

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-2-2
Relating to Exemptions under Section 27156
of the Vehicle Code

TVI MARKETING, INC.
"TURBO VAPOR INJECTOR"

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 Section 39023 of the Health and Safety Code;

IT IS ORDERED AND RESOLVED: That the installation of the "Turbo Vapor Injector" manufactured by TVI Marketing, Inc., has been found to not significantly reduce the effectiveness of required motor vehicle pollution control devices and is therefore exempt from the prohibitions of Section 27156 of the Vehicle Code for 1975 and older model-year vehicles. This device consists of a plastic bottle, rubber hose, and proprietary fluid. This exemption is for Model No 5, CA-03 and VA-04 devices equipped with .022 inch orifice diameter, and fluid specification number GT074.

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

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 "TURBO VAPOR INJECTOR" DEVICE.

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 unlawful, untrue or misleading advertising, and Section 17534 makes violation punishable as a misdemeanor.

Sections 39130 and 39184 of the Health and Safety Code provide as follows:

"39130. No person shall install, sell, offer for sale, or advertise, or, except in an application to the board for certification of a device, represent, any device as a motor vehicle pollution control device unless that device has been certified by the 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 section is a misdemeanor."

"39184, (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the board for accreditation 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 accredited by the board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as an accredited device which, in fact, is not an accredited 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.

Executive Order D-2-1, dated February 28, 1974, is superseded and of no further force and effect.

Executed at Sacramento, California, this 30th day of July, 1975.

WILLIAM SIMMONS
Executive Officer

State of California

AIR RESOURCES BOARD

July 21, 1975

Staff Report

Evaluation of TVI Marketing, Inc.,
"TURBO VAPOR INJECTOR"
for Exemption from the Prohibitions of
Section 27156 of the Motor Vehicle Code

I. Introduction

TVI Marketing, Inc. of Marysville, Michigan, has applied for an exemption from the prohibitions of Section 27156 of the Motor Vehicle Code for its "Turbo Vapor Injector". This section prohibits the installation of any device which reduces the effectiveness of the motor vehicle emission control system. The applicant is requesting an extension of his exemption to include the 1975 and older model year vehicles. This device was originally granted an exemption for the 1974 and older model vehicles by Executive Order D-2-1 dated February 28, 1974. The "Turbo Vapor Injector" models CA-03 and VA-04 are still in use but the fluid has been changed (See system description below).

II. System Description

This device consists of a vapor injector system and a proprietary fluid which is admitted into the PCV system. A plastic bottle is mounted

in the engine compartment with a rubber hose providing the connection with the engine.

According to the applicant, the proprietary fluid is now manufactured by the Grow Chemical Company and is designated by fluid specification number G-1074. The fluid composition is considered similar to the fluid spec. no. 1072 previously exempted.

The control valve which admits vapor to the engine is located on the cap of the bottle. This valve can be adjusted to control the flow rate of the vaporous-fluid mixtures and has a maximum orifice diameter of 0.022 in. The system contains a standpipe which provides venting to the atmosphere. The same model device is used for all vehicle applications.

III. System Function

The vapor injection system operates by applying manifold vacuum to a tee in the PCV line thereby allowing fluid vapor from a storage tank to be displaced through an interconnecting rubber tube into the intake manifold of the engine. Air enters the fluid tank through the top of a standpipe creating bubbles at the bottom end due to the venting action

caused by the engine vacuum. The formed bubbles and subsequent rising action enhance the evaporation rate of the fluid. This vaporous-fluid-mixture generally enters the engine through the PCV line.

IV. System Evaluation

The Air Resources Board Laboratory evaluated the "Turbo Vapor Injector" by performing the following test sequence on three vehicles.

These vehicles were:

1. 1975 Ford Pinto, license No. 195 CVF, 140 CID, 2-bbl., 4 cylinder engine.
2. 1975 Chevrolet Vega, license No. 989 LHV, 140 CID, 2-bbl., 4-cylinder engine.
3. 1975 Datsun B210, registration No. HLB 210 2-bbl., 85.2 CID, 4-cylinder engine.

Each vehicle received the following preparation before each test.

1. The engine operating parameters were checked and set to manufacturers specification if required.
2. The fuel tank was filled to capacity.
3. The vehicle was operated for 10 miles on the road to purge the evaporative emissions cannister.
4. The evaporative emission cannister was disconnected from the vehicle's fuel tank before the cold soak.
5. The evaporative emissions cannister was reconnected before running the CVS test.

A CVS-1975 cold start baseline test was made on each vehicle. The device was then installed and adjusted in compliance to the manufacturer's instructions (Appendix A). A follow-up CVS-II cold start test was then made with the device in operation. The test on the Vega was repeated to verify the results of the first test.

The results of the CVS-II tests are as listed:

	Emission, g/mile			Fuel Economy
	HC	CO	NOx	MPG
<u>1975 Pinto</u>				
Baseline	0.23	2.93	1.04	13.8
With TVI Injector	0.22	2.78	1.09	13.9
<u>1975 Datsun</u>				
Baseline	0.34	2.96	1.96	20.8
With TVI Injector	0.36	2.94	2.11	20.8
<u>1975 Vega (Test #1)</u>				
Baseline	0.38	6.89	1.62	17.1
With TVI Injector	0.60	7.47	1.58	15.7
<u>1975 Vega (Test #2)</u>				
Baseline	0.48	6.17	1.35	16.5
With TVI Injector	0.41	6.00	1.60	15.6
<u>Overall Average Results</u>				
Baseline	0.33	4.14	1.50	17.1
With TVI Injector	<u>0.38</u>	<u>3.91</u>	<u>1.60</u>	<u>16.8</u>
% Change	+15.2	-5.6	+6.7	-1.8
Significance*	No	No	Yes	Yes

*The significance of the data was determined by the paired "t" method.
(See attached)

V. Conclusion

The increase in hydrocarbons was found to be insignificant. The increase in nitrogen oxides was significant but not enough to justify the denial of the device from the prohibitions of Section 27156 of the Vehicle Code. The staff, therefore, recommends that TVI Marketing, Inc., be granted this exemption for its "Turbo Vapor Injector" for the 1975 and older model motor vehicles in all classes.

Device : With TVI Injector
 Vehicle: 1975 Pinto, Datsun, Vega

Statistical Analysis

Since the data were collected by the back-to-back procedure, the "t" statistic for paired observations was used to analyze the data.

Purpose : rough screening test
 Error type: $\alpha = \beta = 0.2$
 Detectable difference = 1.0σ
 Hypothesis: Device is not greater than baseline

<u>Mean</u>	<u>Hydrocarbons</u> (gm/mi)	<u>Carbon Monoxide</u> (gm/mi)	<u>Oxides of Nitrogen</u> (gm/mi)	<u>Fuel Consumption</u> (gal/mi)
w/Device	0.398	4.798	1.595	0.062
Baseline	0.358	4.738	1.493	0.060
% difference	11.189	1.266	6.868	0.002
Significance:	No	No	Yes	Yes
Computed "t"	0.636	0.340	1.637	1.481
Degrees of freedom	3	3	3	3
Critical "t"	.978	.978	.978	.978
Conclusion*	$D \leq B$	$D \leq B$	$D > B$	$D > B$

*Conclusions are made upon 80% confidence level.

B = Baseline; D = Device

IMPORTANT

The TURBO VAPOR INJECTOR performs only one function; it improves the efficiency of combustion of your engine. IT WILL NOT CORRECT ENGINE MALFUNCTIONS, such as faulty or poorly adjusted carburetors or ignition system problems. Therefore, to take maximum advantage of the improvements offered by the TURBO VAPOR INJECTOR, it is best to have the engine properly tuned and running as well as it can before installing the unit.

-PLEASE-

Check your gas mileage before you install your TVI unit. Most people don't know what their present mileage is so they don't know what improvement they are getting from the TVI. Many new cars today often get less than 12 miles per gallon so performance of 14 mpg to 15 mpg following installation of the TVI Unit could represent a 15% to 25% actual improvement in mileage.

In the TVI carton you will find:

- A reservoir containing TURBO FUEL, with a vapor air space at the top, in a bracket
- A 4 foot black rubber connector hose
- A small plastic screen with a short plastic tube (bubbler tube) connected to it
- A plastic bag containing 2 metal "Y"'s, a plastic "T" and 2 screws
- Hose clamps
- Instructions and Warranty Card.

1. MOUNTING THE BRACKET

Locate a space under the hood of the car where the bracket and unit will fit.

Leave the unit in the bracket to do this.

The Reservoir should not be too close to belts or pulleys which could rub against it, and should be as far from the exhaust manifold as practical. It is best to

have the unit as vertical as possible.

Hold the unit in the best location and mark the position of the bracket. Then

remove the Reservoir from the bracket,

hold it back in place and drill or punch

two small holes through two of the mounting

holes in the bracket. Then use the two

sheet metal screws from the plastic bag to

attach the bracket firmly in place.

2. INSTALLING THE RESERVOIR

Prior to placing the Reservoir in the bracket, remove the red plug from the top

of the Reservoir, and insert the curved

bubble tube into the hole. The bubble

tube is curved, so position it so that

the bottom of the bubble tube is not

behind the label so that you can later

see the bubbles for correct adjustment.

This will be a tight fit so make sure

the screen is seated firmly into the

hole until the flare top is flush with

the top of the metal collar, as shown

in the picture. Then place the Reser-

voir in the bracket.

3. HOOKING UP THE UNIT

Remove the carburetor air filter unit

complete and check condition of air

filter - replace if dirty. Locate the PCV valve hose. This is a black hose running from the top of the rocker arm cover or from the top of the manifold chamber into the base of the carburetor or intake manifold. If in doubt, a sharp pull upward on the PCV valve will remove it from its seat and it will look like the picture at right. Reinsert the PCV valve and trace the hose to where it enters the carburetor base or intake manifold. The TVI "Y" or "T" fitting must be installed between the PCV valve and the carburetor base or intake manifold. There must be no other connections into the PCV line between the "Y" or "T" fitting and the carburetor base or intake manifold.

For cars with PCV valves located at the base of carburetor, special fittings will be required and are available upon request or use "ALTERNATE METHOD".

With a sharp knife, cut the PCV valve hose in a convenient place, as close to the carburetor as practical. Into the cut, insert a snug fitting "Y" or "T" that fits the PCV hose. The leg of the Y should point toward the carburetor. Use clamps as shown (spring type) or stainless screw type as shown in the diagram, at all hose junctions of the "Y" or "T". Vacuum leaks at this point can nullify increased mileage. Then attach one end of the TVI connector hose to the open arm of the "Y" or "T" and the other end to the barbed outlet on the valve of the Reservoir. Always use as short a piece of

nose as possible and do not let the hose
does not lay across the top of the block
or the exhaust manifold, which gets ex-
tremely hot, or touch air conditioning
hoses.

B) ALTERNATE METHOD

On some cars, the activated charcoal filled evaporative emission canister is "Tee'd" into the PCV valve line. In this case, another vacuum line to the carburetor base should be used for the TVI Unit as the charcoal could absorb the TVI fuel and defeat the operation of the unit. Also, many cars already have accessories or other items "Tee'd" into the PCV line, in which case it is better to use an alternate line for entry into the carburetor base or intake manifold. On cars where this occurs, the easiest alternate line to use is the small tube running from the damper control in the bottom of the air intake. It is located under the air cleaner and runs to the base of the carburetor. The smaller "Y" furnished with the unit has two smaller ends which will fit this tube, and a larger end on the leg of the "Y" which fits the TVI connector hose. The "Y" should be installed as close to the carburetor as possible.

Some owners have reported better results using this method as their primary hookup instead of the PCV valve line.

4. ADJUSTING THE TURBO VAPOR INJECTOR

Start your engine and let it idle. It is best to have the car warmed up so it is idling at slow speed. Hold the valve body with one hand and gently remove the hose from the barbed outlet stem by twisting clockwise. Immediately block the hose with the end of your thumb. Assuming your engine is warmed up, remove your thumb. If the engine is properly tuned, the RPM's should drop slightly. If the

engine stalls, your mixture is too lean and a mechanic should set it up so that it drops off about 25 to 50 RPM's from manufacturer's specifications (found on the inside cowl of most cars after 1968), when the finger is removed.

If your engine speeds up by the addition of this air your mixture is too rich and should be adjusted by a mechanic. Introducing Turbo fuel into a too rich running engine will not result in the performance improvement you should expect. Once the carburetor is adjusted properly, reconnect the hose to the barbed stem and install clamp as per diagram. Loosen the 3/8 lock nut on the top of the TVI fuel metering valve and, using a narrow screw driver, turn the valve screw counter clockwise to open it. It is fully closed to prevent leaking during shipment and may require several turns to open adequately. Adjust the valve stem so that a stream of bubbles can be seen coming up through the fluid and the surface of the fuel is agitated. Some Reservoir bottles are more dense than others and it may be necessary to remove the reservoir from the bracket and hold it at an angle so the bubbles can be seen coming up the side of the bottle. When the bubble rate is about right, you will be able to see individual bubbles but they will be coming too fast to count them. Bubbling too slowly will cause the unit not to work. Bubbling the unit too fast will use the fuel up too quickly without any significantly greater effect. With the bubble rate adjusted, hold the adjustment screw of the fuel metering

valve with the screw driver and gently tighten the lock nut with a small wrench. At this point check vacuum tightness of hose connections by placing your thumb firmly over bubble tube screen. The valve and cap should start to collapse and squeeze your thumb within about 5 seconds.

FURTHER ADJUSTMENTS AND SERVICING

Shortly after installing your TURBO VAPOR INJECTOR, you may notice that your engine is idling slightly faster than it had been and it may be necessary to have the air idle screw (s) adjusted on your carburetor to slow it down. This will result in further economies of operation. If you have the equipment available (tachometer), readjust the idle to the original idle RPM recommended by the manufacturer. If not, adjust the idle (cars equipped with automatic transmissions) to the point where the car just begins to move when you take your foot off the brake with the car in gear.

It is a good idea to check the reservoir periodically to check the fuel level and to be sure the bubble rate hasn't changed, and recheck the vacuum strength by placing thumb over bubble tube.

SPECIAL NOTE - REPLACING FUEL

The fuel supplied in the unit can be "topped up" as needed through the cap assembly. Be sure to leave a vapour air space at the top. After filling reservoir, make sure the cap is screwed on tight so as to prevent an air leak.

It is also recommended that you change your oil and oil filter after 1500 miles or so after initial installation as the de-carbonizing action of your TVI unit may overload your oil filter.

- 7 -

MECHANICS NOTE: If the spark advance is adjusted during the installation of the unit, be sure to remove the vacuum line from the distributor on cars so equipped and plug the line before making the adjustment.

Except for these simple steps, which is actually less attention than you normally give to your oil, battery and windshield washers, your TURBO VAPOR INJECTOR should operate completely trouble free for the life of your car.

INITIAL EFFECT: Some cars actually lose 1 to 3 miles per gallon for two or three tanks full of gas immediately after installation of the TVI unit. This is caused by the de-carbonizing of the engine by the TVI fuel and is only temporary. If improved performance is not observed after 3 to 6 tanks full of gas, refer to trouble shooting guide.

IMPORTANT: The TURBO VAPOR INJECTOR is an important accessory and must be installed correctly and checked periodically. Air leaks into the TVI system are going to cause the unit to function less efficiently, so be sure all hose clamps are used at proper places (see "Schematic Diagram"). We recommend having a mechanic tighten the carburetor and intake manifold chamber.

NB

If after reading the instructions, you feel that a mechanic could do a better job - take the unit to a good garage and make sure they read the instructions. A properly installed unit will take about 45 minutes to 1 hour including minor adjustments where necessary.

It is uncommon that there are any problems with a correctly installed TURBO VAPOR INJECTOR. However, it is a manufactured item and field experience has shown that certain problems are possible. For this reason we are including this guide to correcting what problems might occur.

ON INSTALLATION:

Unit not bubbling - Check to be sure the valve is open (turn the adjustment screw counter-clockwise).

Connection may be made to the wrong hose. With the engine running pull the connector hose off the TVI cap assembly and put your finger over the end of the hose. If there is a vacuum it will try to pull your finger into the hose. If there is no vacuum, you are hooked up to the wrong hose or your PCV line is plugged.

No noticeable effect - The effect of the TVI is different on every car, depending on its condition, mileage and how the carburetor is adjusted. On some cars the effect is immediate and dramatic, on others it starts and builds very slowly. Give it time to work. It often takes three to six tanks full of gas run through the car to begin to get the full effect.

LEAKS IN THE SYSTEM: Check for air leaks anywhere in the system, around the cap, at the "Y" connector, around the PCV valve. Any leak anywhere will defeat the operation of the unit, even though the reservoir may be bubbling properly. This is the major cause of the failure of TVI units to work properly.

Re-check the hose the unit is connected into. If other things are connected into the same line, they may be adversely affecting the operation. Use the alternate hook-up.

EXCESSIVE FUEL USAGE RATE: Normal usage rate is 3,000 to 6,000 miles per refill of fuel.

Be sure the cap is on tight - If the cap is loose air will be drawn in under it at the top, causing the unit to stop working and using the fuel up completely in as little as 100 miles of operation.

Check the hook-up - If the connector hose is hooked into a common line with the evaporative emission cannister, the effect will be greatly reduced and the fuel will be used up in as little as 1,000 miles of operation.

Check the reservoir for leaks. It may have been rubbing against something.

UNIT STOPS WORKING:

Check the Fuel level - The reservoir may be empty. Refill.
Check to see that a leak has not developed somewhere in the system, usually around the PCV valve, or where PCV hose connects to carburetor.
Check the connector hose to be sure it is not plugged, broken, punctured or disconnected.

LOSS OR EFFECT:

Field experience has repeatedly shown that if the unit is working properly and then the effect begins to diminish or cease, the problem is with some other part of the engine, probably the carburetor, and the car should be checked by a qualified mechanic.

CAUTION

The TURBO VAPOR INJECTOR may cause your car to run so well for such extended periods of time you will have a tendency to skip the normal, recommended maintenance checks. DO NOT DO THIS. The TVI only affects the operation of your engine. All maintenance and safety checks should be performed at the intervals recommended by the manufacturer for the proper safe operation of your car.

INSTALLING THE TVI HOSE ON 1965 and EARLIER CARS

Cars built before 1966 do not have PCV valve hoses and another vacuum source must be used to draw the vapors into the carburetor. Many carburetors will have a 1/8th inch size pipe plug located somewhere on the base of the carburetor. Remove this pipe plug and replace it with a fitting having the proper screw threads on one end and a 1/4" barbed tube fitting on the other. These fittings

can be obtained from an auto supply store or some hardware stores.
Then attach the TVI hose to this fitting.

If there is no vacuum outlet on your carburetor anywhere, it may be necessary to have the base of the carburetor drilled and tapped to accept the screw thread-barbed fitting described above. Most garages should be able to do it satisfactorily.

You are now ready to begin enjoying driving your car as you probably haven't in years.

Thank you for installing a TURBO VAPOR INJECTOR on your car, and we wish you many years of enjoyable, economical, cleaner motoring.

TVI MARKETING

June, 1975

The TURBO VAPOR INJECTOR is Patented. Printed in Canada