

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-8-2
Relating to Exemptions under Section 27156
of the Vehicle Code

AIR QUALITY PRODUCTS
"66-70 PURE POWER"

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 a "66-70 Pure Power" high performance system manufactured by Air Quality Products has been found by the Board to not reduce the effectiveness of a required motor vehicle pollution control device on 1966 through 1970 model year vehicles with engine displacements of over 50 cubic inches, and therefore, vehicles so equipped are exempt from the prohibitions of Section 27156 of the Vehicle Code.

The "66-70 Pure Power" high performance system consists of a capacitive discharge ignition circuit, electric spark retard, and vacuum spark advance disconnect at engine speeds 3300 ± 200 rpm or less.

Changes made to the design or operating conditions of the device as originally submitted to the Air Resources Board for evaluation that adversely affect the vehicle's pollution control devices shall invalidate this Executive Order.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, OR APPROVAL BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ALLEGED BENEFITS OF THE "66-70 PURE POWER" DEVICE.

Section 17500 of the Business and Professions Code makes unlawful, untrue or misleading advertising and Section 17534 makes violation punishable as 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 Sacramento, California, this 26 day of March, 1974.

WILLIAM SIMMONS
Executive Officer

State of California

AIR RESOURCES BOARD

March 22, 1974

Staff Report

Consideration of Air Quality Products' Request
for Exemption of its Pure Power Device for Class
"A" Vehicles

I. Introduction

Air Quality Products, Inc. submitted an application dated December 28, 1973, for exemption of its Pure Power High Performance ignition system for 1966-70 class "a" vehicles under the provisions of Section 27156 of the Vehicle Code. The system comprises an emissions control system and a capacitive discharge ignition system identical with the Pure Power device previously exempted for 1966-70 class "b" through "f" vehicles. A copy of the application is attached, (Exhibit A). The application included system description and effect on emissions which was demonstrated with a fleet of representative vehicles.

Confirmatory tests of 2 class "a" vehicles were conducted at the Air Resources Board Laboratory to substantiate the manufacturer's claims. The device did not increase emissions and generally tended to reduce emissions.

The device, however, costs more than the statutory \$35 and cannot be considered for accreditation as an oxides of nitrogen control device.

II. Device Description

The Air Quality Products device combines an emission control system with a capacitive discharge ignition system. The two systems are contained in a single housing which is installed in the vehicle engine compartment, with the exception of the Volkswagen, where it is installed underneath the rear seat.

The emission control system controls emissions by electronic retard of the ignition timing and, in some vehicles, a solenoid valve is employed to regulate the vacuum advance mechanism. The electronic retard provides a fixed amount of retard to the basic timing below 1400 rpm; a fixed selectable amount of retard between 2° and 10° depending on the particular vehicle - between 1400 rpm and 3300 rpm; restoration of normal timing above 3300 rpm. The amount of retard below 1400 rpm is approximately half of that above 1400 rpm. The solenoid valve controlled vacuum advance is disconnected at engine speeds above 1400 rpm and reconnected at 3300 rpm (approximately 57 mph vehicle speed).

No mechanical adjustments are made to manufacturer's specified spark timing or carburetor specification.

III. Emission Testing

The applicant submitted supporting test data to demonstrate the effectiveness of the "Pure Power" device. Hot start CVS and steady state (at 55 mph) tests were conducted at the Olson Laboratories on a fleet of 5 vehicles supplied by Air Quality Products, Inc. Olson Laboratories

affirmed the vehicles were tested in accordance with California applicable procedures using Indolene - 30 test fuel. Air Quality Products stated the vehicles were adjusted to manufacturer's specifications for timing, air fuel ratio, and idle speed. The timing control module and vacuum advance arrangement appropriate to the vehicle were installed according to the installation table in the application.

The emissions of the three pollutants, hydrocarbon, carbon monoxide, and oxides of nitrogen were determined for each vehicle with and without the device. The results are tabulated in Table I.

The same tests were conducted on two vehicles at the Air Resources Board Laboratory, the results of which are shown in Table II.

The average emissions of both fleets of vehicles were determined, and were the basis of acceptance of the device. Based on staff experience of vacuum spark disconnect, there is no expected increase in aldehydes or hydrocarbon reactivity. Staff evaluations of capacitive discharge ignition systems have shown them to have a negligible effect on exhaust emissions.

IV. Comments

The applicant states that actual testing established satisfactory durability and driveability. Customer satisfaction with equipped class "b" through "f" vehicles is cited as further evidence.

The application describes the marketing, cost and maintenance of the system.

V. Summary

The results of the vehicle tests are as follows:

a) Fleet Average Reduction - Air Quality Products (Olson Laboratories)

	<u>HC</u>	<u>CO</u>	<u>NOx</u>
Hot CVS Test Reduction Average - %	9.3	9.6	44
Steady State Reduction Average - %	39	27	46

b) Fleet Average Reduction - Air Resources Board (El Monte)

	<u>HC</u>	<u>CO</u>	<u>NOx</u>
Hot CVS Test Reduction Average - %	8.7	31	41
Steady State (55 mph)	20	20	44

VI. Recommendation

Based on the Air Resources Board criteria for determining compliance with Section 27156 of the Vehicle Code, it is the staff's conclusion that the use of the Air Quality Products Pure Power High Performance Ignition system for 1966-70 class "a" vehicles will result in emission levels that comply with existing State regulations for the appropriate model year.

Therefore, the staff recommends that this system be exempt from the prohibitions of Section 27156 of the Vehicle Code.

The applicant's system meets the criteria established for the accreditation of an oxides of nitrogen device with the exception of Section 39177.3(a) relating to the cost limit of \$35. Therefore, it is the

staff's recommendation that 1966-1970 class "a" vehicles equipped with the Pure Power High Performance Ignition System be exempted under the provisions of Section 39177 of the Health and Safety Code.

TABLE I (a)

EMISSION DATA - AQP TEST FLEET (OLSON LABORATORY)

	Baseline						With Device					
	CVS-gms/mile			Steady State-ppm			CVS-gms/mile			Steady State-ppm		
	HC	CO	NOx	HC	CO (%)	NOx	HC	CO	NOx	HC	CO (%)	NOx
Volkswagen	4.13	34.6	3.13	306	.34	3878	4.10	34.4	2.11	172	.30	1657
Volkswagen	3.72	43.9	2.87	338	1.60	3320	4.40	43.6	1.60	172	1.00	1638
Datsun	2.06	24.3	5.48	137	.58	3406	1.26	22.6	3.59	74	.47	2754
Opel	2.38	37.8	4.48	132	1.00	3878	1.75	35.6	1.81	118	.83	1938
Toyota	2.15	31.4	3.23	70	.63	2490	1.58	19.3	1.74	64	.47	1281
Average	2.89	34.4	3.84	197	.83	3394	2.62	31.1	2.17	120	.61	1854

TABLE I (b)

EMISSIONS REDUCTION - AQP TEST FLEET (OLSON LABORATORY)

	<u>HC</u>	<u>CO</u>	<u>NOx</u>
CVS Test Reduction Average - %	9.3	9.6	44
Steady State Reduction Average - %	39	27	46

TABLE II (a)
EMISSION DATA - ARB TEST FLEET (EL MONTE)

	Baseline						With Device					
	CVS-gms/mile			Steady State-ppm			CVS-gms/mile			Steady State-ppm		
	HC	CO	NOx	HC	CO (%)	NOx	HC	CO	NOx	HC	CO (%)	NOx
Volkswagen	4.25	22.7	2.71	130	.58	2383	3.86	20.7	1.80	109	.72	1634
Toyota	1.74	39.2	3.25	78	.60	2782	1.61	22.2	1.74	57	.22	1277
Average	3.00	31.0	2.98	104	.59	2583	2.74	21.5	1.77	83	.47	1456

TABLE II (b)
EMISSIONS REDUCTION - ARB TEST FLEET (EL MONTE)

	<u>HC</u>	<u>CO</u>	<u>NOx</u>
CVS Test Reduction Average - %	8.7	31	41
Steady State Reduction Average - %	20	20	44

AIR QUALITY PRODUCTS INC.

950 NORTH MAIN STREET
ORANGE, CALIFORNIA 92667

(714) 532-6727

December 28, 1973

Mr. William Simmons, Executive Officer
AIR RESOURCES BOARD
1025 "P" Street
Sacramento, CA 95814

SUBJECT: APPLICATION FOR AN EXPANSION OF THE EXEMPTION OF THE PURE POWER
"HIGH PERFORMANCE IGNITION SYSTEM" IN LIEU OF AN OXIDES OF
NITROGEN CONTROL DEVICE FOR 1966 THROUGH 1970 MODEL YEARS TO
INCLUDE CLASS "A" VEHICLES.

Dear Mr. Simmons:

Air Quality Products, Inc. is herein applying for an expansion of its exemption for the PURE POWER High Performance Ignition System, in lieu of an oxides of nitrogen control device, for 1966 through 1970 model years to include Class "A" motor vehicles. Testing has been accomplished per Air Resources Board Accreditation Test Procedures. Test results on a fleet of five (5) such vehicles show a system NOx emission reduction capability of 43.5% using the hot CVS cycle and indicates compliance with the general standards.

The device involved herein is the PURE POWER High Performance Ignition and Emission Control device which is currently accredited and exempted, in production, and being installed on 1955-1970 vehicles throughout the State of California. The Volkswagen system uses a different cable than the normal PURE POWER System and the kit includes a ballast resistor instead of vacuum hose. The only other variation in the system is the color of the timing control module that is used, and a stepped electronic retard.

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It is requested that approval of the application be granted at the January 9th meeting of the Air Resources Board. This action will allow Air Quality Products to distribute Class "A" '66-'70 PURE POWER devices throughout California in time for the annual vehicle re-registration period which terminates the first week in February 1974.

SYSTEM DESCRIPTION

The Air Quality Products, Inc. NOx Emission Control System for 1966-1970 Class "A" vehicles is included in its "PURE POWER" High Performance Ignition and Emission Control device for 1966-1970 vehicles (VW System slightly different). The "PURE POWER" device includes two distinct systems. The "Emission Control System" controls emissions through selective control of ignition timing, which includes control of the vacuum spark advance mechanism, on some vehicles, and electronic timing regulation. The "High Performance Ignition System" is a high voltage capacitive discharge ignition system which is designed to improve performance and fuel economy and increase the durability of vehicle spark plugs and ignition points. These two systems, the "Emission Control System" and the "High Performance Ignition System" are packaged in a single housing, which is installed in the vehicle engine compartment, with the exception of Volkswagen which is installed in the well adjacent to the battery underneath the rear seat.

The "Emission Control System" includes a solenoid valve which is employed to selectively regulate the vacuum advance on some vehicles. In operation, the valve causes the vacuum advance mechanism to be disconnected at engine speeds above 1400 RPM, and reconnected at vehicle speeds above approximately 3300 RPM (57 MPH) on 4 cylinder vehicles. Electronic retard is employed in control of all vehicles. This function provides a fixed amount of retard to the basic timing below 1400 RPM, a larger fixed, selectable, amount of retard between 1400 RPM and 3300 RPM and is completely inhibited above 3300 RPM. The electronic retard between 1400 RPM and 3300 RPM is between 2° and 10° depending on the timing control module inserted for that particular vehicle. Electronic retard below 1400 RPM is approximately one-half of the amount of retard above 1400 RPM.

The "High Performance Ignition System" includes a high voltage transformer which increases available output voltage under starting, high speed and high load conditions to enhance vehicle performance in those operating modes. The enhanced rise time of the ignition pulse provides more positive firing, more complete combustion and extended plug life over conventional systems.

SYSTEM INSTALLATION

The system is installed on Class "A" vehicles, except Volkswagen, in the same manner as on Classes B-F for 1966-1970 vehicles, as described in the printed installation instructions with each PURE POWER kit now being sold. That is, it is installed in the engine compartment, mounted with two self tapping screws to the fender wall, or other accessible mounting surface, in as cool a place as possible. The provided ground strap should be terminated under an engine bolt or other electrical ground connection in the engine compartment.

On Volkswagen, the unit is mounted in the well under the rear seat, adjacent to the battery, with two self tapping screws, to the vehicle frame. The ground strap is secured to the frame under one of the existing bolts on the frame. A 1/4" hole is then drilled through the firewall to provide access for the cable from the device to the engine compartment. (See Enclosure I - Installation Instructions for Volkswagen.) Additional installation instructions will be provided for any vehicles which connect electrically in a different manner than the Class B-F vehicles. The only differences in electrical connections which exist from one vehicle to the next revolve around whether the baseline vehicle has a ballast resistor or not, and if so, whether it is on the positive or negative side of the coil. The only other differences in installation on Class "A" vehicles will be whether or not the vacuum advance mechanism is routed through "PURE POWER" and the color of timing control module to be employed. Table I defines the physical and functional requirements for installation of PURE POWER on Class "A" vehicles.

VEHICLE MAKE/MODEL	TIMING CONTROL MODULE COLOR	VAC. ADVANCE Routed THRU PURE POWER	INSTALLATION COMMENTS
Audi	Red	Yes	Disconnect and Plug Retard Diaphragm
Fiat	Black	No	Ballast Resistor must be in series with Red Lead - Baseline vehicle has resistor on - Coil.
MG Midget	Black	No	
Opel (1968-1970)	Blue	Yes	Disconnect and Plug Retard Diaphragm
Peugeot	Black	No	
Toyota - 3RB, KC, M&F Engines	Blue	Yes	
Volkswagen	Black	No	Special Unit - See Enclosure I
All Others	Red	Yes	

TABLE I - INSTALLATION OF PURE POWER ON 1966-70 CLASS "A" VEHICLES

The same pre-installation procedure is recommended with AQP NOx device as with PURE POWER in that the absence of misfires is verified and the vehicle timing and carburetion is adjusted to manufacturer's specification before the system is installed. Detailed installation instructions are being prepared.

COMPLIANCE WITH EMISSION STANDARDS

Vehicles were tested in accordance with the applicable test procedures. TABLE II and TABLE III (enclosed) delineate the emission data measured before and after installation of PURE POWER on a fleet of vehicles of

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engine displacement Class "A", representative of the vehicle population for which exemption application is being made. Five vehicles were evaluated, the test data sheets for which are included in ENCLOSURE II.

The vehicles were adjusted to manufacturer's specification for idle CO, dwell and timing. The absence of mis-fires was verified. The vehicles were then emission tested by the 1972 CVS federal hot-cycle at baseline and a diluted mass sample was taken at 55 MPH cruise. The PURE POWER device was then installed and the CVS and 55 MPH cruise tests were again run. Emission data from the baseline and equipped vehicles are given in TABLE III. The CVS emission tests are measured in grams per mile, while the 55 MPH cruise results are given in parts per million. TABLE II shows the percentage reduction of each emission, for each test, by test vehicle, and for the fleet. Fuel Consumption of the Class "A" test fleet and % Improvement of Consumption is given in Table IV.

Application for exemption is made for all vehicles in engine Class "A" (140 cubic inch engine displacement or smaller), with the following vehicles not included:

- (1) All vehicles with six volt ignition systems.
- (2) All vehicles with positive ground electrical systems.
- (3) All vehicles with engines which include factory installed distributors containing a magnetic or optical pick-up primary timing pulse for ignition initiation.
- (4) All vehicles with engines using fuel injection systems.

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TEST VEHICLE NO.	YEAR	MAKE	DISP.	EXHAUST EMISSION % REDUCTION					
				HOT CVS CYCLE			55 CRUISE MODE		
				HC	CO	NOX	HC	CO	NOX
503	70	Volkswagen	91	0.7	0.7	32.6	43.8	11.8	57.3
507	69	Volkswagen	91	-18.3	0.7	44.3	49.1	37.5	50.7
508	69	Datsun	97	38.8	7.0	34.5	46.0	19.0	19.1
509	70	Opel	112	26.5	5.8	59.6	10.6	17.0	50.0
510	70	Toyota	112	26.5	38.6	46.1	8.6	25.4	48.6
FLEET AVERAGE				9.3	9.6	43.5	39.0	26.0	45.4

TABLE II - CLASS "A" TEST FLEET PERCENT EMISSION REDUCTION

TEST VEHICLE NO.	BASELINE						PURE POWER					
	CVS-GRAM/MILE			55 CRUISE-PPM			CVS-GRAM/MILE			55 CRUISE-PPM		
	HC	CO	NOX	HC	CO(%)	NOX	HC	CO	NOX	HC	CO(%)	NOX
503	4.13	34.63	3.13	306	0.34	3878	4.10	34.39	2.11	172	0.30	1657
507	3.72	43.93	2.87	338	1.60	3320	4.40	43.63	1.60	172	1.00	1638
508	2.06	24.34	5.48	137	0.58	3406	1.26	22.63	3.59	74	0.47	2754
509	2.38	37.76	4.48	132	1.00	3878	1.75	35.58	1.81	118	0.83	1938
510	2.15	31.40	3.23	70	0.63	2490	1.58	19.27	1.74	64	0.47	1281
AV.	2.89	34.41	3.84	197	0.83	3394	2.62	31.10	2.17	120	0.61	1854

TABLE III - CLASS "A" TEST FLEET EMISSION DATA

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TEST VEHICLE NO.	BASELINE FUEL IN GRAMS	PURE POWER FUEL IN GRAMS	% IMPROVEMENT
503	894	904	- 1.12
507	980	910	7.14
508	992	871	12.20
509	912	1049	-15.02
510	1089	1109	- 1.84
AV.	973	968	0.50

TABLE IV - CLASS "A" TEST FLEET FUEL CONSUMPTION AND PERCENT IMPROVEMENT

COMPLIANCE WITH GENERAL STANDARDS1. Noxious or Toxic Emissions/Safety

- A. The device, in its operation, will not cause the emission of any noxious or toxic matter into the ambient air that is not emitted by the motor vehicle engine without the device.
- B. Safety.-- The device does not have operational or failure modes which would result in any unsafe condition which would endanger the motor vehicle, its occupants or persons or property in close proximity to the vehicle, beyond those which may occur in an unequipped vehicle.

2. Hydrocarbon, Carbon Monoxide, Aldehydes, or Hydrocarbon Reactivity

- A. Hydrocarbon, Carbon Monoxide. There is no increase in HC, CO emissions resulting from operation of the device. Tests conducted on five vehicles using CVS hot-start procedures indicate an average of 9.3% reduction of HC and a CO reduction of 9.6%. Measurements at 55 MPH cruise conditions on the same vehicles showed an HC reduction of 39.0%, and a reduction of CO of 26.0%
- B. Aldehydes/Hydrocarbon Reactivity.

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3. Adverse Effects on Vehicle Performance

Driveability testing was accomplished on selected vehicles representative of the vehicles for which exemption is being applied for. Federal driveability evaluations were performed on test vehicles 503 and 507 (Volkswagens) and on the Datsun (TV508). The evaluations indicate no adverse effects on vehicle performance. The other Class "A" vehicles driven were also found to have no adverse driveability effects.

Restoration of the vacuum advance and/or electronic retard at 57 MPH precludes possible valve damage which might ensue as a result of employing a continued vacuum disconnect or electronic retard profile beyond that speed. Vacuum advance restoration at idle (for vehicles without ported spark) and reduced electronic retard at idle protect the vehicle from overheating upon the installation of this device.

4. Device Durability

Data accumulated during accreditation testing for 1955-1965 model year vehicle installation, included durability data for six vehicles which accumulated 25,000 system equipped test miles each. Three of the test vehicles have continued in operation and have now accumulated approximately 60,000 miles each of system equipped operation. To date, approximately 15,000 systems have been installed and are in operation on customer vehicles, on both the 1955-65 and 1966-70 (Class B-F) vehicle retrofit programs in California. Although no known customer owned vehicles have exceeded 50,000 miles, test results of 5,000 hour bench tests (approximately equivalent to 150,000 miles) conducted in the laboratory indicate a mean mileage between failure of 98,000 miles. The device has a full replacement warranty for six months and a warranty, on a prorata basis, for an additional 18 months. It is estimated that a system in normal operation will have an expected useful life of at least 50,000 miles of operation.

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5. Marketing/Distribution

Air Quality Products, Inc. has established a dealer network of approximately 1,000 authorized installation stations. These stations are served directly by Air Quality Products. Some dealers operate in a jobber capacity and sell to other authorized dealers in addition to their normal business. A field representative staff is maintained to provide technical training and warranty service to the dealers.

6. Device Effectiveness

Application of accreditation test procedures reveal that a 43.5% average reduction in NOx is obtained with system equipped vehicles. This reduction demonstrates that the system is more effective than the 42% requirement established by the first system accredited for Class "A" vehicles and therefore, is in compliance with the general standards. The device is also effective at 55 MPH.

7. Device Costs

Statutory Criteria - Section 39177.3(a) Health & Safety Code.

The Air Quality Product device which includes a "High Performance Ignition System" and "Emission Control System", will exceed Thirty-Five (\$35.00) Dollars installed.

8. Device Maintenance Costs

Section 39177.3(b) Health & Safety Code. There is no required maintenance for the life of the device.

9. Device Maintenance

There is no required maintenance for the life of the device. All information related to the operation and installation of the device is included in the installers handbook which accompanies each kit. The installers are instructed to leave this handbook with the purchaser.

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10. Protection of Public Interest

In order to protect the public interest, Section 39177.1 Health & Safety Code requires an agreement by the manufacturer to cross license or allow the State to establish a fair and reasonable device price in the event that only a single device is accredited.

The public currently has available two accredited devices for Class "A" vehicles from which to choose, that will cost no more than Thirty-Five (\$35.00) Dollars. This should adequately protect the public from an optional device which because of its additional performance features costs more than Thirty-Five (\$35.00) Dollars.

In fact, the public interest will be best served, in a mandatory program, by providing them with an exempted device option which includes additional equipment which restores vehicle performance and improves durability while controlling NOx to within State standards.

We hereby agree to comply with any request of the Executive Officer pursuant to provisions III, A, G, H, and I of the Air Resources Board's test procedures.

Your early attention to this application is earnestly requested.

AIR QUALITY PRODUCTS, INC.


By William C. Lanning, Vice President