubble rise through the mercury. These bubbles can cause as serious an error in the results as the error caused by an actual leak.

8.2 While the vacuum system is degassing, adjust the circulating bath until the temperature in the bulb jacket remains with $\pm 0.1^\circ\text{F}$ ($\pm 0.05^\circ\text{C}$) of the specified temperature.

8.3 Proceed as directed in A2.5.3 through A2.5.6 in Annex A2, or A3.2.1.4 through A3.2.2.4 in Annex A3, obtaining initial pressure reading, introducing the sample, and obtaining the final pressure reading.

9. Calculations

9.1 Calculate the "Micromethod" vapor pressure (MVP) by subtracting the initial manometer reading from the final manometer reading. This value represents, in millimeters

of mercury, the sum of the vapor pressure of the sample and the partial pressure of the dissolved air which, for all practical purposes, comes entirely out of solution in the bulb.

$$\text{MVP} = M_2 - M_1$$

where:

MVP = "Micromethod" vapor pressure, mm Hg.

M_1 = initial manometer reading, mm Hg, and

M_2 = final manometer reading, mm Hg.

9.2 Calculate the equivalent Reid vapor pressure by the following equation:

$$\text{RVP} = C_f(\text{MVP}) - a$$

where:

RVP = Reid vapor pressure, psi (kPa).

C_f = correlation factor determined in Annex A1.

MVP = Micromethod vapor pressure, mm Hg, and

a = intercept determined in Annex A1.

10. Precision

10.1 The precision of the method as obtained by statistical examination of interlaboratory test results is as follows:

10.1.1 *Repeatability*—The difference between successive test results obtained by the same operator with the same apparatus under constant operating conditions on identical test material would, in the long run, in the normal and correct operation of the test method exceed the following value only in one case in twenty:

$$4 \text{ mm}$$

10.1.2 *Reproducibility*—The difference between two single and independent results obtained by different operators working in different laboratories on identical test material would, in the long run, in the normal and correct operation of the test method exceed the following value only in one case in twenty:

$$15 \text{ mm}$$

ANNEXES

A1. DETERMINATION OF CORRELATION FACTOR AND INTERCEPT

A1.1 *Summary of Method*—Vapor pressures are determined repetitively by both Methods D 2551 and D 323 on representative samples covering a range of vapor pressures from 0.5 to 17 psi (3.4 to 117 kPa). The averages of each sample by each method are

plotted on rectangular coordinate paper, and the equation which represents the resulting straight line is calculated by the least squares method. The equation obtained applies only to the specific apparatus employed.

NOTE A1—Previously obtained cooperative test data indicate the need of developing a correlation factor for each vapor pressure test unit. The correlation factor determined for any one unit will not necessarily be applicable to another unit including additional units of a multionit system such as shown in Fig. A1. Under no circumstances shall correlation factors be interchanged.

A1.2 *Procedure*—Determine the Reid vapor pressure in accordance with Method D 323 and the "Micro" vapor pressure in accordance with the procedure described in this method using apparatus conforming to the requirements of and operated in the manner prescribed in Annex A2 or A3. In obtaining data, use at least eight typical motor and aviation fuels. Average the data for each sample by each method and plot the averages on rectangular coordinate paper.

A1.3 *Calculations*:

A1.3.1 Calculate the correlation factor C_f by using the following equation:

$$C_f = (n\sum xy - \sum x \sum y) / (n\sum x^2 - (\sum x)^2)$$

where:

C_f = correlation factor,

n = number of samples,

x = individual sample averages determined by Method D 2551, and

y = individual sample averages determined by Method D 323.

A1.3.2 Calculate the intercept, a , by using the following equation:

$$a = \bar{y} - C_f \bar{x}$$

where:

a = intercept,

$\bar{y}$ = grand average of Reid vapor pressures (RVP).

$\bar{x}$ = grand average of "Micro" vapor pressures (MVP), and

C_f = correlation factor.

A2. STANHOPE-SETA APPARATUS FOR VAPOR PRESSURE BY MICROMETHOD

A2.1 *Schematic Diagram of Apparatus*—The valve block is most conveniently fabricated from metal. The connection between the valve block and the bulb assembly shall be vacuum-tight, and all the valves used shall be designed for service in a vacuum system. Valves V_1 and V_2 shall be needle valves; all the rest may be of a quick-opening variety. The valve block and bulb connections shall be so designed as to reduce to a minimum the amount of mercury required to fill the volumes defined by fiducial marks B and valves V_1 and V_2 or V_3 and V_4 . See Fig. A1.

A2.2 *Vapor Pressure Bulb Assembly*:

A2.2.1 The bulb assembly shall conform to the general design shown in Fig. A2. The bulb, C , shall incorporate a mercury-sealed-orifice sample introduction system F , as described in A2.2.2.* It shall have a side arm for connection to the manometer system and a down leg for connection to the vacuum system and drain. Fiducial marks shall be etched or fused on side arm A and on down leg B in such a manner that the volume between these two marks shall be 5 ± 0.03 mL. The bulb and its connections shall be enclosed in a water jacket having a bottom inlet, a top outlet, and a means for inserting a thermometer. The minimum distance between fiducial mark B and the bottom of the water jacket shall be 25 mm. The minimum distance between orifice D and the top of the mercury reservoir shall be 75 mm.

A2.2.2 *Mercury Reservoir, F* , as shown in Fig. A2, having in its bottom a small tapered orifice, D , leading into bulb C . Normally, the mercury is prevented from running into the bulb by a suitable plug E .

A2.2.3 For each bulb a plug, E (Fig. A2) consisting of a weighted rod with a plastic tip capable of preventing mercury from flowing through the orifice when the plug is in position as shown in Fig. A2.

A2.2.4 A vacuum breaker, similar in construction to the plug, but incorporating a capillary tube in place of the rod so that, when placed in the orifice opening, the vacuum in the bulb will be broken by

entry of atmospheric air.

A2.3 *Mercury Displacement Pipet*, is simple in concept but the design is critical.* The sample is introduced through the orifice by means of a mercury displacement pipet, Fig. A3, having a tapered tip designed to make ring contact with the conical wall of the orifice. The vacuum of the bulb (Fig. A2) draws the sample from the pipet and pulls mercury from the reservoir, C (Fig. A3) in behind it. Transfer is complete when mercury from C starts to enter the bulb. The pipet shall deliver 1 ± 0.03 mL of sample.

NOTE A2—The external leg, A , must be a little longer than the reservoir leg so that, when filled with mercury and held in the position shown, the tendency will be for the mercury to siphon out of the reservoir. Actual mercury flow is prevented by the capillary repulsion of the small aperture at the tip. Similarly, the bore of capillary D is sufficiently small that its capillary depression is greater than the height of the mercury in the reservoir C . This prevents mercury from entering the pipet unless additional pressure is applied to the side arm and also assures complete filling with the sample.

A2.4 *Auxiliary Equipment*:

A2.4.1 Ice bath for chilling samples.

A2.4.2 Apparatus for cleaning dirty mercury, and

A2.4.3 A supply of clean mercury.

A2.5 *Degassing the Vacuum System*:

A2.5.1 In cases where the apparatus is used con-

* The fabrication of a microvapor pressure bulb with its sample introduction system is an art requiring the services of a highly skilled glass blower. Critical design details are given in Motilau, A. Y., "Rapid Precise Microvapor Pressure Method," *Analytical Chemistry*, Vol 29, 1957, pp. 1196-1202.

* Alternatively, Fisher special sample pipets may be used. An aspirator bulb or air-pressure hose capable of applying pressure to the side arm of the mercury-displacement pipet is not required if the Fisher sample pipet is used.

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KANBAS

United States Senate

OFFICE OF THE REPUBLICAN LEADER

WASHINGTON, DC 20510-7020

FACSIMILE COVER SHEET

TIME: 13:00DATE: 1 September 1992

TO:

Bob Zoellick

FROM:

Jim Whittinghill

RE:

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PAGES TO FOLLOW THIS COVER SHEET.

COMMENTS:

SENT BY:

TELEPHONE: (202) 224-7771 FACSIMILE: (202) 224-3163

PLEASE DELIVER A.S.A.P.

SENT BY: Xerox Telecopier 7020 : 9- 2-92 : 7:13 :

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State of Illinois

ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

217/782-3397

August 31, 1992

The Honorable Jim Edgar
207 Statehouse
Springfield, Illinois 62706

Dear Governor Edgar:

In response to your request, IEPA staff have reviewed a number of documents addressing the use of ethanol as a fuel blend and its impact on ozone air quality. Our review included the following pertinent documents: the SAI Chicago ethanol study ("Comparison of the Air Quality Effects of Ethanol and MTBE in Reformulated Gasoline in the Chicago Region in 1995"), an excerpt from the Auto/Oil study ("Summary of Air Quality Modeling Results for Ethanol and RVP Fuels"), and portions of the "Five-City Study" ("A Low-Cost Application of the Urban Airshed Model to the New York Metropolitan Area and the City of St. Louis").

Based on these studies, our conclusion is that the difference in ozone air quality impact between the use of ethanol blended fuel and lower volatility gasolines will be statistically insignificant in future years. The SAI study for Chicago indicated that the difference in ozone air quality impact between the use of ethanol blended fuel and MTBE fuel was 0.3 parts per billion (ppb). The "Five-City Study" which included St. Louis, showed an air quality difference of only 1 ppb. Relative to the ozone air quality standard of 120 ppb this is a difference of less than 1 percent, which is significantly below the margin of error allowed by USEPA for such modeling demonstrations.

The Auto/Oil study, funded by the automobile and oil industries, and which evaluated the impact on air quality in New York, Dallas/Fort Worth and Los Angeles indicated an ozone air quality difference between ethanol blended fuel and low RVP gasoline in the range of 1 to 3 ppb. Even this study, which could be expected to have a bias, if any, in favor of these industries indicated small differences which are also statistically insignificant.

In the next several years Illinois, as well as other states with ozone air quality problems, will be developing and implementing several major programs to combat the high ozone ambient levels. The Clean Air Act mandates provisions such as the enhanced inspection/maintenance program, Stage II vapor recovery controls on gasoline dispensing facilities and the low Reid vapor pressure (RVP) of fuels. Whether ethanol blended fuel or low RVP gasoline is utilized, these control measures will further assist to eliminate any differences between the two fuels. The dramatic impact of these and other programs must be taken into account in assessing ozone air quality over the next few years.

We believe that USEPA recognizes the statistically insignificant difference in impact between ethanol blended fuel and low RVP gasoline on ozone air quality. They, however, continue to interpret the provisions of the Clean Air Act Amendments to require actual 15% reduction in the emissions of hydrocarbons relative to the 1990 baseline gasoline. It is our opinion that the emphasis should be placed not on the amount of emissions, which is merely an indicator, but rather on their potential to reduce ozone, which is the ultimate goal. Consequently, improvements in ozone air quality should be the primary focus regarding the use of ethanol blended fuels.

In conclusion, all of the studies reviewed indicate there will be significant improvement in air quality with the use of either ethanol blends or lower RVP gasoline. Any difference in hydrocarbon emissions attributed to ethanol does not result in statistically significant differences in ozone air quality. Studies of this nature typically contain assumptions and technical procedures that could be challenged. However, we do not believe that these assumptions and procedures, even if reasonably revised, would produce statistically different results. Even if the difference in ozone air quality is slightly higher than originally predicted by the models, we believe these increases can be compensated by reductions in other source categories. Further, USEPA must also realize that ethanol blended fuels significantly reduce carbon monoxide (CO) emissions. Besides providing obvious improvements in CO air quality, it is documented that CO emission reductions mitigate ozone formation.

For many years now, both USEPA and IEPA have accepted ethanol as a clean burning fuel. We in Illinois continue to believe that ethanol can play a significant role in our overall air pollution control strategies.

We will be happy to provide you with more detailed information and discussion regarding our review of these studies.

Sincerely,

Mary A. Gade / BM

Mary A. Gade
Director

cc: Allen Grosboll, Executive Assistant
Terry Moreland, Washington Office
Kirk Dillard, Chief of Staff



August 24, 1992

FOR WHOMEVER JAMES A. BAKER DESIGNATES TO HANDLE THE ETHANOL MATTER:

1. I am told that gas people are not concerned about the one pound waiver for ethanol. The methanol people are concerned about further tax breaks for ethanol; but the ethanol folks say "That's way in the future!"

Please comment on the above paragraph.

2. Do I have the authority to grant the waiver or does this rest only with Reilly?

Boyden says Reilly can grant the waiver, but EPA feels the supporting science does not exist. The corn growers tell me:

a. Such science does exist.

b. EPA refuses to release the science they are relying on to block the waiver. Madigan says he has requested the science and has been refused.

In the attached packet is a paper on vapor pressures scientifically backing the ethanol factors.

What's the story on the science?

3. Ken Lay has written the attached letter on behalf of the methanol (gas) people. He'll need a reply.

How widespread in the oil industry is opposition to the one pound waiver?

4. EPA testified on May 24, 1991, that the waiver would not adversely affect air quality. **Why the change?**

This is a very sensitive political subject. It requires a lot of thought. Bob Dole and the entire Ag community come in on the ethanol side and Ken Lay on behalf of the natural gas people.

Everywhere I went at the Illinois Fair, the corn growers brought this question up to me. It is a critical issue with my strong supporters. I have long supported Ethanol. We don't know where Clinton will be on this.

FROM THE PRESIDENT



Kenneth L. Lay
Chairman and
Chief Executive Officer

P. O. Box 1188
Houston, Texas 77251-1188
(713) 853-6773

August 20, 1992

The Honorable George W. Bush
President of the United States
The White House
1600 Pennsylvania Avenue, NW
Washington, DC 20500

Dear Mr. President:

One of the clear victories of your past four years was enactment of the Clean Air Act Amendments of 1990. Environmental benefits derived from the reformulated fuels section alone will contribute heavily towards a future of clean air for our children and our grandchildren. In addition, this legislation firmly established the principle that environmental goals can be achieved most efficiently when reliance is placed on competitive market forces.

With this in mind, I was alarmed to learn recently that some parties are recommending that you override the Reg-Neg market forces by imposing a government intruding tax subsidy for ethanol blenders.

During the two years of Congressional debate on the Clean Air Act and the following two years of the Reg-Neg process, all parties (including those representing the ethanol interests) openly came together under your strong leadership to design a positive, market-driven agenda to save our environment. As the "Environmental President," you can stand proud over the pending EPA implementation of the oxygenated fuels program to start in 39 CO nonattainment areas this November.

Enron, among many others, has moved strongly towards meeting the oxygenated fuels demand by entering the methanol and methyl tertiary butyl ether (MTBE) business. We acquired half a billion dollars of existing domestic facilities and are currently completing a new 15,000 barrels per day MTBE unit in Pasadena, Texas, which begins operation in 8-10 weeks.

The Honorable George W. Bush
Page 2
August 20, 1992

Other U.S. companies have moved towards developing the widest possible market of oxygenated fuels with oxygenates such as MTBE, methanol, tertiary amyl methyl ether (TAME), ethanol, ethyl tertiary butyl ether (ETBE), tertiary amyl ethyl ether (TAEE) and diethyl isopropyl ether (DIPE), to name a few. Enron supports these developments as clearly mandated by the Act and the Reg-Neg Agreement principles and as a clear indication competitive market forces are working.

Although Saudi Arabia and other countries are getting geared up to produce MTBE, the United States clearly has the lead at this time. Inasmuch as derivatives of natural gas provide all the feedstock for MTBE, this is also creating large new markets for domestically produced natural gas.

I believe that the EPA has, through the Reg-Neg process, met the requirements of the Clean Air Act Amendments and the reformulated fuels requirements which were enacted as a key part of your environmental policy. Ethanol will be part of the reformulated gasoline (RFG) supply in the United States because of an already existing healthy tax credit which makes it competitive with all other oxygenated fuels. It needs no further incentive or advantage.

I believe the EPA Reg-Neg proposal presents sound environmental and economic benefits to the United States without mandating a market which would be contrary to the rules of sound market place principles. Your continued support of the Reg-Neg process is respectfully requested and vital if the goals of the Clean Air Act Amendments are to be achieved.

Sincerely,

Ken

Mr. President-

cc: Jim Baker
Sam Skinner
Boyden Gray
Clayton Yeutter
Henson Moore

I cannot emphasize strongly enough, if The Reg-Neg's are altered to give ethanol a preference or new tax credits, it could seriously damage your chances of carrying Texas and other producing states in November.
Ken

EPA ON THE RECORD

Exhibit "A"

"Several phenomena reduce the ozone impact of higher RVP gasohol relative to gasoline . . . (e.g., the lesser tendency of ethanol emissions to produce ozone (reactivity) compared to hydrocarbons, and a reduction in carbon monoxide (CO) emissions and thus a reduction in CO's role in ozone production). As detailed in the Final Regulatory Impact Analysis, recent studies have indicated that the ozone impact of gasohol at 1.0 RVP higher than gasoline is less than we earlier believed."

-55 Fed. Reg. 23658,23658 (June 11, 1990)

"It appears that allowing a one psi RVP allowance for ethanol blends would not contribute to as significant of a change in ozone levels as EPA previously thought."

-U.S. EPA, Office of Air and Radiation, Office of Mobile Sources, (May 1990)

". . . that overall, the 1.0 psi exemption should not adversely affect air quality . . . this action is consistent with EPA's national fuel policy."

-56 Fed. Reg. 23804,23807 (May 24, 1991)

"This decision was based on the conclusion that the 1.0 psi exemption should not adversely affect air quality overall and because of the potential economic harm to the ethanol industry that eliminating the exemption would create."

-57 Fed. Reg. 3978,3979 (Feb. 3, 1992)

- * This is totally contrary to the EPA's current actions.



**National Corn
Growers Association**

1000 Executive Parkway, Suite 105
St. Louis, MO 63141-6397
314/275-9915 FAX 314/275-7061

August 22, 1992

The President
The White House
Washington, D.C.

Mr. President:

Over the past several days, Environmental Protection Agency Administrator Bill Reilly has made public and private statements that providing a volatility tolerance for ethanol blends "cannot be supported by science." These representations are incorrect and we fear have led you to reject a proposal which would have assured a role for ethanol in the reformulated gasoline program (RFG) and stimulated tremendous economic growth across rural America.

Mr. President, it is important that you realize that these statements effectively reverse a ten-year-long position of the EPA, based on extensive scientific analysis of the ozone-forming potential of ethanol blends, in which the Agency repeatedly has concluded that the overall emissions benefits of ethanol offset the slight increase in evaporative VOC emissions. The most recent statement to this effect was February 1992 Federal Register Notice rejecting a New Jersey Implementation Plan for ozone which had not included the one-psi volatility tolerance for ethanol;

"This decision was based on the conclusion that the 1.0 psi exemption should not adversely affect air quality overall and because of the potential economic harm to the ethanol industry that elimination of the exemption would create."

It is important to note that EPA's reversal on this issue has been allowed without any scientific analysis to support such action and without the opportunity for any public comment. Moreover, additional air quality studies for Chicago, New York and 14 other cities have been provided to the Agency during the current RFG rulemaking. These studies by Systems Applications International, the nation's leading air quality modeling firm, further confirm the offsetting environmental benefits which justify the continuation of the volatility tolerance for ethanol.

*More for
Exhibit 'A'*



In fact, it is particularly disturbing that by summarily dismissing these latest air quality reports, EPA appears to have predetermined the conclusion of an ongoing regulatory proceeding, in direct violation of the Administrative Procedures Act.

Mr. President, while some have suggested that this untimely reversal is a function of competitively motivated oil industry lobbying, we are not, as yet, drawing that conclusion. Simply put, while we believe your conviction to assure a role for ethanol is real, your EPA appears to have set a course that locks ethanol out of this important market. Tremendous opportunities across the Midwest are being squandered as a result. This issue demands your immediate attention.

Sincerely;



Tim Trotter
President

AUG 14 1992

This comment is filed on behalf of the Ad Hoc Ethanol Committee. The Committee is comprised of U.S. ethanol plants producing virtually all of the nation's fuel ethanol; national farm and commodity organizations representing farmers across the country that have worked toward value-added markets for American grain and a safer environment; potential ethanol producers representing economic development opportunities across rural America; equipment manufacturers, technology design engineers, and suppliers to the ethanol industry; consumer and environmental organizations interested in the promotion of renewable energy and competitive fuel markets; and, ethanol education and promotion organizations that have worked to decrease our dependence on imported oil, improve air quality, and create rural economic development opportunities across the country.

The following organizations and companies are members of the Ad Hoc Ethanol Committee submitting these comments:

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The following pages list additional organizations which have signed on to the comments submitted by the Ad Hoc Ethanol Committee.



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INVESTIGATING VAPOR PRESSURES AND THEIR MEASUREMENT

THERMO CONCEPTS, INC.

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Work done by Tim Lee, Director of Research and

David Ruppert

August 3, 1992

PURPOSE

Much misinformation has recently been publicized about the effects of blending petroleum products with oxygenates. Investigation was therefore necessary to clarify the actual results and their significance upon our environment.

R.V.P.

R.V.P. is the acronym for Reid Vapor Pressure, or vapor pressure measured by the Reid method. Mr. Reid standardized vapor pressure measurement by prescribing the method of filling a vessel three-quarters full, sealing the vessel and attaching a pressure gauge at the top of the vessel. He would then vary the temperature and note the resulting change in vapor pressure of various liquids. For the purpose of this paper, vapor pressure and R.V.P. are the same unless otherwise specified.

ASTM STANDARD TEST METHOD FOR VAPOR PRESSURE D 323-89

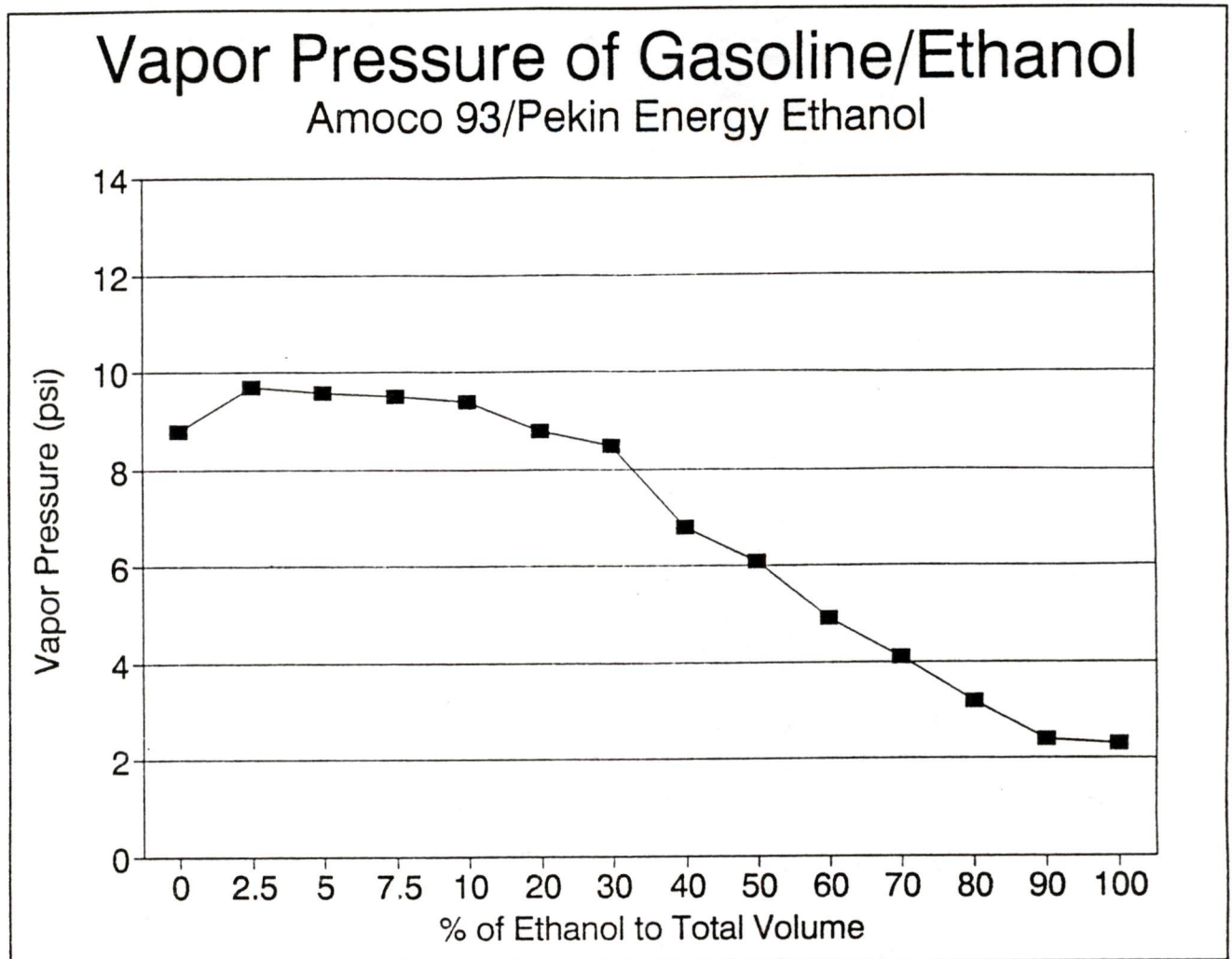
The ASTM Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method), D 323-89, may be summarized as follows; the fuel sample to be used is initially maintained at 32°F (0°); the liquid chamber of the vessel is filled 70-80% full with the chilled fuel sample; the assembled vapor pressure apparatus is shaken vigorously and immersed in a bath at 100°F until a constant pressure is observed. The standard requires simultaneously running two parallel tests using the identical samples.

This Standard, ASTM D 323-89, is recommended by ASTM to determine the vapor pressure of gasoline and other volatile petroleum products. ASTM has approved this method for petroleum products only and specifically not for oxygenated products other than MTBE (Methyl Tertiary Butyl Ether - an ether using Thorium Oxide [a radio-active substance] in some methods of production). Therefore it is not approved by ASTM for oxygenates or their blends with gasolines.

OXYGENATES' AZEOTROPIC REACTION WITH GASOLINE

ASTM approves this vapor pressure test with only petroleum products because oxygenates form an azeotrope (larger combined molecule of fuel) with gasoline. Fuel oxygenates are alcohols such as ethanol and ethers such as MTBE. These oxygenates are composed of hydrogen, carbon and oxygen. When blended with gasoline, the vapor pressures of the blends do not react in a predictable linear fashion. As oxygenate is

added to the gasoline, the vapor pressure of the blend increases to a peak and then declines as the percentage of oxygenate is increased (see graph).



As shown graphically above, decreasing the amount of ethanol below 10% will increase the vapor pressure of the mixture, while further increasing the oxygenate (ethanol) content will in fact decrease vapor pressure.

NO APPROVED TEST FOR VAPOR PRESSURE OF OXYGENATED BLENDS

D 323 is the most commonly referred test method for determining the vapor pressure of gasoline-ethanol blends. Since ASTM does not recommend test D 323 for oxygenated fuel, other approved vapor pressure tests were investigated. The Standard Test Method for Vapor Pressure of Petroleum Products (Micromethod), D 2551-80, was discontinued in 1989. The general vapor pressure test E 1194 is inappropriate for oxygenated blends, because the scope of the test covers only measuring pure liquids or solids. Test method D 1267 is approved only for liquefied petroleum gases. Test method ES 14 Vapor Pressure for Petroleum Automatic Method again targets only petroleum products.

Since no approved ASTM standard test procedure is known for a gasoline-ethanol blend, it is imperative that results reported by gasoline companies, General Motors, Archer

Daniels Midland or any other fuel research facility should be examined closely. If the test method is not discussed thoroughly or if the test results are extrapolated and not determined empirically, the resulting vapor pressure values should be questioned.

CONCEPTUALLY - NOT DEFINITELY - SPEAKING

To further complicate the matter of using a vapor pressure test method, it is necessary to separate what results can be factual and what results can only be discussed in a conceptual manner. ASTM even admits that using the D 323-89 method cannot measure the "true" vapor pressure of petroleum. In the precision and bias section of the test method, the discussion notes that " 1 out of 20 tests will differ in determining the vapor pressure of a petroleum sample."

Further, in determining absolute bias, "since there is no accepted reference material suitable for determining the bias for the procedure in Test Method D 323 for measuring the vapor pressure, bias cannot be determined. The amount of bias between this test vapor pressure and true vapor pressure is unknown." In other words, gasoline is too complex and variable to be able to establish a standard vapor pressure value.*

Gasoline is comprised of numerous and varying strings of hydro-carbons. To change the characteristics of the gasoline, blenders add detergents, surfactants and oxygenates to obtain the desired fuel attributes. As different gasolines and varying amounts of benzene, toluene or xylene (BTX Group) are added, the gasoline's characteristics become increasingly complex. Because of gasoline's complexity, it is impossible to generalize its characteristics. It is therefore only possible to talk "conceptually."

ISSUES FOR DISCUSSION

1) Arbitrarily adding a 1 psi boost to the vapor pressure of the base gasoline when adding ethanol as an oxygenate is inappropriate. The vapor pressure depends on the composition of the gasoline as well as the denaturant used in the ethanol. The interaction between the gasoline and ethanol is predictable in concept, but cannot be extrapolated as the 1 psi boost infers.

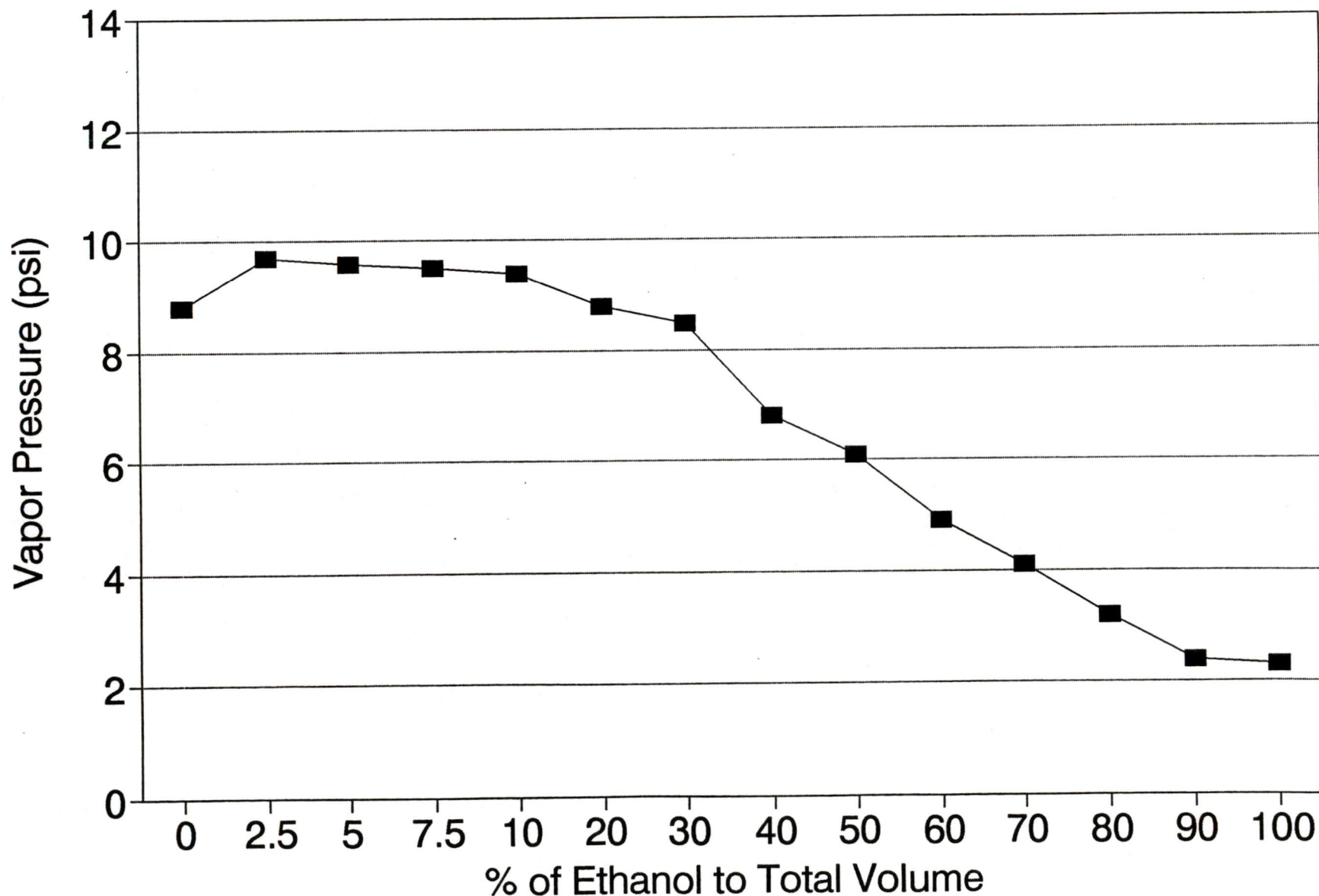
2) Implying that ethanol alone increases VOC's (Volatile Organic Compounds) since it increases the vapor pressure is inappropriate. First, by the time ethanol is blended with gasoline at the terminal, the gasoline has already released more Volatile Petroleum Solvents (or VOC's) into the ectosphere than the blended fuel will in the course of distributing the fuel to the gasoline station. (to be discussed in future paper)

Second the evaporated azeotrope molecules can only contribute to the potential for VOC's. The molecules can be contained within the fuel system of a car and would not be exposed to air. (see earlier paper "Controlling VOC's")

Finally, the substantial benefits in adding ethanol to gasoline to reduce combustion emissions outweigh any potential hazards created.

Vapor Pressure of Gasoline/Ethanol

Amoco 93/Pekin Energy Ethanol





tinuously, follow this procedure at least every three days. Lower the mercury in the system to the lowest practical level, which in Fig. A1 would be just above valves V_1 and V_2 . Replace the seal plug E with the vacuum breaker (capillary vent plug) and apply vacuum to the system. After 1 or 2 min, replace the vacuum breaker with the seal plug.

A2.5.2 Connecting Manometer System—Adjust the leveling bulb until the mercury level in the manometer is approximately 760 mm below fiducial mark A, Fig. A1. Close needle valves V_3 and V_4 . Open V_1 and V_2 and then gradually open V_3 and V_4 , letting the mercury rise to its equilibrium point. When the bulb on the left is to be used in a determination, close V_3 to isolate the right bulb from the manometer system. When the right bulb is to be used, close V_4 . The remaining procedure will involve only the left-hand side of the system.

A2.5.3 Measuring Initial Bulb Pressure—Measure the initial bulb pressure by performing the following steps in sequence:

A2.5.3.1 Check the jacket temperature. If it deviates from the prescribed value by more than 0.1°F, adjust the temperature until it is within the prescribed limits.

A2.5.3.2 If the pressure in the system is below 500 μ m (67 kPa) and essential constant, close V_2 (Fig. A1).

A2.5.3.3 Raise the plug from the orifice momentarily and allow the mercury to fill the bottom leg to between 10 and 20 mm below fiducial mark B. If the leg fills above fiducial mark B draw off the excess mercury above B through V_2 to the pump line and trap.

A2.5.3.4 With V_2 open, adjust the leveling device until mercury in the bulb side arm is level with fiducial mark A. Observe the level of the mercury in the side arm closely. Any air leak into the bulb will cause a drop in the mercury level of the side arm away from fiducial mark A. A leak will be readily observable as bubbles rising into the bulb through one of the mercury layers. Correct any leak into this system before proceeding.

A2.5.3.5 With the level of the mercury in the bulb side arm at fiducial mark A, read and record the level of the mercury in the manometer to the nearest 1 mm.

A2.5.4 Sample Introduction—After the recording the initial manometer reading, introduce the sample as follows:

A2.5.4.1 Close V_3 , locking the mercury level at approximately mark A.

A2.5.4.2 Choose the sample pipet size that will give the V/L required for the vapor pressure measurement. This quantity is calculated as follows:

$$V/L = \frac{\text{volume of bulb} - \text{volume of pipet}}{\text{volume of pipet}}$$

Fill the pipet bore with mercury by applying pressure to the mercury reservoir side arm. If the pipet is held in a vertical position, the greater length of the external capillary leg will keep the mercury column pressed tightly against the pipet tip. The small opening in the tip prevents the flow of mercury out of the tip; do not tilt the pipet toward the bulb end or the mercury

may siphon back into the reservoir.

A2.5.4.3 Lower the pipet tip well below the surface of the sample in its container. Tilt the pipet momentarily in the direction of its tip to ensure complete filling with mercury, then tilt as far as possible in the other direction to lower the mercury reservoir below the tip. Generally, mercury will flow back into its reservoir spontaneously, pulling the sample into the pipet behind it. If tilting does not start the flow, the momentary application of a slight vacuum to the reservoir will start it. The aspirator bulb or a house vacuum hose may be used for this purpose. When the sample has a high vapor pressure, the application of too high a vacuum to the mercury reservoir will cause the formation of vapor bubbles in the pipet. One or two small bubbles do not affect the results, but their appearance can be minimized by reducing the pressure an amount just sufficient to start the flow. The vacuum hose or aspirator bulb should then be immediately removed. If vaporization in the pipet exceeds a few small bubbles, chill the pipet before transferring the sample to the apparatus. Chill by filling the pipet with mercury to its tip, applying the thumb of one hand to the tip and the index finger of the other hand to the bulb side arm, and immersing the top three quarters of the pipet in an inverted position in the ice bath used to chill the samples. The pipet should then be quickly wiped dry and filled with sample. Never, under any circumstances, allow water to enter the pipet with the sample.

A2.5.4.4 Remove the filled pipet from the sample container and immediately insert the tip into the bulb-orifice mercury reservoir to a point close to the orifice. Then, in one smooth motion, remove the plug from the orifice and gently insert the tip of the pipet in its place (Note A5). Atmospheric pressure will push the sample into the evacuated bulb. Transfer is complete when mercury from the pipet starts to follow the sample into the bulb. At this point, remove the pipet and replace the plug in the orifice. When the vapor pressure of the sample is so high that the bulb vacuum is insufficient to complete the sample transfer, complete the transfer by applying air pressure to the side arm of the pipet either with the aspirator bulb or an air-pressure line.

NOTE A3—Before reuse, rinse the pipet twice with acetone and dry by attaching a vacuum hose to the side arm with the pipet in a hanging position.

NOTE A4—The currently available commercial instrument is supplied with a pipet and pipet filler. As the sample is introduced into the instrument with this pipet, mercury from the orifice reservoir is drawn into the pipet behind it. This pipet may be used in place of the one described in Note A3 for samples of 12-lb Reid vapor pressure (82.7 kPa) or less. Before reuse, the pipet and its filler shall be rinsed with acetone and dried.

NOTE A5—Introduction of the sample requires slow deliberate motions and a relatively gentle touch. Speed is not required; it can only cause damage to the pipet or the bulb orifice. Note that the pipet tip can be introduced into the mercury pool almost all the way down to the orifice before the plug is removed. Thus, the pipet may be substituted for the

plug and the plug for the pipet with easy slow motions and without undue lapse of time. Keep in mind that the excess mercury is readily removed and that excess mercury having been in the bulb will in no way affect the results obtained. If the sample does not transfer properly, do not apply heavy pressure to the pipet in the orifice seat. This may very well break the pipet tip or orifice seat. Failure to transfer is almost invariably caused by a plugged orifice or pipet tip.

A2.5.5 Leveling Mercury After Sample Introduction—It is extremely important, when the manometer system is being adjusted to balance the pressure of the sample, that the mercury level in the bulb side arm not be permitted to drop more than 3 mm from mark A, Fig. A1. If the mercury is allowed to drop much below this level, the evaporation of the hydrocarbon mixture may be increased beyond that required for equilibrium at the specified V/L . The consequent recompression to the required V/L will require the system be kept in balance for considerably longer periods to reach final equilibrium.

A2.5.6 Measuring Final Bulb Pressure—Measure the final bulb pressure as follows:

A2.5.6.1 Raise the mercury level in the bottom leg of the bulb exactly to mark B, Fig. A1, by carefully lifting the plug and letting a little mercury drop through the orifice. Again, overfilling above mark B can be corrected by drawing off the excess mercury above B through the slightly cracked valve V_2 into the pumping system trap.

A2.5.6.2 Crack needle valve V_1 until the mercury level just begins to fall slowly away from mark A; then immediately compensate for this drop by raising the leveling device. Keep the mercury level within 2 to 3 mm of mark A until the balance is reached. Finally, open V_1 until it does not seriously restrict the mercury flow, and adjust the level exactly to mark A.

A2.5.6.3 Check the jacket temperature; the final reading shall not be made unless the jacket temperature is stabilized within the prescribed limits. Allow the stabilized system to remain undisturbed for a minimum of 2 min and again adjust the mercury level to mark A.

A2.5.6.4 Read to the nearest mm and record the mercury level in the manometer.

A2.5.7 Preparing Apparatus for Next Sample—Prepare the apparatus for the next sample as follows:

A2.5.7.1 Close valve V_4 .

A2.5.7.2 Put the vacuum breaker in the orifice in place of the plug.

A2.5.7.3 Open valve V_1 allowing the sample to drain into the beaker.

A2.5.7.4 If the previous sample had a low vapor pressure, such as that of a jet fuel, the bulb shall be

flushed with precipitation naphtha or an equivalent light solvent. Flushing is accomplished by drawing the precipitation naphtha into the bulb using the manometer system as a Toepfer pump. Where the sample is drained through the vacuum trap the flushing must be accomplished by introducing the precipitation naphtha through the bulb orifice. Replace the vacuum breaker with the plug and then apply the vacuum hose to the drain line of the bulb. Leave the vacuum hose on the drain line.

A2.5.7.5 Lower the mercury-leveling bulb to about 760 mm below fiducial mark A. Open V_1 slowly, lowering mercury to the top of the expansion bulb in the manometer line. Then close V_1 again. In two-bulb systems, such as shown in Fig. A1 alternate use of the bulb is recommended.

A2.6 Cleaning Techniques

A2.6.1 Cleaning Micromethod Vapor Pressure (MVP) Bulbs—At least once a day flush the bulb with acetone and dry by applying a vacuum thereto. With long usage, the micromethod vapor pressure bulbs will accumulate deposits in their jackets, in sample chambers and, particularly, in the mercury reservoirs. These last deposits can cause clotting of the orifice. Periodically the micromethod vapor pressure bulbs should be removed from the apparatus and thoroughly cleaned with nitric acid.

NOTE A6—Do not use chromic acid to clean parts that may contain traces of mercury or mercury compounds as dark insoluble deposits will result.

A2.6.2 Suggestions for Minimizing Dirt Problems

A2.6.2.1 Only the cleanest mercury should be used in the instrument. Even newly purchased mercury from a sealed bottle will quite often be found to have a black scum. It is essential that mercury-cleaning apparatus be available in the laboratory.

A2.6.2.2 Even new micromethod vapor pressure bulbs and pipets should be acid-cleaned and dried before installation. If the pipet has a plastic tip, the tip should be removed during acid wash.

A2.6.2.3 The circulating bath should be filled with distilled water. Vinyl¹⁰ tubing is preferred for water connections.

A2.6.2.4 Dust will accumulate on the surface of the mercury in the bulb reservoirs. Therefore, never let all the mercury in the reservoir pass through the orifice; keep the mercury level high.

A2.6.2.5 Keep the external surfaces of the pipets, plugs, and vacuum breakers clean by wiping periodically with lint-free tissue. If this is not done, they will gradually accumulate a dark scum which can cause plugging of the orifice.

¹⁰ Tygon has been found satisfactory for this purpose.

A3. MEECO APPARATUS FOR VAPOR PRESSURE BY MICROMETHOD

A3.1 Apparatus

A3.1.1 Vapor Pressure Apparatus—The apparatus shall consist of a water-jacketed vapor pressure bulb (Fig. A5), sample charging tube (Fig. A6), mercury leveling reservoir (Fig. A7), and O-ring adapters (Fig.

A8) for connections at needle metering valve A and valve B. Assemble the apparatus as shown schematically in Fig. A4, connecting the vapor pressure bulb side arm to the mercury leveling reservoir by means of a suitable length of heavy wall rubber tubing

incorporating valve E¹¹ (Fig. A4).

A3.1.2 Vapor Pressure Bulb Assembly.—The bulb assembly shall conform to the design shown in Fig. A5. It shall have a side arm for connection to the manometer and a down leg for connection to the vacuum and drain system. A graduation mark shall be etched or fused on the manometer side arm so that the volume of the vapor pressure bulb shall be approximately 25 mL. The bulb and its connections shall be enclosed in a water jacket having a bottom inlet, a top outlet, and a means for inserting a thermometer. The vapor pressure bulb shall be calibrated by the following procedure:

A3.1.2.1 Assemble the apparatus as shown in Fig. A4 except substitute a 50-mL buret for the sample charging tube, Fig. A6. Open valve E and needle metering valve A. Raise the mercury-leveling reservoir until the mercury level coincides with the graduation mark on the vapor pressure bulb side arm and then close valve E.

A3.1.2.2 Close valves A and C and open valves B and D. Start the vacuum pump and evacuate the vapor pressure bulb to 0.5 mm Hg (67 Pa) or less as indicated on the Zimmerli gage and then close valves B and D. Open the stopcock of the buret and fill the bulb with distilled water exactly to its zero graduation mark. If necessary, tap the buret to expel trapped air. Open valve A and allow the vapor pressure bulb to fill with water.

A3.1.2.3 Record the volume of water delivered by the buret as the volume of the vapor pressure bulb.

A3.1.3 Sample Charging Tube.—The apparatus shown in Fig. A6 shall be of all-glass construction. The charging tube shall be enclosed in a water jacket having a bottom inlet, top outlet, and a means of inserting a thermometer. Two fiducial marks shall be inscribed on the sample charging tube, the positions of which shall be such that the volume between them represents one fifth of the volume of the vapor pressure bulb or approximately 5 mL.

A3.1.4 Mercury-Leveling Reservoir.—The apparatus shall be of glass construction as shown in Fig. A7, and so mounted that manometer measurements are obtained by reading the mercury level through the side arm.

A3.1.5 O-Ring Adapters:

A3.1.5.1 Type 304 stainless steel tubing shall be machined to meet the requirements given in Fig. A8. Machine the inlet and exit to the needle metering valve A, Fig. A4,¹² such that a 0.197-in. (5.00-mm) inside diameter O-ring adapter can be silver soldered into the inlet and a 0.079-in. (2.01-mm) inside diameter adapter soldered into the outlet. Place an O-ring gasket around the polished surfaces of each adapter. Attach the inlet adapter to the sample charging tube and the outlet adapter to the water-gasketed vapor pressure bulb with the aid of pinch clamps.¹³

A3.1.5.2 Machine the inlet of a Hoke valve¹⁴ to accommodate a 0.079-in. (2.01-mm) inside diameter O-ring adapter and attach it with silver solder. Place an O-ring gasket around the polished surface of the adapter and attach the adapter to the spherical joint of the exit of the water-jacketed vapor pressure bulb with a pinch clamp.

A3.1.5.3 Attach a stainless steel 0.25-in. tee by

means of a nipple to the above mentioned Hoke valve. Attach two additional Hoke valves to this tee to conform to the piping arrangement shown in Fig. A4. Make connections from these latter two valves via nipples to the vacuum pump and to the drain with suitable lengths of heavy wall tubing.

A3.2 Procedure:

A3.2.1 Depressing the Vacuum System:

A3.2.1.1 Turn on the circulating water pump and adjust the water bath temperature such that the temperature in the jacket surrounding the vapor pressure bulb is $\pm 0.1^\circ\text{F}$ ($\pm 0.05^\circ\text{C}$) of the specified temperature.

A3.2.1.2 Open valves A, B, C, D, and E. Raise the mercury-leveling reservoir until the mercury level coincides with the graduation mark on the manometer side arm of the vapor pressure bulb. Close valves E, A, and C. Start the vacuum pump and evacuate the system until a pressure of 0.5 mm (500 μm) or less is indicated on the Zimmerli gage.

A3.2.1.3 Lower the mercury-leveling reservoir a distance approximately equal to the prevailing barometric pressure. Open valve E and adjust the mercury level to the graduation mark on the manometer side arm of the vapor pressure bulb. Position the zero mark of the meter stick opposite the mercury level in the reservoir side arm. Close valve B.

A3.2.1.4 If after a 2-min period the pressure as measured by the manometer does not change more than 0.5 mm (67 Pa), close valves E and D and record the manometer reading as the initial manometer reading in millimetres of mercury.

A3.2.2 Determining Vapor Pressure:

A3.2.2.1 Chill the sample charging tube to a temperature of $50 \pm 5^\circ\text{F}$ ($10 \pm 3^\circ\text{C}$) by circulating a refrigerated coolant through its surrounding jacket.

A3.2.2.2 Remove the chilled sample container from the cooling bath and insert the previously chilled transfer connection and air tube. Fill the cooled sample charging tube to its upper fiducial mark while maintaining the end of the transfer connection within 0.25 in. (6.4 mm) of the bottom of the sample charging tube.

A3.2.2.3 Introduce the volume of sample between the fiducial marks into the vapor pressure bulb with the aid of valve A.

A3.2.2.4 Allow 7 min for the vapor pressure to come to equilibrium. Raise the mercury leveling reservoir to the highest point on the manometer. Open valve E. Lower the mercury-leveling reservoir and adjust the mercury level to the graduation mark on the manometer side arm of the vapor pressure bulb. Record the mercury level on the manometer as the final manometer reading in millimetres of mercury.

¹² Valve Type DR328K, Catalog No. 303SS is obtainable from Hoke, Inc., 1 Tenakill Park, Cresskill, N.J.

¹³ A stainless steel, sensitive straight-type, $\frac{1}{8}$ in. IPS, $\frac{1}{16}$ in. orifice valve, Catalog No. 54-2-11, obtainable from Fluid Control Co., 5150 Ridge Ave., Philadelphia, Pa. 19128 has been found satisfactory for this purpose.

¹⁴ Obtainable from Hoke, Inc., 1 Tenakill Park, Cresskill, N.J., Catalog No. 303S, Type R328K.

¹⁵ Obtainable from Fisher Scientific Co., Pittsburgh, Pa., Catalog No. 5-885, Size No. 12.

A3.2.3 Preparing Apparatus for Next Sample:

A3.2.3.1 Close valve E and open valves A, B, and C in that order allowing the unused portion of sample to be discharged to the drain. Close valve A.

A3.2.3.2 Clean the vapor pressure bulb by washing with two 15-mL portions of solvent (Note A8), adding the solvent through the sample charging tube and valve A. Dry the sample charging tube, using a house vacuum, by keeping valve A open after introducing

the last portion of solvent. Close valves A and C. Open valve D and evacuate the vapor pressure bulb to 0.5 mm (67 Pa) pressure or less for at least 5 min.

NOTE A8—Solvent shall be prepared by mixing equal volumes of acetone and light naphtha.

A3.2.3.3 Proceed with the next determination starting with A3.2.2.1.

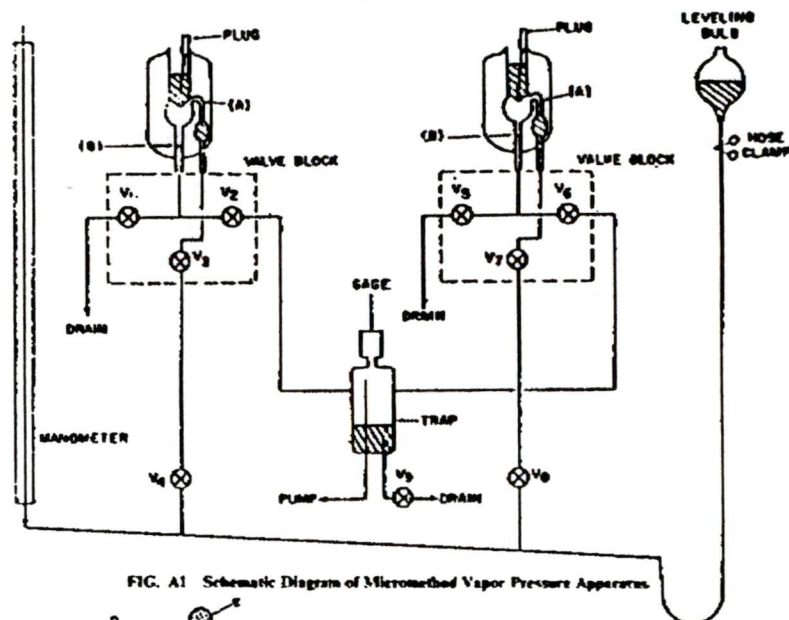
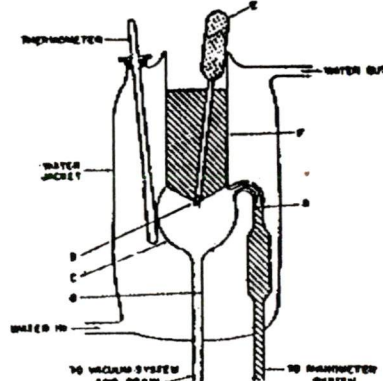


FIG. A1 Schematic Diagram of Micromethod Vapor Pressure Apparatus.



Volume of bulb between A and B = 5 ± 0.03 mL
Minimum distance between B and bottom of water jacket = 25 mm
Minimum distance between D and top of mercury reservoir = 75 mm

FIG. A2 Vapor Pressure Bulb Assembly for Micromethod

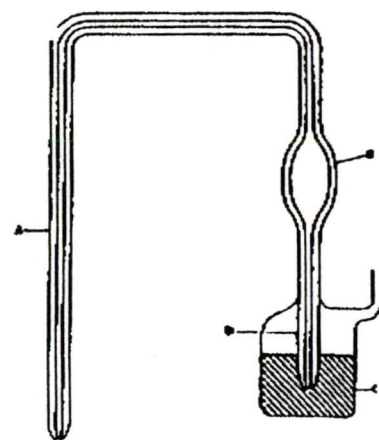


FIG. A3 Mercury Displacement Pipet

2007 CAT TECH CTR E 854

1975 E 854

500

D 2551

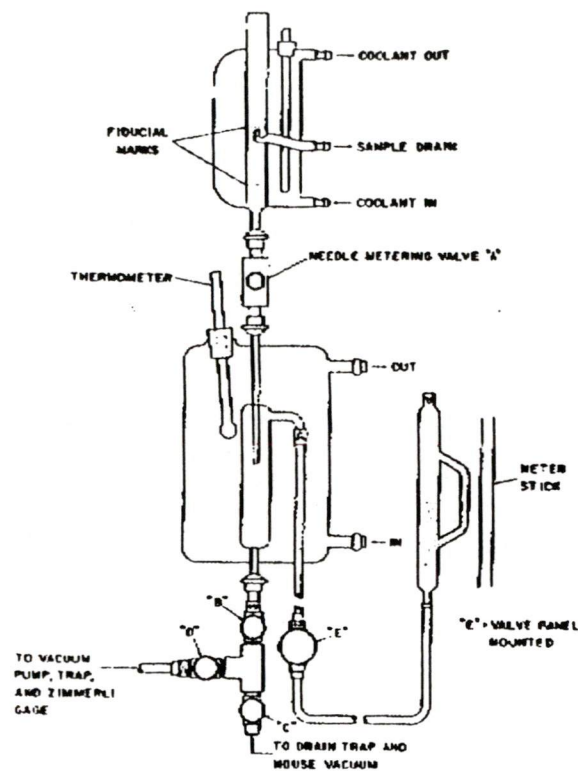


FIG. A4 Assembly of Micro Pressure Apparatus

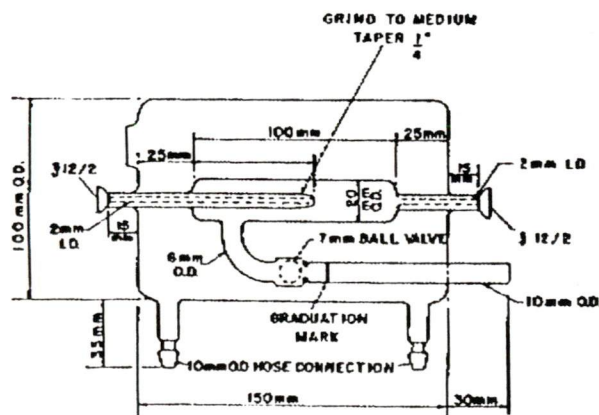
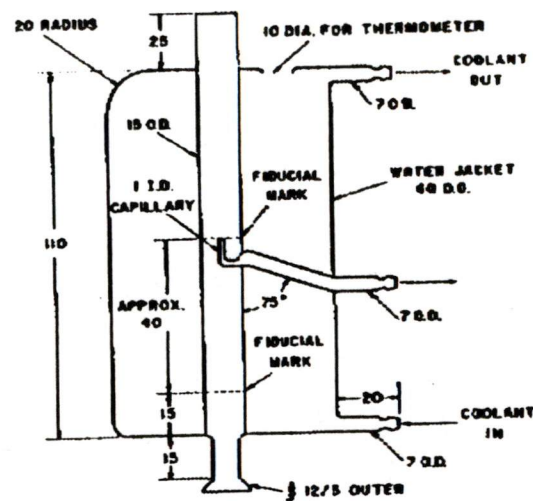


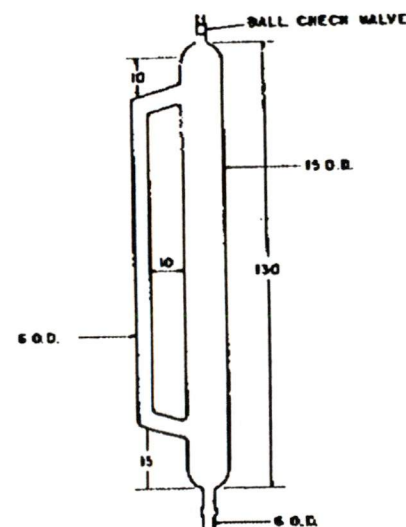
FIG. A5 Water-Jacketed Inner Tube

D 2551



NOTE—All dimensions in millimetres.

FIG. A6 Sample Charging Tube



Note—All dimensions in millimetres.

FIG. A7 Mercury Leveling Reservoir

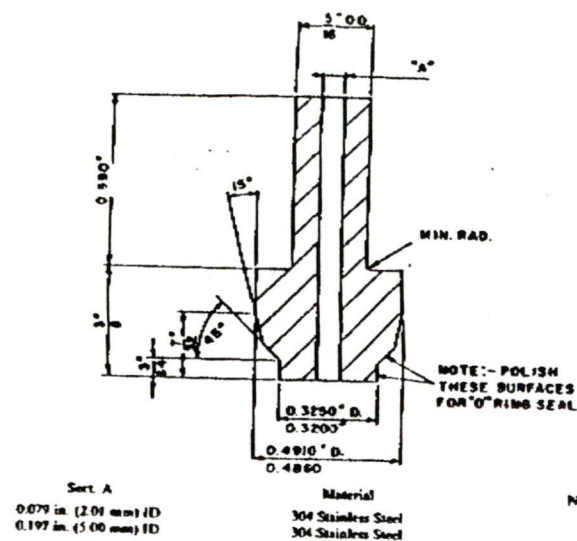


FIG. A8 C-Ring Adapter

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Designation: D 86 - 82⁶²



Designation: 123/84

An American National Standard
American Association of State
Highway and Transportation Officials Standard
AASHTO No. T 115-801
British Standard 4349

Standard Method for Distillation of Petroleum Products¹

This standard is issued under the fixed designation D 86; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval. This is also a Standard of the Institute of Petroleum issued under the fixed designation IP 123. The final number indicates the year of last revision.

This method was adopted as a joint ASTM-IP standard in 1964.

This method has been adopted for use by government agencies to replace Method 1001 of Federal Test Method Standard No. 791b.

¹ NOTE 1—Editorial correction was made in Table A1.1 in September 1986.

² NOTE 2—The position of Fig. 1 was corrected editorially in July 1988.

1. Scope

1.1 This method covers the distillation of motor gasolines, aviation gasolines, aviation turbine fuels, special boiling point spirits, naphthas, white spirit, kerosines, gas oils, distillate fuel oils, and similar petroleum products.

NOTE 1—The values stated in inch-pound units are to be regarded as the standard.

NOTE 2—For the distillation of natural gasoline, see ASTM Method D 216, Distillation of Natural Gasoline (IP Designation: 191).² For the distillation of volatile organic liquids or relatively pure solvents, see ASTM Method D 1078, Distillation Range of Volatile Organic Liquids.³

NOTE 3—For the distillation of aviation turbine fuels and other products of such wide boiling range that the low distillation thermometer specified in Group 3 of Table 1 is inadequate, this method may be applied by substituting the high-distillation thermometer, together with the other test conditions specified in Group 3 (see 10.3).

2. Referenced Documents

2.1 ASTM Standards:

E 1 Specification for ASTM Thermometers⁴

E 77 Method for Inspection and Verification of Liquid-in-Glass Thermometers⁵

E 133 Specification for Distillation Equipment⁴

3. Summary of Method

3.1 A 100-ml sample is distilled under prescribed conditions which are appropriate to its nature (Table 1). Systematic observations of thermometer readings and volumes of

condensate are made, and from these data, the results of the test are calculated and reported.

4. Significance

4.1 Distillation (volatility) characteristics of petroleum products are indicative of performance in their intended applications. Petroleum product specifications generally include distillation limits to assure products of suitable volatility performance.

4.2 The empirical results obtained by use of this distillation method have been found to correlate with automotive equipment performance factors and with other characteristics of petroleum products related to volatility.

5. Definitions

5.1 *initial boiling point*—the thermometer reading that is observed at the instant that the first drop of condensate falls from the lower end of the condenser tube.

5.2 *end point or final boiling point*—the maximum thermometer reading obtained during the test. This usually occurs after the evaporation of all liquid from the bottom of the flask. The term "maximum temperature" is a frequently used synonym.

5.3 *dry point*—the thermometer reading that is observed at the instant the last drop of liquid evaporates from the lowest point in the flask. Any drops or film of liquid on the side of the flask or on the thermometer are disregarded.

NOTE 4—The end point (final boiling point), rather than the dry point, is intended for general use. The dry point may be reported in connection with special purpose naphthas, such as used in the paint industry. Also, it should be substituted for the end point (final boiling point) whenever the sample is of such a nature that the precision of the end point (final boiling point) cannot consistently meet the requirements given in Section 11.

5.4 *decomposition point*—the thermometer reading that coincides with the first indications of thermal decomposition of the liquid in the flask.

NOTE 5—Characteristic indications of thermal decomposition are an evolution of fumes, and erratic thermometer readings which usually

¹ This method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants.

In the IP, this method is under the jurisdiction of the Standardization Committee.

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² Annual Book of ASTM Standards, Vol 05.01.

³ Annual Book of ASTM Standards, Vol 06.03.

⁴ Annual Book of ASTM Standards, Vols 05.03 and 14.03.

⁵ Annual Book of ASTM Standards, Vol 14.03.

show a decided decrease after any attempt is made to adjust the heat.

5.5 percent recovered—the volume in millilitres of condensate observed in the receiving graduate, in connection with a simultaneous thermometer reading.

5.6 percent recovery—the maximum percent recovered, as observed in accordance with 9.7.

5.7 percent total recovery—the combined percent recovery and residue in the flask, as observed in accordance with 9.8.

5.8 percent loss—100 minus the percent total recovery.

5.9 percent residue—the percent total recovery minus the percent recovery, or the volume of residue in millilitres if measured directly.

5.10 percent evaporated—the sum of the percent recovered and the percent loss.

6. Apparatus

6.1 All of the section and figure reference numbers in 6.1.1 through 6.1.7 refer to Specification E 133, the standard to which all the items listed shall conform.

6.1.1 **Flask**—Flask B, as shown in Fig. 3.

6.1.2 **Condenser and Cooling Bath**—Section 4; Figs. 1 and 2.

6.1.3 **Shield**—Section 5; Figs. 1 and 2.

6.1.4 **Heater**—Section 6; Figs. 1 and 2.

6.1.5 **Flask Support**—Table 2 (Specification E 133), boards B or C.

6.1.6 **Graduated Cylinder**—Section 8; Graduate B, 100 ml, as shown in Fig. 4.

6.1.7 Thermometer—Section 9, ASTM Thermometers 7F (7°C) and 8F (8°C) or IP Thermometers 5C (low distillation) and 6C (high distillation) conforming to the IP Specifications for Standard Thermometers. Under certain test conditions the bulb of the thermometer may be 50°F (28°C) above the temperature indicated, and at an indicated temperature of 700°F (371°C) the temperature of the bulb is approaching a critical range in the glass. Thermometers that have been exposed to such conditions should not be reused without checking their ice point to verify calibration as prescribed in Specification E 1 and Method E 77.

NOTE 6—Data have been obtained that indicate that the Precision-Shell Automatic Distillation Apparatus is capable of giving test results that correspond in level and precision with those obtained by the manual procedures of this method, when the apparatus has been calibrated according to instructions supplied by the manufacturer. A condensed summary of these supporting data is given in Appendix X1.

7. Sample

7.1 In the case of any product having a Reid vapor pressure of 9.5 psi (65.5 kPa) or higher, cool the sample bottle to the temperature range indicated in Table 1 for measuring the distillation charge. Collect the sample in the previously cooled bottle, preferably by immersing the bottle in the liquid, where possible, and discarding the first sample. Where immersion is not possible, the sample shall be drawn off into the previously cooled bottle in such a manner that agitation is kept at a minimum. Close the bottle immediately with a tight-fitting stopper, and place it in an ice bath or refrigerator capable of maintaining the sample at a tempera-

TABLE 1 Test Conditions

	Group 1	Group 2	Group 3	Group 4
Sample characteristics:				
Vapor pressure at 100°F, lb (ASTM D 323, ¹ IP 69 or IP 171)	9.5 or above	below 9.5	below 9.5	below 9.5
Distillation				
initial boiling point, °F (°C)	...	...	212 (100) or below	above 212 (100)
end point, °F (°C)	482 (250) or below	482 (250) or below	above 482 (250)	above 482 (250)
Preparation of apparatus:				
ASTM Distillation Thermometer No.	low; 7F (7C)	low; 7F (7C)	low; 7F (7C)	high; 8F (8C)
IP Distillation Thermometer No.	5C	5C	5C	6C
Diameter of hole in flask support, in. (mm) ²	1.5 (37.5)	1.5 (37.5)	2.0 (50)	2.0 (50)
Temperature at start of test:				
Flask and thermometer, °F (°C)	55 to 65 (13 to 18)	55 to 65 (13 to 18)	55 to 65 (13 to 18)	not above ambient
Flask support and shield	not above ambient	not above ambient	not above ambient	...
Graduate and 100-ml charge, °F (°C)	55 to 65 (13 to 18)	55 to 65 (13 to 18)	55 to 65 (13 to 18)	55 (13) to ambient
Flask (Section 6.1)	B (125 ml)	B (125 ml)	B (125 ml)	B (125 ml)
Conditions during test procedure:				
Temperature of condenser bath, °F (°C)	32 to 34 (0 to 1)	32 to 40 (0 to 4)	32 to 40 (0 to 4)	32 to 140 ³ (0 to 60)
Temperature of bath around graduate, °F (°C)	55 to 65 (13 to 18)	55 to 65 (13 to 18)	55 to 65 (13 to 18)	within ±5 (±3) of temperature of distillation charge
Time from first application of heat to initial boiling point, min	5 to 10	5 to 10	5 to 10	5 to 15
Time from initial boiling point to 5% recovered, s	60 to 75	60 to 75	...	...
Uniform average rate of condensation from 5% recovered to 5-ml residue in flask, ml/min	4 to 5	4 to 5	4 to 5	4 to 5
Time from 5-ml residue to end point, min	3 to 5	3 to 5	5 max	5 max

¹ ASTM Method D 323, Test for Vapor Pressure of Petroleum Products (Reid Method).²

² As determined under all test conditions of the group concerned.

³ The Institute of Petroleum specifies a 2-in. opening for the flask support board. Hole diameters are to be reviewed.

⁴ The proper condenser bath temperature will depend upon the wax content of the sample and of its distillation fractions. The minimum temperature which permits satisfactory operation should be used. In general, a bath temperature in the 32 to 40°F (0 to 4°C) range is suitable for kerosene and products meeting the specifications for Grade No. fuel oil as prescribed in ASTM Specifications D 396, for Fuel Oils,² and those meeting the specifications for Grade No. 1-D diesel fuel oil as prescribed in ASTM Classification D 975, Classification of Diesel Fuel Oils.² In some cases involving Grade No. 2 fuel oil (Specifications D 396), Grade No. 2-D diesel fuel oil (Classification D 975), gas oils and similar distillates, it may be necessary to hold the condenser bath temperature at some point in the 100 to 140°F (38 to 60°C) range, in order to avoid the condensation of solid waxy material in the condenser tube.

ture not to exceed 60°F (15°C).

7.2 Samples of materials that visibly contain water are not suitable for testing. If the sample is not dry, and the initial boiling point is below 150°F (66°C), obtain another sample which is free from suspended water for the test. If the initial boiling point is above 150°F (66°C), shake the sample with anhydrous sodium sulfate or other suitable drying agent and separate it from the drying agent by decanting.

8. Preparation of Apparatus

8.1 Refer to Table 1 and select the flask, flask support, and thermometer, which are required by the sample to be tested. Bring the respective temperatures of the flask, thermometer, graduate, flask support, and shield to their required values for starting the test.

8.2 Fill the condenser box to cover the condenser tube with any nonflammable coolant which is suitable for the temperature required by Table 1, such as chopped ice, water, brine, or ethylene glycol solution. If chopped ice is used, add sufficient water to cover the condenser tube. If necessary, make any suitable provision, such as circulation, stirring, or air blowing, so as to maintain the required condenser bath temperature throughout the test. Similarly, make any necessary provision so that the temperature of the bath around the graduate will remain within the limits required in Table 1.

8.3 Remove any residual liquid in the condenser tube by swabbing with a piece of soft, lint-free cloth attached to a cord or copper wire.

8.4 Bring the temperature of the sample within the range prescribed in Table 1. Measure 100 ml of the sample in the graduated cylinder and transfer it as completely as practicable to the distillation flask, taking care that none of the liquid flows into the vapor tube.

8.5 Fit the thermometer, provided with a snug-fitting, well-rolled cork, tightly into the neck of the flask so that the bulb is centered in the neck and the lower end of the capillary is level with the highest point on the bottom of the inner wall of the vapor tube (see Fig. 1).

8.6 Place the flask containing the charge in its support; and by means of a cork through which the vapor tube has been passed, make a tight connection with the condenser tube. Adjust the flask so that it is in a vertical position, and so that the vapor tube extends into the condenser tube for a distance of 1 to 2 in. (25 to 50 mm).

8.7 Place the graduate that was used to measure the charge, without drying, into its bath under the lower end of the condenser tube so that the end of the condenser tube is centered in the graduate and extends therein for a distance of at least 1 in. (25 mm), but not below the 100-ml mark. Cover the graduate closely with a piece of blotting paper, or similar material, suitably weighted, which has been cut to fit the condenser tube snugly. Maintain the level of the bath around the graduate so that it is at least as high as the 100-ml mark.

8.8 Note and record the prevailing barometric pressure, and proceed at once with the distillation, as given in Section 9.

9. Procedure

9.1 Apply heat to the distillation flask and contents. The heating at this stage must be so regulated that the time interval between the first application of heat and the initial boiling point does not exceed the limit as prescribed in Table 1.

9.2 Immediately after observing the initial boiling point, move the graduate so that the tip of the condenser touches its inner wall. Continue to regulate the heating so that the rate of condensation into the graduate shall be uniform and within the limits prescribed in Table 1. Repeat any distillation which did not meet the foregoing conditions.

9.3 In the interval between the initial boiling point and the end of the distillation, observe and record whatever data are necessary for the calculation and reporting of the results of the test as prescribed in Section 10. These observed data may include thermometer readings at prescribed percentages recovered, or percentages recovered at prescribed thermometer readings, or both. Record all volumes in the graduate to

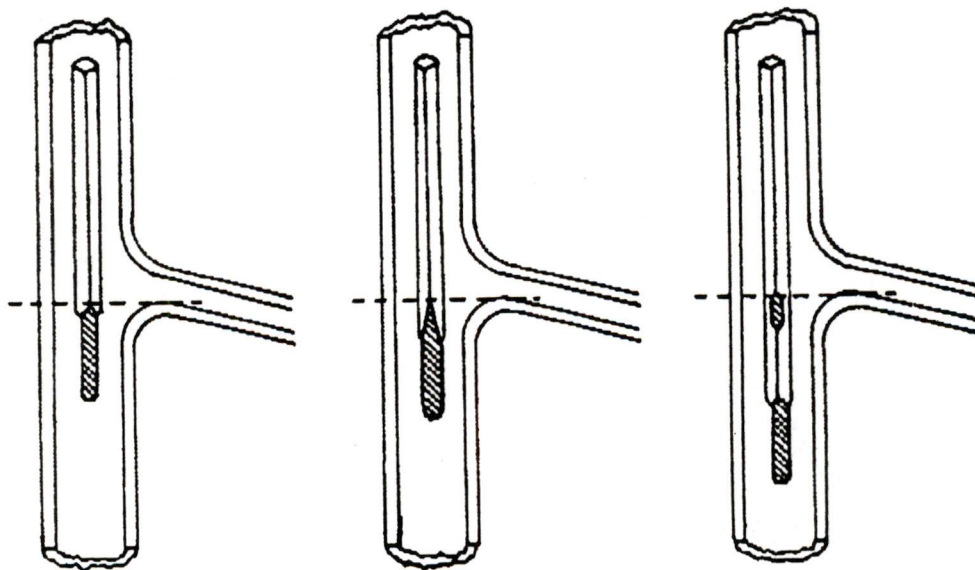


FIG. 1 Position of Thermometer in Distillation Flask

the nearest 0.5 ml and all thermometer readings to the nearest 1.0°F (0.5°C).

NOTE 7—In cases in which no specific data requirements have been indicated, record the initial boiling point, the end point (final boiling point) or dry point, or both, and thermometer readings at 5 % and 95 % recovered and at each multiple of 10 % recovered from 10 to 90, inclusive.

9.4 If a decomposition point is observed, discontinue the heating and resume the procedure as directed in 9.7. Otherwise, proceed as directed in 9.5.

9.5 When the residual liquid in the flask is approximately 5 ml, make a final adjustment of the heat, if necessary, so that the time from the 5 ml of liquid residue in the flask to the end point (final boiling point) shall meet the requirements given in Table 1. If this condition is not satisfied, repeat the test, with appropriate modification of the final heat adjustment.

9.6 Observe and record the end point (final boiling point) or dry point, or both, as required, and discontinue the heating. At the end point (final boiling point), observe if all the liquid has evaporated from the bottom of the flask. If not, include a note of this fact in the report as prescribed in Section 10.

9.7 While the condenser tube continues to drain into the graduate, observe the volume of condensate at 2-min intervals until two successive observations agree. Measure this volume accurately, and record it, to the nearest 0.5 ml, as percent recovery. If the distillation was previously discontinued under the conditions given in 9.4, deduct the percent recovery from 100, report this difference as "Percent Residue and Loss," and omit the procedure given in 9.8 and 9.9.

9.8 After the flask has cooled, pour its contents into the condensate in the graduate and allow to drain until no appreciable increase in the volume of liquid in the graduate is observed. Record this volume, to the nearest 0.5 ml as percent total recovery.

TABLE 2 Approximate Corrected Thermometer Readings

Temperature Range		Correction ^a per 10-mm Difference in Pressure	
°C	°F	°C	°F
10 to 30	50 to 86	0.35	0.63
30 to 50	86 to 122	0.38	0.68
50 to 70	122 to 158	0.40	0.72
70 to 90	158 to 194	0.42	0.76
90 to 110	194 to 230	0.45	0.81
110 to 130	230 to 266	0.47	0.85
130 to 150	266 to 302	0.50	0.89
150 to 170	302 to 338	0.52	0.94
170 to 190	338 to 374	0.54	0.98
190 to 210	374 to 410	0.57	1.02
210 to 230	410 to 446	0.59	1.06
230 to 250	446 to 482	0.62	1.11
250 to 270	482 to 518	0.64	1.15
270 to 290	518 to 554	0.66	1.19
290 to 310	554 to 590	0.69	1.24
310 to 330	590 to 626	0.71	1.28
330 to 350	626 to 662	0.74	1.32
350 to 370	662 to 698	0.76	1.37
370 to 390	698 to 734	0.78	1.41
390 to 410	734 to 770	0.81	1.45

^a To be added in case barometric pressure is below 760 mm Hg; to be subtracted in case barometric pressure is above 760 mm Hg.

TABLE 3 Values of the Constants "A" and "B" Used in Obtaining Corrected Distillation Loss

Observed Barometric Pressure, mm	A	B
560	0.231	0.384
570	0.240	0.380
580	0.250	0.375
590	0.261	0.369
600	0.273	0.363
610	0.286	0.357
620	0.300	0.350
630	0.318	0.342
640	0.333	0.333
650	0.353	0.323
660	0.375	0.312
670	0.400	0.300
680	0.428	0.286
690	0.461	0.269
700	0.500	0.250
710	0.545	0.227
720	0.600	0.200
730	0.667	0.166
740	0.750	0.125
750	0.857	0.071
760	1.000	0.000

9.9 Deduct the percent total recovery from 100 to obtain the percent loss.

10. Calculations and Report

10.1 For each test, calculate and report whatever data are required by the specification involved, or as customarily established for the sample under test, or in accordance with Note 7.

10.2 Report all percentages to the nearest 0.5, all thermometer readings to the nearest 1.0°F (0.5°C), and the barometric pressure to the nearest 1 mm.

10.3 When ASTM Thermometer 8F (8C) or IP Thermometer 6C is used in testing aviation turbine fuels and similar products, pertinent thermometer readings may be obscured by the cork. To provide the desired data, a second distillation according to Group 3 of Table 1 may have been performed. In such cases, readings from ASTM Thermometer 7F (7C) or IP Thermometer 5C may be reported in place of the obscured ASTM Thermometer 8F (8C) or IP Thermometer 6C readings, and the test report shall so indicate. If, by agreement, the obscured readings are waived, the test report shall so indicate.

10.4 When the report is to be based on thermometer readings corrected to 760-mm Hg barometric pressure (Note

TABLE 4 Repeatability and Reproducibility

Evaporated Point	Repeatability, r	Reproducibility, R
IBP	6	10
5 %	$r_o + 1.2$	$R_o + 2.0$
10-80 %	r_a	R_o
90 %	r_o	$R_o - 2.2$
95 %	r_o	$R_o - 1.7$
FBP	7	13

As an example, suppose we want the repeatability, r , and the reproducibility, R , for the 90 % point when $F/V \% = 6$. From the graph

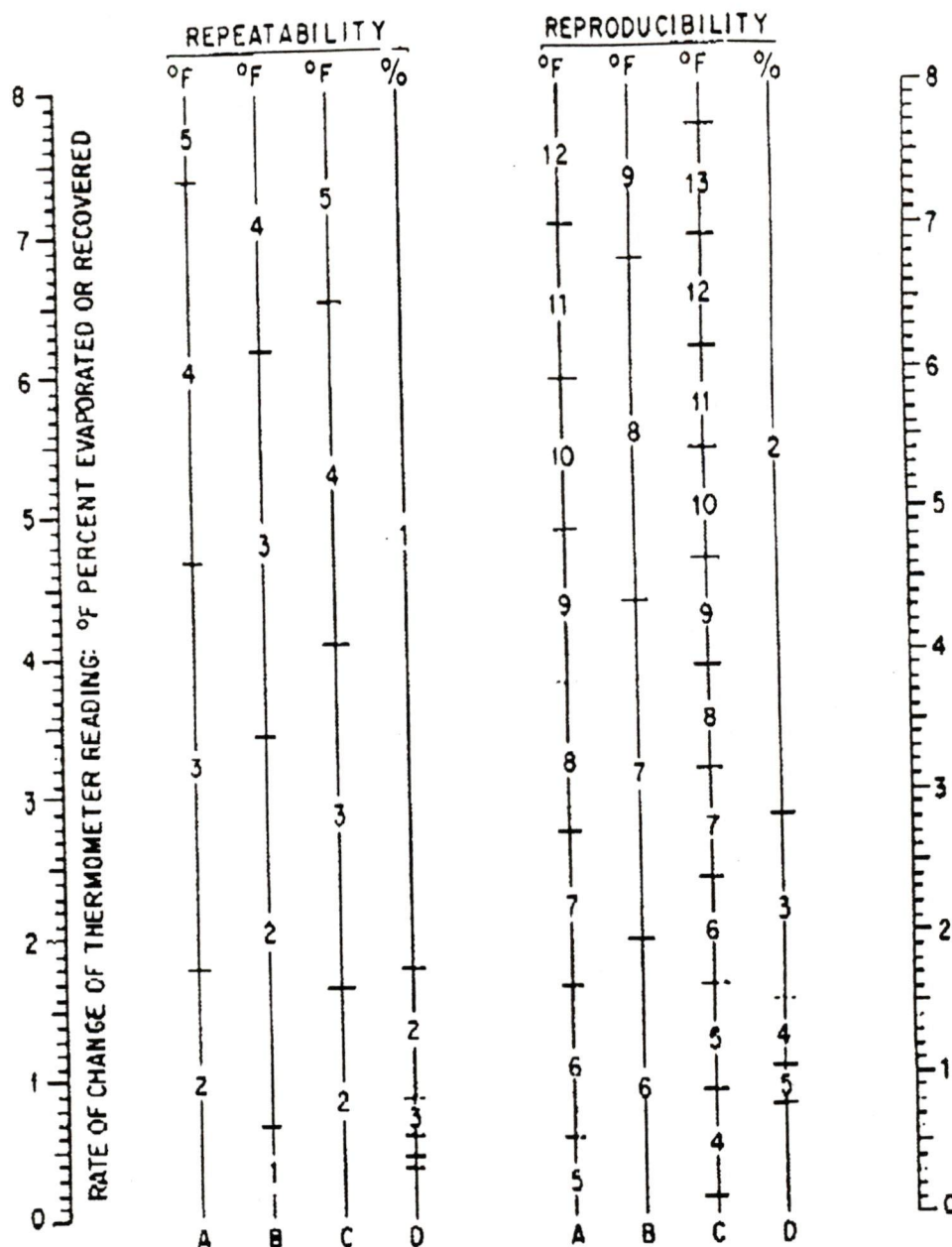
$$r_o = 7.4$$

$$R_o = 14.0$$

Using the table, we determine if there is an offset and whether it is added or subtracted.

$$r = r_o - 7.4 = 7$$

$$R = R_o - 2.2 = 14.0 - 2.2 = 11.8 \approx 12$$



A—Initial boiling point, °F (see footnote 8)
B—End point (final boiling point) or dry point, °F (see footnote 8)
C—Thermometer reading at prescribed percent evaporated or recovered, °F
D—Percent evaporated or recovered at prescribed thermometer reading

FIG. 2 Precision of Distillation ASTM Method D 86 - IP 123 (Fahrenheit) (See Section 11)

8), obtain the correction to be applied to each thermometer reading by means of the Sydney Young equation as given below, or by the use of Table 2. After applying the corrections and rounding each result to the nearest 1.0°F (0.5°C), use the corrected thermometer readings in all further calculations and reporting.

For Celsius readings:

$$C_i = 0.00012 (760 - P)(273 + t_i)$$

For Fahrenheit readings:

$$C_j = 0.00012 (760 - P)(460 + t_j)$$

where:

C_i and C_j = corrections to be added algebraically to the observed thermometer readings t_i or t_j respectively. Convenient approximations of these corrections are given in Table 2, and
 P = barometric pressure, mmHg, prevailing at the time of the test.

NOTE 8—Thermometer readings shall be corrected to 760-mm Hg pressure except when product definitions, specifications, or agreements between the purchaser and the seller indicate, specifically, that such correction is not required or that correction shall be made to some other base pressure. The report shall include the observed pressure and shall

state whether corrections have or have not been applied.

10.5 After barometric corrections of the thermometer readings have been made, if required, the following data require no further calculation prior to reporting: initial boiling point, dry point, end point (final boiling point), decomposition point, and all pairs of corresponding values involving percentages recovered and thermometer readings. Percent loss and percent residue are calculated in accordance with their respective definitions as set forth in 5.8 and 5.9.

10.6 It is advisable to base the report on relationships between thermometer readings and percentages evaporated

in any case in which the sample is a gasoline, or any other product classed under Group 1 in Table 1, or in which the percent loss is greater than 2.0. Otherwise, the report may be based on relationships between thermometer readings and percentages evaporated or recovered. Every report must indicate clearly which basis has been used.

10.7 To report percentages evaporated at prescribed thermometer readings, add the percent loss to each of the observed percentages recovered at the prescribed thermometer readings, and report these results as the respective percentages evaporated.

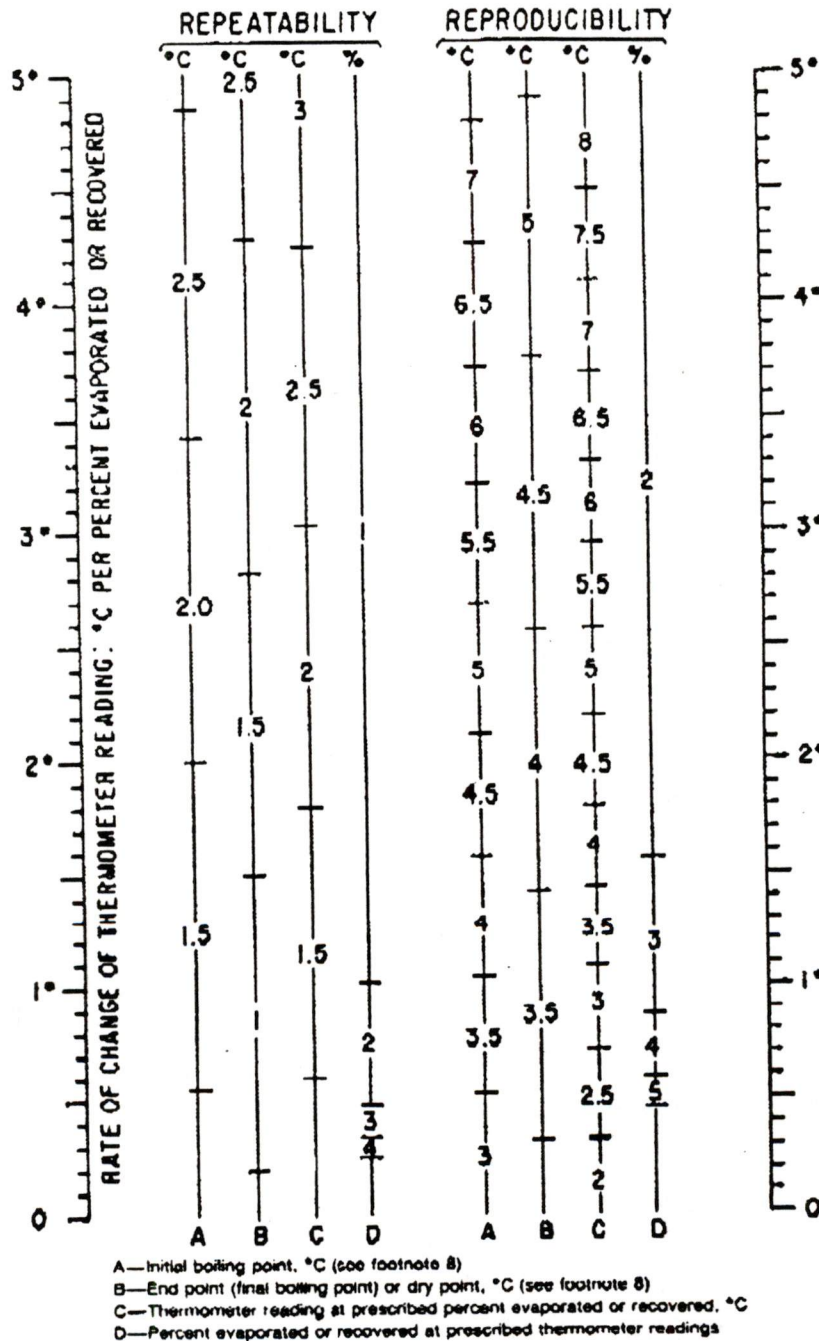


FIG. 3 Precision of Distillation ASTM Method D 86 - IP 123 (Celsius) (See Section 11)

10.8 To report thermometer readings at prescribed percentages evaporated, use either of the two following procedures, and indicate on the report whether the graphical procedure or the arithmetical procedure has been used.

10.8.1 *Graphical Procedure*—Using graph paper with uniform subdivisions, plot each thermometer reading (corrected for barometric pressure, if required) against its corresponding percent recovered. Plot the initial boiling point at 0 % recovered. Draw a smooth curve connecting the points. For each prescribed percent evaporated, deduct the distillation loss, in order to obtain the corresponding percent recovered, and take from the graph the thermometer reading which this percent recovered indicates (Note 9). Values obtained by graphical interpolation procedures are affected by the care with which the plot is made.

10.8.2 *Arithmetical Procedure*—Deduct the distillation loss from each prescribed percentage evaporated in order to obtain the corresponding percentage recovered. Calculate each required thermometer reading as follows:

$$T = T_L + \frac{(T_H - T_L)(R - R_L)}{(R_H - R_L)}$$

where:

T = thermometer reading at the prescribed percent evaporated,

R = percent recovered corresponding to the prescribed percent evaporated,

R_H = percent recovered adjacent to, and higher than R , at which a thermometer reading " T_H " was noted, and

R_L = percent recovered adjacent to, and lower than R , at which a thermometer reading " T_L " was noted.

NOTE 9—Values obtained by the arithmetical procedure are affected by the extent to which the distillation graph is nonlinear. Intervals between successive data points must, at any stage of the test, be at least as narrow as indicated in Note 7. In no case shall a calculation be made which involves extrapolation.

NOTE 10—See Appendix X2 for numerical examples illustrating the foregoing graphical and arithmetical procedures.

10.9 If thermometer readings are corrected to 760-mm Hg pressure, the actual loss shall be corrected to 760-mm Hg pressure, according to the equation given below. The corre-

sponding corrected percent recovery is computed on the basis that it is greater than the actual recovery by the same amount as the corrected loss is less than the actual loss. When reporting data, state whether the corrections have or have not been applied.

$$\text{Corrected loss} = AL + B$$

where:

L = percent loss as calculated from test data, and
 A and B = numerical constants, the values of which depend upon the prevailing barometric pressure. These constants are listed in Table 3, in connection with the prevailing pressure.

11. Precision⁶

11.1 The following criteria should be used for judging the acceptability of results (95 % probability):

11.1.1 Duplicate results obtained by the same operator and apparatus should not be considered suspect unless they differ by more than the repeatability which, according to Fig. 2 or 3, is appropriate to the test result obtained and to the rate of change in thermometer reading which prevailed at the stage at which the result was obtained.

11.1.2 The results obtained by each of two laboratories should not be considered suspect unless the two results differ by more than the reproducibility which, according to Fig. 2 or 3, is appropriate to the test result obtained and to the rate of change in thermometer reading which prevailed at the stage at which the result was obtained.

11.1.3 To facilitate the use of Figs. 2 and 3, the rate of change in thermometer reading in degrees Fahrenheit or Celsius per the percentage evaporated or recovered, at any point between the initial boiling point and the end point (final boiling point) or dry point, should be assumed to be the same as the average rate between two data points which are equidistant above and below the point in question. The span from the point in question to either of the other data points should not represent more than 10 % evaporated or recovered in any case, nor more than 5 % if the point in question is not included in the 10 to 90 % range. For the initial boiling point, end point (final boiling point), or dry point, the rate of change should be assumed to be the same as the average rate over an interval, not to exceed 5 % evaporated or recovered, between the extreme point and the next data point above or below it.

11.1.4 In Fig. 2 or 3, it will be noted that the left and right marginal scales, representing the rate of change in thermometer reading, are identical. This is to facilitate the establishing of a horizontal line across the chart and at the required level, which may be done in any convenient manner. Wherever this line intersects the appropriate precision scale, the zone in which such intersection falls will indicate the expected repeatability or reproducibility.

11.1.5 For gasoline and oxygenated gasoline, duplicate results obtained by the same operator and apparatus should

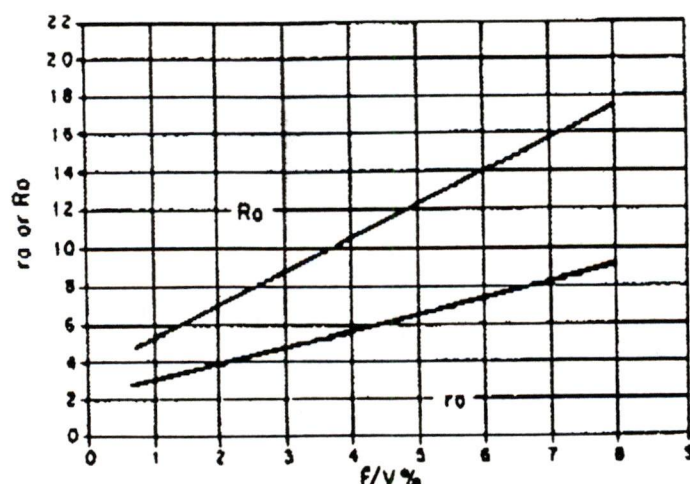


FIG. 4 Repeatability, r and Reproducibility, R . D - 85 Manual Method North American and IP Labs

⁶ Precision for this method is under review. Indications are that precision for initial boiling point and end point (final boiling point) or dry point may be indeterminate.

not be considered suspect unless they differ by more than the repeatability which according to Fig. 4 and Table 4 is appropriate to the test result obtained and to the rate of change in thermometer reading which prevailed at the stage at which the result was obtained.

11.1.6 For gasoline and oxygenated gasoline, the results

obtained by each of two laboratories should not be considered suspect unless the two results differ by more than the reproducibility that according to Fig. 4 and Table 4 is appropriate to the test result obtained and to the rate of change in thermometer reading that prevailed at the stage at which the result was obtained.

ANNEXES

(Mandatory Information)

A1. AUTOMATIC DISTILLATION OF PETROLEUM PRODUCTS

A1.1 *Scope*—This test method covers the distillation of motor gasolines, aviation gasolines, aviation turbine fuels, special boiling point spirits, naphthas, white spirit, kerosines, gas oils, distillate fuel oils, and similar petroleum products.

A1.2 *Summary of Method*—A 100-ml sample is distilled in an automatic distillation apparatus under prescribed conditions that are appropriate to its nature (Table A1.1). The automatic apparatus duplicates the distillation conditions that are described in the manual method. The prescribed conditions are selected from the program control offered by the apparatus. A smooth curve of vapor temperature readings versus percent recovered of the condensate are recorded by the apparatus. From this curve corrections must be applied to obtain temperature readings corrected for barometric pressure or on a percent evaporated basis, or both.

A1.3 Definitions:

A1.3.1 *initial boiling point*—the temperature reading recorded at the instant the first drop of condensate falls from the lower end of the condenser tube.

A1.3.2 *end or final boiling point*—the maximum temperature reading recorded at the end of the distillation.

NOTE A1—An automatic distillation instrument will give either dry point or final boiling point. Should a dry point be required, an optical dry point detector may be fitted and optically clear flasks used. Visual detection in reasonably clear distillation flasks also may be satisfactory.

A1.3.3 *dry point*—the temperature recorded at the instant the last drop of liquid evaporates from the lowest point in the flask.

A1.3.4 *decomposition point*—the temperature recorded which coincides with the first indications of thermal decomposition of the liquid in the flask.

TABLE A1.1 Test Conditions
(These are essentially the same as in Table 1)

	Group 1	Group 2	Group 3	Group 4
Sample characteristics:				
Vapor pressure at 100°F, psi (kPa)	9.5 or above (65.5)	below 9.5 (65.5)	below 9.5 (65.5)	below 9.5 (65.5)
ASTM D 323, IP 69-171				
Initial boiling point ^a	...	...	212°F (100°C) or below	above 212°F (100°C)
Distillation				
End (final boiling) point ^c	482°F (250°C) or below	482°F (250°C) or below	above 482°F (250°C)	above 482°F (250°C)
Preparation of apparatus:				
Temperature range selection	32-575°F (0-300°C)	32-575°F (0-300°C)	32-575°F (0-300°C)	32-730°F (0-400°C)
Diameter of hole in flask support, in. (mm)	1.50 (37.5)	1.50 (37.5)	2.0 (50)	2.0 (50)
Temperature at start of test:				
Flask and thermocouple/resistance thermometer	55-65°F (13-18°C)	55-65°F (13-18°C)	55-65°F (13-18°C)	not above ambient
Flask support and shield	not above ambient	not above ambient	not above ambient	...
Receiver and 100-ml charge	55-65°F (13-18°C)	55-65°F (13-18°C)	55-65°F (13-18°C)	55°F (13°C) to ambient
Flask (A1.4.2)	125 ml	125 ml	125 ml	125 ml
Conditions during test procedure:				
Temperature of condenser bath ^a	32-34°F (0-1°C)	32-40°F (0-4°C)	32-40°F (0-4°C)	32-140°F (0-60°C)
Temperature of receiver compartment	55-65°F (13-18°C)	55-65°F (13-18°C)	55-65°F (13-18°C)	within 5°F (3°C) of temperature of distillation charge
Time from first application of heat to initial boiling point (min) ^a	5-10	5-10	5-10	5-15
Time from initial boiling point to 5 % recovered (s) ^a	60-75	60-75	...	...
Uniform average rate of condensation from 5 % recovered to 5 % residue in flask, ml/min ^a	4-5	4-5	4-5	4-5
Time from 5 ml residue to end point, min	3-5	3-5	5 max	5 max

^a These parameters are fixed by setting the program controls.

^b As Table 1.

^c As Table 1.



Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method)¹

This standard is issued under the fixed designation D 323; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense to replace Method 1201 of Federal Test Method Standard No. 791b. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

1. Scope

1.1 This test method provides procedures for the determination of vapor pressure (Note 1) of gasoline, volatile crude oil and other volatile petroleum products. Procedure A is applicable to gasoline and other petroleum products with a vapor pressure of less than 180 kPa (26 psi). Procedure B, although it may be applicable to these other materials, has been tested by ASTM only for gasoline. Neither method is applicable to liquefied petroleum gases (Note 2) or fuels containing oxygenated compounds other than MTBE. Procedure C, is for materials with a vapor pressure of greater than 180 kPa (26 psi) and Procedure D, for aviation gasoline with a vapor pressure of approximately 50 kPa (7 psi).

NOTE 1—Because the external atmospheric pressure is counteracted by the atmospheric pressure initially present in the vapor chamber, the Reid vapor pressure is an absolute pressure at 37.8°C (100°F) in kilopascals (pounds-force per square inch). The Reid vapor pressure differs from the true vapor pressure of the sample due to some small sample vaporization and the presence of water vapor and air in the confined space.

NOTE 2—For determination of the vapor pressure of liquefied petroleum gases refer to Test Method D 1267.

1.2 This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. For specific hazard statements, see Notes 3, 6, 9, and 10.

1.3 The values stated in acceptable metric units are standard. The values given in parentheses are provided for information purposes only.

2. Referenced Documents

2.1 ASTM Standards:

- D 1267 Test Method for Vapor Pressure of Liquefied Petroleum (LP) Gases (LP-Gas Method)²
- D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products³
- E 1 Specification for ASTM Thermometers⁴

¹ This test method is under the jurisdiction of Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.08 on Volatility.

Current edition approved Oct. 27, 1989. Published January 1990. Originally published as D 323 - 30. Last previous edition D 323 - 82¹².

² Annual Book of ASTM Standards, Vol 05.01.

³ Annual Book of ASTM Standards, Vol 05.03.

⁴ Annual Book of ASTM Standards, Vols 05.03 and 14.03.

3. Summary of Test Method

3.1 The liquid chamber of the vapor pressure apparatus is filled with the chilled sample and connected to the vapor chamber which has been heated to 37.8°C (100°F) in a bath. The assembled apparatus is immersed in a bath at 37.8°C (100°F) until a constant pressure is observed. The reading, suitably corrected is reported as the Reid vapor pressure.

3.2 All four procedures utilize liquid and vapor chambers of the same internal volume. Procedure B utilizes a semi-automatic apparatus immersed in a horizontal bath and rotated while attaining equilibrium. Either a Bourdon gage or pressure transducer may be used with this procedure. Procedure C utilizes a liquid chamber with two valved openings. Procedure D requires more stringent limits on the ratio of the liquid and vapor chambers.

4. Significance and Use

4.1 Vapor pressure is an important physical property of volatile liquids. This test method is used to determine the vapor pressure at 37.8°C (100°F) of petroleum products and crude oils with initial boiling point above 0°C (32°F).

4.2 Vapor pressure is critically important for both automotive and aviation gasolines, affecting starting, warmup, and tendency to vapor lock with high operating temperatures or high altitudes. Maximum vapor pressure limits for gasoline are legally mandated in some areas as a measure of air pollution control.

4.3 Vapor pressure of crude oils is of importance to the crude producer and the refiner for general handling and initial refinery treatment.

4.4 Vapor pressure is also used as an indirect measure of the evaporation rate of volatile petroleum solvents.

5. Apparatus

5.1 The required apparatus for procedures A, C, and D is described in Annex A1. Apparatus for Procedure B is described in Annex A2.⁵

6. Sampling

6.1 The following sections on sample handling apply to Procedures A, B, and D.

6.2 The extreme sensitivity of vapor pressure measurements to losses through evaporation and the resulting changes in composition is such as to require the utmost

WEATHERING

⁵ Vapor pressure apparatus meeting the requirements of Procedure B are available from UIC Inc., P.O. Box 863, Joliet, IL 60434 or Walter Herzog GmbH, D-6970 Lauda-Königshofen Postfach 320.

D 323

precaution and the most meticulous care in the handling of samples. The provisions of this section shall apply to all samples for vapor pressure determinations, except as specifically excluded for samples having vapor pressures above 180 kPa (26 psi); see Section 11.

6.3 Sampling shall be done in accordance with Practice D 4057.

6.4 **Sample Container Size**—The size of the sample container from which the vapor pressure sample is taken shall be 1 L (1 qt). It shall be 70 to 80 % filled with the sample.

6.4.1 The present precision statement has been derived using samples in 1-L (1-qt) containers. However, samples taken in containers of other sizes as prescribed in Practice D 4057 can be used if it is recognized that the precision could be affected. In the case of referee testing, the 1-L (1-qt) sample container shall be mandatory.

6.5 **Hazards**—The Reid vapor pressure determination shall be the first test withdrawn from the sample container. The remaining sample in the container can not be used for a second vapor pressure determination. If necessary, obtain a new sample.

6.5.1 Protect the samples from excessive heat prior to testing.

6.5.2 Do not test the samples in leaky containers. They should be discarded and new samples obtained.

6.6 **Sample Handling Temperature**—In all cases, cool the sample container and contents to 0 to 1°C (32 to 34°F) before the container is opened. Sufficient time to reach this temperature shall be assured by direct measurement of the temperature of a similar liquid in a like container placed in the cooling bath at the same time as the sample.

7. Preparation for Test

7.1 The following sections on Preparation for Test apply to Procedures A, B, and D.

7.2 **Verification of Sample Container Filling**—With the sample at a temperature of 0 to 1°C (32 to 34°F), take the container from the cooling bath, unseal it, and examine its ullage. The sample content, as determined by use of a suitable gage, shall equal 70 to 80 % of the container capacity.

7.2.1 Discard the sample if its volume is less than 70 % of the container capacity.

7.2.2 If the container is more than 80 % full, pour out enough sample to bring the container contents within the 70 to 80 % range. Under no circumstance shall any sample poured out be returned to the container.

7.3 **Air Saturation of Sample in Sample Container**

7.3.1 With the sample again at a temperature of 0 to 1°C (32 to 34°F), take the container from the cooling bath, open it momentarily, reseal it, and shake it vigorously. Return it to the bath for a minimum of 2 min.

7.3.2 Repeat 7.3.1 twice more. Return the sample to the bath until the beginning of the procedure.

7.4 **Preparation of Liquid Chamber**—Completely immerse the open liquid chamber (in an upright position) and the sample transfer connection (Fig. 1) in a bath at 0 to 1°C (32 to 34°F) for at least 10 min.

7.5 **Preparation of Vapor Chamber**—After purging and rinsing the vapor chamber and pressure gage in accordance with 8.5, connect the gage to the vapor chamber. Immerse

the vapor chamber to at least 25.4 mm (1 in.) above its top in the water bath maintained at $37.8 \pm 0.1^\circ\text{C}$ ($100 \pm 0.2^\circ\text{F}$) for not less than 10 min just prior to coupling it to the liquid chamber. Do not remove the vapor chamber from the bath until the liquid chamber has been filled with sample as described in 8.1.

8. Procedure

8.1 **Sample Transfer Procedures A, B, and D**—Remove the sample from the cooling bath, uncap, and insert the chilled transfer tube (see Fig. 1). Remove the liquid chamber from the cooling bath, and place the chamber in an inverted position over the top of the transfer tube. Invert the entire system rapidly so that the liquid chamber is upright with the end of the transfer tube approximately 6.35 mm (0.25 in.) from the bottom of the liquid chamber. Fill the chamber to overflowing. Withdraw the transfer tube from the liquid chamber while allowing the sample to continue flowing up to complete withdrawal.

NOTE 3: Warning—Make provision for suitable containment and disposal of the overflowing sample to avoid a fire hazard.

8.2 **Assembly of Apparatus**—Immediately remove the vapor chamber from the water bath and couple the filled liquid chamber to the vapor chamber as quickly as possible without spillage. When the vapor chamber is removed from the water bath, connect it to the liquid chamber without undue movement which could promote exchange of room temperature air with the 37.8°C (100°F) air in the chamber. Not more than 10 s shall elapse between removing the vapor chamber from the water bath and completion of the couplings of the two chambers. With Procedure B it is necessary to disconnect the spiral tubing at the quick action disconnect, after removing from the water bath and before making the connection to the vapor chamber.

8.3 **Introduction of the Apparatus into Bath**

8.3.1 **Procedure A**—Turn the assembled apparatus upside down and allow all the sample in the liquid chamber to drain into the vapor chamber. With the apparatus still inverted, shake it vigorously eight times up and down. With the gage end up, immerse the assembled apparatus in the bath, maintained at $37.8 \pm 0.1^\circ\text{C}$ ($100 \pm 0.2^\circ\text{F}$), in an inclined position so that the connection of the liquid and vapor chambers is below the water level and carefully examine for leaks (Note 4). If no leaks are observed, further immerse the apparatus to at least 25 mm (1 in.) above the top of the vapor

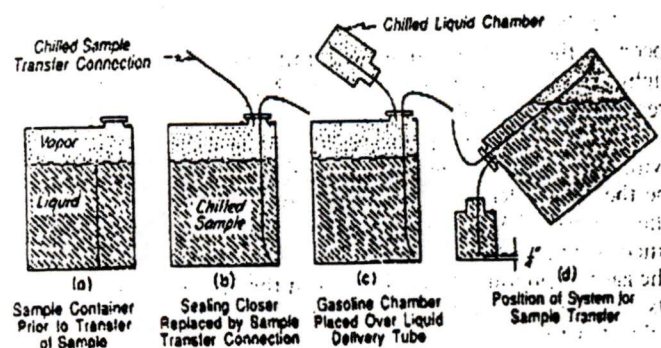


FIG. 1 Simplified Sketches Outlining Method Transferring Sample to Liquid Chamber from Open-Type Containers

chamber. Observe the apparatus for leaks throughout the test and discard the test at anytime a leak is detected.

NOTE 4—Liquid leaks are more difficult to detect than vapor leaks; and because the coupling between the chambers is normally in the liquid section of the apparatus, give it particular attention.

8.3.2 *Procedure B*—While holding the apparatus vertical immediately reconnect the spiral tubing at the quick action disconnect. Tilt the apparatus to 20 to 30 degrees downward for four or five seconds to allow the sample to flow into the vapor chamber without getting into the tube extending into the vapor chamber from the gage, or pressure transducer. Place the assembled apparatus into the water bath maintained at $37.8 \pm 0.1^\circ\text{C}$ ($100 \pm 0.2^\circ\text{F}$) in such a way that the bottom of the liquid chamber engages the drive coupling and the other end of the apparatus rests on the support bearing. Turn on the switch to begin the rotation of the assembled liquid-vapor chambers. Observe the apparatus for leakage throughout the test (Note 4). Discard the test at anytime a leak is detected.

8.4 Measurement of Vapor Pressure:

8.4.1 *Procedure A*—After the assembled apparatus has been in the water bath for at least 5 min, tap the pressure gage lightly and observe the reading. Withdraw the apparatus from the bath and repeat the instructions of 8.3.1. At intervals of not less than 2 min, tap the gage, observe the reading and repeat 8.3.1 until a total of not less than five shakings and gage readings have been made. Continue this procedure, as necessary, until the last two consecutive gage readings are the same indicating that equilibrium has been attained. Read the final gage pressure to the nearest 0.25 kPa (0.05 psi) and record this value as the uncorrected vapor pressure of the sample. Without undue delay remove the pressure gage from the apparatus (Note 5) without attempting to remove any liquid which may be trapped in the gage, check its reading against that of the manometer while both are subjected to a common steady pressure which is not more than 1.0 kPa (0.2 psi) from the recorded uncorrected vapor pressure. If a difference is observed between the manometer and gage readings, the difference is added to the uncorrected vapor pressure when the manometer reading is higher, or subtracted from the uncorrected vapor pressure when the manometer reading is lower, and the resulting value recorded as the Reid vapor pressure of the sample.

NOTE 5—Cooling the assembly prior to disconnecting the gage will facilitate disassembly and reduce the amount of hydrocarbon vapors released into the room.

8.4.2 *Procedure B*—After the assembled apparatus has been in the bath for at least 5 min, tap the pressure gage lightly and observe the reading. Repeat the tapping and reading at intervals of not less than 2 min, until two consecutive readings are the same. (Tapping is not necessary with the transducer model but the reading intervals should be the same.) Read the final gage or transducer pressure to the nearest 0.25 kPa (0.05 psi) and record this value as the uncorrected vapor pressure. Without undue delay disconnect the gage or pressure transducer from the apparatus and check its reading against that of the manometer while both are subjected to a common steady pressure which is not more than 1.0 kPa (0.2 psi) different from the recorded uncorrected vapor pressure. If a difference is observed

between the manometer and gage or transducer readings, the difference is added to the uncorrected vapor pressure when the manometer reading is higher, or subtracted from the uncorrected vapor pressure when the manometer reading is lower, and the resulting value recorded as the Reid vapor pressure of the sample.

8.5 Preparation of Apparatus for Next Test:

8.5.1 Thoroughly purge the vapor chamber of residual sample by filling it with warm water above 32°C (90°F) and allowing it to drain. Repeat this purging at least five times. Purge the liquid chamber in the same manner. Rinse both chambers and the transfer tube several times with petroleum naphtha, then several times with acetone, then blow dry using dried air. Place the liquid chamber in the cooling bath or refrigerator in preparation for the next test.

8.5.2 If the purging of the vapor chamber is done in a bath, be sure to avoid small films of floating sample by keeping the bottom and top openings of the chamber closed as they pass through the water surface.

8.5.3 *Preparation of Gage Procedure A*—Disconnect the gage from its manifold connection with the manometer, and remove trapped liquid in the Bourdon tube of the gage by repeated centrifugal thrusts. This is accomplished in the following manner: hold the gage between the palms of the hands with the right palm on the face of the gage and the threaded connection of the gage forward. Extend the arms forward and upward at an angle of 45° . Swing the arms rapidly downward through an arc of about 135° so that centrifugal force aids gravity in removing trapped liquid. Repeat this operation at least three times or until all liquid has been expelled from the gage. Connect the gage to the vapor chamber with the liquid connection closed and place in the 37.8°C (100°F) bath to condition for the next test.

8.5.4 *Preparation of Gage or Transducer Procedure B*—In the correct operation of Method B liquid should not reach the gage or transducer. If it is observed or suspected that liquid has reached the gage, purge the gage as described in 8.5.3. The transducer has no cavity to trap liquid. Assure that no liquid is present in the T handle fitting or spiral tubing by forcing a stream of dry air through the tubing. Connect the gage or transducer to the vapor chamber with the liquid connection closed and place in the 37.8°C (100°F) bath to condition for the next test.

NOTE 6: Caution—Do not leave the vapor chamber with the gage attached in the water bath for a longer period of time than necessary to condition for the next test. Water vapor can condense in the Bourdon tube and lead to erroneous results.

9. Hazards

9.1 Gross errors can be obtained in vapor pressure measurements if the prescribed procedure is not followed carefully. The following list emphasizes the importance of strict adherence to the precautions given in the procedure:

9.1.1 *Checking the Pressure Gage*—Check all gages against a manometer after each test in order to ensure higher precision of results (8.4). Read the gage while in a vertical position and after tapping it lightly.

9.1.2 Shake the container vigorously to ensure equilibrium of the sample with the air in the container (7.3.1).

9.1.3 *Checking for Leaks*—Check all apparatus before and during each test for both liquid and vapor leaks (Note 4).

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9.1.4 *Sampling*—Because initial sampling and the handling of samples will greatly affect the final results, employ the utmost precaution and the most meticulous care to avoid losses through evaporation and even slight changes in composition (Sections 6 and 8.1). In no case shall any part of the Reid apparatus itself be used as the sample container prior to actually conducting the test.

9.1.5 *Purging the Apparatus*—Thoroughly purge the pressure gage, the liquid chamber, and the vapor chamber to be sure that they are free of residual sample. (This is most conveniently done at the end of the previous test.) (See 8.5.)

9.1.6 *Coupling the Apparatus*—Carefully observe the requirements of 8.2.

9.1.7 *Shaking the Apparatus*—Shake the apparatus vigorously as directed in 8.3.1 in order to ensure equilibrium.

10. Report

10.1 Report the results to the nearest 0.25 kPa (0.05 psi) the gage result observed in 8.4.1 or 8.4.2, after correcting for any difference between the gage and manometer, as the Reid vapor pressure in kilopascals (pounds-force per square inch) without reference to temperature.

PROCEDURE C—FOR PRODUCTS HAVING REID VAPOR PRESSURES ABOVE 180 kPa (26 psi)

11. General

11.1 With products having vapor pressures over 180 kPa (26 psi), the procedure described in Sections 6 to 9 is hazardous and inaccurate. Consequently, the following sections define changes in apparatus and procedure for the determinations of vapor pressures above 180 kPa. Except as specifically stated, all the requirements of Sections 1 to 10 and Section 17 shall apply.

NOTE 7—Either Procedure A or B can be used to determine if the vapor pressure of a product is above 180 kPa.

12. Apparatus

12.1 *Apparatus*, as described in Annex A1 using the liquid chamber with two openings.

12.2 *Pressure Gage Calibration*—A dead-weight tester (A1.7) can be used in place of the mercury manometer (A1.6) for checking gage readings above 180 kPa (26 psi). In 8.4.1, 8.4.2, 9.1.1 and 10.1 whether the words *manometer* and *manometer reading* appear, include as an alternative *dead-weight tester* and *calibrated gage reading* respectively.

13. Sampling

13.1 Sampling 6.4, 6.4.1, 6.5, and 6.6 shall not apply.

13.2 *Sample Container Size*—The size of the sample container from which the vapor pressure sample is taken shall not be less than 0.5 L (1 pt) liquid capacity.

14. Preparation for Test

14.1 Sampling 7.2 and 7.3 shall not apply.

14.2 Any safe method of displacement of the test sample from the sample container that assures filling the liquid chamber with a chilled, unweathered sample may be employed. The following 14.3 to 14.5, together with 15, describe displacement by self-induced pressure.

14.3 Maintain the sample container at a temperature

sufficiently high to maintain superatmospheric pressure but not substantially over 37.8°C (100°F).

14.4 Completely immerse the liquid chamber, with both valves open, in the water cooling bath for a sufficient length of time to allow it to reach the bath temperature of 0 to 4.5°C (32 to 40°F).

14.5 Connect a suitable ice-cooled coil to the outlet valve of the sample container.

NOTE 8—A suitable ice-cooled coil can be prepared by immersing a spiral of approximately 8 m (25 ft) of 6.35-mm (0.25-in.) copper tubing in a bucket of ice water.

15. Procedure

15.1 Sections 8.1, 8.1.1, and 8.2 shall not apply.

15.2 Connect the 6.35-mm (0.25-in.) valve of the chilled liquid chamber to the ice-cooled coil. With the 12.7-mm (0.5 in.) valve of the liquid chamber closed, open the outlet valve of the sample container and the 6.35-mm (0.25-in.) valve of the liquid chamber. Open the liquid chamber 12.7-mm (0.5-in.) valve slightly and allow the liquid chamber to fill slowly. Allow the sample to overflow until the overflow volume is 200 mL or more. Control this operation so that no appreciable drop in pressure occurs at the liquid chamber 6.35-mm (0.25-in.) valve. In the order named, close the liquid chamber 12.7-mm (0.5-in.) and 6.35-mm (0.25-in.) valves; and then close all other valves in the sample system. Disconnect the liquid chamber and the cooling coil.

NOTE 9: Warning—Combustible. Precautions—Keep away from heat, sparks, and open flame. Keep container closed. Use only with adequate ventilation. Avoid prolonged breathing of vapor or spray mist. Avoid prolonged, repeated contact with skin.

NOTE 10: Warning—Provide a safe means of disposal of liquid and vapor escaping during this whole operation.

15.2.1 To avoid rupture because of the liquid-full condition of the liquid chamber, the liquid chamber must be quickly attached to the vapor chamber and the 12.7-mm (0.5-in.) valve opened.

15.3 Immediately attach the liquid chamber to the vapor chamber and open the liquid chamber 12.7-mm (0.5-in.) valve. Not more than 25 s shall pass in completing the assembly of the apparatus after filling the liquid chamber, using the following sequence of operations:

15.3.1 Remove the vapor chamber from the water bath.

15.3.2 Connect the vapor chamber to the liquid chamber.

15.3.3 Open the liquid chamber 12.7-mm (0.5-in.) valve.

15.4 If a dead-weight tester is used instead of the mercury manometer (12.2), apply the calibration factor in kilopascals (pounds-force per square inch) established for the pressure gage to the uncorrected vapor pressure. Record this value as the calibrated gage reading and use in Section 10 in place of the manometer reading.

16. Precautions

16.1 The precaution 9.1.2 shall not apply.

PROCEDURE D—FOR AVIATION GASOLINES Approximately 50 kPa (7 psi) Reid Vapor Pressure

17. General

17.1 The following paragraphs describe changes in apparatus and procedure for the determination of the vapor pressure of aviation gasoline. Except as specifically stated

 D 323

herein, all the requirements set forth in Sections 1 to 10 and 18 shall apply.

17.1.1 *Ratio of Vapor and Liquid Chambers*—The ratio of the volume of the vapor chamber to the volume of the liquid chamber shall be between the limits of 3.95 and 4.05 (see Note A1.1 in Annex A1).

17.1.2 *Checking the Pressure Gage or Pressure Transducer*—The gage shall be checked at 50 kPa (7 psi) against a mercury column before each vapor pressure measurement to ensure that it conforms to the requirements of Section A1.2. This preliminary check shall be made in addition to the final gage comparison specified in 8.4 and 8.4.2.

18. Precision⁶ and Bias

18.1 The following criteria is to be used for judging the acceptability of results (95 % confidence):

18.1.1 *Repeatability*—The difference between successive test results obtained by the same operator with the same apparatus under constant operating conditions on identical test material would, in the long run, in the normal and correct operation of the test method, exceed the following value only in 1 case in 20.

Procedure	Range		Repeatability		
	kPa	psi	kPa	psi	
A Gasoline	35-100	5-15	3.2	0.46	Note 11

18.1.2 *Reproducibility*—The difference between two, single and independent results, obtained by different operators working in different laboratories on identical test material would, in the long run, in the normal and correct operation of the test method, exceed the following value only in 1 case in 20.

Procedure	Range		Reproducibility		
	kPa	psi	kPa	psi	
A Gasoline	35-100	5-15	5.2	0.75	Note 11
B Gasoline	35-100	5-15	4.5	0.65	Note 11
A	0-35	0-5	2.4	0.35	Note 12
A	110-180	16-26	2.8	0.4	Note 12
C	>180	>26	4.9	0.7	Note 12
D Aviation gas	50	7	1.0	0.15	Note 12

NOTE 11—These precision values are derived from a 1987 cooperative program⁶ and the current Committee D-2 on Determining Precision Data Method RR:D02-1097.

NOTE 12—These precision values were developed in the early 1950's prior to the current statistical evaluation method.

18.2 Bias:

18.2.1 *Absolute Bias*—Since there is no accepted reference material suitable for determining the bias for the procedure in Test Method D 323 for measuring Reid vapor pressure, bias cannot be determined. The amount of bias between this test vapor pressure and true vapor pressure is unknown.

A1.1
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A1.1
chamber
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% in 10
the end
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vapor
diameter
the 6.35
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shall be
shall be
not pre
A1.1
tion or
cylinder

ASTM admits some fault to the method,
however, gasoline and other fuel persons use
results as the bible.

B. The Increased Volatility of Ethanol Blends Does Not Contribute to Ozone Formation

1. EPA and Congress Have Previously Concluded That the Increased Volatility of Ethanol Blends Does Not Significantly Increase Ozone Formation

EPA has long recognized that ethanol blends do not adversely affect ozone levels. Indeed, it was because of this recognition that EPA provided 10 percent ethanol blends with a one-pound RVP volatility tolerance in summertime ozone nonattainment areas. In August 1987, EPA proposed standards limiting the volatility of gasoline and ethanol blends. EPA's volatility rulemaking was promulgated in two parts. In the Phase I regulations, EPA provided an "interim" one-pound volatility tolerance for ethanol blends. In Phase II regulations, published in June 1990, EPA made the volatility tolerance permanent. EPA cited two reasons for doing so: the logistical impossibility of obtaining sub-RVP blendstocks for blending with ethanol, and the lack of adverse environmental impacts attributable to providing the volatility tolerance. With regard to the latter, EPA stated:

several phenomena reduce the ozone impact of higher RVP gasohol relative to gasoline. . . , (e.g., the lesser tendency of ethanol emissions to produce ozone (reactivity) compared to hydrocarbons, and a reduction in carbon monoxide (CO) emissions and thus a reduction in CO's role in ozone production). As detailed in the Final Regulatory Impact Analysis, recent studies have indicated that the ozone impact of gasohol at 1.0 RVP higher than gasoline is less than we earlier believed (i.e., a range of about zero to 1 percent increase in ozone levels. . .).

...

EPA would require strong evidence of severe environmental consequences in order to support a policy which might

eliminate this industry, evidence which does not currently exist. This 1.0 psi RVP allowance for gasohol adopted in this final rule thus reflects the moderation in EPA's concern about negative air quality impact. . . .

Notice of Final Rulemaking, "Volatility Regulations for Gasoline and Alcohol Blends Sold in Calendar Years 1992 and Beyond," 55 Fed. Reg. 23658, 23665 (June 11, 1990)

EPA's Final Regulatory Impact Analysis ("FRIA"), cited above, examined the results of an Urban Airshed Model ("UAM") study, commissioned by the Agency, which quantified the impact on ozone levels of 100 percent penetration of ethanol blends in New York City and 50 percent penetration of ethanol blends in St. Louis. EPA's analysis of the UAM study contains the following statements:

[T]here is virtually no change in peak ozone levels for any oxygenated blend scenario when the urban airshed model is used. . . . [T]he St. Louis results also predicted no change in peak ozone for 50 percent use of an ethanol/gasoline blend with a 1 psi RVP allowance. . . . [I]t appears that allowing a 1 psi RVP allowance for ethanol blends would not contribute to as significant of a change in ozone levels as EPA previously thought.

Final Regulatory Impact Analysis and Summary and Analysis of Comments, Phase II Gasoline Volatility Regulations, U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Mobile Sources, May 1990, page 3-40.

EPA has consistently adhered to its technical position regarding the one-pound volatility tolerance. In a May 1991 Federal Register notice disallowing the State of Maryland's request to eliminate the one-pound volatility tolerance from Maryland's proposed gasoline volatility control program, the Agency stated that:

EPA [has] concluded that the potential economic jeopardy to the fuel ethanol industry associated with requiring the same

RVP standard for gasoline and gasoline-ethanol blends is significant, and that overall, the 1.0 psi exemption should not adversely affect air quality. . . . This action is consistent with EPA's national fuel policy.

Final Rule, "Approval and Promulgation of Implementation Plans; Revision to State of Maryland Implementation Plan for Ozone," 56 Fed. Reg. 23804, 23807 (May 24, 1991).

EPA responded similarly to New Jersey's request:

This decision was based on the conclusion that the 1.0 psi exemption *should not adversely affect air quality overall* and because of the potential economic harm to the ethanol industry that eliminating the exemption would create.

Notice of Proposed Rulemaking, "Approval and Promulgation of Implementation Plans; Proposed Partial Disapproval of New Jersey Implementation Plan for Ozone," 57 Fed. Reg. 3978, 3979 (Feb. 3, 1992) (emphasis added).

Finally, the recognition of the propriety of an allowance for ethanol in fuel volatility regulations has been embodied in the Clean Air Act itself. Section 211(h) provides that RVP for 10 percent blends of ethanol are to be one-psi higher than otherwise established.

2. Recent Studies Have Reaffirmed the Conclusion that the Increased Volatility of Ethanol Blends Does Not Adversely Affect Ozone Formation

Recent studies performed by Dr. Gary Z. Whitten, of Systems Applications International,^{31/} compared urban ozone generated by an 11 percent MTBE blend that

^{31/} Whitten, Gary Z., Systems Applications International, *Final Report: Comparison of the Air Quality Effects of Ethanol and MTBE in Reformulated Gasoline in the Chicago Region in 1995*, Vol. 1: Modeling (continued...)

met the simple model requirements for reformulated gasoline as containing a minimum 2 percent oxygen by weight and a maximum volatility of 8.1 psi RVP, with the urban ozone generated with a similar 10 percent ethanol blend that has 3.5 percent oxygen but exceeds the simple model's RVP limit by 1 psi (i.e., with 9.1 RVP).^{32/} Dr. Whitten's study used the Urban Airshed Model. Although, as discussed in Section IV.C.2, the relevant comparison is between ethanol blends and baseline gasoline, *not* MTBE blends, the results both reinforce the previous conclusions about the ozone-forming potential of ethanol and highlight the arbitrariness of allowing an 8.1 psi MTBE blend but not a 9.1 psi ethanol blend.

The historical episode used was an ozone episode which occurred on July 21-22, 1987, currently the best meteorological database available for the Chicago area, translated into a preliminary UAM-V run for the Lake Michigan Ozone Study,^{33/} with appropriate meteorological inputs, initial and boundary conditions, and emissions inputs. The use of UAM-V allows for a cost-effective analysis of a region of this size, eliminating uncertainties resulting from the use of smaller regions. The study used

^{31/}(...continued)

Protocol, July 10, 1992 & Vol. 2: Results, July 29, 1992, ("Ethanol-MTBE Comparison Study"). [Attached hereto as Exhibit No. 4.]

^{32/} This ethanol blend does not meet the simple model RVP standard; however, it is arbitrary of EPA to promulgate a rule under the assumption that MTBE is "RVP neutral," as EPA has proposed, in light of existing EPA guidance which suggests that gasoline blends with MTBE produce higher evaporative emissions than conventional gasolines at the same RVP. *Guidance on Estimating Motor Vehicle Emission Reductions from the Use of Alternative Fuels and Fuel Blends*, U.S. Environmental Protection Agency, Ann Arbor Michigan (EPA-AA-TSS-PA-88-1).

^{33/} Morris, R.E., C.A. Emery, T.C. Myers, R.C. Kessler, B. Shi and M.A. Yocke, *Preliminary Photochemical Modeling of the Lake Michigan Region Using the Nested-Grid Urban Airshed Model*, Systems Applications International, San Rafael, California (SYSAPP-92/055).

EPA's Mobile 4.1 model in determining the effects of oxygenated fuels on mass emissions. Any adjustments for carbon monoxide and ozone forming VOC evaporative and running loss emissions for the oxygenated fuel scenarios were taken from EPA guidance or guidance documents. Species profile data were drawn from the Auto/Oil Air Quality Improvement Research Program ("AQIRP"), the running loss profile from the AQIRP database, or EPA recommendations.^{34/}

The results of this study establish that there is no significant difference between the maximum level of ozone generated through use of an 11 percent MTBE blend and the levels of ozone generated through use of a 10 percent ethanol blend. The maximum difference in ozone production due to ethanol use, of *less than one-third of one part per billion*,^{35/} did not increase peak ozone levels at all. Indeed, the only detectable consequence of ethanol use occurred in relatively low ozone areas. The highest peak that increased due to the use of ethanol still reached only approximately 60 parts per billion, while ozone peaks elsewhere, *using either MTBE or ethanol*, ranged as high as approximately 120 parts per billion, or higher.^{36/}

Thus, the use of a 10 percent ethanol blend does not appreciably increase ozone formation in comparison with an 11 percent MTBE blend. Rather, the 75 percent

^{34/} Ethanol-MTBE Comparison Study, Vol. 1, at 10; Vol. 2, at 3-4.

^{35/} Ethanol-MTBE Comparison Study, Vol. 2, Figure 5, at 9; Figure 6, at 10. So trivial a difference is easily displaced by errors in experimental data or modeling assumptions. Ethanol-MTBE Comparison Study, Vol. 2, at 4, 12 (differential impact of using a 10 percent MTBE blend compared to an 11 percent MTBE blend may be of same magnitude as shift in time of day of emissions, which latter does not change total amount of emissions); *id.* at 23-24 (describing need for better data and further studies to improve methodology of previous studies used by EPA).

^{36/} Ethanol-MTBE Comparison Study, Vol. 2, at 4.

additional oxygen present in the ethanol blend compensates for ozone forming VOC emissions, due primarily to three effects. First, the increased ozone forming VOC emissions from higher volatility can be low in photochemical reactivity, because the increase is from light, mainly paraffinic, vapor and ethanol itself, not from the high boiling fraction, which contains the most reactive aromatics. Second, the oxygen in the fuel reduces the exhaust ozone forming VOC emissions, which are more reactive than the increased evaporative emissions, particularly in older cars. Third, carbon monoxide, which is an ozone precursor, is reduced by the increase in fuel oxygen. Additionally, much of the increased evaporative emissions, particularly running losses, are released later in the day than much of the highly reactive cold start exhaust emissions, which are released during a time of day when the impact of ozone forming VOC emissions on ozone formation is much more significant.^{37/}

3. Ethanol's Lesser Ozone Forming Potential Can Be Acknowledged Through Scientifically Based Credits

EPA precedent and recent scientific analysis demonstrate that ethanol's lesser ozone forming potential can be acknowledged by discounting the nonreactive oxygen in ethanol emissions; crediting ethanol for reductions in carbon monoxide, an ozone forming compound not generally considered a VOC; and by taking into account both the reduced exhaust ozone forming VOCs of ethanol and ethanol's molecular weight.

^{37/} *Id.* at 17-32.

THE WHITE HOUSE

WASHINGTON

August 25, 1992

NOTE FOR THE PRESIDENT

FROM:

JABIII



I have given to Bob Zoellick the sealed envelope you sent containing questions regarding ethanol and have asked him to handle it.

cc: Bob Zoellick ✓



August 24, 1992

MEMORANDUM FOR JAMES A. BAKER III

From: The President

Re: Ethanol

Inasmuch as you tell me you are recused from involvement in any and all energy matters, in the attached sealed envelope are some questions regarding ethanol.

It is imperative that we resolve the dispute between EPA and the corn growers.

Please tell me whom you want to handle this issue here in the White House.

Bob Teeter and Ed Madigan were with me at the Illinois Fair when I discussed this with key corn growers -- most big supporters.

I am giving Boyden a copy of all the documentation. He's been in the middle of this.

cc: Boyden Gray

FROM THE PRESIDENT

SHALL I DRAFT A LTR OF REPLY TO API?

AND FORWARD TO APPROPRIATE AND INTERESTED
STAFF?

YES _____

NO _____

OTHER _____

LRT

Document Originally
Attached to
Following Page

American Petroleum Institute
1220 L Street Northwest
Washington, D.C. 20005
202-682-8446



Betty Anthony
Federal Agencies Department

American Petroleum Institute
1220 L Street, Northwest
Washington, D.C. 20005
202-682-8100



Charles J. DiBona
President

August 31, 1992

The Honorable
Robert B. Zoellick
Deputy Chief of Staff
The White House
Washington, D.C. 20500

Dear Mr. Zoellick:

In your new position, there is a very significant issue that you will encounter regarding the role of ethanol in the implementation of the reformulated gasoline provisions of the Clean Air Act Amendments of 1990 (CAAA). I wanted to take this opportunity to outline our concerns and to stress the overriding importance of this issue to the petroleum industry.

There has been an effort recently by ethanol producers and the corn growers to seek special treatment for ethanol fuels. The petroleum industry strongly urges that these efforts continue to be opposed because such special treatment:

- would violate the CAAA which established a "fuel neutral" approach based on performance standards for fuels and which did not require the use of specific types of fuels such as ethanol;

- would overturn the historic agreement that resulted from a regulatory negotiation between EPA, the petroleum industry, environmental groups, state air quality officials, the ethanol industry and the corn growers;

- is not needed since ethanol demand is growing and the CAAA requirements present considerable growth opportunities for ethanol fuels; and

- would force the petroleum industry which has lost over 50% of its jobs in the past decade to incur additional costs and the resultant job loss to assure further expansion of the ethanol industry.

The special treatment sought by the ethanol industry has taken several forms. First, they have asked that ethanol fuels be allowed to have a higher volatility than other reformulated gasolines, i.e. they have sought a one pound Reid Vapor Pressure (RVP) waiver. RVP

Robert B. Zoellick
August 31, 1992
Page 2

is a measure of how easily fuels evaporate. Thus, this special waiver for ethanol ignores the very direct, adverse effects on air quality of higher volatility ethanol blends. It conflicts with the goals of the Clean Air Act Amendments which require that ozone-forming emissions, such as volatile organic compounds (VOCs) and nitrogen oxides (NOx), be reduced.

With a one pound waiver, an ethanol blend would actually increase VOC emissions by almost 6% instead of achieving the 15% reduction required in the Act. And, the Auto/Oil Air Quality Improvement Research Program, a comprehensive research program on vehicles and fuels jointly sponsored by fourteen oil companies and the three domestic automakers, has clearly demonstrated the VOC and NOx emission increases associated with such blends. The Program's modeling of the effects of ethanol blends on ozone showed that peak ozone levels increased in all of the cities modeled -- an increase of 11-21 percent.

Such a waiver is a clear violation of the agreement produced by EPA's regulatory negotiation on reformulated gasoline. That agreement, which was signed by all parties, including the ethanol industry and the corn growers, set specific volatility limits for reformulated gasoline. These were expressed in terms of a maximum RVP level and did not in any way provide an additional one pound waiver for ethanol blends. These RVP levels represented a significant concession by the petroleum industry. I can tell you unequivocally that I would not have signed that agreement if it had contained the one pound waiver for ethanol blends.

Another approach put forth by the ethanol industry is to force refiners to compensate for ethanol's higher volatility by producing a more expensive low volatility blendstock. Thus, the petroleum industry -- an industry that has lost 450,000 jobs in the last ten years and more than 40,000 in 1992 alone -- would be forced to bear higher costs to subsidize an expansion of the ethanol industry.

Moreover, these proposals are founded on the erroneous suggestion that ethanol fuels will not play an important role in the reformulated and oxygenated fuels programs established by the CAAA. In fact, all available oxygenates, including ethanol, will be needed to meet the significantly increased demand these programs will create.

Available forecasts uniformly project increased demand for ethanol throughout the 1990s. Ethanol consumption has increased rapidly from under 100 million gallons per year in 1980 to about 800 million gallons in 1991. The Energy Information Administration estimates

Robert B. Zoellick
August 31, 1992
Page 3

that implementation of the oxygenated fuels program this year will result in consumption increasing to about 1.1 billion gallons. This amounts to more than a 35% increase since last year. And, ethanol demand in 1993 will be even higher since 1993 is the first full year of the oxygen requirements.

Ethanol demand will increase further in 1995 when the reformulated gasoline program becomes effective. Various forecasts indicate that ethanol demand could double relative to 1991 levels, i.e., reach 1.5 - 1.6 billion gallons in 1995. Further, a forecast by Information Resources Inc. projects ethanol demand of 1.8 - 2.1 billion gallons in 2000.

Thus, it is apparent that the ethanol market is growing and is likely to continue to grow. The Energy Information Administration forecasts an annual growth rate in ethanol demand of 5.6%. In contrast, gasoline demand is forecast to grow at 1.5% annually.

In summary, special treatment for ethanol fuels will interfere with the efficient functioning of fuel markets; make it more difficult to comply with the reformulated gasoline provisions of the Clean Air Act Amendments; impose significant new costs on American consumers; and is unnecessary since ethanol demand is growing and will continue to grow at a rapid pace. We believe the Administration should strongly oppose such efforts because they interfere with the marketplace and promote the use of fuels that have a harmful effect on air quality.

I look forward to working with you in your new position. If you have any questions or wish to discuss these issues further, please contact me.

Sincerely,

A handwritten signature in dark ink, appearing to read "Charles F. Brum". The signature is fluid and cursive, with the first name "Charles" being more legible than the last name "Brum".



State of Illinois

ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

217/782-3397

August 31, 1992

The Honorable Jim Edgar
207 Statehouse
Springfield, Illinois 62706

Dear Governor Edgar:

In response to your request, IEPA staff have reviewed a number of documents addressing the use of ethanol as a fuel blend and its impact on ozone air quality. Our review included the following pertinent documents: the SAI Chicago ethanol study ("Comparison of the Air Quality Effects of Ethanol and MTBE in Reformulated Gasoline in the Chicago Region in 1995"), an excerpt from the Auto/Oil study ("Summary of Air Quality Modeling Results for Ethanol and RVP Fuels"), and portions of the "Five-City Study" ("A Low-Cost Application of the Urban Airshed Model to the New York Metropolitan Area and the City of St. Louis").

Based on these studies, our conclusion is that the difference in ozone air quality impact between the use of ethanol blended fuel and lower volatility gasolines will be statistically insignificant in future years. The SAI study for Chicago indicated that the difference in ozone air quality impact between the use of ethanol blended fuel and MTBE fuel was 0.3 parts per billion (ppb). The "Five-City Study" which included St. Louis, showed an air quality difference of only 1 ppb. Relative to the ozone air quality standard of 120 ppb this is a difference of less than 1 percent, which is significantly below the margin of error allowed by USEPA for such modeling demonstrations.

The Auto/Oil study, funded by the automobile and oil industries, and which evaluated the impact on air quality in New York, Dallas/Fort Worth and Los Angeles indicated an ozone air quality difference between ethanol blended fuel and low RVP gasoline in the range of 1 to 3 ppb. Even this study, which could be expected to have a bias, if any, in favor of these industries indicated small differences which are also statistically insignificant.

In the next several years Illinois, as well as other states with ozone air quality problems, will be developing and implementing several major programs to combat the high ozone ambient levels. The Clean Air Act mandates provisions such as the enhanced inspection/maintenance program, Stage II vapor recovery controls on gasoline dispensing facilities and the low Reid vapor pressure (RVP) of fuels. Whether ethanol blended fuel or low RVP gasoline is utilized, these control measures will further assist to eliminate any differences between the two fuels. The dramatic impact of these and other programs must be taken into account in assessing ozone air quality over the next few years.

We believe that USEPA recognizes the statistically insignificant difference in impact between ethanol blended fuel and low RVP gasoline on ozone air quality. They, however, continue to interpret the provisions of the Clean Air Act Amendments to require actual 15% reduction in the emissions of hydrocarbons relative to the 1990 baseline gasoline. It is our opinion that the emphasis should be placed not on the amount of emissions, which is merely an indicator, but rather on their potential to reduce ozone, which is the ultimate goal. Consequently, improvements in ozone air quality should be the primary focus regarding the use of ethanol blended fuels.

In conclusion, all of the studies reviewed indicate there will be significant improvement in air quality with the use of either ethanol blends or lower RVP gasoline. Any difference in hydrocarbon emissions attributed to ethanol does not result in statistically significant differences in ozone air quality. Studies of this nature typically contain assumptions and technical procedures that could be challenged. However, we do not believe that these assumptions and procedures, even if reasonably revised, would produce statistically different results. Even if the difference in ozone air quality is slightly higher than originally predicted by the models, we believe these increases can be compensated by reductions in other source categories. Further, USEPA must also realize that ethanol blended fuels significantly reduce carbon monoxide (CO) emissions. Besides providing obvious improvements in CO air quality, it is documented that CO emission reductions mitigate ozone formation.

For many years now, both USEPA and IEPA have accepted ethanol as a clean burning fuel. We in Illinois continue to believe that ethanol can play a significant role in our overall air pollution control strategies.

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We will be happy to provide you with more detailed information and discussion regarding our review of these studies.

Sincerely,

Mary A. Gade / BM

Mary A. Gade
Director

cc: Allen Grosboll, Executive Assistant
Terry Moreland, Washington Office
Kirk Dillard, Chief of Staff

MARY GADE CAN BE
reached at: 217-782-9540

To: Bob Zelleck

FR: GOVERNOR Jim EDGAR
ILLINOIS

OUR phone # (618) 542-6677

OUR FAX # (618) 542-3054

4 pages

-contact Tom Livingston if
problems



**National Corn
Growers Association**

Washington Office
201 Massachusetts Ave., N.E., Suite C-4
Washington, D.C. 20002
202/546-7611

TO: Bob Zoellick

CC: Secretary Edward Madigan
Robert Teeter
Robert E. Grady
James Whittinghill

FROM: Keith Heard

DATE: August 31, 1992

RE: Ethanol Issue

=====

Please review the attached poll NCGA commissioned regarding the ethanol issue. As you can see, this is a hot issue in the Midwest. I will not attempt to convince you of the importance of the Midwest in the election. I made sure that this information was not released publicly, but only for your background.

I can provide you technical information, legal documents and past EPA rulings on this subject if needed. However, I am sure you have plenty of documents for your review. I do believe that you have all the justification needed to grant a one pound waiver.

If I can be of further assistance, please let me know.

HOWARD J. RUBENSTEIN ASSOCIATES, INC.

PUBLIC RELATIONS

The Clean Air Act, Reformulated
Gasoline Use and
Presidential Voting Preferences

A Public Opinion Survey of the
Agricultural Community

SURVEY RESULTS

THE CLEAN AIR ACT, REFORMULATED GASOLINE USE AND PRESIDENTIAL VOTING PREFERENCES

A PUBLIC OPINION SURVEY OF THE AGRICULTURAL COMMUNITY

SURVEY RESULTS

Preface

The purpose of this survey was to ascertain the opinion of the agricultural community from eight states regarding the use of ethanol as a part of the reformulated gasoline program mandated in the newly revised Clean Air Act and its affect on voting preferences in the 1992 Presidential election.

Included in the survey were questions regarding general support for renewable fuels such as ethanol, the inclusion of ethanol in the cleaner reformulated gasolines mandated in the Clean Air Act and whether the failure of The Environmental Protection Agency (EPA) to allow ethanol to be used in reformulated gasoline markets would cause respondents to be more or less likely to vote for President George Bush in November.

How The Survey Was Conducted

The telephone survey included responses from farmers, selected at random, from agricultural organization lists in eight states: Illinois, Ohio, Kentucky, Wisconsin, Iowa, Missouri, Michigan, and Minnesota.

In all cases, only those respondents that indicated they were members of a farm family and planned to vote in the 1992 Presidential election were asked to complete the survey.

In total 648 respondents participated in the survey.

Based on the total survey sample, there is a possible margin of error of plus or minus 5%.

The respondents were called at home during the hours of 12 noon and 8 p.m. local time.

This survey was conducted by one of the nation's largest, independent public relations firms specializing in marketing support, environmental and public affairs, crisis management and publicity. Similar work has been done for hundreds of other corporate, fortune 500, non-profit and entertainment clients.

THE CLEAN AIR ACT, REFORMULATED GASOLINE USE
AND PRESIDENTIAL VOTING PREFERENCES

A PUBLIC OPINION SURVEY OF THE AGRICULTURAL COMMUNITY

SURVEY RESULTS

Are you a supporter of renewable fuels such as ethanol?

YES	98.8%
NO	0.8%
NR	0.5%

Do you believe that ethanol should be used in the cleaner reformulated gasolines that are mandated in the newly revised Clean Air Act?

YES	92.3%
NO	4.6%
NR	3.1%

If EPA fails to allow ethanol to be used in reformulated gasoline markets, would you be more or less likely to vote for President Bush in November?

LESS LIKELY	66.8%
MORE LIKELY	4.6%
UNDECIDED	26.9%

Note: Survey margin of error (+/- 5%)

Telephone Survey

Name _____ Phone # _____

Hello, my name is _____ and I'm conducting a survey on behalf of the National Corn Growers Association. Could I ask you a few questions?

1. Are you a member of a farm family?

YES NO

2. Are you planning to vote in the November Presidential election?

YES NO

3. Are you a supporter of renewable fuels such as ethanol?

YES NO

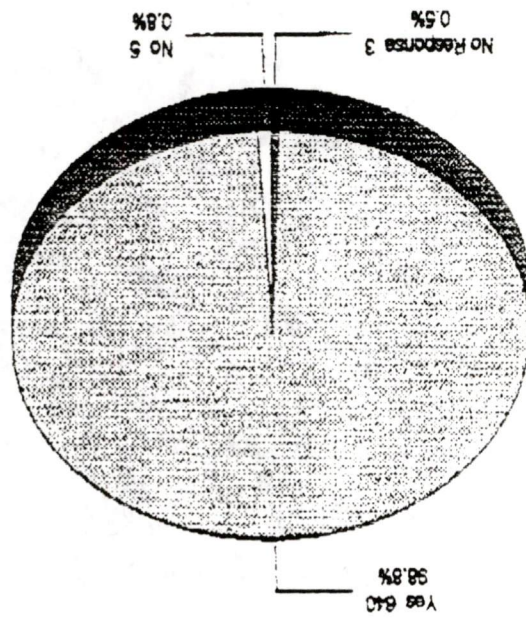
4. Do you believe that ethanol should be used in the cleaner reformulated gasolines that are mandated in the newly revised Clean Air Act?

YES NO

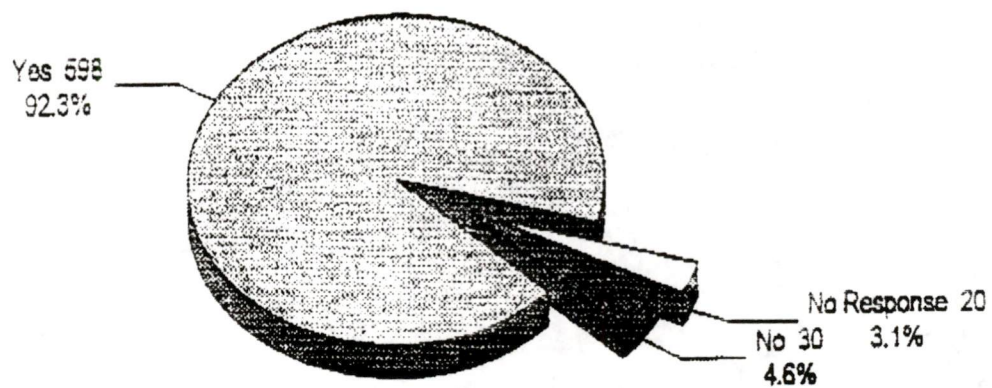
5. If EPA fails to allow ethanol to be used in reformulated gasoline markets, would you be more or less likely to vote for President Bush in November?

MORE LESS

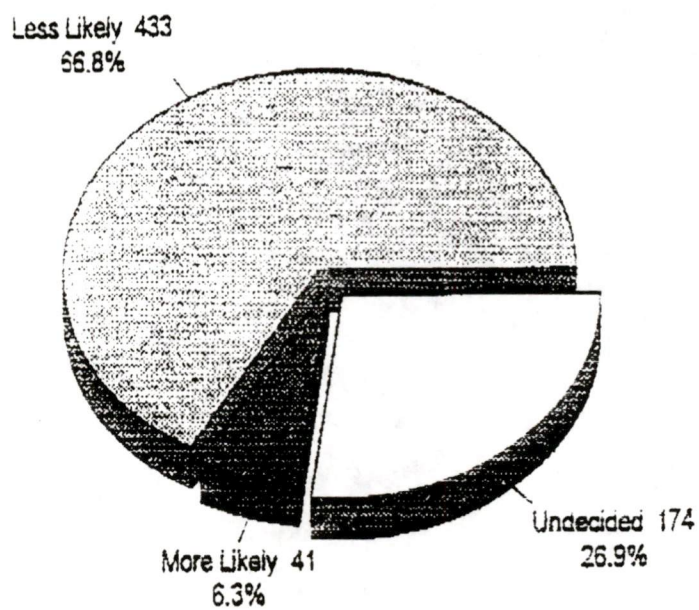
Are you a supporter of renewable fuels such as ethanol?



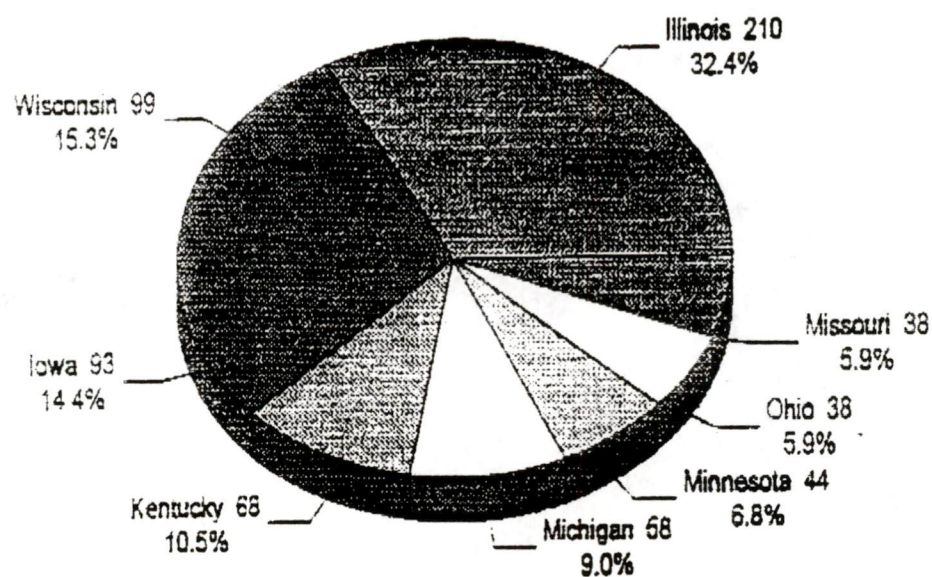
Do you believe that ethanol should be used in the cleaner reformulated
gasolines that are mandated in the newly revised Clean Air Act?



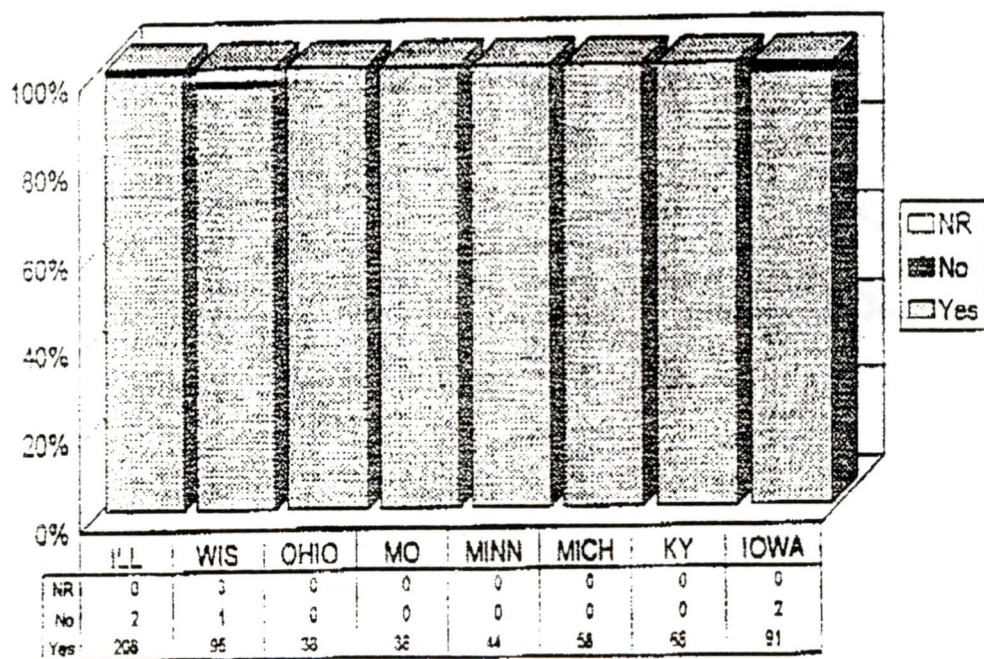
If EPA fails to allow ethanol to be used in reformulated gasoline markets, would you be more likely to vote for President Bush in November?



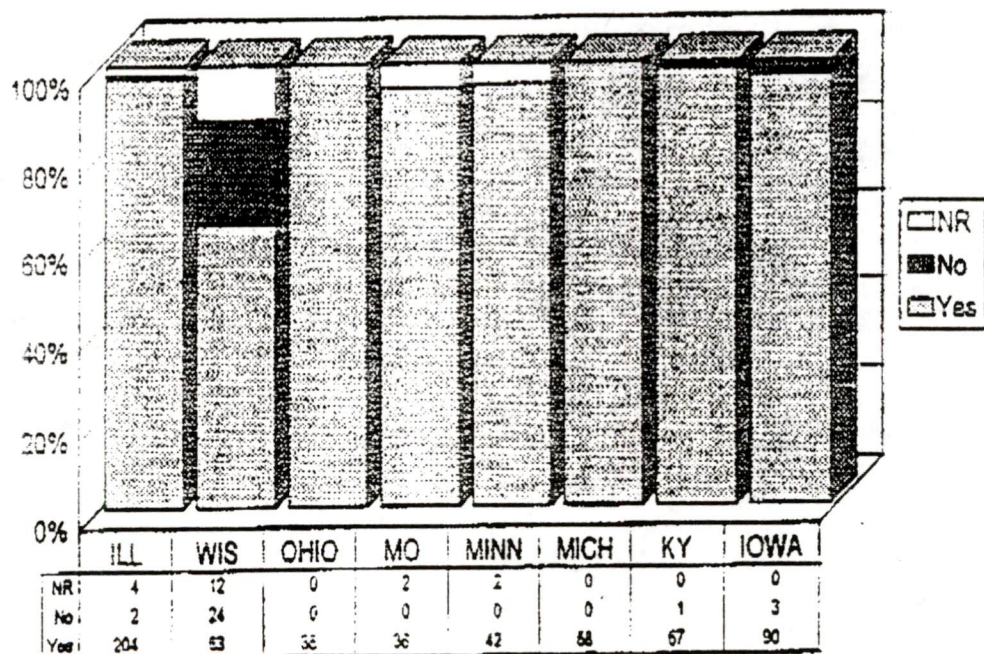
States Included in Survey
Number and percentage of respondents



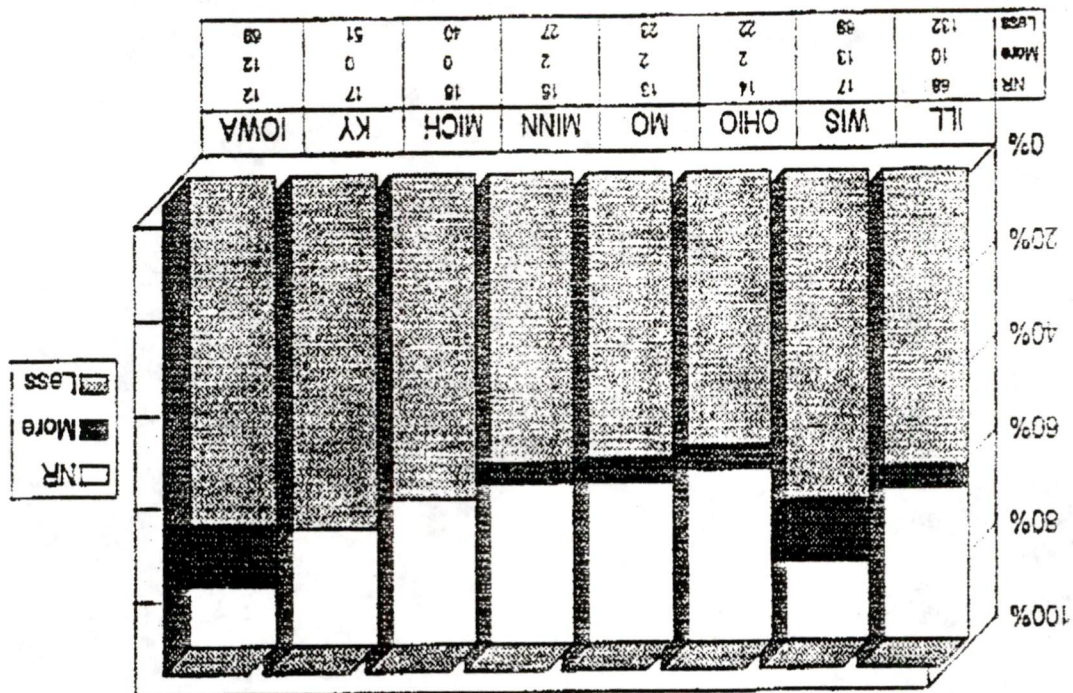
Are you a supporter of renewable fuels such as ethanol?



Do you believe that ethanol should be used in the cleaner reformulated
gasolines that are mandated in the newly revised Clean Air Act?



If EPA fails to allow ethanol to be used in reformulated gasoline markets, would you be more or less likely to vote for President Bush in November?



Survey Results

(Support for Newsweek Issue 2 (Obama) used in October 2008 in poll conducted by EPA) Weighted percentages (likely to vote for Bush if EPA not included estimate)

	ILL	WIS	OHIO	MO	MINN	MICH	KY	IOWA	Total
Total	32.4%	13.3%	5.9%	5.9%	6.8%	9.0%	10.3%	14.4%	100.0%
U		2.0%							0.3%
None		1.0%							0.2%
1 U	1.9%	9.1%		5.3%	4.5%				2.6%
1a2 U	30.0%	5.1%	36.8%	23.9%	29.5%	31.0%	25.0%	12.9%	23.8%
1a2 M	4.3%	7.1%	5.3%	5.3%	4.5%			9.7%	4.8%
1a2 L	62.9%	51.5%	57.9%	60.5%	61.4%	69.0%	73.5%	74.2%	63.9%
1 no2 U		1.0%							0.2%
1 no2 M		5.1%						1.1%	0.9%
1 no2 L		17.2%					1.5%		2.8%
no1 no2 U	0.5%								0.2%
no1 no2 M	0.5%							2.2%	0.5%
no1 no2 L		1.0%							0.2%

Percentages are of each state's respondents (total for each state represents the weight of the state in the survey)

Survey Results

1 (support renewable subs) 2 (estanol used in cleaner fuel mandated by EPA) More/Less/Undecided (likely to vote for Bush if EPA not include estanol)

	ILL	WIS	OHIO	MO	MINN	MICH	KY	IOWA	Total
Total:	219	99	38	38	44	58	68	93	648
U		2							2
More:		1							1
1 U	4	9		2	2				17
1&2 U:	63	5	14	11	13	18	17	12	153
1&2 M	9	7	2	2	2			9	31
1&2 L	132	51	22	23	27	40	60	69	414
1 no2 U		1							1
1 no2 M		5						1	6
1 no2 L		17					1		18
no1 no2 U	1								1
no1 no2 M	1							2	3
no1 no2 L		1							1

*Natural Resources
Defense Council*

1350 New York Ave., N.W.
Washington, DC 20005
202 783 7800
Fax 202 783-5917

September 1, 1992

Mr. Robert Zoellick
Assistant to the President and Deputy Chief of Staff
The White House
Washington, DC 20500

by fax

Dear Mr. Zoellick:

We are writing with continuing deep concern over the Administration's handling of the regulations for reformulated gasoline required under the Clean Air Act.

As you know, 35 different interest groups signed an historic agreement in August 1991 to implement the reformulated gasoline program. The Administration, represented by EPA and DOE, signed that agreement. So did the environmental community, through NRDC and the Sierra Club. And so did the ethanol industry, which was amply represented by the Renewable Fuels Association, the National Corn Growers Association, and others.

Each group, including the Administration, publicly committed itself to support the agreement through to promulgation. Last September, in fact, President Bush himself called this gasoline agreement "extraordinary" and "a giant step toward cleaner air".

Despite their signed and public commitment, the Renewable Fuels Association and the National Corn Growers Association have seen fit to break their word and attack the agreement. They are pressing the Administration to do the same. They are seeking either a waiver or an offset to allow the marketing of gasohol blends that violate the RVP limits they themselves agreed to.

We strenuously oppose any such action. The "reg neg" agreement specifically and unequivocally sets limits on the volatility of reformulated gasoline: 7.2 pounds Reid Vapor Pressure (RVP) in southern areas, 8.1 pounds in northern areas. There is no way anyone can read the agreement to permit any different RVP limits for gasoline containing ethanol.

Any such waiver or offset scheme would mean more pollution for tens of millions of people living in the nine most smog-laden cities where sale of reformulated gas is mandatory, and in some 60 other smoggy cities eligible to elect reformulated gas. That is unacceptable.

A waiver or an offset would also be illegal. The reformulated gas provisions of the Clean Air Act do not permit an RVP waiver for ethanol blends. Those provisions also require a 15% reduction in mass VOC emissions, expressly ruling out considerations of reactivity or credits for carbon monoxide.

Mr. Robert Zoellick
September 1, 1992
Page 2

Various schemes for offsetting credits have been proposed despite these legal limitations. The EPA has found that these schemes are scientifically erroneous and simply do not add up. Scientifically, as well as legally, the offsets idea will not withstand analysis.

Enclosed, for your information, is an editorial from the August 26 Chicago Tribune. The editorial backs last year's negotiated agreement and warns the President not to "turn his back on good science and clean air in the cities."

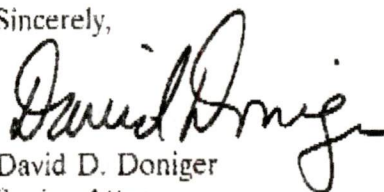
Frankly, we were very disturbed by comments earlier this year by your predecessor on this issue, Mr. Yeutter, as reported in the Tribune and the New York Times. His comments suggested that the Administration may not keep its own commitment to the agreement.

We expect the Administration to keep its word.

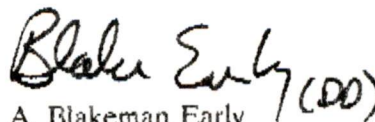
To do otherwise would do more than dirty the air of the cities counting on reformulated gas. It would irretrievably tarnish the reputation of ethanol as a clean fuel. And it would poison the atmosphere for resolving contentious environmental disputes through negotiation instead of conflict and litigation.

The fuels agreement received very broad and very favorable publicity for the Administration. It was a well-deserved feather in the Administration's cap that should not be lightly thrown away.

Sincerely,



David D. Doniger
Senior Attorney
Natural Resources Defense Council



A. Blakeman Early
Washington Director
Pollution and Toxics Program
Sierra Club

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Chicago Tribune

August 26, 1992, Wednesday, NORTH SPORTS FINAL EDITION

HEADLINE: The ticklish politics of ethanol

BODY: More than the heat and humidity made Gov. Jim Edgar uncomfortable Sunday at the Illinois State Fair.

Preparing for President Bush's campaign stop, Edgar, an unabashed cheerleader for ethanol, wondered what Bush would tell farmers about the future for the corn-derived alternative fuel.

Would he side with corn growers and promote expanded markets for ethanol? Or would he accede to those concerned about air quality and uphold proposed restrictions on its use in some major cities?

Bush met privately with farm leaders, but he said nothing publicly about ethanol. His silence bespoke volumes about the delicate politics of clean air and special interests in this election year.

In Illinois, corn farmers sell about 17 percent of their crop at premium prices to ethanol producers such as Decatur-based Archer-Daniels-Midland. The producers, in turn, get a federal tax subsidy to make ethanol-blended fuels competitive at the pump.

But science has turned what would seem like an easy political home run into a potential foul ball. Burning ethanol-blended gasoline reduces emissions of carbon monoxide, but it also creates more harmful ozone and smog than pure gasoline, especially on warmer days.

That's why William Reilly, Environmental Protection Agency administrator, favors a proposed rule that would restrict the use of ethanol during the summer in nine major cities, including Chicago. The limitation would begin in 1995.

Although they took part in negotiations on the rule last year, the ethanol proponents say they misunderstood. Now facing slower growth in ethanol sales, they want the rule changed, contending new evidence will show ethanol-blended fuels can be used in the largest cities year-round without damaging air quality.

Corn growers have been promising such data for some time without delivering. In the meantime, the White House is said to be looking for a political compromise. One possibility might be to push an ethanol derivative that meets the clean air standards and likely can be processed in oil-company refineries.

a step would please farmers because it would boost ethanol. Some oil companies would be happy to run the product through refineries, although ethanol producers, undoubtedly, would object.

Lost in this high-wire balancing act, unfortunately, is good public policy. Everyone should be looking for the most efficient, least expensive way to reduce pollution.

Bush has reason to worry about political support from Illinois farmers. But in seeking a compromise that won't alienate too many voters, he shouldn't turn his back on good science and clean air in the cities. For now, unfortunately, that means restricting ethanol's use.

BOB COLE
KANSAS

United States Senate

OFFICE OF THE REPUBLICAN LEADER

WASHINGTON, DC 20510-7010

FACSIMILE COVER SHEET

TIME: 18:00DATE: 31 August '92

TO:

Bob Zoellick

FROM:

Jim Whittinghill

RE:

5 PAGES TO FOLLOW THIS COVER SHEET

COMMENTS:

SENT BY:

TELEPHONE: (202) 224-7771 FACSIMILE: (202) 224-3163

PLEASE DELIVER A.S.A.P.

JIM WHITTINGHILL
FAX --

**Document Originally
Attached to
Following Page**

Bob - Taken from testimony of Michael
Czeskleba - Senior Business Analyst for Ashland
Oil - during the Chicago hearings on RFG.

~~CONFIDENTIAL~~

TO: MARTIN L. ANDREAS

FROM: ED HARJEHAUSEN

DATE: JULY 29, 1992

SUBJECT: ETBE ECONOMICS

Determined NOT to be
National Security Classified Marking
By 42 (NLGB) on 5/5/25

This memo demonstrates that ETBE is non-competative and is not a solution to the RFG issue.

The following is a review of ethanol's value as a feedstock for ETBE. This information is based on today's current market and conversations with a number of refiners (including Arco Chemical - largest MTBE producer in the world). As you know, ethanol is a direct competitor to methanol as an ether feedstock. The following is a comparison of today's actual pricing if ethanol was used as an ether feedstock or ethanol's pricing under the proposed legislative change.

	<u>Actual</u>	<u>Proposed</u>
Today's methanol price	.40¢	.40¢
Crocco's publication (Dlvd. Gulf Coast)		
Additional value of	.10¢ ¹	.10¢ ¹
ethanol vs. methanol		
Tax Advantage	.36¢ ²	.54¢ ³
Dlvd. Selling Price Gulf Coast	.86	\$1.04
less frt. to Gulf Coast from Midwest	.05	.05
Net Price of Ethanol FOB Midwest	.81¢	.99¢

Based on the actual current numbers, ethanol as a feedstock would have to be sold at .42¢ less than today's current ethanol price. Under the proposed scenario, the price for ethanol as an ether feedstock would be .24¢ less than today's current ethanol price. This gap will increase as ethanol is sold for it's oxygen value in the CO non-attainment cities.

- ¹ Based on lower RVP value and slightly higher octane.
- ² Current taxable blenders tax credit taxed at a 33% corporate tax rate.
- ³ Assumes a change in the tax incentive removing the taxable tax credit status.

AUG-31-1992 11:42 FROM

TO

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P.05

AIR QUALITY STUDIES REGARDING ETHANOL'S IMPACT ON OZONE

EPA has long recognized that ethanol blends do not adversely affect ozone levels. Indeed, it was the Agency's conclusion that ozone would not be increased that led the Congress to codify in the Clean Air Act the EPA's Fuel Volatility Rulemaking which provided a one-psi volatility tolerance for ethanol blends sold in summertime ozone nonattainment areas. According to the EPA,

several phenomena reduce the ozone impact of higher RVP gasohol relative to gasoline... (e.g., the lesser tendency of ethanol emissions to produce ozone (reactivity) compared to hydrocarbons, and a reduction in carbon monoxide (CO) emissions and thus a reduction in CO's role in ozone production). As detailed in the Final Regulatory Impact Analysis, recent studies have indicated that the ozone impact of gasohol at 1.0 psi RVP higher than gasoline is less than we earlier believed (i.e., a range of about zero to 1 percent increase in ozone levels..).

Notice of Final Rulemaking, "Volatility Regulations for Gasoline and Alcohol Blends Sold in Calendar Year 1992 and Beyond," 55 Fed. Reg. 23658, June 11, 1990.

The studies to which EPA referred, and others which have been completed since, include the following:

1. "Evaluation of the Impact of Ethanol/Gasoline Blends on Urban Ozone Formation," by Systems Applications International (SAI), of San Rafael, California, February, 1988.

The February 1988 technical study, performed by SAI, a nationally recognized and respected atmospheric chemistry consulting group, modeled the impact of 100-percent market penetration of 10-percent ethanol blends in 7 metropolitan areas of the country, including Chicago, Boston, Washington, Tulsa, Nashville, St. Louis, and Phoenix.

The results of this study revealed that in a summertime gasoline volatility control program (an ozone control program which now exists in Chicago but did not in 1987), if 100 percent of the motor vehicles used a volatility-reduced, 10-percent ethanol/gasoline blend, the net ozone reduction compared to 100 percent of the motor vehicles using only the volatility-reduced gasoline would be 2.4 percent rather than 1.6 percent. In other words, reducing the volatility of gasoline and adding 10-percent ethanol would achieve a 50 percent greater reduction in ozone formation than merely reducing the volatility of the gasoline.



- 2 -

The breakthrough SAI study conclusively put to rest the discredited, and now rejected, theory that ethanol blend usage always contributes to a metropolitan area's ozone problem. SAI identified and articulated as the technical basis for this conclusion that the decrease in ozone formation achieved by large reductions of carbon monoxide emissions from ethanol blends offsets the ozone formation attributable to the slight increase in hydrocarbon and nitrous oxide emissions from such blends.

It is important to note that EPA formally adopted SAI's technical analysis. In EPA's 1988 guidance document accompanying the Agency's MOBILE4 computer model -- which must be used by all 50 states in identifying emissions from that portion of their motor vehicle fleet using alternative fuels -- EPA stated that, "carbon monoxide emission reductions from alternative fuels will assist in attaining the national ambient air quality standard for ozone." (Guidance on Estimating Motor Vehicle Emission Reductions From the Use of Alternative Fuels and Fuel Blends, January 1988)

2. "A Low-Cost Application of the Urban Airshed Model to the New York Metropolitan Area and the City of St. Louis", (Five-City Study), prepared for the U.S. Environmental Protection Agency, by Systems Applications, Inc., May, 1989.

In order to further measure "the strength of this effect," (i.e., the effect of CO reductions on ozone formation) EPA's Office of Policy, Planning and Evaluation (OPPE) contracted with SAI to perform more rigorous ozone modeling using the Urban Airshed Model (UAM) to more fully ascertain the impact on ozone formation attributable to the use of 10-percent ethanol blends.

SAI used the UAM to determine ozone formation if 100 percent of the vehicles in New York City in 1995, and 50 percent of the vehicles in St. Louis in 1995, used a 10-percent ethanol blend with a 1.0 psi RVP tolerance provided. The UAM modeling results confirmed the prior conclusion that ethanol blends do not increase ozone concentrations. EPA's analysis of the UAM study contains the following statements:

[T]here is virtually no change in peak ozone levels for any oxygenated blend scenario when the urban airshed is used....[T]he St. Louis results also predicted no change in peak ozone for 50 percent use of an ethanol/gasoline blend with a 1 psi RVP allowance for ethanol. ...[I]t appears that allowing a 1 psi allowance for ethanol blends would not contribute to as significant of a change in ozone levels as EPA previously thought."

- 3 -

Final Regulatory Impact Analysis and Summary of Comments,
Phase II Gasoline Volatility Regulations, U.S. Environmental
Protection Agency, Office of Mobile Sources, May 1990.

3. Comparison of the Air Quality Effects of Ethanol and MTBE in Reformulated Gasoline in the Chicago Region in 1995, by Systems Applications International, July 1992.

To evaluate the effect of ethanol when blended with a reformulated gasoline blendstock, the Illinois Department of Environmental Resources and the Illinois and National Corn Growers Associations commissioned SAI to perform an air quality emission test, using the Urban Airshed Model, which examined the ozone impact of a 100 percent penetration of 10% ethanol blends in all gasoline powered vehicles in the four-state Chicago-Milwaukee regional area for 1995.

The air quality impacts of the ethanol blend were compared to that of an 11 percent MTBE gasoline blend that meets the 1990 Clean Air Act and Reg-Neg RFG requirements. The results of this study established that there is no significant difference between the maximum levels of ozone generated through the use of an 11-percent MTBE blend and the levels of ozone generated through use of a 10-percent ethanol blend. The maximum difference in ozone production due to ethanol use (less than one-third of one part per billion), did not increase peak ozone levels at all. Moreover, a preliminary exposure analysis indicates that the ethanol-blended RFG actually produced less ozone formation than the MTBE-blended RFG over the most populated areas, and the area of peak ozone, with either ethanol or MTBE fuel blends, was predicted to occur over Lake Michigan.

4. Comparison of the Air Quality Effects of Ethanol and MTBE in Reformulated Gasoline in the New York Region in 1995, prepared for the National Corn Growers Association, by Systems Applications International, August 1992.

The purpose of this study was to determine how much the higher oxygen in a 10-percent ethanol/RFG blend, when compared to an 11-percent MTBE/RFG blend, can compensate for the higher volatility in the ethanol blend. The standard version of the Urban Airshed Model (UAM-IV) was used to estimate the extent of this compensation in the New York region in 1995. The results show a scientifically insignificant increase of .0007 ppm compared to the MTBE blend. Moreover, the simulated ozone peaks in the region of the highest ethanol impact were about half the absolute ozone peak concentration (i.e., approximately 60 ppb ozone).

- 4 -

5. Comparison of the Air Quality Effects of Ethanol and MTBE in Reformulated Gasoline in 14 Cities Using the EKMA Model, prepared for the National Corn Growers Association, by Systems Applications International, August 1992.

This study used the mobile emissions inventories for the New York UAM study to prepare Empirical Kinetics Modeling Approach (EKMA) inputs for 14 cities that have been identified as having serious urban ozone problems. The cities modeled include Baltimore, Boston, Chicago, Hartford, Houston, Los Angeles, Nashville, New York, Philadelphia, Phoenix, San Diego, St. Louis, Tulsa, and Washington.

While not as sophisticated as urban airshed tests, EKMA models provide a fair guidepost for evaluating ozone potential. For example, the EKMA tests presented in this study were consistent with the UAM studies prepared for both New York and Chicago. Specifically, the average difference in the 14 cities modeled was less than one-half of one part per billion, ranging from a scientifically insignificant .67 ppb increase to a 1.28 ppb decrease with ethanol blends.

CONCLUSION

Ethanol and MTBE blends are virtually indistinguishable when evaluating their impact on ozone formation. The 75 percent additional oxygen in an ethanol blend compensates for increased ozone forming evaporative VOC emissions. This is due to primarily three effects. First, the increased ozone forming VOC emissions from higher volatility is low in photochemical reactivity, because the increase is from light, mainly paraffinic, vapor and ethanol itself, not from the high boiling fraction, which contains the most reactive aromatics. Second, the oxygen in the fuels reduces the exhaust ozone forming VOC emissions, which are more reactive than the increased evaporative emissions, particularly in older cars. Third, carbon monoxide, which is an ozone precursor, is reduced by the increase in fuel oxygen.

EPA has recognized these offsetting benefits for more than five years, and promulgated the Final Fuel Volatility Rulemaking based on this scientific analysis. There is certainly no rational explanation, or contradictory scientific evidence, to justify EPA reversing its historic position.

