TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

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EPA Evaluation of Fuel Maximiser™ Under Section 511 of the Motor Vehicle Information and Cost Savings Act.

5. REPORT DATE
November 1981

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7. AUTHOR(S)
Thomas J. Penninga

8. PERFORMING ORGANIZATION REPORT NO.

9. PERFORMING ORGANIZATION NAME AND ADDRESS
U.S. Environmental Protection Agency
Office of Mobile Source Air Pollution Control
Test and Evaluation Branch
Ann Arbor, MI 48105

10. PROGRAM ELEMENT NO.

11. CONTRACT/GRANT NO.

12. SPONSORING AGENCY NAME AND ADDRESS
Same as box 9.

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Technical

14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES
Revision?

16. ABSTRACT

This document announces the conclusions of the EPA evaluation of the "Fuel Maximiser™" under the provisions of Section 511 of the Motor Vehicle Information and Cost Savings Act.

The "Fuel Maximiser™" an automotive fuel economy device, has been evaulated by the Environmental Protection Agency at the request of the U.S. Postal Service. The results of the EPA testing demonstrate that with either road or dynomometer testing procedures, the "Fuel Maximiser™" failed to improve vehicle fuel economy. The two test vehicles are representative of domestic manufactured vehicles and should have noted an improvement if the device performed as it was claimed to do. It is concluded that the "Fuel Maximiser™" has no effect on vehicle fuel economy.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Automobiles Fuel Consumption Tests	Fuel Economy	

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES
		42
	20. SECURITY CLASS *(This page)*	22. PRICE

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PB84-129881

EPA Evaluation of Fuel Maximiser™ Under Section 511 of the Motor Vehicle Information and Cost Savings Act

by

Thomas J. Penninga

November, 1981

Test and Evaluation Branch
Emission Control Technology Division
Office of Mobile Source Air Pollution Control
U.S. Environmental Protection Agency

6560-26

ENVIRONMENTAL PROTECTION AGENCY

[40 CFR Part 610]

[FRL _____]

FUEL ECONOMY RETROFIT DEVICES

Announcement of Fuel Economy Retrofit Device Evaluation for "Fuel Maximiser™"

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice of Fuel Economy Retrofit Device Evaluation.

SUMMARY: This document announces the conclusions of the EPA evaluation of the "Fuel Maximiser™" device under provisions of Section 511 of the Motor Vehicle Information and Cost Savings Act.

BACKGROUND INFORMATION: Section 511(b)(1) and Section 511(c) of the Motor Vehicle Information and Cost Savings Act (15 U.S.C. 2011(b)) requires that:

(b)(1) "Upon application of any manufacturer of a retrofit device (or prototype thereof), upon the request of the Federal Trade Commission pursuant to subsection (a), or upon his own motion, the EPA Administrator shall evaluate, in accordance with rules prescribed under subsection (d), any retrofit device to determine whether the retrofit device increases fuel economy and to determine whether the representations (if any) made with respect to such retrofit devices are accurate."

(c) "The EPA Administrator shall publish in the Federal Register a summary of the results of all tests conducted under this section, together with the EPA Administrator's conclusions as to -

(1) the effect of any retrofit device on fuel economy;

(2) the effect of any such device on emissions of air pollutants; and

(3) any other information which the Administrator determines to be relevant in evaluating such device."

EPA published final regulations establishing procedures for conducting fuel economy retrofit device evaluations on March 23, 1979 [44 FR 17946].

ORIGIN OF REQUEST FOR EVALUATION: On February 11, 1981, the EPA received a request from the U.S. Postal Service for evaluation of a fuel saving device termed "Fuel Maximiser™". This device consists of a small coil of copper wire in a plastic enclosure which is positioned over the negative terminal of the vehicle battery. The device allegedly creates an ion charge in the vehicle which modifies the molecular structure of the fuel, thus increasing vehicle fuel economy.

Availability of Evaluation Report: An evaluation has been made and the results are described completely in a report entitled: "EPA Evaluation of the Fuel Maximiser™ device Under Section 511 of the Motor Vehicle Information and Cost Savings Act," report number EPA-AA-TEB-511-82-1 consisting of 91 pages including all attachments.

EPA also tested the Fuel Maximizer™ device. The EPA testing is described completely in the report "EPA Testing Evaluation of the Fuel Maximiser™ - A Retrofit Fuel Economy Device." EPA-AA-TEB-81-4, consisting of 41 pages. This report is contained in the preceding 511 evaluation as an attachment.

Copies of these reports may be obtained from the National Technical Information Service by using the above report numbers. Address requests to:

National Technical Information Service
U.S. Department of Commerce
Springfield, VA 22161
Phone: Federal Telecommunications System (FTS) 737-4650
Commercial 703-487-4650

Summary of Evaluation

The results of the EPA testing demonstrate that with either road or dynamometer testing procedures, the Fuel Maximiser™ failed to improve vehicle fuel economy. The two test vehicles tested are representative of domestic manufactured vehicles and should have noted an improvement if the device performed as it was claimed to do. It is concluded that the Fuel Maximiser™ has no effect on vehicle fuel economy.

FOR FURTHER INFORMATION CONTACT: Merrill W. Korth, Emission Control Technology Division, Office of Mobile Source Air Pollution Control, Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, Michigan 48105, 313-668-4299.

Date

Kathleen Bennett
Assistant Administrator
for Air, Noise, and Radiation

EPA Evaluation of the Fuel Maximiser™ Device Under Section 511 of the Motor Vehicle Information and Cost Savings Act

The following is a summary of the information on the device as supplied by the Applicant and the resulting EPA analysis and conclusions.

1. **Marketing Identification of the Device:**

   Fuel Maximiser™

2. **Inventor of the Device and Patents:**

   A. **Inventor**

   Charles G. Roberts and Ernest DeMichele
   Farmington Hills, MI

   B. **Patent**

   #4158346 and #4074670

3. **Companies Representing the Device**

   Mectronic Inc.
   22025 Grand River Ave.
   Detroit, MI 48219

   and

   Energy Dynamics Inc.
   4049 Reduth Ct.
   Birmingham, MI 48010

4. **Representing Companies Organization Principals:**

Charles Roberts	Chief Executive Office - Metronics, Inc. Technical Director - Energy Dynamics Inc.
Edward D. Spicer	Chm. Bd. of Directors - Energy Dynamics Inc. Chief Engineer - Energy Dynamics Inc. Chief Exec. Officer - Energy Dynamics, Inc.

5. **Description of Device (as supplied by the device representative):**

   A. **Purpose of the Device:**

   "... increases engine efficiency and consequently increases the miles per gallon obtainable by the internal combustion engine for given speed and loading conditions."

B. Theory of Operation:

"Inherent in any electric process is the formation of ions. The ions are attached to the battery terminals (electrode). The ions move through the battery solution toward the electrode opposite in charge of the charge in the ion. An ion is a charged particle. There are two kinds of ions, positive ions (cations) and negative ions (anions). The Fuel Maximiser™ works with the ions attracted to the negative battery terminal. The oscillator in the Fuel Maximiser™ attracts the ions (cations) into the fiber block. Iron is the best known conductor for ions. Therefore the iron wire lead provides a natural path for the ions to travel from the Fuel Maximiser™ block into the car or truck body. The ions formed at the battery terminal actually form a small field at the tip of the terminal whether it is a top mounted terminal or a side mounted terminal. This field is about 3/4" in diameter. That is why the Fuel Maximiser™ is secured firmly to the battery terminal, so that it is in the center of the ion field.

"Over the period of time it takes to use three to five tanks of fuel, an ion field is formed throughout the vehicle body. This field also surrounds the fuel tank. The presence of the ions causes disturbance in the molecular charge for the fuel. This means that the molecules of fuel move slightly further apart. When the fuel is mixed with air, to make the fuel air ratio necessary for combustion, it takes less fuel (because of the separation of molecules or expansion) to provide the volumetric efficiency that the engine had, and must have, to provide power and to present a leaning of the mixture, which would result in burned valves. The molecules being further apart more readily admit oxygen to the point of carburation. The end result is the use of less fuel. For the average driver (13,000 miles per year), an improvement will be 1 to 4 miles per gallon increase in mileage. For a fleet application, the total cost of fueling will be reduced by a minimum of 10%."

A second version was supplied with the patent. It reads;

"The precise mode of operation and the underlying scientific principles upon which the device of the present invention operates are unclear and not entirely understood at this time. One theory, however, is that the efficiency unit reacts to magnetic fields surrounding it to generate a beneficial ion transfer, for reasons unknow at this time, increases the efficiency of the internal combustion engine to which the battery is conected."

C. Detailed Description of Construction:

"The present invention comprises a pair of closely adjacent, preferably oppositely wound electrically conductive coils which are encapsulated in a suitable insulating material and form an efficiency unit. The coils have their ends connected to each other and are preferably wound about an iron core such that the number of windings on one coil is three times the number of windings on the other coil.

The encapsulated efficiency unit is positioned closely adjacent the positive pole of the battery for the engine while an electrical wire extends from the encapsulated coils at one end and is electrically connected to the negative terminal of the battery at its other end. The first mentioned end of the wire is preferably electrically connected to the coils, either directly or indirectly by connection with the iron core."

NOTE: Installation instruction provided with the device directs installation to be made on the negative terminal.

6. Applicability of the Device (as described by the device representative):

"The Fuel Maximiser™ works on any liquid fueled, rubber tired vehicle. It works with gasoline, diesel, propane, or gasohol."

7. Costs (as supplied by device representative):

The cost given for various test fleets was $25.00 each with a fleet discount price of $18.00

8. Device Installation - Tools and Expertise Required (as described in the inventor supplied literature):

"1. Put the Fuel Maximiser™ on the negative pole of the vehicle starting battery.

2. Use the strap provided to secure the lead wire of the Fuel Maximiser™ securely on the negative battery cable. The Fuel Maximiser™ should center over the negative pole of the battery and be positioned as closely as possible to it.

3. Carefully bend the lead wire of the Fuel Maximiser™ in the direction of the nearest vehicle body ground. Do not use any existing wire ground from other devise. Make a small hole in the body under the hood with a drill or punch. A drop of paint or nail polish may be put over the new hole, if desired. Use the screw (provided) to secure the lead wire terminal to the metal body.

CAUTION: SOME VEHICLES (MOSTLY FOREIGN) HAVE POSITIVE POLE GROUND. IN THIS CASE, PUT THE FUEL MAXIMISER™ ON THE POSITIVE POLES AND CONNECT SAME (AS IN DRAWINGS)."

A copy of the complete installation instructions is attached (see Attachment B). The only tools required are a drill, punch, and a small wrench.

9. Device Operation (as described in literature supplied by the device representative):

"The Fuel Maximiser™ has no moving parts and will last the life of the vehicle, if it is used according to the instructions."

No further operational instructions were included in the literature. However, verbal communications with the inventor indicated the following two additional operational instructions.

a) It takes two to three tankfuls of gasoline before the maximum effect of the device will be noticed.

b) Grounding the vehicle body by attaching chains, cables, exhaust collection systems negate the desired effect of the Fuel Maximiser™.

10. Maintenance (as supplied by the device inventor):

"The Fuel Maximiser™ has no moving parts and will last the life of the vehicle if it is used according to the instructions."

11. Effects on Vehicle Emissions (non-regulated) (as supplied by the device inventor):

"There are no adverse effects regarding air pollution nor is there any "tampering" with engine components."

12. Effects on Vehicle Safety (as supplied by the device inventor):

No statements or data supplied.

13. Test Results (Regulated Emissions and Fuel Economy) (as submitted by the device inventor):

A. Fuel Maximiser™ On-Highway Tests

The test procedure used was a constant 55 mph speed maintained for a 225 mile trip on Interstate highway. No details as to how the fuel used was measured, or vehicle checkouts were given. The results for 12 vehicles are given in Attachment C. A summary is given below:

Vehicle No.	MPG % Improvement	Vehicle No.	MPG % Improvement
2	10.0%	8	0
3	20.9%	9	(-) 2.5%
4	24.1%	10	(-) .1%
5	5.1%	11	18%
6	24.5%	12	0%
7	9.2%	13	24%

Average = 9.5% improvement in fuel economy.

B. Postal Service Fuel Consumption

1. A letter from the inventor to a member of the Birmingham Michigan Postal Service documenting improvements of 2 mpg, 4 mpg, and 2.3 mpg.

2. Two letters from the inventor to a member of the U.S. Postal Service documenting fuel consumption tests with 21 U.S. Postal vehicles with an average fuel economy improvement of 9.1%. The attached data was not well documented and difficult to understand. There are 4 pages, apparently from the Rochester, Michigan Post Office which document fleet fuel consumption for December, 1977 and January, 1978. Both months are labeled "w/o unit". The two month fleet average fuel economies are 7.33-mpg December 1977, and 7.67-mpg January, 1978.

   These documents are followed by 9 pages of records recording the weekly vehicle usage and fuel consumption for the weeks of 2/9 thru 2/15, 1978, 2/23 thru 3/1, 1979, 3/9 thru 3/15, 1978, and for the month of June, 1978. These 9 pages also included 4 pages describing the usage of 29 additional vehicles.

   The prefacing letter indicates that the devices were installed at the end of January 1978. The "with device" records for February, March, and April used a different type of recording procedure. The following summary covers the data which can be learned from the P.O. records. A copy of those records is attached (see Attachment D).

Time Period	Average MPG Without Device	Average MPG With Device
December	7.33	
January	7.67	
2/9 thru 2/15	9.571 *	6.73
2/16 thru 2/22	not included	
2/23 thru 3/1	7.433 *	7.825
3/2 thru 3/8	not included	
3/9 thru 3/15	8.1633 *	8.0437

*Control Vehicles

C. Ethyl Corporation Data

This data was taken using the Federal Test Procedure (FTP) and Highway Fuel Economy Procedure (HFET) on a 1979 Chrysler New Yorker. One set of FTP/HFET tests was made without the device installed and one with the device installed. A summary of the Ethyl test data is given below. Attachment E presents the Ethyl data as supplied by the inventor.

	FTP (grams/mile) HC	CO	NOx	MPG*	HFET (grams/mile)* HC	CO	NOx	MPG*
Baseline	1.31	22.29	.58	15.01	.85	12.79	.66	21.36
With Device after accumulating 100 miles	1.29	20.62	.68	14._8**	.60	10.28	.70	20.95

*Fuel economy given in miles/gallon.
**Middle digit was indistinguishable.

It must be noted that the inventor claims that the device will not work with the FTP and HFET because tailpipe connection - exhaust collection systems and the vehcle restraining cable ground out the device created ion field.

D. A letter from Energy Dynamic's Inc. documenting testing performed by the city of Akron on police and bailiff vehicle . A summary of the test data is given below:

	Without Fuel Maximiser™ (mpg)	With Fuel Maximiser™ (mpg)	Percent Increase
Police cars	8.66	10.91	26%
Baliff cars	10.94	11.22	2.5%
Total	9.88	11.00	11.4%

Several comments on the data were supplied by Energy Dynamics. They commented that the bailiff's cars were used in shorter trips with increased choke operations. The change from summer to winter grade fuels was also noted as reducing the improvement noted with the Fuel Maximiser™.

E. A letter from Energy Dynamics to the Means Service Inc. in Akron, Ohio which documented testing of 14 vehicles with and without the device. No details as to the types of testing, driving routes, or fuel measurement techniques were included. A summary of the test data is given below:

	With Device	With Device	Percent Increase
5 cars	16.97	20.42	20.33%
8 trucks	6.33	7.09	12.01%
Total	9.68	11.34	17.19%

A note is made that several of the trucks showed a negative or minimal increase in fuel economy. This was attributed to improper installation and aluminum bodies in which "the improvement in mileage sometimes takes longer to become apparent."

F. A testimonial from Waterford Dial-A-Ride which noted a 8.65% increase in fuel economy. No documentation on test procedure or fuel measurement methods was attached.

G. A letter from Mectronics Inc. to the City of Woodhaven documenting the testing of 5 test vehicles. No testing method or fuel measurement method was noted. A summary of the test results is given below.

	Without Device	With Device	Percent Improvement	Comments
Vehicle #1	13.90	16.78	20.72%	
Vehicle #2	10.47	12.95	23.69%	
Vehicle #3	13.04	No records	-	
Vehicle #4	9.6	No records		
Vehicle #5	13.5	13.5	0.0%	Suspected defective unit

H. A report written by Metronics Corporation on improvements in fuel economy found by installing the Fuel Maximiser™ on 10 Birmingham School Buses. No records or documentation were supplied. A summary of the results is given below:

	Without Device	With Device	Percent Improvement
Total Miles	6957	16253	
Total Gallons	1284	2767	
MPG	5.42	5.87	8.30%

I. Two pages of fuel consumption records from Thrifty Acres, a supermarket chain, with miles per gallon figures on 42 vehicles with and without the devices. The records also present weekly fuel economy figures for 13 vehicles. No documentation of measurement or test procedures was included. THe average fuel economy improvement was 10.97%.

J. A report written by Metronics Corporation for the sheriff of Lapeer County. The report documents the fuel economy improvements noted on 10 police cars. An average of 12.12% percent fuel economy improvement was noted.

K. Several testimonials from satisfied customers.

14. TEB Test Results (EPA Confirmatory Testing Data):

The EPA testing of the Fuel Maximizer™ is covered in a separate report, EPA-AA-TEB-82-1, which is enclosed as Attachment F.

15. Analysis

A. Description of the Device:

The theory of operation as explained in the literature presented by the inventor is in conflict with molecular theory. While the description uses many "buzz-words", the theory is not correct. As stated, ions are formed in the fluid of the battery, these ions due to their positive charge are attracted to the negative pole of the battery. As stated the metal pole of the battery has a high (+)ion density. However, ions do not flow through metals. Metals are composed of atoms held in a crystaline lattice. The atoms can donate or receive electrons and become ions. However, these ions do not leave the crystaline lattice. The concept of attracting cations into the fiber block and then conducting them down an iron wire is false. An ion cannot jump from one material to another. The "oscillator" spoken of is a copper wire wound around an iron U-shaped wire. The described concept would require an ion to change its nuclear make-up from lead (Pb) (common battery pole material), to fiber, to copper (Cu), to iron (Fe). Ions do not change the number of protons or neutrons in non-nuclear reactions. Only the number of electrons can change. The complete concept of ion-flow in a solid material is incorrect. Even given that ions do flow through solids, the concept of charging a vehicle with an ion charge and thereby causing a disturbance in the molecular charge in the fuel is in disagreement with all commonly held theories of atomic and molecular activity. An ion charge is an electrical charge as ions have either extra or less than the number of electrons required. Therefore, ion charge is no different than electricity. Why the device works differently than electricity is not explained. How the ion charge changes the density of the fuel is also not explained. The theory of operation simply does not explain why the device works.

The second explanation given is that the inventor is not sure of why the device works but believes it may involve ion flow. It is possible that the theory of operation is not understood. However, the ion flow theory is not correct.

B. Applicability of the Device:

The applicability of the device to any liquid fueled, rubber tired vehicle is judged to be correct as long as the vehicle has a battery.

C. Device Installation - Tools and Expertise Required:

The installation instructions are straight forward. The device installation can be complete within 5 to 10 minutes with a minimal mechanical expertise.

D. Device Operation:

No operational instructions were supplied or appear to be required.

E. Effects on Vehicle Emissions (non-regulated):

The applicant submitted no test data on non-regulated emissions. However, since the device does not appreciably modify the vehicle's emission control system or power train, it appears reasonable to assume that the device would not significantly affect a vehicle's non-regulated emissions.

G. Effects on Vehicle Safety:

The device is judged to not adversely affect vehicle safety.

H. Test Results (Regulated Emissions and Fuel Economy) Supplied by the Inventor:

The majority of the data submitted was correspondence from the Fuel Maximiser™ representing companies to various governmental agencies and private firms. The correspondence documented the fuel savings noted in the "before and after" fleet tests. There are several problems with this data which make its usage questionable. They are:

1. Only one set of data, the Ethyl Laboratory data, was measured by an independent laboratory. All other reports are written by Energy Dynamics or Metronics.

2. Very little documentation on the test fleet, the mileage accumulation, the fuel measurement method, fuel variations, test procedures, and reduction of data methods. There were fleet fuel consumption records attached to several pieces of correspondence but accurate analysis of these forms is difficult due to missing information, poor copies, and poor labeling.

3. All but the Ethyl test data was composed of fleet testing over several months of operation. Such fleet tests can have large errors due to testing variables. Often noted variables are:

    1) Fuel changes from winter grade to summer grade fuel which will increase fuel economy in warmer months.

    2) Changing ambient conditions due to seasonal changes.

    3) Changes in vehicle condition of repair.

    4) Changes in vehicle usage.

    5) Changes in vehicle operators.

Any introduction of variables will increase the uncertainty of the results. An analysis of the individual data is given below:

1. Fuel Maximiser™ On Highway Tests

The problems with this data set are:

i) The data is not presented by an independent laboratory but by the device representatives.

ii) No details as to vehicle conditions, ambient conditions, driver instructions, measurement methods, vehicle preconditioning, or test procedures was presented.

iii) The data presents no information on the effect of the device on urban driving.

The results are impressive but require authentication.

2. Postal Service Fuel Consumption

The letters submitted by Metronics again do not have independent verification and present no documentation as to how the test procedures were carried out. The Postal Records as noted above were difficult to understand. Several weeks were not included with the "with device" data. The data itself when properly analyzed showed no significant fuel economy improvements over the control cars tested. The results of this testing do not imply that the device works or does not work, just that the documentation was very poor.

3. The Ethyl Corporation Data

This data is presented by an independent laboratory using well documented laboratory procedures. The device showed no significant improvement in emissions or fuel economy. However the inventor claims concerning dynamometer testing must be noted. If one refutes the "ion-grounding" theory then the Ethyl data shows the device does nothing for emissions or fuel economy.

4. City of Akron Police and Bailiff's Vehicles

This data is presented by the inventor and lacks independent verification. It is stated to be based on information sent by the City of Akron. No testing procedures or documentation are supplied.

5. Means Service Inc. - Test Vehicles

This data also is presented by the inventor and lacks independent verification. The results showed vehicle to vehicle variability as one car increased 4.26 mpg and others lost 1.38 mpg. No testing procedures or documentation were supplied.

6. Waterford Dial-A-Ride

(See Number 11)

7. City of Woodhaven Data

The inventor presents fuel economy measurements for 5 vehicles. Records for two of the vehicles showed an improvement while two others were missing data. This data is not supplied by an independent laboratory and lacks documentation and test procedure descriptions.

8. The Birmingham Public School Data

This data is not submitted by an independent laboratory and gives no documentation as to test procedures, controls, etc.

9. The Thrifty Acres Test Data

This data set is sizable but does not describe test procedures, test vehicles, and fuels used. Different times of the year are compared-3/1/thru 5/26 and 2/9 thru 3/1 without the device and 3/8 thru 10/11 with the device. Many pieces of data are missing. The data is not presented by an independent laboratory or by Thrifty Acres.

10. Lapeer County Sheriff's Office

The data is presented by Mectronics Corporation and does not document procedures, vehicles, or actual raw test data.

11. Various Testimonials

These testimonials do not document testing methods or procedures.

An analysis of the supplied testing demonstrates that the only data which is well documented and presented by a recognized independent testing laboratory shows that the device does not work. All of the other test results are presented by the device representatives and lack technical validity. The data while voluminous, consists only of the device representatives writing to others how well their device works. This type of data is insufficient to prove that the device works as advertised.

H. Analysis of EPA Test Results:

The EPA laboratory testing showed for both vehicles in both test procedures that the Fuel Maximiser™ had an insignificant effect on fuel economy or emissions. The changes noted on HC, CO, and NOx for the HFET cycle are not significant when one looks at the magnitude of the numbers and realizes that there are no standards for HC, CO, and NOx for the highway cycle. There will normally be some variation in fuel economy noted during extended mileage accumulation. Therefore the shifts noted in CO and FE for the Citation are not unusual. It is proper to average the baseline values on either side of the "with Fuel Maximiser™" tests because no "residual type effect" claims are made for the device. Such an average compensates for gradual changes in the test vehicles performance. The road testing confirms the dynamometer testing. The dynamometer testing also confirmed the applicability of the Ethyl test data, which indicated no improvement.

I Conclusions

EPA fully considered all of the information submitted by the device representatives. The EPA evaluation of the Fuel Maximiser™ was based on that information and the results of the EPA testing performed on the device. The inventor submitted no documented test data that proved the "Fuel Maximiser™" would improve fuel economy. The only independent test data submitted indicated that the device did not work. The EPA testing while taking into account precautions suggested by the inventor, also showed that the device had no effect on vehicle fuel economy. Therefore, it is concluded that the Fuel Maximiser™ has no effect on vehicle fuel economy.

List of Attachments

Attachment A	Patent Application (provided with 511 Application)
Attachment B	Copy of installation instructions
Attachment C	On-highway Test Results
Attachemnt D	Post Office Records
Attachment E	Ethyl Test Data
Attachment F	EPA Report # AA-TEB-82-2

ATTACHMENT A - Pages 19 - 27

UNITED STATES PATENT NO. 4,158,346

June 19, 1979

Not clearly reproducible from submitted document. Copy will be furnished upon request from the U.S. Environmental Protection Agency, Emission Control Technology Division, Test & Evaluation Branch, 2565 Plymouth Rd. Ann Arbor, MI 48105

ATTACHMENT B - DEVICE INSTALLATION

Not clearly reproducible from submitted document. Copy will be furnished upon request from the U.S. Environmental Protection Agency, Emission Control Technology Division, Test & Evaluation Branch, 2565 Plymouth Rd. Ann Arbor, MI 48105

ATTACHMENT C - ON HIGHWAY TEST RESULTS

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upon request from the U.S. Environmental
Protection Agency, Emission Control Technology
Division, Test & Evaluation Branch, 2565
Plymouth Rd. Ann Arbor, MI 48105

ATTACHMENT - D POST OFFICE RECORDS

Pages 30 - 49

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Attachment E

ETHYL CORPORATION 50
RESEARCH AND DEVELOPMENT DEPARTMENT · RESEARCH LABORATORIES
1600 WEST EIGHT MILE ROAD · FERNDALE, MICHIGAN 48220 · (313) 399-9600

January 15, 1981

Mr. Ed Spicer
Energy Dynamics, Inc.
4049 Reduth Ct.
Birmingham, Michigan 48010

Dear Mr. Spicer:

We have completed exhaust emissions testing on a 1979 Chrysler New Yorker (Michigan License #LCM-341) both with and without your Fuel Maximizer device. These tests were performed in accordance with Federal Procedure as published in the Federal Register (42FR 32906; June 28, 1977). Results for the cold-start city ('75 CVS C-H) and highway (HWFET) tests are shown below:

	'75 CVS C-H Emissions, g/mile			HWFET Emissions, g/mile		
	HC	CO	NOx	HC	CO	NOx
Baseline (w/o device)	1.31	22.29	0.58	0.85	12.79	0.66
With device (after accumulating 100 miles)	1.29	20.62	0.68	0.60	10.28	0.70

It is my observation that this device does not adversely affect exhaust emissions. Any increases or decreases noted in the data are within the limits of test repeatability for a single car/single test program.

Per your request, I observed the installation of the device. The time required for installation was less than five minutes.

Copies of the data sheets are enclosed. If you have any questions, please call me.

Sincerely,

John P. Sunne
Project Engineer
Automotive Research Div.

JPS:mew

ETHYL CORPORATION RESEARCH LABORATORIES - FERNDALE, MICHIGAN

MASS VEHICLE EMISSION DATA SHEET.

AMI CVS Sampler # 1 Driver EH Oper. EH

Test Cycle: 1972 HEW Schedule ☐ 1975 HEW Schedule ☑ Other ☐

Vehicle No. LCM-341 Odometer 32363 Date 1-13-81

Vehicle Make CHRYSLER 79' Engine Displacement 318 Inertia Wt. 4000

Test Conditions 75' CVS — BASELINE HP at 50 mph 10.7

Fuel Type TANK (CAL. IND.) Duration of Soak 16 HR Soak Temp. 75°

Lbs. Fuel at Start — Barometer 29.15 Dry Bulb 68 °F Wet Bulb 49 °F

Lbs. Fuel at End — Lbs. Fuel Consumed —

FID Calibration: Atten (1) 23.8 = 1462 ppmc; Atten (2) / = ppmc; Atten (3) 23.4 = ppmc; Atten (4) / = ppmc

CO Calibration: (1) 0-3200; (2); (3); (4)

Bag 3 (Background)

	Scale	PPM
HC	2.0 1.6	.6
CO	— — =	.4 .5
CO_2	2.1 2.1 = .064	1.7 .052
NO_x	.1 .1 =	.2

	Bag 1 Scale	Bag 1 ppm	Bag 2 Scale	Bag 2 ppm	Bag 4 Scale	Bag 4 ppm		A/F Ratio
HC	36		10.2		17.5			
CO	82.6	2406	22.8	359	43.8	777		
CO_2	49.6	1.809	32.2	1,070	42	1,463		
NO_x		18		11.6		23.3		
NO		20.5		13.3		26.6		
NO_2								A/F =

Total Volume = Bag 1: 2402 FT^3, Bag 2: 4694 FT^3, Bag 3: 2445 FT^3, = V mix

HC mass = Vmix (16.33) (HCppmc) (10^{-6}) = 8.81 g(1) 3.52 g(2) 4.24 g(4)

CO mass = Vmix (32.97) (COppm) (10^{-6}) = 190.54 g(1) 48.46 g(2) 62.28 g(4)

NO_x mass = Vmix (54.16) (NO + NO_2) (10^{-6}) = 1.88 g(1) 2.07 g(2) 2.48 g(4)

CO_2 = 2183.93 3145.10 1795.02

1972 HEW Schedule g/mi = $\frac{\text{Bag 1} + \text{Bag 2}}{7.5}$ Cold ___ Drive ___ Neutral

HC mass ___ g/mi

CO mass ___ g/mi

NO_x mass ___ g/mi

1975 HEW Schedule g/mi = $\frac{.43\ \text{Bag 1} + \text{Bag 2} + .57\ \text{Bag 4}}{7.5}$ Hot ___ Drive ___ Neutral

79 STDS.

HC mass 1.31 g/mi 1.50

CO mass 22.29 g/mi 15.0

NO_x mass 0.58 g/mi 2.0

CB = 15.01 MPG CO_2 = 552.13

Roll Cts. 8401 = 8365 = 5.59 mi.
" " " 2 = 17359 = 3.86 "
" " " 3 = 25671 = 5.57 "

ATTACHMENT E ETHYL TEST DATA

Pages 53 - 55

Not clearly reproducible from submitted document. Copy will be furnished upon request from the U.S. Environmental Protection Agency, Emission Control Technology Division, Test & Evaluation Branch, 2565 Plymouth Rd. Ann Arbor, MI 48105

Attachment F
EPA-AA-TEB-82-2

Evaluation of the Fuel Maximiser™ - A Retrofit Fuel Economy Device

By

Thomas J. Penninga

November 1981

Test and Evaluation Branch
Emission Control Technology Division
Office of Mobile Source Air Pollution Control
U.S. Environmental Protection Agency

Background

The U.S Postal Service investigates items advertised through the mail, for possible prosecution if mail-fraud is suspected. The U.S. Postal service requested that EPA evaluate the Fuel Maximiser™, a fuel economy retrofit device. The purpose of the evaluation was to determine if the device in question did perform as it was claimed. A meeting was held with the U.S. Postal Service representative and with representatives of the device. The device representatives explained the theory by which the device works and presented substantiating test data. An evaluation of the theory and data presented is made in EPA Report EPA-AA-TEB-511-82-1.

Description of Device:

The following description of the device was included in the supporting data supplied by the device manufacturer. Figures 1A and 1B show the actual device.

"The present invention comprises a pair of closely adjacent, preferably oppositely wound electrically conductive coils which are encapsulated in a suitable insulating material and form an efficiency unit. The coils have their ends connected to each other and are preferably wound about an iron core such that the number of windings on one coil is three times the number of windings on the other coil.

"The encapsulated efficiency unit is positioned closely adjacent the positive pole of the battery for the engine while an electrical wire extends from the encapsulated coils at one end and is electrically connected to the negative terminal of the battery at its other end. The first mentioned end of the wire is preferably electrically connected to the coils, either directly or indirectly by connection with the iron core."

Test Procedure - Road Testing

A two-phase test plan was devised which took into account the device inventors concerns about testing. The first phase involved on-road testing as suggested by the device inventors. The second phase involved chassis dynamometer testing.

The inventor supplied two proposed test plans to the EPA. A copy of his instructions are attached (see Attachment A). The Alternate Test Plan for fuel economy was run. The requirements were:

(1) "two vehicles required

(2) conduct test on an oval track or a measured section of highway of 50 miles or more one way and return to the starting point. Ambients should be observed. Both vehicle tests must be conducted the same day.

(3) In all tests no instrumentation can be used other than topping of the fuel tank. Bounce car to remove all air from the tank.

Note: Do not use fifth wheel for measurement.

The inventor was contacted as to the feasibility of installing in-vehicle volumetric fuel measurement systems. He stated that such instrumentation would not negate the effectiveness of his device. Two vehicles, a 1979 Pinto and a 1980 Citation were checked to manufacturers specifications. A detailed description of the test vehicles is attached (see Attachment B). Two Fluidyne volumetric fuel measurement devices were sent to the GM Proving Ground for calibration and cleaning. Both instruments calibrated within 1% over the useful flow rates. Several additional procedures were followed. They were:

i) The vehicles were warmed for 1/2 hour prior to beginning the test.

ii) The fuel measurement did not begin until the vehicle had stabilized at 50 mph.

iii) The two cars were driven in tandem with the same driver-vehicle combination during each phase of the test.

iv) The first day of testing after both vehicles completed the first run, the device was installed only on the Pinto, after which a second run was made. The second day the same procedure was followed but the device was installed only on the Citation.

v) After the first two days of testing, it was noted that the second run of 100 miles consistently demonstrated higher fuel economy from the first run. This was probably due to engine temperature considerations and increased ambient temperatures during the test day. To determine the effect of the device, two additional test days were run where the first run was made with the device installed and the second run made without the device. Any reduction in the fuel economy gains noted during the second run could then be attributed to the device. On the third day of testing, the device was initially installed on the Pinto. On the fourth day, the device was initially installed on the Citation.

vi) On the first day of testing, the Pinto demonstrated unrepresentative fuel economy (low) for the first leg of the run. This data was considered an outlier and not used in analysis. Comparative results were based only on the down leg of the two runs.

Results - Road Testing

A Summary of the test data is given below:

Fuel Maximiser™ On Road Test Data

Date	Run No.	Leg	Pinto Fuel Economy	Pinto Composite	Citation Fuel Economy	Citation Composite
10/7/81	#1	Up	25.07	26.61	19.68**	23.72
10/7/81	#1	Down	28.35		29.85	
10/7/81	#2	Up	*26.13	*27.34	27.92	29.59
10/7/81	#2	Down	*28.66		31.48	
10/16/81	#1	Up	26.33	27.54	27.14	29.10
10/16/81	#1	Down	28.88		31.36	
10/16/81	#2	Up	27.71	28.31	*29.23	*30.27
10/16/81	#2	Down	28.94		*31.39	
10/28/81	#1	Up	*27.06	*27.66	27.98	29.05
10/28/81	#1	Down	*28.29		30.20	
10/28/81	#2	Up	27.11	27.89	28.37	29.42
10/28/81	#2	Down	28.72		30.55	
10/29/81	#1	Up	27.63	27.27	*29.88	*29.46
10/29/81	#1	Down	26.92		29.06	
10/29/81	#2	Up	28.26	27.73	30.70	29.93
10/29/81	#2	Down	27.21		29.20	

*with device
**questionable data

There are several ways to analyze this test data

A. Car to Car Comparison

1. This method assumes that each vehicle would see the same improvement from run #1 to run #2.

2. Any difference noted when the device was added would be attributed to the device.

3. The (Run #2 - Run #1)/((Run #1 + Run #2)/2) X 100 percentages were calculated. The results are given below:

Date	Vehicle with Device	Vehicle without Device	Device Contribution
10/7/81	2.70%	5.23%*	(-) 2.62%
10/16/81	3.94%	2.76%	(+) 1.18%
10/28/81**	.83%	1.27%	(+) .44%
10/29/81**	1.58%	1.67%	(+) .09%
			Ave = (-) .22%

*based only on down run comparison.

**since device was tested first, this is a positive value.

B. Individual Car Comparison

1. This method assumes that a vehicle would see the same improvement from run #1 to run #2 each day.

2. Any difference between the amount of improvement could be attributed to the device.

3. Average (non-device improvements) were calculated and are presented below.

Vehicle without Device (Average)	Vehicle with Device	Device Contribution
Pinto 2.22%	2.70%	(+) .49%
Pinto 2.22%	.83%	(+) 1.39%
Citation 3.30%*	3.94%	(-) .64%
Citation 3.30%*	1.58%	(+) 1.72%

*uses only the down leg of the 10-7 data Ave = (+) .74%

C. A third method of analysis is to average all of the tests for each vehicle without the device and compare it to the average of the data with the device.

1. This method assumes that the variables induced by ambient conditions and day-to-day testing are cancelled out during the test project.

2. This method assumes that the Run #1 - Run #2 difference will also cancel out.

Vehicle without Device (mpg)		Vehicle with Device (mpg)	Device Contribution (%)
Pinto	27.56	27.50	(-) .22%
Citation	29.37	29.86	(+) 1.69%
			Ave = (+) .74%

All three methods of analysis show that the Fuel Maximiser™ has negligible effect on fuel economy. The (+) .74% improvement is well within the test-to-test variability of the road test. The data does demonstrate the problems with running a simple without/with test. Such a test would not account for the changes in vehicle and ambient conditions and would demonstrate a false gain in fuel economy attributed to the device.

Test Procedure - Dynamometer Testing

A second set of tests were run at EPA in which the test vehicles were tested on a vehicle dynamometer. However once the Fuel Maximiser™ was installed, the vehicle was not touched by tie down straps or exhaust collection system. This was due to the inventor's concerns that grounding of the vehicle negates the effectiveness of the Fuel Maximiser™ by rerouting the ion flow generated by the device. The procedure was performed by not using a restraining cable, only wheel chocks. Similarly an exhaust collection cone was placed around the vehicle exhaust system. The negative pressure of the collection system takes in all of the vehicle exhaust without touching the exhaust system. No other instrumentation such as fans, drivers aides, etc., were allowed to touch the vehicles. The actual testing sequence was as follows:

a. The test vehicles were set to manufacturer's specifications.

b. Baseline testing which included two FTP and two HFET test sequences was run with the vehicle restrained by a tie-down cable and without the device installed.

c. The device was then installed according to the installation instructions in the device package.

d. The vehicles then were fueled from fuel cans and driven on an average urban driving cycle until three tanks of fuel each were consumed. Each night the vehicles were parked in a fenced off area to avoid accidental grounding of the vehicles.

e. The vehicles were pushed by hand onto a vehicle dynamometer where the wheel chocks and exhaust collection cone were used. Two "with device" FTP/HFET sequences were performed on each vehicle.

f. The device was then removed and the vehicle grounded with the metal tie-down strap. The regular exhaust collection system was attached to the vehicle exhaust. One or two FTP/HFET sequences were performed on each vehicle.

A summary of the results is given below:

Table I

A. Pinto		FTP Results				
Test #	Date	HC	CO	NOx	FE	Comments
81-0287	7-29-81	1.187	9.481	1.5620	22.47	Baseline
81-0312	7-30-81	1.184	8.923	1.7296	21.91	Baseline
81-0488	8-13-81	1.210	9.148	1.7493	21.94	with Fuel Maximiser™
81-0490	8-14-81	1.183	9.068	1.7243	21.84	with Fuel Maximiser™
81-0492	8-21-81	1.155	8.930	1.9259	21.97	without Fuel Maximiser™
B. Citation						
81-0494	8-25-81	.380	3.227	1.054	19.43	Baseline
81-0496	8-27-81	.416	3.615	1.044	19.93	Baseline
81-0498	9-16-81	.373	4.036	1.054	19.81	with Fuel Maximiser™
81-0852	9-17-81	.377	3.080	1.121	20.02	with Fuel Maximiser™
81-0856	9-18-81	.416	3.133	1.117	20.10	without Fuel Maximiser™
81-0858	9-22-81	.411	4.593	1.086	20.04	without Fuel Maximiser™

Table II

A. Pinto		HFET Results				
Test #	Date	HC	CO	NOx	FE	Comments
81-0286	7-29-81	.4896	.947	1.6798	29.96	Baseline
81-0313	7-30-81	.5130	.961	1.7179	29.84	Baseline
81-0489	8-13-81	.4747	.959	1.9023	30.16	with Fuel Maximiser™
81-0491	8-14-81	.4258	.866	1.8184	29.88	with Fuel Maximiser™
81-0493	8-19-81	.4841	.868	1.2457	30.38	without Fuel Maximiser™
81-0616	8-21-81	.4770	.898	2.183	30.17	without Fuel Maximiser™
B. Citation						
81-0380	8-5-81	.04579	.1285	1.0879	29.14	previous Baseline
81-0409	8-6-81	.04622	.2480	1.0251	29.02	previous Baseline
81-0410	8-6-81	.05293	.4863	.9181	28.99	previous Baseline
81-0495	8-25-81	.0504	1.1361	.8417	27.63*	Baseline
81-0497	8-27-81	.0513	.4576	.9196	28.34	Baseline
81-0499	9-16-81	.0590	.6025	.8545	28.69	with Fuel Maximiser™
81-0853	9-17-81	.0560	.5404	.9733	28.98	with Fuel Maximiser™
81-0857	9-18-81	.0506	.2854	1.0053	29.11	without Fuel Maximiser™
81-0859	9-22-81	.0512	.1925	.9791	28.94	without Fuel Maximiser™

*Questionable data. Three previous baseline tests (shown) gave fuel economy much higher than the 27.63. Therefore, for analysis an average of all 5 baseline tests will be used.

Table III
Comparison Summary

A. Pinto	FTP (in gms/mile)					HFET (in gms/mile)				
	# of tests	HC	CO	NOx	FE-mpg	# of tests	HC	CO	NOx	FE-mpg
Without Device	3	1.18	9.11	1.74	22.12	4	.49	.92	1.96	30.08
With Device	2	1.20	9.11	1.74	21.89	2	.45	.91	1.86	30.02
% Difference		+1.83	0.0	0.0	-1.04		-8.3	-.6	-4.92	-.2
B. Citation										
Without Device	4	.41	3.64	1.08	19.88	7	.05	.42	.97	28.74
With Device	2	.38	3.56	1.09	19.91	2	.06	.57	.91	28.84
% Difference		-7.6	-2.31	+1.14	+.18		+15.5	+36.32	-5.6	+.32

A copy of the actual EPA test data sheets for these tests is attached (see Attachment C).

Analysis of EPA Dynamometer Testing:

The EPA laboratory testing showed that for both vehicles the Fuel Maximiser™ had an insignificant effect on fuel economy or emissions. The changes noted on HC, CO, and NOx for the HFET cycle are not significant when one looks at the magnitude of the numbers. There will normally be some variation in fuel economy noted during extended mileage accumulation. Therefore the shifts noted in CO and FE for the Citation are not unusual. It is proper to average the baseline values on either side of the "with Fuel Maximiser™" tests because no "residual type effect" claims are made for the device. Such an average compensates for gradual chages in the test vehicles performance.

Conclusions

The results of the EPA testing demonstrate that with either road or dynamometer testing procedures, the Fuel Maximiser™ failed to improve vehicle fuel economy. The two test vehicles tested are representative of domestic manufactured vehicles and should have noted an improvement if the device performed as it was claimed. Since both test programs found no change in fuel consumption attributable to the device, it is concluded that the Fuel Maximiser™ has no effect on fuel economy.

Figure 1A

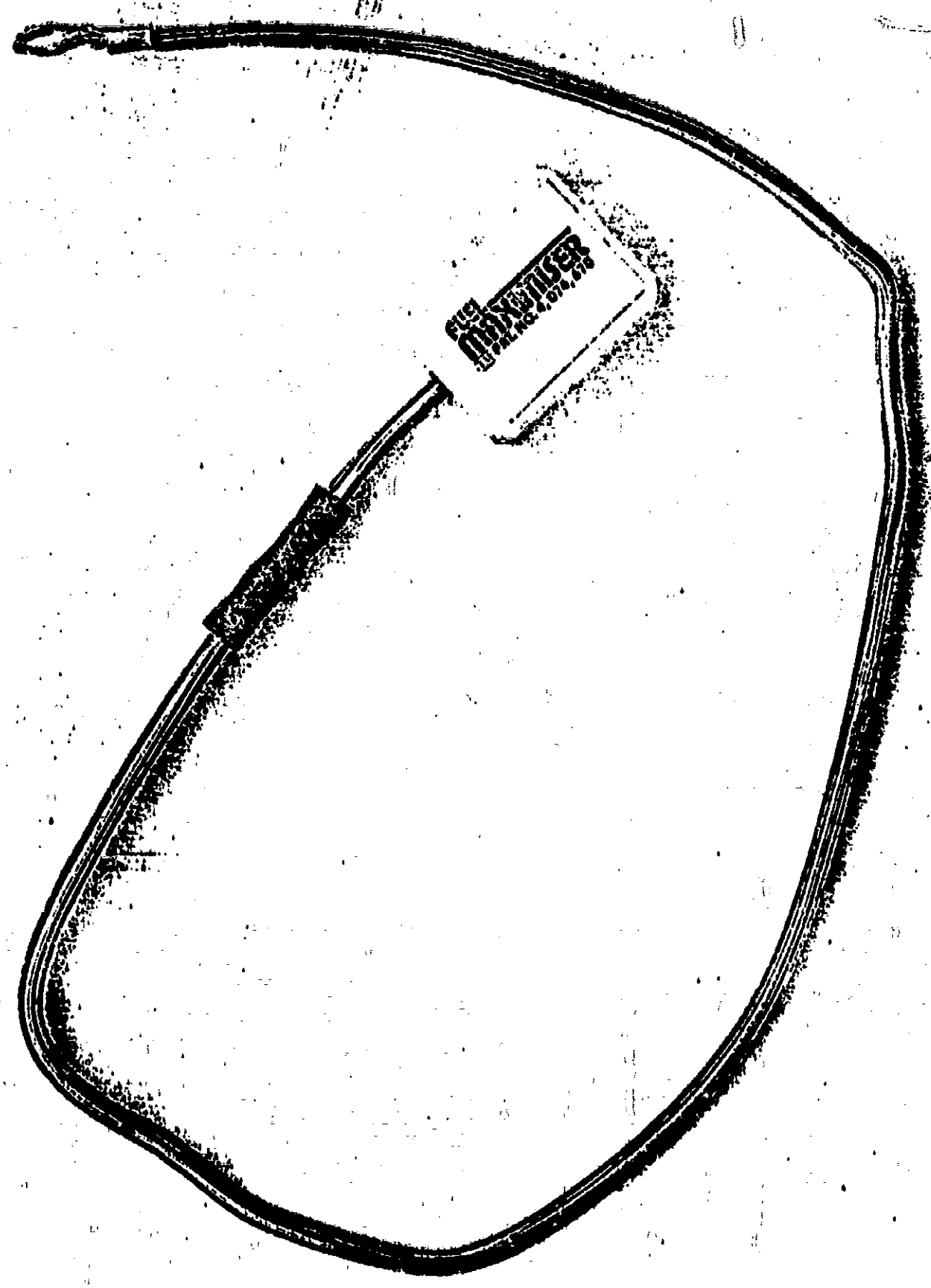
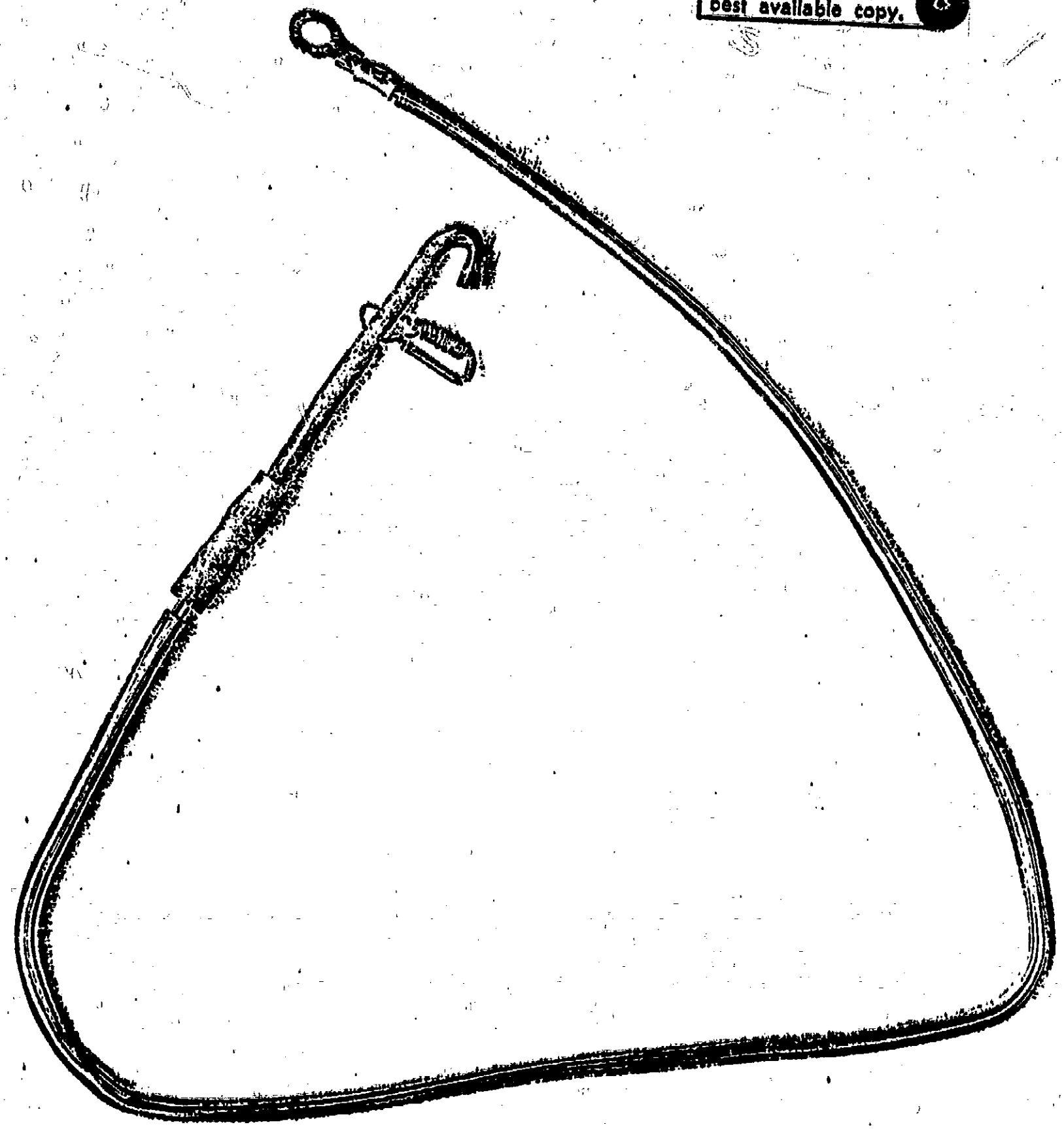


Figure 1B



Attachment A

Energy Dynamics Inc.
313 · 644-3747 · 693-4196
4049 REDUTH CT. BIRMINGHAM, MI. 48010

FUELMAXIMISER MANUFACTURER TEST REQUIREMENTS

It has been our experience that the Fuelmaximiser System cannot be tested for fuel economy according to FTP on a dynamometer because the tie-down straps and the electrical equipment receiving the exhaust emissions negate the desired effect of the Fuelmaximiser.. In fact, the fuel economy may worsen as a consequence of the machinery involved. This is because the ion field generated by the Fuelmaximiser is dissipated to "earth ground".

TEST PROCEEDURE FOR EMISSIONS

FTP as published in the Federal Register (42 FR-32906, June 28, 1977.)
No composite carbon test for fuel economy will be accepted.

PREFERRED TEST PROCEDURE FOR FUEL ECONOMY

1. This test must be conducted on-the-road.

2. A minimum of ten vehicles are required.

3. Three full tanks of fuel driven before the device is installed. The driving should represent both city and highway experience.

4. Install the device according to the manufacturers instructions and duplicate step three (3).

ALTERNATIVE TEST FOR FUEL ECONOMY

1. Two vehicles rquired.

2. Conduct test on an oval track or a measured section of highway of 50 miles or more one way and return to starting point. Ambients should be observed. Both vehi tests must be conducted the same day.

3. In all tests no instrumentation can be used other than topping of the fuel tank. Bounce car to remove all air from the tank.

Note: Do not use fifth wheel for measurement.

VEHICLE SPECIFICATION REPORT -(LD TESTING)- DATE OF ENTRY : 7/30/81

VEHICLE SPECIFICATIONS

MANUFACTURER	VEHICLE ID / VER	REPRESENTED CARLINE	MODEL CODE	DRIVE CODE	SOURCE
GENERAL MOTORS	[illegible]A687AW139507 2		SEDAN	FRONT DRIVE STR. LEFT	MANUFACTURER

VEHICLE TYPE	ACTUAL VEHICLE MODEL	MODEL YEAR	ACTIVE YEAR	DRIVE AXL #TS FULL TANK	DRIVE AXL #TS EMPTY TANK	CURB WEIGHT	INERTIA CLASS	EQUIV. TEST WEIGHT	O/D CODE	ACTUAL DYNO HP	RUNNING CHG NUMBER
NON-CER	CITATION	80	80				3000	3000		7.3	

ASSIGNED OF OR DURABILITY VEHICLE ID	ALT. MANUFACTURER	ODOMETER CORRECTION INITIAL	ODOMETER CORRECTION FACTOR

TIRE - SPECIFICATIONS

TIRE & RIM SIZES	MFR	CONSTR	SWL N	SWL M	BLT N	BLT M	PSI FT	PSI RR
P185/80R13	UNIROYAL							

ENGINE SPECIFICATIONS

DISPLACEMENT	BORE	STROKE	RATED HP	ENGINE TYPE	ENGINE CONFIGURATION	NO. CYL.	NO. CARBS	TOTAL BBLS	FUEL SYSTEM MFR/MODEL	FUEL INJCT?	TURBO?	COMP. RATIO	COAST-DOWN TM
2800. M	.	.		OTTO SPARK	V-BLOCK	6	1	1		NO	NO	.	

IGNITION TIMING 1	IGNITION TIMING 2	TIM. TOL.	TIMING RPM	RPM TOL.	TIMING GEAR	% CO LEFT	% CO RIGHT	%CO COMB	CO TOL.	IDLE RPM	IDLE TOL.	IDLE GEAR	ENGINE FAMILY	ENGINE CODE
8B			650									DRIVE	01C2EY 2.8L	

DRIVE TRAIN AND CONTROL SYSTEM SPECIFICATIONS

AXLE RATIO	N/V RATIO	ODOMETER	A/C INSTALLED	EXHAUST TYPE	CRANKCASE SYSTEM	TRANSMISSION CONFIG	TRANSMISSION MODIF	TRANSMISSION CODE	SHIFT INDIC. LIGHT	EVAPORATION SYSTEM	FUEL TYPE
.	.	MILES		SINGLE RIGHT REAR	CLOSED				-NO ENTRY	CANISTER	UNLEADED (AT EPA-IND HO)

MAIN-TANK CAPACITY	MAIN-TANK VOLUME	AUX.-TANK CAPACITY	AUX.-TANK VOLUME	SHIFT SPEED	EVAPORATIVE EMISSION FAMILY	EVAPORATIVE EMISSION CODE	SALES CLASS
14.0G	5.6G			DO NOT SHIFT MANUALLY			49 STATE LIGHT DUTY VEH

CONTROL SYSTEM TYPES

PULSATING AIR SYSTEM

OXIDATION CATALYST

VEHICLE SPECIFICATION COMMENTS

[redacted] MAXIMIZER DEVICE TESTING - T. PENNINGA

DYNO SITE:0207 TEST # 81-0859 | 1980 HIGHWAY FUEL ECONOMY ANALYSIS | PROCESSED: 09:07:36 NOV 15, 1983

MFR. CODE	VEHICLE I.D.	VERSION	EVAP	MFR. REP. INIT.	RUN CHG.	RETEST CODE	ACHP	ALT. H.P. METH	EQUIVALENT TEST WEIGHT	ACTUAL DYNO H.P.	TRANS. CONFG.	OVERDRIVE CODE	TEST TYPE: EXPERIMENTAL (ECTD) / TEST PROCEDURE: HWFE
40	IX687AN139507	2	N						3000	7.3			

PREP DATE	CURB WEIGHT	DRIVE AXLE WEIGHT	GAUGE	AXLE MEASURE	IGNITION TIMING #1	IGNITION TIMING #2	RPM	GEAR	% CO LEFT	% CO RIGHT	% CO COMB	IDLE RPM	GEAR	SOAK PERIOD	MEASURED COASTDOWN TIME

AMBIENT TEST CONDITIONS

BARO "HG	WET BULB	AMB TEMP	UNITS	RELATIVE HUMIDITY	SODIUM GR/LB	CVS UNIT
29.16	60.6	75.2	F	42.5	NONE	27C

TEST DATE	HR.	DYNO SITE	ACTUAL INERTIA SETTING	INDICATED DYNO H.P.	DVO H.P.	ODOM.	TIRE PRESSURE	NOX FACTOR	ALDEHYDES
9-22-81	10	0207	3000	5.7		35547.0	45.00	0.9199	

BAG 1 10.343 MILES 16.645 KM 24115. ROLL REVS. SECS. VMIX= 3988.0 CU.FT. DILUTION FACTOR = 8.537
SITE #A202

	EXHAUST SAMPLE RANGE	METER	CONC.	BACKGROUND SAMPLE RANGE	METER	CONC.	CORRECTED CONCENTRATIONS	MASS EMISSIONS GMS.	GMS/MI	GMS/KM	AUX. FIELD1	AUX. FIELD2	AUX. CODE
HC-FID	14	15.0	10.96	14	4.4	3.20	8.14 PPM	0.53	0.051	0.032			
NOX-CHEM	16	51.3	51.15	16	0.2	0.28	50.97 PPM	10.13	0.979	0.608	MPG	KPL	L/100KM
CO2	23	71.9	1.567	23	2.3	0.039	1.533 %	3166.78	306.182	190.253	28.9	12.30	8.1
CO	17	0.2	15.15	17	0.0	0.0	15.15 PPM	1.99	0.193	0.120			

WEIGHTED VALUES	HC	CO	CO2	NOX
GRAMS/MILE	0.051	0.19	306.	0.98
BEFORE ROUNDING	0.05124	0.1925	306.18	0.9791
GRAMS/KM	0.032	0.12	190.	0.61
BEFORE ROUNDING	0.03184	0.1196	190.25	0.6084

WEIGHTED VALUES	MPG	KPL	L/100KM
72-74 FTP	28.9	12.3	8.1
	28.9372	12.3112	8.1226
UNWEIGHTED FTP	28.9	12.3	8.1
	28.9330	12.3007	8.1296
	28.9	12.3	8.1
	28.9330	12.3007	8.1296

COMMENTS: FUEL MAXIMIZER PROJECT
CITATION: BASELINE HFET #9