

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-93
Relating to Exemptions under Section 27156
of the Vehicle Code

AUTOMOTIVE ENERGY SYSTEMS, INC.
"SCOVER ENERGY SYSTEM"

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-5;

IT IS ORDERED AND RESOLVED: That the installation of the Scover Energy System manufactured by Automotive Energy Systems, Inc. of 4827 N. Sepulveda Blvd., Suite 410, Sherman Oaks, CA 91403 has been found to not reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for 1979 and older gasoline powered vehicles except 1977-1979 Chrysler and Porsche vehicles, and engines equipped with the Chrysler lean burn system, feedback controls, or three-way catalysts.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those submitted by the device manufacturer.

Changes made to the design or operating conditions of the device, as exempted by the Air Resources Board, that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board. Exemption of a kit shall not be construed as an exemption to sell, offer for sale or advertise any components of the kit as individual devices.

This Executive Order does not constitute any opinion as to the effect that the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF THE "SCOVER ENERGY SYSTEM".

No claim of any kind, such as "Approved by Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

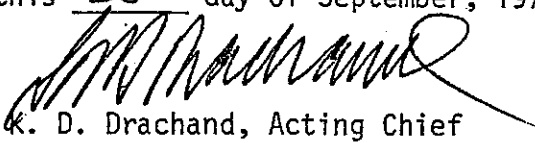
Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

"43644. (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at El Monte, California, this 28th day of September, 1979.


K. D. Drachand, Acting Chief
Mobile Source Control Division

State of California
AIR RESOURCES BOARD

September 27, 1979

Staff Report

Evaluation of the Automotive Energy Systems, Inc. "Scover
Energy System" in Accordance with Section 2222, Title 13
of the California Administrative Code

I. Introduction

Automotive Energy Systems, Inc. of 4827 N. Sepulveda Blvd, Suite 410, Sherman Oaks, California 91403 has submitted an application for exemption of the Scover Energy System from the prohibitions of Section 27156 of the California Vehicle Code.

II. System Description

The Scover System is an exhaust gas recirculation device consisting of a reed valve mounted on the exhaust manifold and a flexible metal hose from the valve to a fitting on the air cleaner. Exhaust gas is metered through the valve and enters the clean side of the air cleaner above the carburetor inlet. When the exhaust manifold is in a condition of negative gage pressure, the direction of flow is reversed and clean air is pulled into the exhaust manifold.

Timing is specified at OEM setting except on pre-1975 vehicles requiring premium fuel where retard of 50% of the OEM value is recommended. The applicant represents the device as recirculating approximately 1% of the total exhaust flow on vehicles with OEM EGR valves and 6% of the total flow on vehicles without EGR valves.

III. Applicants Submittal

A. Operating Principles

According to the applicant, the Scover Energy System performs three major functions: exhaust gas recirculation, fresh air backflow to the exhaust manifold and cylinders, and high frequency oscillation of the intake air/fuel mixture.

The effect of exhaust gas recirculation is to enrich the intake air/fuel mixture allowing adjustment of the carburetor and timing for increased fuel economy. The exhaust gas recirculation also preheats the mixture for better cold engine performance and increases engine life.

The applicant also states that fresh air drawn into the exhaust manifold during the valve overlap period will scavenge residual exhaust gas in the cylinders and cause leaning of the air/fuel ratio to increase fuel economy in certain operating modes. This fresh air return also serves to relieve vacuum in the cylinders caused by deceleration.

High frequency sound wave oscillations from exhaust gas pulses passing through small holes in the valve are conducted to the carburetor inlet where AES, Inc. believes they increase turbulence to aid in air/fuel vaporization and mixing. These oscillations are intended to improve burning characteristics and increase fuel economy.

B. Benefit Claims

Automotive Energy Systems, Inc. claims that the Scover Energy System will:

- 1) increase fuel economy
- 2) reduce emissions
- 3) reduce engine wear
- 4) reduce oil consumption and carbon build-up
- 5) allow use of regular grade fuel in vehicles that require premium grade
- 6) increase performance
- 7) allow better hot and cold starts

C. Testing

Automotive Energy Systems, Inc. submitted data as shown in Table I. The net percent changes from baseline are shown in parentheses.

Table 1 - Applicant's Emission Test Results

<u>Vehicle</u>	<u>Test</u>	<u>HC g/mi</u>	<u>CO g/mi</u>	<u>NOx g/mi</u>	<u>FE mi/gal</u>
1978 Honda Civic CVCC, 91 CID	Baseline-cold CVS-II	0.53	5.03	1.43	26.23
	Device-cold CVS-II	0.60	5.19	1.62	25.36
		(13%)	(3%)	(12%)	(-3.3%)
1979 Chevrolet 305 CID	Baseline-cold CVS-II	0.55	1.93	1.13	15.54
	Device-cold CVS-II	0.60	2.72	1.06	15.34
		(9%)	(41%)	(-6%)	(-1%)
1979 Chevrolet 305 CID	Baseline HFET	0.04	0.0	1.43	21.48
	Device HFET	0.04	0.0	1.38	21.37
		(0%)	(0%)	(-3%)	(-1%)
1968 Ford, 289 CID	Baseline-cold CVS-II	3.06	23.19	4.59	14.69
	Device-cold CVS-II	3.08	23.19	3.70	14.87
		(0%)	(0%)	(-19%)	(1%)
1968 Ford 289 CID	Baseline HFET	1.69	6.44	6.00	20.31
	Device (4 holes) HFET*	1.71	7.07	5.26	20.62
		(1%)	(10%)	(-12%)	(2%)
	Device (6 holes) HFET	1.80	8.14	4.68	20.83
		(7%)	(26%)	(-22%)	(3%)

Additional data was presented on an Audi and a Buick using the Japanese 10-mode exhaust emissions test, and a 1972 Ford Mustang using the CVS-II. The Audi and Buick are considered unacceptable test vehicles because their odometer mileage (1450 and 237 miles respectively) indicates that they may not be stabilized with respect to emissions and fuel economy. The Mustang was tested with a defective carburetor, and is also considered unsuitable as a test vehicle.

*The Scoyer valve is obtainable in various metering configurations to accommodate different engine sizes. The number of holes in the orifice plate controls the metering. A four hole plate is the proper size for a 289 CID engine.

IV. Air Resources Board Testing

The Air Resources Board (ARB) conducted a confirmatory test on a 1974 Chevrolet Vega with a 140 CID, 4 cylinder engine. The base-line tests were performed with the vehicle adjusted to vehicle manufacturer's specifications. The device was installed according to the device manufacturer's instructions, except that timing was retarded as for a vehicle using premium grade fuel. The Vega was designed for regular grade fuel, and the test results given in Appendix II are therefore not used in the evaluation.

A retest was conducted on the same car at the correct (OEM) timing setting. The results of the retest are presented below in Table 2.

Table 2 - ARB Emission Test Results

<u>Vehicle</u>	<u>Test</u>	<u>HC</u> <u>g/mi</u>	<u>CO</u> <u>g/mi</u>	<u>NOx</u> <u>g/mi</u>	<u>FE</u> <u>mi/gal</u>
1974 Chev Vega, 140 CID	Baseline - cold CVS-II	2.46	13.44	1.97	20.8
	Device - cold CVS-II	2.01	13.98	1.85	20.6
		-18%	4%	-6%	-1%
1974 Chev Vega, 140 CID	Baseline - HFET	1.04	3.07	1.60	26.7
	Device - HFET	1.09	3.33	1.47	27.6
		5%	-8%	-8%	3%

A filter was used on a hot start CVS-75 test to trap particulates and measure possible carburetor contamination. The filter accumulated 0.006 grams of particulates during the hot-start CVS-75 cycle, or approximately 0.0005 grams per mile with a total exhaust flow through the valve of 4.354 standard cubic feet (SCF) or approximately 0.392 SCF/mi.

V. Discussion

Evaluation of the emission data in table I shows a borderline (10-15%) tendency to increase emissions in the test vehicles. The 1979 Chevrolet shows a 41% increase in CO. No significant increase in fuel economy is evident from any of the tests.

The exhaust carries approximately 0.0005 grams of particulates per mile for the test vehicle. This was measured by installing a fiberglass filter in the Scover valve line and weighing the filter before and after a hot-start CVS-II. The amount of particulates is insignificant in this case, but could conceivably cause problems in vehicles which have Scover valves with higher rates of exhaust gas recirculation to the air cleaner or poor engine condition. OEM exhaust gas recirculation is a nominal 9-10 standard cubic feet per minute (SCFM) compared to 4-5 SCF for the entire CVS-II cycle through the Scover valve (approx. 31 minutes). The amount of Scover recirculation in this vehicle is a small percentage of the OEM recirculation except that the Scover valve operates in all engine modes while an OEM valve does not.

Adding inert exhaust gas to carburetor inlet air has the effect of causing enrichment of the air/fuel mixture which can only be slightly compensated for by adjusting idle mixture screws. If the exhaust gas recirculation is large enough to reduce NO_x then it could also be expected to decrease fuel economy and increase HC

and CO. The HC and CO effects of enrichment might be offset if the cylinders are scavenged as the applicant describes, but then the NOx could be expected to increase because the residual exhaust gases in the cylinders which act to lower NOx are removed.

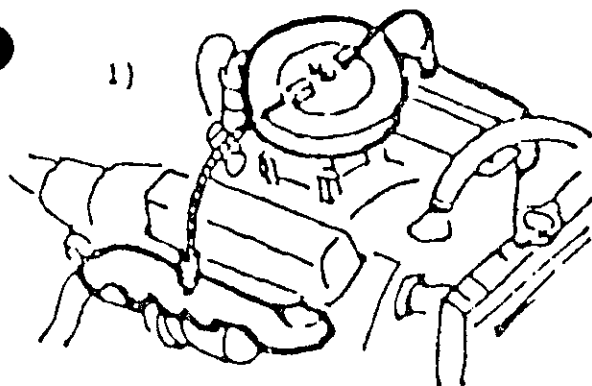
Under the conditions stated in an Executive Order, the AES, Inc. may not claim reduced emissions. Other claims such as increased fuel economy and performance have not been substantiated. Some, claims appear to be contradictory. For instance, timing retard and exhaust gas recirculation are known to reduce fuel economy and performance in most cases.

VI. Recommendation

The staff recommends that the Executive Officer exempt the Scover Energy System from the prohibitions of VC 27156 as no significant increase in emissions can be documented.

The Scover Energy System must be installed in a vertical position on the exhaust manifold. (See illustrations.)

1)



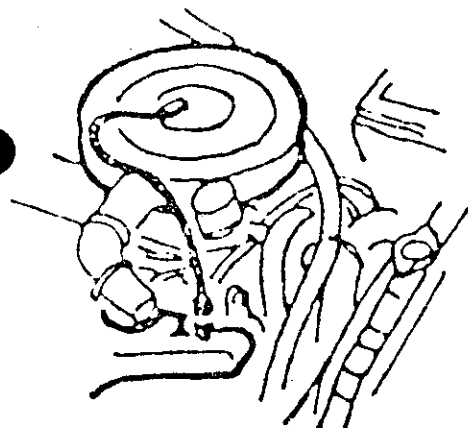
TYPICAL V-8 OR V-6 SCOVER INSTALLATION USING LEFT OR RIGHT EXHAUST MANIFOLD, WHICHEVER IS MOST CONVENIENT.

- 1) Locate a suitable position on the exhaust manifold. Preferably, near where two exhaust ports join together and where the Scover Energy System can be mounted in a vertical position.

Note: In some cases it may be necessary to drill the manifold hole at a nonvertical position, then use adapter (included in package) in order to correctly mount the Scover Energy System in a vertical position.

- 2) After locating correct position, drill a hole using a 7/16 drill bit in the exhaust manifold, using grease as a lubricant to catch filings. Tap the hole deep, using a 1/4 - 18 NPT tapered tap. Start engine, part throttle, to blow out any remaining filings from manifold area. Turn engine off.

- 3) Turn the lock nut to its top position on the male thread of the Scover unit. When adapters are being used, install the adapter into the manifold making sure it is tight. Install Scover unit into adapter and/or manifold hand tight. Tighten lock nut to secure Scover unit to adapter and/or manifold.



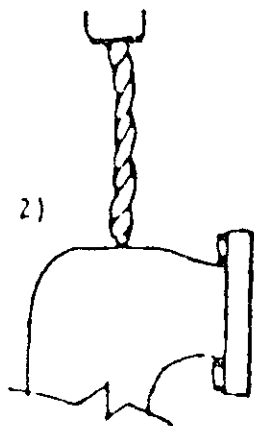
TYPICAL 4 and/or 6 CYLINDER SCOVER INSTALLATION

TOP MANIFOLD INSTALLATION

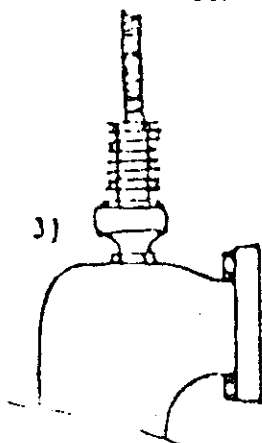
OR

SIDE MANIFOLD INSTALLATION

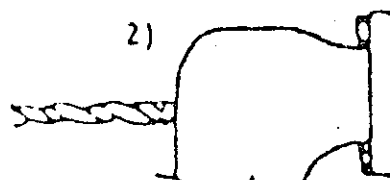
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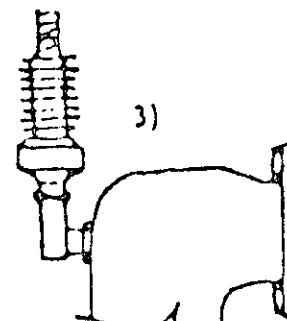
3)



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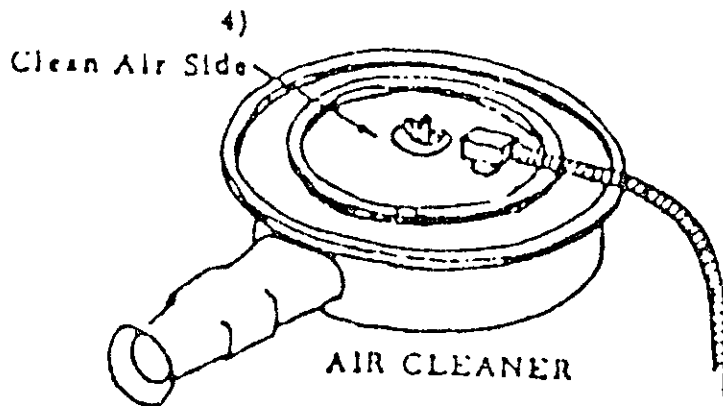


3)



- 4) Determine the correct position on the clean air side of the air filter housing.

Note: The clean air side is defined as being a position after the air has passed through the air filter cleaning element and is entering the carburetor. If it is impossible to correctly install the tubing to the top side of the air filter housing due to insufficient hood clearance between the housing and the hood, the connection should be made to the underside of the housing. If doubtful about the hood clearance, a check should be made by placing a lump of putty on the housing and closing the hood. Then measure the clearance available.



Drill a 7/16" hole at the selected position in the housing. Tighten the tubing into place using lock nut that is provided on the connector.

Air Filter Connector - The lock nut on the inside of the air cleaner housing must be secured from any possibility of working loose.

- 5) Now the engine must be started and run until it has attained normal operating temperature. Then, adjust to manufacturer's specifications.

Note: All engine timing must remain set at manufacturer's specifications with the exception listed below.

- 6) Engines manufactured prior to 1975 which require premium fuel can use regular fuel with the Scover Energy System by retarding timing 50% of value, i.e., manufacturer's specification 6° BTDC, set timing with Scover Energy System to 3° BTDC.
- 7) Attach timing instruction label adjacent to the vehicle manufacturer's tune-up label in engine compartment.