EPA Evaluation of the Sav-A-Mile Device Under Section 511 of the Motor Vehicle Information and Cost Savings Act

This document contains several pages which may not reproduce well. Any questions concerning the legibility of these pages should be directed to: Merrill W. Korth, Environmental Protection Agency, Office of Mobile Source Air Pollution Control, Emission Control Technology Division, 2565 Plymouth Road, Ann Arbor, MI 48105, (313) 668-4299 or FTS 374-8299

By

John C. Shelton

October, 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 "Sav-A-Mile"

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 "Sav-A-Mile" 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 May 18, 1981, the EPA received a request from Energy Managers of America for evaluation of a fuel saving device termed "Sav-A-Mile". This device is designed to fit between the carburetor and the intake manifold. It is claimed to increase evaporation and atomization of the fuel prior to burning by passing it through a heat-conductive wire mesh screen. It is also claimed to function as an insulating block between the carburetor and the intake manifold.

Availability of Evaluation Report: An evaluation has been made and the results are described completely in a report entitled: "EPA Evaluation of the Sav-A-Mile Device Under Section 511 of the Motor Vehicle Information and Cost Savings Act," report number EPA-AA-TEB-511-82-2 consisting of 45 pages including all attachments.

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
Telephones: FTS 737-4650
or Commercial 703-487-4650

Summary of Evaluation

EPA fully considered all of the information submitted by the Device manufacturer in the Application. The evaluation of the "Sav-A-Mile" device was based on that information.

The "Sav-A-Mile" consists of a piece of copper cloth and a flat piece of insulating material which is placed between the carburetor and intake manifold of a gasoline engine. The stated purpose is to increase the efficiency of the engine and decrease the amount of pollutants generated.

Although the limited amount of test data submitted by the applicant did suggest some improvement over an unmodified induction system, the results were not obtained in accordance with EPA requirements and the data did not adequately quantify the amount of any improvement. In general, EPA has found that devices of this type are not effective in reducing emissions or improving 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 "Sav-A-Mile" 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:

"Sav-A-Mile"

2. Inventor of the Device and Patents:

A. Inventor

Frank Cook
Rt. 4, Box 1
Ft. Mill, SC 29715

B. Patent

The applicant has applied for a patent (see Attachment B)

3. Manufacturer of the Device:

Plastic Products
Hi Way 161
Bessemer City, NC 28106

4. Manufacturing Organization Principals:

Henry Baxter
Plastic Products
Hi Way 161
Bessemer City, NC 28106

5. Marketing Organization in U.S. making Application:

Energy Managers of America
11407 W. 48th Avenue
Wheatridge, CO 80033

6. Applying Organization Principals:

Ray Wickstrom - Chairman of the Board
Mike Rucker - President

7. Description of Device:

A. Purpose of the Device (as supplied by Applicant):

"The device designed is to fit between the carburetor and manifold of an internal combustion engine in order to increase fuel efficiency, engine efficiency and reduce pollution emissions. The device functions both to reduce evaporation of

fuel from the carburetor and the manifold, and to increase evaporation and atomization of the fuel prior to burning, by passing the fuel through a heat conductive wire mesh screen."

B. Theory of Operation (as supplied by Applicant):

"The Sav-A-Mile is comprised of a piece of cloth made out of copper or other heat conductive materials which is placed on the intake manifold of an engine in such a manner that the fuel mix must pass through the cloth to enter the manifold. The outer edges of the cloth maintain close proximity to the metal portion of the manifold so that it may readily receive the heat produced at and around the flange of the manifold and conduct heat into the center of the cloth, wherein the heat can be transmitted to the fuel mixture as it passes through the cloth. The Sav-A-Mile further comprises of a flat piece of insulating material placed between the solid portions of the carburetor to insulate the carburetor from the heat generated at the manifold to create a large reservoir of heat for use by the cloth. The insulating piece is so shaped as to conform with the shape of the flange of the carburetor and to cause no interference to the flow of fuel mixture from the carburetor into the manifold."

C. Detailed Description of Construction (as supplied by Applicant):

A detailed description is provided in Attachment B.

8. Applicability of the Device (as supplied by Applicant):

An application chart is provided in Attachment B.

9. Costs (as supplied by Applicant):

Not supplied.

10. Device Installation - Tools and Expertise Required (as supplied by Applicant):

Only the Installation Instructions were supplied in response to this paragraph (Attachment B).

11. Device Operation (as supplied by Applicant):

Only the Installation Instructions were supplied in response to this paragraph (Attachment B).

12. Maintenance (claimed):

"None"

13. Effects on Vehicle Emissions (non-regulated) (claimed):

"Data will be forthcoming upon completion of the Air Quality Resources Board of California test."

14. Effects on Vehicle Safety (claimed):

"Does not apply"

15. Test Results (Regulated Emissions and Fuel Economy) (submitted by Applicant):

a) Letter from Cummins Carolinas, Inc. (Attachment B).

b) Custom Engineering Laboratories Tests (Attachment F).

c) "More data will also be forthcoming upon completion of the Air Quality Resources Board of California test."

16. Analysis

A. Description of the Device:

The device is judged to be adequately described in Section 7.

B. Applicability of the Device:

The applicability of the device stated in the application appears to cover most gasoline-fueled vehicles equipped with carburetors.

C. Costs:

Not supplied

D. Device Installation - Tools and Expertise Required:

Only simple tools and average mechanical skills should be required for most installations (see Attachment B).

E. Device Operation:

The device has no moving parts. Only the installation instructions were supplied with the application.

F. Device Maintenance:

None

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

The device is unlikely to affect non-regulated emissions.

H. Effects on Vehicle Safety:

If the device is installed properly, it will not afffect the safety of the vehicle.

I. Test Results Supplied by Applicant:

The applicant did submit test data per the Federal Test Procedure and Highway Fuel Economy Test. These are the only EPA recognized test procedures*. This requirement for test data following these procedures is stated in the application test policy documents that EPA sends to potential applicants. The test data submitted by the applicant are analyzed below.

(1) The data submitted by the applicant in Attachment F were from a single vehicle and consisted of a single test sequence (both FTP and HFET) with and without the "Sav-A-Mile" device installed. In order to evaluate repeatability of the vehicle/test sequence, EPA requires that these tests be run in duplicate at each test point. In addition, EPA requires that at least two vehicles be tested. These requirements were clearly stated to the applicant in a letter of May 1, 1981 (Attachment A).

(2) A review of these data showed that:

(a) HC and NOx emissions over the FTP decreased slightly

(b) CO emissions over the FTP decreased substantially

(c) FTP fuel economy increased slightly

(d) HFET fuel economy increased slightly.

However, due to the weakness in the data noted above, the data does not confirm these conclusions.

(3) No data from the California Air Resources Board were submitted.

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* From EPA 511 Application test policy documents:

Test Results (Regulated Emissions and Fuel Economy):
Provide all test information which is available on the effects of the device on vehicle emissions and fuel economy.

The Federal Test Procedure (40 CFR Part 86) is the only test which is recognized by the U.S. Environmental Protection Agency for the evaluation of vehicle emissions. The Federal Test Procedure and the Highway Fuel Economy Test (40 CFR Part 600) are the only tests which are normally recognized by the U.S. EPA for evaluating vehicle fuel economy. Data which have been collected in accordance with other standardized fuel economy measuring procedures (e.g. Society of Automotive Engineers) are acceptable as supplemental data to the Federal Test Procedure and Highway Fuel Economy Data will be used, if provided, in the preliminary evaluation of the device. Data are required from the test vehicle(s) in both baseline (all parameters set to manufacturer's specifications) and modified forms (with device installed).

J. Test Results Obtained by EPA:

Due to weaknesses in the data submitted by the applicant, the device was not tested by EPA.

18. Conclusions

EPA fully considered all of the information submitted by the device manufacturer in the application. The evaluation of the "Sav-A-Mile" device was based on that information. While thorough mixing of fuel and air and even distribution of the mixture will enhance the combustion process, there is no evidence that the use of "Sav-A-Mile" device will result in any significant improvements over an unmodified engine. Therefore, based on EPA's experience with similar devices, there is no reason to support any claims for improvements in fuel economy or exhaust emissions due to the use of the "Sav-A-Mile" device.

List of Attachments

Attachment A	Letter, EPA to Mr. Mike Rucker of Energy Managers of America, May 1, 1981.
Attachment B	511 application from Mr. Mike Rucker of Energy Managers of America, May 11, 1981
Attachment C	Letter, EPA to Mr. Mike Rucker of Energy Managers of America, June 10, 1981.
Attachemnt D	Letter, EPA to Mr. Mike Rucker of Energy Managers of America, July 7, 1981.
Attachment E	Letter, Mr. Mike Rucker of Energy Managers of America to EPA, July 23, 1981.
Attachment F	Letter, EPA to Mr. Mike Rucker of Energy Managers of America, August 13, 1981.

May 1, 1981

Mr. Mike Rucker
Energy Managers of America
11407 West 48th Avenue
Wheat Ridge, CO 80033

Dear Mr. Rucker:

This letter is in response to your inquiry of 4/29/81, regarding an EPA evaluation of the Save-a-Mile device. The Environmental Protection Agency is charged by Congessional mandate to evaluate fuel economy and emission control devices. While the EPA does not actually "approve" such devices, it does conduct evaluations for the purpose of increasing the common knowledge in the area. For this reason, the outcome of any testing by EPA becomes public information. It is this information which may be cited, although no claims can be made that any EPA findings constitute "approval" of the device or system.

Enclosed with this letter is a packet of materials which you will need to apply for an EPA evaluation of your device. This packet consists of 1) an application format, 2) a document entitled "EPA Retrofit and Emission Control Device Evaluation Test Policy" and 3) a copy of the applicable Federal Regulations.

In order for the EPA to conduct an evaluation of your device, we must have an application. Once you have reviewed all the documents in the packet, you should prepare an application in accordance with the guidelines of the application format. A critical part of the application is the substantiating test data. The required test results will have to be obtained at a laboratory of your choice. Such testing would be conducted at your expense. A list of laboratories, which are known to have the equipment and personnel to perform acceptable tests, has been included in the enclosed packet. If you desire, we can assist in the development of a satisfactory test plan.

There are, however, several aspects concerning testing at an outside laboratory which I would like to bring to your attention at this time:

The tests are conducted in a "back-to-back" manner, once with the vehicle in baseline condition, and again with the device installed with no vehicle adjustments between tests. If installation of the device also involves some adjustments, e.g. timing, fuel-air mixture, choke or idle speed, another test sequence with only these adjustments should be inserted between the first and last. If mileage accumulation is necessary in order to realize the full benefit, the same number of miles that are accumulated before the test runs must also be accumulated before baseline runs. In addition, the method of mileage accumulation should be kept constant. Also as a minimum, the test sequence shall consist of a hot-start LA-4 portion (bags 1 and 2) of the Federal Test Procedure (FTP) and a Highway Fuel Economy Test (HFET). The details of these tests are contained in the enclosed packet. Although only a hot-start FTP is required to minimize the costs to you, you are encouraged to have the entire cold-start test performed since any testing and evaluation performed by EPA will be based on the complete FTP, and you may wish to know how a vehicle with your device performs over this official test. As a final requirement, the personnel of the outside laboratory you select should perform every element of your test plan. This includes preparation of the test vehicle, adjustment of parameters and installation of the device.

Submission of Data - We require that all test data obtained from the outside laboratories in support of your application be submitted to us. This includes any results you have which were declared void or invalid by the laboratory. We also ask that you notify us of the laboratory you have chosen, when testing is scheduled to begin, what tests you have decided to conduct, allow us to maintain contact with the laboratory during the course of the testing, and allow the test laboratory to directly answer any questions at any time about the test program.

Cost of the Testing - The cost of the minimum test plan (two vehicles, two test sequences in duplicate) described above should be less than $2000 per vehicle and less than $4000 for the total test at any of the laboratories on the list. It should be recognized that additions to the minimum test plan (such as mileage accumulation, parameter adjustment, or additional testing) will result in additional costs. In any case, you will have to contact them individually to obtain their latest prices.

Outcome of the Tests - In order for EPA to best utilize our facilities, confirmatory testing will only be performed on those devices that demonstrate a statistically significant improvement in fuel economy or emissions based on data from an EPA-recognized independent laboratory. We have established some guidelines which will help you determine whether the test results with your device should be considered encouraging. These values have been chosen to assure both of us that a real difference in fuel economy exists, and that we are not seeing only the variability in the results. The table below presents the minimum number of cars that need to be tested for varying degrees of fuel economy improvement, assuming a typical amount of variability in fuel economy measurement. For a minimum test plan which was conducted on a fleet of two cars, the average improvement should be at

least 8%. If at least an 8% difference in average fuel economy can be shown, then we would be able to say statistically at the 80% confidence level that there is a real improvement.

Similarly, we would expect a minimum of 5% improvement for a fleet of 5 vehicles. Test results which display a significant increase in emission levels should be reason for concern.

Minimum Fuel Economy Improvements versus Size of Test Fleet

Fleet Size	Average Improvement Required
2	8%
3	7%
4	6%
5	5%
10	4%
25	2%

Once we receive your application, it will be reviewed to determine if it meets the requirements listed in the format. If your application is not complete, we will ask you to submit further information or data. After any missing information has been submitted, your application will be reconsidered, and once it meets our requirements, you will be advised of our decision whether or not EPA will perform any confirmatory testing. Any EPA testing will be performed at no cost to you and you will be given the opportunity to concur with our test plan. Once this testing is complete, an evaluation report will be written. If no further testing is required, the report will be written solely on the basis of the test data submitted and our engineering analysis.

Despite the current backlog and increasing number of inquiries regarding fuel economy device evaluations, the EPA intends to process your application in as expeditious a manner as possible. We have established a goal of twelve weeks from the receipt of a complete application to the announcement of our report. The attainment of this objective requires very precise scheduling, and we are depending on the applicant to respond promptly to any questions, or to submit any requested data. Failure to respond in a timely manner will unduly delay the process. In the extreme case, we may consider lack of response as a withdrawal of the application.

I hope the information above and that contained in the enclosed documents will aid you in the preparation of an acceptable application for an EPA evaluation of your device. I will be your contact with EPA during this process and any subsequent EPA evaluation. My address is EPA, Motor Vehicle Emission Laboratory, 2565 Plymouth Road, Ann Arbor, Michigan, 48105. The telephone number is (313) 668-4200. Please contact me if you have any questions or require any further information.

Sincerely,

Merrill W. Korth
Device Evaluation Coordinator
Emission Control Technology Division

Enclosures

ENERGY MANAGERS OF AMERICA

May 11, 1981

1. Application for Evaluation of a Fuel Economy Retrofit Device Under Section 511 of the Motor Vehicle Information and Cost Savings Act.

2. Trade Name: Sav-A-Mile

3. a) Frank Cook
Rt. 4 Box 1
Ft. Mill, SC 29715

b) Patent Enclosed

4. a) Plastic Products
Hi Way 161
Bessemer City, NC 28106

b) Dana Corporation
Division of Victor Products
P. O. Box 1333
Chicago, IL 60690

5. a) Henry Baxter
Plastics Products
Hi Way 161
Bessemer City, NC 28106

b) Dana Corporation
Division of Victor Products
P.O. Box 1333
Chicago, IL 60690

6. Energy Managers of America
11407 W. 48th Ave
Wheatridge, CO 80033

7. a) Ray Wickstrom - Chairman of the Board
Mike Rucker - President

b) Mike Rucker

8. a) The device designed is to fit between the carburetor and manifold of an internal combustion engine in order to increase fuel efficiency, engine efficiency and reduce pollution emissions. The device functions both to reduce evaporation of fuel from the carburetor by providing an insulating block between the carburetor and the manifold, and to increase evaporation and atomization of the fuel prior to burning, by passing the fuel through a heat conductive wire mesh screen.

b) The Sav-A-Mile is comprised of a piece of cloth made out of copper or other heat conductive material which is placed on the intake manifold of an engine in such a manner that the fuel mix must pass through the cloth to enter the manifold. The outer edges of the cloth maintain close proximity to the metal portion of the manifold so that it may readily receive the heat produced at and around the flang of the manifold and conduct the heat into the center of the cloth, wherein the heat can be transmitted to the fuel mixture as it passes through the cloth. The Sav-A-Mile further comprises of a flat piece of insulating material placed between the solid portions of the carburetor to insulate the carburetor from the heat generated at the manifold and to create a large resevoir of heat for use by the cloth. The insulating piece is so shaped as to conform with the shape of the flang of the carburetor and to cause no interferance to the flow of fuel mixture from the carburetor into the manifold.

c) Detailed description of the invention. With reference to the drawings, a standard double throat carburetor has been employed for the description, although the device is suitable for use upon carburetors with any number of throats. The device includes a flat sheet of insulating material (11). the insulating material (11) should be heat resistant, of good strength, impact resistant and able to withstand the pressure of being tightly bound between the carburetor (15) and the manifold (16), more particularly between the manifold flange (20) and the carburetor flange (19). Grade C phenolic with cnavas base in laminated sheets has proven to be a satisfactory material for the insulating material although equivalent materials may be employed. The thickness of the insulating materail (11) should be large enough to provide adequate insulation for the carburetor (15) but the thickness is limited in practice by the mechanical consideration of being able to fit the device into existing engine compartments. A thickness of 3/8 inches has been found to be the optimal size although higher thicknesses should produce better results where their use is possible. The insulating material (11) is of the same shape as the flange (19) of the carburetor (15)with which it is in contact including centrally located passageways aligned with the throats (10) of the carburetor (15) to allow

the free passage of the fuel mixture. In other words, the insulating material (11) is interposed between all contact points of the carburetor (15) and manifold (16) to insure adequate insulation of the carburetor (15) and to prevent heat dissipation from the manifold (16).

Between the insulating material (11) and the flange (20) of the manifold (16) is placed a sheet of mesh cloth (12) composed of copper or other heat conducting material. The optimal material for the mesh cloth (12) has been found to be square mesh wire cloth made of pure copper. The optimal demensions of the cloth (12) have been found to be 40 meshes per lineal inch, with a wire diameter of .010 inches, an opening width of 0.150 inches providing 36 percent of open area. Equivalent materials may be used that are highly conductive, heat resistant, resistant of corrosion, and that have the proper ratio of open area to area of contact in order to maximize fuel atomization and vaporization while minimizing interference to flow of fuel into the manifold (16). The outside edges of the mesh cloth (12) are so shaped to align with the contact portions of the carburetor (15) and the manifold (16) and the cloth (12) is so placed as to cause all fuel mixture flowing from the carburetor (15) to the manifold (16) to pass through the cloth (12).

Between the flange of the carburetor (19) and the insulating material (11), between the insulating material (11) and the cloth (12), and between the cloth (12) and the manifold flange (20) are placed gaskets (13) made of asbestos or other material as are commonly used in the field to insure a tight and leakproof seal between the components. All the components are provided with openings (17) aligned with the openings of the carburetor (21) and the mainfold (22) through which bolts (18) or equivalent connecting devices may pass. The components are drawn tightly together according to the specifications for the engine being used.

When in place and the engine is running, the invention provides for insulation for the carburetor (15) by means of the insulating material (11) from the heat generated in the area of the manifold (16). The mesh cloth (12), whose outer edges are in close proximity to the manifold (16) and the heat normally generated there, conducts the heat into the center of the mesh cloth (12) where it may be transmitted to the fuel mixture just prior to the mixture entering the manifold (16) causing the mixture to be more completely atomized and vaporized. The steady flow of fuel through the center of the cloth (12) rapidly removes the heat creating a large thermodynamic differential between the center and outer edges of the cloth (12), thus encouraging the steady flow of heat toward the area of contact between the cloth (12) and the fuel.

While the preferred embodiment of the invention is described herein, it is to be understood that the invention is not limited to the precise sonstruction herein

modifications coming within the scope of the invention as defined in the appended claims. As previously discussed, the device can be adapted to any type of carburetor merely by insuring that all throats of the carburetor are matched by passageways in the insulating material.

What I claim is:

1. A device to be mounted between a carburetor and an intake mainfold of an internal combustion engine to prevent premature fuel evaporation and improve fuel atomization and vaporization comprising:

a) means for insulating said carburetor from heat transmitted from said manifold, and;

b) means for simultaneously passively introducing said heat into said fuel and stomizing said fuel by impact.

2. A device to be mounted between a carburetor and an intake manifold of an internal combustion engine to prevent premature fuel evaporation and improve fuel atomization and vaporization comprising:

a) a flat sheet of heat resistant insulating material having passageways equal in size and aligned with the throats of said carburetor, said insulating material being attached to the flange of said carburetor by tight and leakproof means, and;

b) a flat piece of meshed, heat conducting material mounted transversely to the flow of said with one side attached to said insulating material by tight and leakproof means and one side attached to the flange of said manifold by tight and leakproof means.

3. The device in Claim 2 wherein the said insulating materail is somprised of grad C phenolic.

4. The device in Claim 2 wherein the said meshed material is somprised of wire cloth made of copper.

9. See attached APPLICATION CHART

10. See attached INSTRUCTION SHEETS FOR EM4002-U and EM4004-U

11. See attached Instruction sheets

12. None

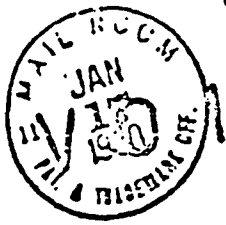
13. Data will be forthcoming upon completion of the Air Quality Resources Board of California's test.

14. DOES NOT APPLY

15. See attached letter from Cummings Carolina. More data will also be forthcoming upon completion of the Air Quality Resources Board of California's test.

W. RYAN HOVIS
ATTORNEY AT LAW

1169 WEST OAKLAND AVENUE
SUITE C
ROCK HILL, SOUTH CAROLINA 29730



D 324-1122

January 14, 1980

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: 703-557-3158

Frank Cook — Group: R Unit 342

Serial No. 06/051,982

Filed: June 25, 1979

For: Fuel Efficiency Device

TO: THE COMMISSIONER OF PATENTS & TRADEMARKS

Sir:

Since I have received no correspondence concerning the above referenced patent since its filing, I was concerned that perhaps an office response had been lost in the mail. I would appreciate it if you could inform me of the present status of this Application.

Respectfully submitted,

W. Ryan Hovis
Registration No. 28860

WRH/gw

Action on the above identified application is to be expected on or before December, 1980.

SPA Group 340
2/7/80

1169 WEST OAKLAND AVENUE
SUITE C
ROCK HILL, SOUTH CAROLINA 29730

June 21, 1979

In the United States Patent
& Trademark Office
Washington, D.C. 20231

To: The Commissioner of Patents and Trademarks

Sir: Transmitted herewith for filing is the patent application of Inventor: Frank Cook.

Enclosed are:

1 sheet of drawings
9 pages of specifications
2 pages of oath and power of attorney
check in the amount of $75.00 to cover filing fee

Respectfully submitted,

/s/

W. Ryan Hovis
Registration No: 28,860

WRH/gw

Enclosures

FUEL EFFICIENCY DEVICE

ABSTRACT OF THE DISCLOSURE

A device designed to fit between the carburetor and manifold of internal combustion engines in order to increase fuel efficiency, engine efficiency, and reduce pollutant emissions. The device functions both to reduce evaporation of fuel from the carburetor by providing an insulating block between the carburetor and the manifold and to increase vaporization and atomization of the fuel prior to burning by passing the fuel through a heat conducting wire mesh screen.

BACKGROUND OF THE INVENTION

There are two principle causes for the failure of present day internal combustion engines to completely burn the fuel introduced into the engine. First a considerable quantity of fuel is lost through evaporation as the fuel is introduced into the warm carburetor. Second, there tends to be incomplete burning of the fuel due to the failure of the fuel to be completely atomized and vaporized.

The complete burning of the fuel is handled in the present invention by interposing a wire mesh cloth between the carburetor and the intake manifold in such a manner that the fuel mixture must pass through the cloth to enter the manifold. The impact of the fuel mixture against the cloth serves to more completely atomize the fuel droplets. In addition, the cloth is made of a highly conductive material which transmits engine and manifold heat to the fuel mixture

as it strikes the cloth thus evaporating the droplets into vapor. The heat supply to the cloth is increased by means of the insulating material discussed below. After passing through the cloth the fuel is thus in a gas, rather than a liquid state, and will be burned more efficiently.

The problem of fuel evaporation from the carburetor is remedied by placing a layer of insulating material between the cloth and the solid portions of the carburetor. The carburetor is thus insulated from engine heat, remains cooler, and causes less fuel evaporation. Moreover, the insulation helps prevent heat dissipation from the manifold and thus creates a larger reservoir of heat to be used by the mesh cloth.

Several inventions have attempted to achieve energy saving and pollution prevention results by placing devices between the carburetor and intake manifold. The patent to Larson No. 3,449,098 teaches the use of a foraminus material to increase atomization and mixing. It does not, however, employ the use of a heat conductive material to increase evaporation nor does it involve insulation of the carburetor in combination with the foraminus material. The patent to Goldman No. 2,657,123 teaches the use of wire screen in conjunction with rotating propellers. Again, the invention does not provide for heating the mixture nor for insulating the carburetor.

The patent to Burwinkle et al No. 3,459,162 teaches the use of foraminus plates, rather than mesh, and provides for heating the mixture by passing engine exhaust through passageways in the plates. The patent to Ramey No. 2,701,557 again teaches the use of screen or mesh between the carburetor and the manifold for atomization but does not employ heating for evaporation nor does it employ insulation of the carburetor. The patent to Henderson No. 3,088,447, designed to decrease pollutants, employs heating of the fuel mixture but teaches heating by means of electrical resistance or recycling of the exhaust.

The patent to Chandler No. 2,085,574 teaches insulation of the carburetor, but not by means employed herein and not in combination with the mesh cloth designed to heat the fuel mixture. The patent to Balfe No. 2,072,862 teaches insulation of the carburetor by means different from those employed herein and not in combination with the mesh cloth designed to heat the fuel mixture.

The advantage of the present invention over those enumerated above is that the present invention combines the beneficial effects of insulation of the carburetor with the beneficial effects of passage of the fuel mixture through the mesh cloth in order to atomize the fuel, and further to heat and vaporize the fuel by heat conduction. Furthermore the present invention operates in a purely passive manner requiring no outside heating or other devices and can be simply

and easily installed between the carburetor and intake manifold without alteration to the manifold, the carburetor, or other parts of the engine.

SUMMARY OF THE INVENTION

The present invention pertains to a device to be placed between the carburetor and intake manifold of an internal combustion engine with the purpose of increasing the efficiency of fuel usage of the engine and decreasing the amount of air pollutants generated by the engine. The invention is comprised of a piece of cloth made out of copper or other heat conducting materials which is placed on the intake manifold of the engine in such a manner that the fuel mixture must pass through the cloth to enter the manifold. The outer edges of the cloth maintain close proximity to the metal portions of the manifold so that it may readily receive the heat produced at and around the flange of the manifold and conduct the heat into the center of the cloth, wherein the heat can be transmitted to the fuel mixture as it passes through the cloth. The invention further comprises a flat piece of insulating material placed between the solid portions of the carburetor to insulate the carburetor from the heat generated at the manifold and to create a larger reservoir of heat for use by the cloth. The insulating piece is so shaped as to conform to the shape of the flange of the carburetor and to cause no

interference to the flow of fuel mixture from the carburetor into the manifold.

BRIEF DESCRIPTIONS OF THE DRAWINGS

One embodiment of the invention will be described below with reference to the accompanying drawings in which:

Figure 1 shows an exploded perspective view of the device as it would be placed between the carburetor and the manifold.

Figure 2 shows a cross-sectional side view of the device along the line 2-2 of Figure 1 as the device is in place between the carburetor and the manifold.

DETAILED DESCRIPTION OF THE INVENTION

With reference to the drawings, a standard double throat carburetor has been employed for the description, although the device is suitable for use upon carburetors with any number of throats. The device includes a flat sheet of insulating material 11. The insulating material 11 should be heat resistant, of good strength, impact resistant, and able to withstand the pressure of being tightly bound between the carburetor 15 and the manifold 16, more particularly between the manifold flange 20 and the carburetor flange 19. Grade C phenolic with canvas base in laminated sheets has proven to be a satisfactory material for the insulating material although equivalent materials may be employe The thickness of the insulating material 11 should be large enough to

provide adequate insulation fo the carburetor 15 but the thickness is limited in practice by the mechanical considerations of being able to fit the device into existing engine compartments. A thickness of 3/8 inches has been found to be the optimal size although higher thicknesses should produce better results where their use is possible. The insulating material 11 is of the same shape as the flange 19 of the carburetor 15 with which it is in contact including centrally located passageways aligned with the throats 10 of the carburetor 15 to allow the free passage of the fuel mixture. In other words, the insulating material 11 is interposed between all contact points of the carburetor 15 and manifold 16 to insure adequate insulation of the carburetor 15 and to prevent heat dissipation from the manifold 16.

Between the insulating material 11 and the flange 20 of the manifold 16 is placed a sheet of mesh cloth 12 composed of copper or other heat conducting material. The optimal material for the mesh cloth 12 has been found to be square mesh wire cloth made of pure copper. The optimal dimensions of the cloth 12 have been found to be 40 meshes per lineal inch, with a wire diameter of .010 inches, an opening width of 0.150 inches providing 36 percent of open area. Equivalent materials may be used that are highly conductive, heat resistant, resistant to corrosion, and that have the proper ratio of open area to area of contact in order to maximize fuel atomization and

vaporization while minimizing interference to flow of fuel into the manifold 16. The outside edges of the mesh cloth 12 are so shaped as to align with the contact portions of the carburetor 15 and the manifold 16 and the cloth 12 is so placed as to cause all fuel mixture flowing from the carburetor 15 to the manifold 16 to pass through the cloth 12.

Between the flange of the carburetor 19 and the insulating material 11, between the insulating material 11 and the cloth 12, and between the cloth 12 and the manifold flange 20 are placed gaskets 13 made of asbestos or other material as are commonly used in the field to insure a tight and leakproof seal between the components. All the components are provided with openings 17 aligned with the openings of the carburetor 21 and the manifold 22 through which bolts 18 or equivalent connecting devices may pass. The components are drawn tightly together according to the specifications for the engine being used.

When in place and the engine is running, the invention provides for insulation for the carburetor 15 by means of the insulating material 11 from the heat generated in the area of the manifold 16. The mesh cloth 12, whose outer edges are in close proximity to the manifold 16 and the heat normally generated there, conducts the heat into the center of the mesh cloth 12 where it may be transmitted to the fuel mixture

just prior to the mixture entering the manifold 16 causing the mixture to be more completely atomized and vaporized. The steady flow of fuel through the center of the cloth 12 rapidly removes the heat creating a large thermodynamic differential between the center and outer edges of the cloth 12, thus encouraging the steady flow of heat toward the area of contact between the cloth 12 and the fuel.

While the preferred embodiment of the invention is described herein, it is to be understood that the invention is not limited to the precise construction herein disclosed and the right is reserved to all changes and modifications coming within the scope of the invention as defined in the appended claims. As previously discussed, the device can be adapted to any type of carburetor merely by insuring that all throats of the carburetor are matched by passageways in the insulating material.

What I claim is:

1. A device to be mounted between a carburetor and an intake manifold of an internal combustion engine to prevent premature fuel evaporation and improve fuel atomization and vaporization comprising:

(a) means for insulating said carburetor from heat transmitted from said manifold, and;

(b) means for simultaneously passively introducing said heat into said fuel and atomizing said fuel by impact.

2. A device to be mounted between a carburetor and an intake manifold of an internal combustion engine to prevent premature fuel evaporation and improve fuel atomization and vaporization comprising:

(a) a flat sheet of heat resistant insulating material having passageways equal in size and aligned with the throats of said carburetor, said insulating material being attached to the flange of said carburetor by tight and leakproof means, and;

(b) a flat piece of meshed, heat conducting material mounted transversely to the flow of said fuel with one side attached to said insulating material by tight and leakproof means and one side attached to the flange of said manifold by tight and leakproof means.

3. The device in Claim 2 wherein the said insulating material is comprised of grade C phenolic.

4. The device is Claim 2 wherein the said meshed material is comprised of wire cloth made of copper.

STATE OF SOUTH CAROLINA)
)
COUNTY OF YORK)

As the below named inventor, being duly sworn, I depose and say that:

My residence, post office address and citizenship are stated below next to my name; that

I verily believe I am the original, first and sole inventor of the invention entitled: Fuel Efficiency Device described and claimed in the attached specifications; that

I do not know and do not believe the same was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof for more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representative or assigns more than twelve months prior to this application, that I acknowledge my duty to disclose information of which I am aware which is material to the examination of this application, and that no application for patent or inventor's certificate on this invention has been filed in any country foreign to the United States of America prior to this application by me or my legal represent-

atives or assigns.

I hereby appoint the following attorney to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: W. Ryan Hovis, Registration No. 28,860. Address all telephone calls to W. Ryan Hovis at telephone number 803-324-1122.

Address all correspondence to W. Ryan Hovis, 1169 W. Oakland Avenue, Suite C, Rock Hill, South Carolina 29730.

Full name of sole inventor: Frank Cook

Inventor's Signature: _____

Date: _____

Residence: _____

Citizenship: _____

Post Office Address: _____

Sworn to and subscribed before me this ____ day of _____, 1979.

_____
Notary Public for South Carolina

My Commission Expires: _____.

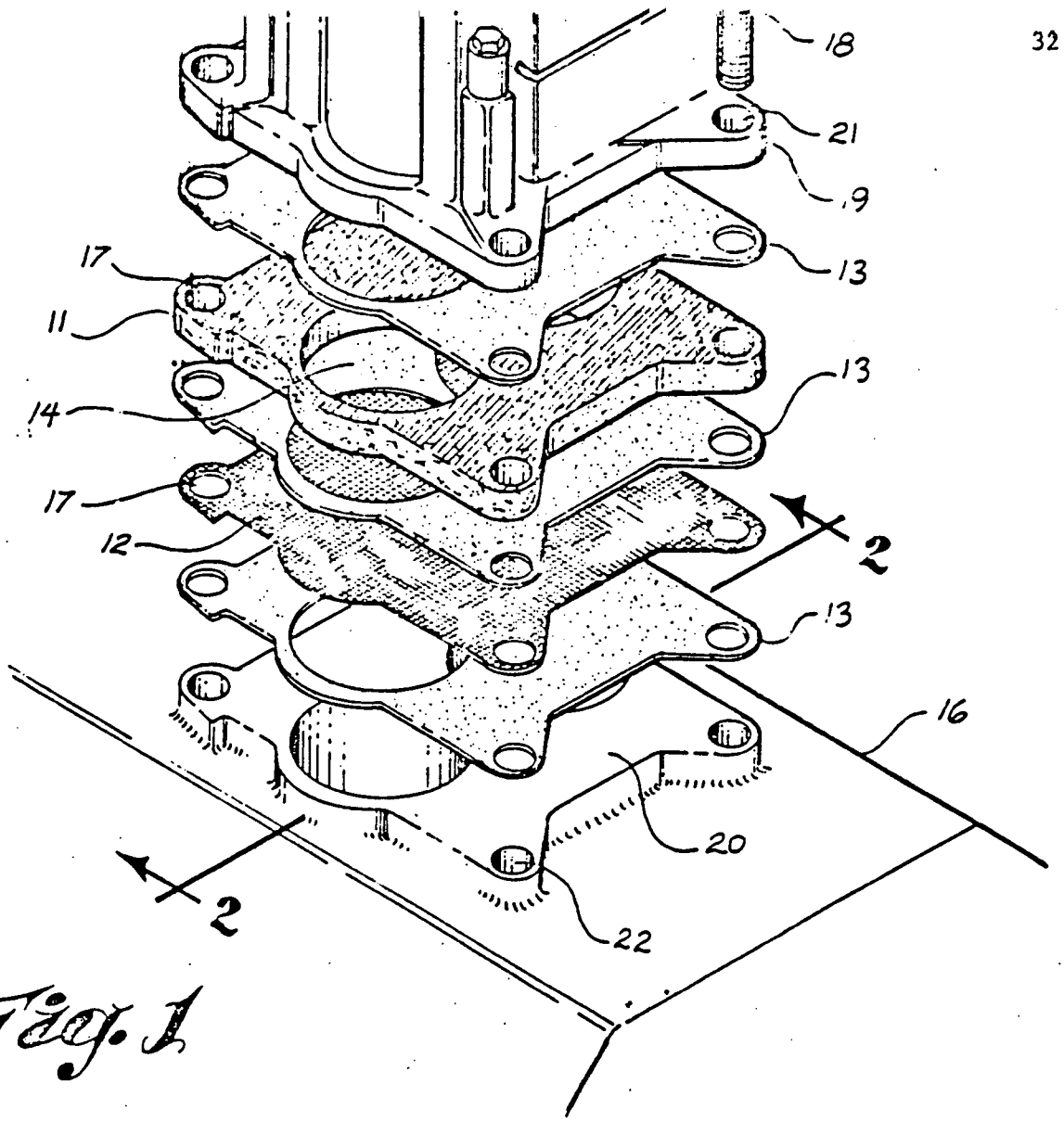


Fig. 1

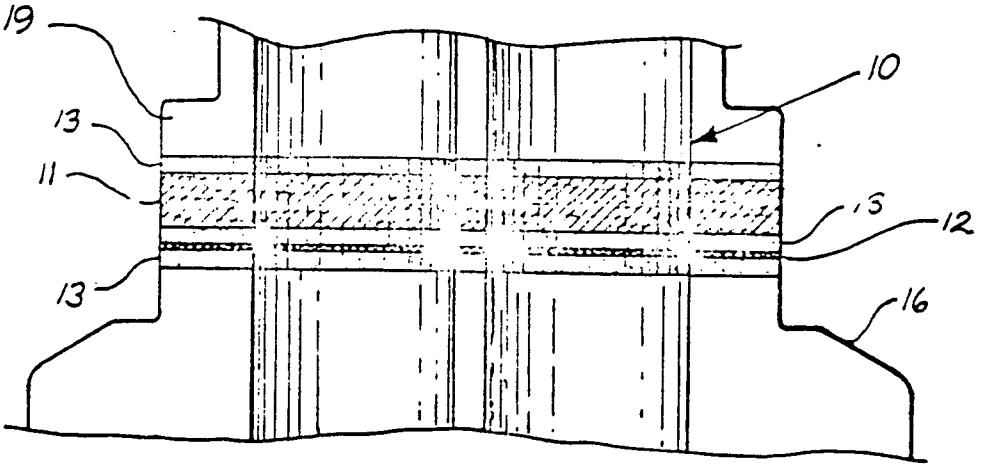


Fig. 2

Cummins Carolinas Inc.

January 15, 1980

Emco Corp.
Fort Mill, S.C.

Gentlemen;

We dyno tested the 1979 Concord DL Vehicle without the use of a gas saving device and with it. We find that the 'Save a mile' carburetor plate increased milage by a 6 miles per gallon average on our chassi dyno.

During the test the carbon and hydro carbons dropped from CO%2½ HC5 to CO3¼% HC2 1/2.

Sincerely

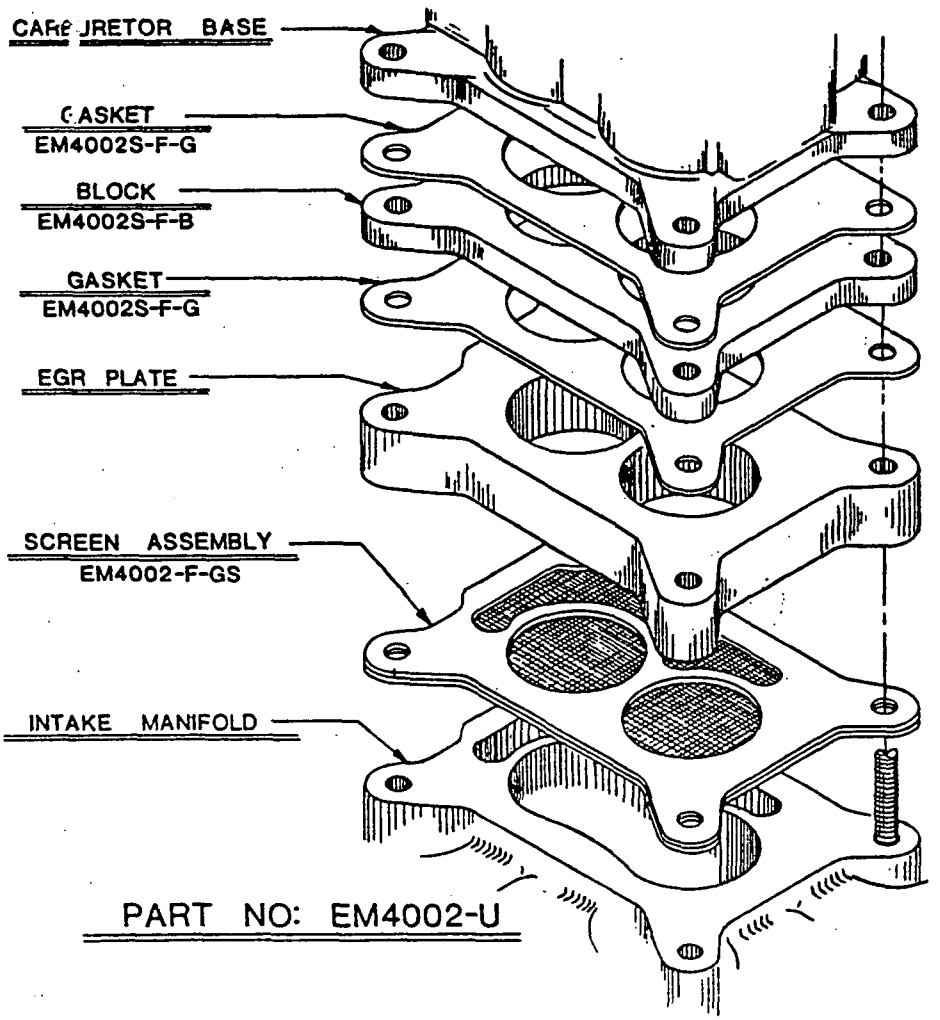
Gary E. Donahue

Shop Supervison

3700 NORTH INTERSTATE 85 • P. O. BOX 26603 • CHARLOTTE, N. C. 28213 • 704/596-7690

SAV-A-MILE

INSTALLATION INSTRUCTIONS



PART NO: EM4002-U

EMCO
INTERNATIONAL
CORPORATION
P.O. BOX 613, FORT MILL,
SOUTH CAROLINA 29715

Use SAV-A-MILE
and wear a smile

INSTALLATION INSTRUCTIONS

FOR

SAV-A-MILE

(A)
1. Remove air cleaner and attaching hoses.
2. Disconnect fuel line and vacuum hoses to carburetor, making sure you know where vacuum lines are to be reconnected.
3. Remove carburetor attaching bolts or stud nuts.
4. Remove carburetor, making sure to clean mating surfaces on intake manifold and carburetor.

NOTE: On engine equipped with EGR plate, between intake and carburetor, the EGR plate should be removed and old gaskets cleaned from surfaces of both intake and EGR plate.

(B)
1. Now place laminated gasket and screen assembly on models having EGR plate between EGR plate and intake manifold. On all other models, the gasket-screen assembly should be placed directly on the intake manifold.
2. Now place one gasket on top surface of EGR plate, then place spacer block and another gasket on top of block.
3. Replace carburetor.

NOTE: On some models, it will be necessary to back out existing studs about a quarter-inch; On some GM models, longer bolts (supplied in kits for those models) will be necessary.

(C)
1. After carburetor has been installed and secured, be careful to re-install all vacuum hoses properly. Also be sure to torque down bolts and stud nuts to recommended pressure.
2. Crank engine, check for vacuum leaks and smoothness of idle.
3. Replace air cleaner and attaching vacuum lines and hoses.
4. At this time, a road test should be made to insure proper running of the vehicle.

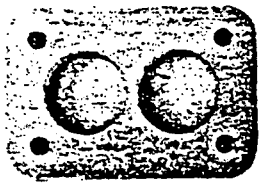
NOTE: After a few hours of running, recheck the torque on the stud nuts or bolts to ensure the carburetor is seated properly to prevent any vacuum leaks.

PRIOR TESTING HAS PROVEN BEST RESULTS WERE ATTAINED AT SPEEDS NOT EXCEEDING THE NATIONAL HIGHWAY SPEED LIMIT. DRIVE 55 mph STAY ALIVE, AND LET SAV-A-MILE SAVE FOR YOU.

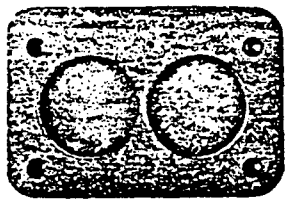
Thank you for buying SAV-A-MILE and tell a friend

(See reverse side for installation diagram)

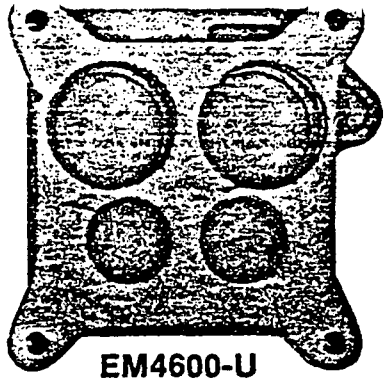
P.O. BOX 613, FORT MILL,
SOUTH CAROLINA 29715



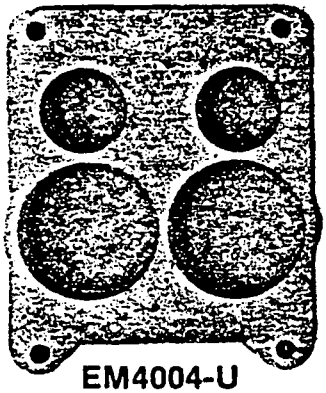
EM1002-U



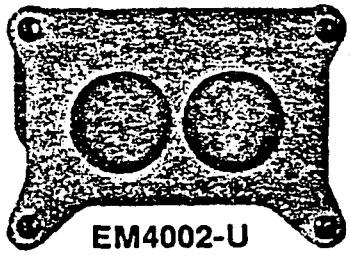
EM2002-U



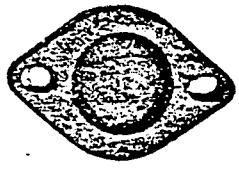
EM4600-U



EM4004-U
EM4004-UC



EM4002-U



EM1001-U

TERMS AND POLICIES

Ordering—When ordering, use part number only.

Shipping—All orders will be shipped by UPS or other common carrier unless otherwise specified.

Special Application—Contact EMCO International Corp.

Invoices—Invoices will be mailed the same date products are shipped to distributors. All deliveries will be made C.O.D.

Returns—Written or verbal permission must be obtained from EMCO International before returning any merchandise for credit. All returns must be prepaid.

Claims—All claims for loss or damage must be made to Carrier.

Prices—All orders are subject to state and federal taxes where applicable. All prices are subject to change without notice.

Defective Merchandise—Full credit or replacement will be given for any unit returned defective, with the exception of the following:

(1)–No aerosols must be used following installation of the Save-A-Mile unit.
(2)–Any screen damage.
*The Sav-A-Mile unit is warranted for the life of the installation as there are no products used in its construction that will wear out.

EMCO International reserves the right to make changes in its Sav-A-Mile unit at any time to improve the product.

This warranty limits any implied warranty, and no other person, company, or organization is authorized to assume for EMCO International any other liability in connection with the sale of the Sav-A-Mile unit.
(Some states do not allow limitations on how long an implied warranty lasts. This limited warranty gives you specific legal rights, and you may also have other rights which vary from state to state. If you need assistance, contact your state's Consumer Affairs Office.)

EMCO INTERNATIONAL CORP. WARRANTY

EMCO International warrants that all of its products are free from defects in material workmanship. All EMCO products are subject to the conditions established in this policy.

1. EMCO warrants that when Sav-A-Mile units are properly installed in their correct application they will be free from defect.

2. Due to the variety of modifications made on all engines that may affect performance economy for engine life, EMCO's obligation under this warranty is limited to the repair or replacement of the Sav-A-Mile Unit.

This warranty begins on the date of purchase by the consumer. This warranty will be void on any Sav-A-Mile unit that shows evidence of misapplication, improper installation, abuse, lack of proper maintenance, negligence, or alteration from their original design.

APPLICATION CHART

AMERICAN/MOTORS

Year	Model	Bbl.	Mfg.	Our No.
6 Cylinder				
1963	196	1	M	EM1001-U
1960-70	196,232, Eng. P/P	2	C	EM1002-U
1960-79	196, 199, 232, 258 Eng	1	H	EM1001-U
8 Cylinder				
1960-79	250, 287, 290, 304, 327, 343, 401	4	C, H	EM4004-U
	360 Eng.	2	C, H	EM4002-U

BUICK

Year	Model	Bbl.	Mfg.	Our No.
6 Cylinder				
1962-63	198, 215 Eng.	1	R	EM1001-U
1964-65	225, 250 Eng.	1	R	EM1001-U
1966-67	198, 225 Eng.	2	R	EM1002-U
1968-79	250 Eng.	1	R	EM1001-U
8 Cylinder				
1962-63	Le Sabre	2	R	EM2002-U
1964-67	300, 340 Eng.	2	C, R	EM2002-U
1966	340 Eng. w/AT (Calif)	2	R	EM2002-U
1966-73	350, 400, 425, 430, (455) Eng.	4	C, R	EM4004-U
1968-79	350 Eng.	2	R	EM2002-U

CADILLAC

Year	Model	Bbl.	Mfg.	Our No.
1967-79	ALL	4	C, R	EM4004-U

CAPRI

Year	Model	Bbl.	Mfg.	Our No.
4 Cylinder				
1972-74		2	H	EM4002-U

CHEVROLET (Camaro, Chevelle, Chevy II /Nova, Corvette, Vega)

Year	Model	Bbl.	Mfg.	Our No.
6 Cylinder				
1963-79	194, 230, 250 Eng.	1	C, R	EM1001-U
1964-67	327 Eng.	4	H	EM4000-U
1965-69	307, 327, 396, 427 Eng.	4	H	EM4000-U
1966-68	283, 327 Eng.	2	R	EM2002-U
1966-69	302, 392 Hi Perf Eng.	4	H	EM4000-U
1967-69	427 Eng. (400-435hp)	2	H	EM4002-U
1968-79	327, 350, 396, 400, 402, 427, 454 Eng.	4	C, R	EM4004-U
1968-71	307 Eng.	2	R	EM2002-U
1969-71	327, 350, 396, 400 Eng.	2	R	EM2002-U
1972-79	307 Eng.	2	R	EM2002-U
1970-79	350, 396, 402, 454 Eng.	4	H	EM4000-U
1972	350, 400 Eng.	2	R	EM2002-U
1973-79	350, 400 Eng.	2	R	EM2002-U
1969-71	Z-28	4	H	EM4000-U

COMET/MONTEGO

Year	Model	Bbl.	Mfg.	Our No.
6 Cylinder				
1969-79	250 Eng.	1	C, M	EM1001-U
8 Cylinder				
1969-79	302 Eng.	2	M	EM4002-U

COUGAR

Year	Model	Bbl.	Mfg.	Our No.
1963-71	260, 289, 302, 351, 390 Eng.	2	M	EM4002-U
1972-79	302 Eng.	2	M	EM4002-U
1972-79	351, 390 Eng.	2	M	EM4002-U

CHEVROLET TRUCK

Year	Model	Bbl.	Mfg.	Our No.
4 & 6 Cylinder				
1963-79	194, 230, 250, 292 Eng.	1	C, R	EM1001-U
8 Cylinder				
1960-67	265, 283, 322, 327 Eng.	2	C, R	EM2002-U
1966-79	348, 350, 366 Eng.	2	R	EM2002-U
1967-79	356 Eng.	4	H	EM4000-U
1968	396 Eng.	2	H	EM4002-U
1968-79	307 Eng.	2	R	EM1002-U
1068-79	427 Eng.	4	H	EM4000-U
1969-70	350, 396, 402 Eng.	4	C, R	EM4004-U

CHRYSLER & IMPERIAL

Year	Model	Bbl.	Mfg.	Our No.
1960-79	360, 361, 383, 400 Eng.	2	C, H, S, B	EM2002-U
1967-71	383 Eng.	4	C, H	EM4000-U
1967-72	440 Eng.	4	C, H	EM4000-U
1972-79	400 Eng.	4	C (TQ)	EM4004-U
1973-79	440 Eng.	4	C (TQ)	EM4004-U

DODGE PASSENGER

Year	Model	Bbl.	Mfg.	Our No.
6 Cylinder				
1960-79	195, 225 Eng.	1	C	EM1001-U
1960-79	225 Eng.	1	H	EM1001-U
8 Cylinder				
1960-79	273, 318 Eng.	2	C, R	EM1002-U
1960-79	360, 361, 383, 400 Eng.	2	C, H, S, B	EM2002-U
1968-71	350, 383 Eng.	4	C, H	EM4000-U
1971-72	400 Eng.	4	H, C	EM4000-U
1972-79	340, 360, 400 Eng.	4	C (TQ)	EM4004-UC
1973-79	440 Eng.	4	C (TQ)	EM4004-UC

DODGE TRUCK

Year	Model	Bbl.	Mfg.	Our No.
6 Cylinder				
1961-79	198, 225 Eng.	1	C, H	EM1001-U
8 Cylinder				
1960-79	273, 318, 361 Eng.	2	C, S	EM1002-U
1960-79	361 Option, 383, 400	2	C, H	EM2002-U
1960-79	413 Eng.	2	S	EM2002-U
1960-79	413 Eng.	4	C, H	EM4000-U
1960-79	413 Eng.	2	H	EM2002-U
1972-79	360, 400, 440 Eng.	4	C (TQ)	EM4004-UC

FAIRLANE/TORINO

Year	Model	Bbl.	Mfg.	Our No.
6 Cylinder				
1969	250 Eng.	1	H	EM1001-U
1969-79	250 Eng.	1	C, M	EM1001-U
8 Cylinder				
1962-71	260, 289, 302, 351 Eng.	2	M	EM4002-U
1972-79	351, 390, 400 Eng.	2	M	EM4002-U
1970-71	302, 351C Eng.	2	F	EM4002-U

FALCON

Year	Model	Bbl.	Mfg.	Our No.
8 Cylinder				
1963-70	260, 289, 302 Eng.	2	H, M	EM4002-U

FORD PASSENGER

Year	Model	Bbl.	Mfg.	Our No.
6 Cylinder				
1965-69	240 Eng. (Exc. w/S.T. 68-69)	1	H	EM1001-U
1965-79	240 Eng.	1	C, M	EM1001-U
8 Cylinder				
1963-72	260, 289, 302, 351, 351C, 351W, 390, 400, 429 Eng.	2	H, M	EM4002-U
1965-79	352, 390, 428, 427, 429 Eng.	4	H, M	EM4000-U
1970	429 Eng.	4	R	EM4000-U
1973-79	351C, 351, 390, 400, 429 Eng.	2	M	EM4002-U
1972-79	302 Eng.	2	M	EM4002-U
1974-79	w/C (Calif only)	4	C	EM4000-U

FORD BRONCO

Year	Model	Bbl.	Mfg.	Our No.
6 Cylinder				
1974-79	200 Eng.	1	C	EM1001-U
8 Cylinder				
1966-79	289, 302 Eng.	2	M, H	EM4002-U

FORD TRUCK

Year	Model	Bbl.	Mfg.	Our No.
6 Cylinder				
1964-69	240, 262, 300 Eng.	1	H	EM1001-U
1964-79	240, 250, 262, 300 Eng.	1	C, M	EM1001-U
8 Cylinder				
1960-79	292, 302, 330, 332, 352, 360, 361, 390 Eng.	2	M	EM4002-U
1960-69	292, 302 Eng.	2	H	EM4002-U
1962-79	330, 332, 353, 360, 361, 390 Eng.	2	H	EM4002-U
1968-71	302 Eng.	2	H	EM4002-U
1970-75	360, 390, 401, 477, 534 Eng.	4	H	EM4000-U

GMC TRUCK

Year	Model	Bbl.	Mfg.	Our No.
4 & 6 Cylinder				
1960-63	351, 401, 478 Eng.	2	S	EM1002-U
1961-69	305C, D & E Eng.	2	S	EM1002-U
1964-70	230, 250, 292 Eng.	1	C, R	EM1001-U
1965-69	351, 351C, 351E Eng.	2	S	EM2002-U
1970	305C, 351C Eng. w/CCS	2	S	EM2002-U
1972-79	230, 250, 292 Eng.	1	C, R	EM1001-U
8 Cylinder				
1968-79	327, 350, 396, 400, 455 Eng.	4	C, R	EM4004-U
1968-73	307 Eng.	2	R	EM1002-U
1969	366, 427 Eng.	4	H	EM4000-U
1969-73	350 Eng.	2	R	EM2002-U
1971-79	350, 366, 427 Eng.	4	H	EM4000-U
1973-79	GMC Motor Home	4	R	EM4004-U
1972	350 Eng.	2	R	EM2002-U
1974-79	350 Eng.	2	R	EM2002-U

IHC TRUCK

Year	Model	Bbl.	Mfg.	Our No.
1966	BD282, BG241 Eng.	1	H	EM1001-U
1966	V239 Eng.	4	H	EM4000-U
1966, 69-79	RD450 Eng.	2	H	EM4002-U
1966-79	V266, V304, V345, V501 Eng.	2	H	EM4002-U
1968	V304, BG220, 265 Eng.	1	H	EM1001-U
1968-79	V549 Eng.	4	H	EM4000-U
1968-79	RD406 Eng.	2	H	EM4002-U
1969-71	V304 Eng.	2	C	EM4002-U
1969-79	196, 232, 358 Eng.	1	H	EM1001-U
1969-79	V392 Eng.	4	H	EM4000-U
1969-79	RD501 Eng.	4	H	EM4000-U
1970	V549, V220, VF200 Eng.	4	H	EM4000-U
1970-71	V402, V461, 478 Eng.	2	H	EM4002-U
1972-79	V478 Eng.	4	H	EM4000-U
1972-79	V401 Eng.	4	H	EM4000-U

JEEP CORP.

Year	Model	Bbl.	Mfg.	Our No.
1962-65	230 Eng.	2	H	EM2002-U
1964-79	225, 226, 230, 232, 258 Eng.	1	R	EM1001-U
1966, 67, 71	225, 304 Eng.	2	R	EM4002-U
1968, 70, 71	350 Eng.	2	R	EM2002-U

LINCOLN

Year	Model	Bbl.	Mfg.	Our No.
1960-62	430 Eng.	2	C	EM4002-U
1963-72	430, 460, 472 Eng.	4	C, M	EM4000-U
1973-79	460 Eng.	4	C, M	EM4600-U

MAVERICK

Year	Model	Bbl.	Mfg.	Our No.
6 Cylinder				
1971-79	250 Eng.	1	C	EM1001-U
1073-79	250 Eng.	1	M, C	EM1001-U
8 Cylinder				
1971-79	302 Eng.	2	M	EM4002-U

MERCURY

Year	Model	Bbl.	M
1960-71	292, 351, 352, 390, 400, 429 Eng.	2	C,
1960-62	352 Eng.	2	H
1961-79	352, 390, 410, 428, 429 Eng.	4	H,
1971-79	351, 400, 429 Eng.	2	M
1970-79	351, 390, 400, 429 Eng.	2	H
1970	429 Eng.	4	R
1971-79	429, 460 Eng.	4	M

MUSTANG

Year	Model	Bbl.	M
6 Cylinder			
1969-79	250 Eng.	1	C
8 Cylinder			
1965-71	351, 400, 429 Eng.	2	M
1965-79	260, 289, 302 Eng.	2	M
1966	289 Eng.	4	M
1969	302 Eng. (Boss)	4	H
1970-79	429 Cobra Eng.	4	R
1970	302 Eng.	2	H
1970	351C Eng.	2	H
1972	302, 351W Eng.	2	H
1972	351CV spct bore	2	H
1972-79	351, 400, 429 Eng.	2	M

MUSTANG II

Year	Model	Bbl.	M
4 Cylinder			
1974-79		2	H

OLDSMOBILE

Year	Model	Bbl.	M
6 Cylinder			
1964-79	225, 250 Eng.	1	C
1963-73	330, 350, 394, 400, 425, 455 Eng.	2	C
1966-79	330, 350, 400, 425, 455 Eng.	4	C
1972	350 Eng.	2	R
1974-79	350 Eng.	2	R

PINTO

Year	Model	Bbl.	M
4 Cylinder			
1971-79		2	F

PLYMOUTH (Barracuda,

Year	Model	Bbl.	M
6 Cylinder			
1960-79	225 Eng.	1	C
1970-79	225 Eng.	1	H
8 Cylinder			
1962-79	273, 318 Eng.	2	C
1963-79	360, 361, 383, 400 Eng.	2	C
1966-79	273, 350, 383 Eng.	4	C
1967-79	413, 426, 440 Eng.	4	C
1971	318 Eng.	2	R
1972-79	340, 360, 400 Eng.	4	C
1973-79	440 Eng.	4	C

PONTIAC (Firebird, Ten

Year	Model	Bbl.	M
6 Cylinder			
1984-79	215, 230, 250 Eng.	1	C
8 Cylinder			
1963-73	326, 350, 389, 400, 455 Eng.	2	C
1966-79	350, 400, 428, 455 Eng.	4	C
1969	350 Eng. (Tempest-Firebird)	2	R
1971	307 Eng.	2	R
1972	307 Eng.	2	R
1972	350 Eng.	2	R
1974-79	350 Eng.	2	R

THUNDERBIRD

Year	Model	Bbl.	M
1957-60	312 Eng.	4	H
1961-72	390, 428, 429, 460 Eng.	4	F
1970-79	429 Cobra Jet Eng.	4	F

May 14, 1981

Mr. Mike Rucker
Energy Managers of America
11607 West 43th Avenue
Wheat Ridge, CO 80033

Dear Mr. Rucker:

I am sorry that a list of independent laboratories was not included in our May 1, 1981 mailing to you.

The laboratory list is enclosed with this letter.

Sincerely,

Merrill W. Korth
Device Evaluation Coordinator
Test and Evaluation Branch

Enclosure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR, MICHIGAN 48105

June 10, 1981

OFFICE OF
AIR, NOISE AND RADIATION

Mike Rucker
Energy Managers of America
11407 W. 48th Avenue
Wheatridge, CO 80033

Dear Mr. Rucker:

We have reviewed your recent application for an evaluation of the "Sav-A-Mile" fuel economy retrofit device. Following are two comments on your application:

1. There is reference made to tests being run by California Air Resources Board but there is no mention of the test plan. Any testing performed in support of an application for an EPA evaluation should be based on a test plan approved by EPA. This is to ensure that the test plan will adequately evaluate the device and that the results will be acceptable to us.

2. The test results from Cummins Carolinas, Inc. are inadequate from an evaluation standpoint. It does not appear that the tests were conducted in accordance in the current Federal Test Procedure as described to you in my letter of May 1. In any case, complete test data from each test should be supplied and they should include all "before and after" tests run.

We hope these comments are helpful to you in conducting a test program to evaluate Sav-A-Mile. We are looking forward to reviewing the results from the testing being performed at the California Air Resources Board. We are also expecting your test plan for an evaluation at a laboratory which we have recognized. We are prepared to help you develop this plan.

In order to process applications for EPA evaluations more efficiently, we have established a schedule for each. On this basis, I ask that you respond to this letter by June 30 and to plan on submitting test results from an EPA recognized laboratory by July 13. Please contact me if you have any questions.

Sincerely,

Merrill W. Korth

Merrill W. Korth, Device Evaluation Coordinator
Test and Evaluation Branch

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR, MICHIGAN 48105

OFFICE OF
AIR, NOISE AND RADIATION

July 7, 1981

Mr. Mike Rucker
Energy Managers of America
11407 West 48th Avenue
Wheatridge, CO 80033

Dear Mr. Rucker:

In my letter to you of June 10, 1981, I explained the requirement for testing of "Sav-A-Mile" by an independent laboratorary recognized by EPA. I also asked for the submittal of a test plan at that time. I requested that you respond to my letter by June 30, 1981. We have not received your response. Since you have not supplied EPA with appropriate test data for "Sav-A-Mile", we have insufficient data to support your claim for its fuel economy benefit.

Under the provisions of Section 511 of the Motor Vehicle Information and Cost Savings Act, EPA is required to evaluate your additive on the basis of available information and publish the results of our evaluation in the Federal Register.

We have begun to prepare our report. Please contact me immediately if you do not understand this course of action. My telephone number is (313) 668-4299.

Sincerely,

Merrill W. Korth

Merrill W. Korth, Device Evaluation Coordinator
Test and Evaluation Branch

July 23, 1981

Mr. Merrill W. Korth
Device Evaluation Coordinator
Test and Evaluation Branch
United States Environmental Protection Agency
Ann Arbor, MI 48105

Dear Merrill;

Concerning your letter of July 7. Due to some conflicts, we have been going in too many directions at once in our company and I was forced to go to our office in Hawaii and was unable to answer your letter of June 10th. Please find enclosed the test data we have received from Custom Engineering Performance and Emmission Laboratory. Our tests there will be continuing concerning a fuel consumption test and concerning testing of other vehicles. I hope you will accept this preliminary data. The laboratory in California is having a hard time finding a 4 cylinder engine which will comply with California specifications. I will be sending you other information as soon as I receive it.

Sincerely yours,

Michael Rucker

Michael Rucker
President

MR/dm

Enclosure

NOTE: No data was enclosed with this letter.
Mark

CUSTOM ENGINEERING
Performance and Emissions Laboratories

Mr. Ray Wickstrom
E.M.A.
11407 West 48th Avenue-Suite B
Wheat Ridge, Colorado 80033

June 22,1981

Mr. Wickstrom;

Custom Engineering would like to take this opportunity to thank you for selecting our laboratory to perform the tests required to prove the benefits of your companies device.

The following tests were performed on a 1979 Ford F100 pick-up with a 302 C.I.D. engine. These were run in accordance with CFR 40. July 1, 1979, where applicable.

Baseline

-EPA 1975 FTP Cold Start

-EPA Highway Fuel Economy Test

-1975 FTP Cold Start Test with device

-EPA Highway Fuel Economy Test with Device

The test vehicle was received and checked in at Custom Engineering for Baseline pre-test tune up, checked and adjusted if necessary, to comply with manufacturers engine idle perameters such as timing and RPM.

Immediately following completion of the baseline tests, the device was installed by Custon Engineering per E.M.A. instructions (see attachment II). After the installation the vehicle was run on the Dyno for approximately 15 minutes @ 40 MPH. The purpose of this is to verify the function of the device through a driving break-in period. At the conclusion of this period the idle emission perameters were re-checked, and a drop in emissions was noted.

-Idle CO from .5% to .3%

CUSTOM ENGINEERING
Performance and Emissions Laboratories

-Idle HC from 150ppm to 90ppm

The test vehicle was then scheduled for tests with the device.

The results of these tests are shown on attachment I. The emission results for hydrocarbons (HC), carbon monoxide(CO), carbon dioxide(CO_2), and oxides of nitrogen, corrected for humidity(No_{xc}) are reported in grams per mile (g/mi). Fuel Economy reported as miles per gallon (MPG) is calculated using the carbon atom balance method as per CFR 40.

The test results were obtained using the described test vehicle and no inference should be made as to how other types of vehicles may perform under similar conditions. A continuation of this program is scheduled which will involve a 4-cyl engine as soon as the vehicle has been procured.

Sincerely,

K. L. Downing

K.L. Downing, General Manager
Custom Engineering

C.C./Billy Closson

7091-A Belgrave Ave (714) 891-5704 Garden Grove, Ca. 92641

CUSTOM ENGINEERING
Performance and Emissions Laboratories

E.M.A.

Attachment I

1979 Ford F100 pick-up
302 C.I.D. w/ auto trans.
V.I.N. F10GREC6669
Inertia Wt. 4000lbs.
Odometer 51338

75 FTP	HC	CO	CO_2	No_x	F.E.
Baseline	1.38	7.17	627.59	1.76	13.79
W/ Device	1.2	2.68	619.47	1.73	14.1
% Difference	-13%	-63%	-1.3%	-1.7%	+2.2%

HWFET					
Baseline	.58	.12	465.64	2.223	18.975
W/ Device	.6	.1	449.83	1.99	19.6
% Difference	+3%	-17%	-3.4%	-10.5%	+3.3%

7091-A Belgrave Ave. (714) 891-5704 Garden Grove, Ca. 92641

CUSTOM ENGINEERING
Performance and Emissions Laboratories

TESTING AGREEMENT

CE SALES ORDER #_____ DATE 6/2/21

Agreement made this day between Custom Engineering Performance and Emissions Laboratories, hereinafter called CE and FAMILY MANAGEMENT ASSOC. hereinafter called the "CLIENT".

1. Tests — CE agrees under the terms and conditions set forth herein to perform the following testing program:

   Miscellaneous preparatory efforts -- including consultation time, tune-up procedures, etc. -- to enable definition of the extent of testing to be done; followed by testing according to stipulated dyno-CVS procedures, at the appropriate charges by prior mutual agreement as specified in attachment(s) to this testing agreement.

1.1 Time — The tests will be conducted, consistent with CE's prior commitments, as soon as possible after this Testing Agreement is completed by both CE and CLIENT.

2. Charges — Service of CE personnel and equipment will be billed per attached schedule. Charges will be based on each hour or fraction thereof. Services to be rendered are shown on the attachment to this agreement.

3. Conditions — CE and CLIENT incorporate the condition below into this agreement.

CLIENT agrees that no attempt at recovery of payment is to be based on any conditions of the test vehicle which would not characterize the Certified or stock configuration which such vehicle represents unless such condition is specifically provided for in this Agreement. Any characteristic of the test vehicle which is incompatible with the FTP (40 CFR 85) or the standard testing facility and equipment which CE uses in the implementation of the test procedures, or any result of such a characteristic which occurs during the test sequences, will not justify recovery of payment.

3.1 CE will furnish to the CLIENT at the expiration of this Agreement, three copies of a written report of the test results. A computer printout analysis will be considered the same as a written report. Additional reports or documentation will be provided for additional cost to be mutually agreed upon in advance.

3.2 CE agrees to hold the results of these tests in confidence and to use its best effort to assure that they are not divulged to any other party without authorization from the CLIENT in writing. CE makes no representations, nor assumes responsibility for any results or information other than as they appear in the complete written report referred to above.

3.3 CLIENT agrees not to use the CE name or excerpts from the report in connection with any advertising or sales promotional purposes without specific prior approval of CE in writing.

3.4 CE agrees to use its best effort to maintain the security of CLIENT'S device while in the possession of CE and to hold in confidence confidential information disclosed to CE in writing in order to facilitate performance of the tests.

3.5 It is agreed and understood that CE is acting as an independent contractor in the performance of any and all work hereunder and shall be solely liable and responsible for the payment of all legal claims made by its employees or agents on account of any damages to property or persons arising out of or in connection with the performance of this Agreement.

3.6 In the event of cancellation or alteration of this schedule by CLIENT, CE reserves the right to assess a charge to recover any losses or costs resulting from such cancellation or alteration. The total charge shall not exceed twenty percent (20%) of the estimated project cost.

4. Payment CLIENT agrees to the following method of payment:

☐ Cash in advance - Certified Check #_____ Date _____.

☐ Net upon receipt of invoice - P.O. #_____.

5. Special Conditions Testing Special conditions and terms to this specific testing Agreement are included in Attachment (2) if applicable.

☐ Not Applicable

☐ Applicable

6. AUTHORIZATION In witness thereof the parties hereto set their hands:

Client [illegible]

Address 11047 W 48th Ave Suite B

City/State Wheatridge CO 80033

SIGNATURE [signature]

Title Sales Director

Date June 4, 1991

Phone/Area Code 303 - 420 - 2851

CUSTOM ENGINEERING
Performance and Emissions Laboratories

Signature [signature]

Title [illegible]

Date 6/12/91

August 13, 1981

OFFICE OF
AIR AND WASTE MANAGEMENT

Mr. Michael Rucker, President
Energy Managers of America
11407 West 48th Avenue - Suite B
Wheat Ridge, CO 80033

Dear Mr. Rucker:

I have received your letter dated July 23, 1981. Unfortunately, it appears that you are having Sav-A-Mile tested before submitting a test plan to us for comment and approval. As I emphasized in my letter of June 10, any testing performed in support of an application for an EPA evaluation should be based on a test plan approved by us. This is to ensure that the test plan will adequately evaluate the device. For example, in the data supplied in your letter, it appeared that only one test sequence was performed with and without your device. Because of test and vehicle variability, we insist on duplicate test sequences at each test point. Also, data supplied to us should be complete, e.g., bag by bag analysis, and not just the final test results. This allows us to perform a more thorough evaluation.

I must must inform you that Custom Engineering is no longer on our list of recognized laboratories. They have not yet submitted an application in response to our new requirements. I am enclosing a current list of recognized facilities for your use in the future.

In order to process these applications in a timely manner, we have established a schedule for each. Although we are now behind schedule with your device, I will grant you an extension until August 24 for submission of a test plan to me. By September 15, I will expect the results of testing at a recognized laboratory. Please contact me if you have any questions. My telephone number is (313) 668-4299.

Sincerely,

Merrill W. Korth
Device Evaluation Coordinator
Test and Evaluation Branch

Enclosure

cc: 511 File "Sav-A-Mile"