No. 45 Original

IN THE

Supreme Court of the United States

OCTOBER TERM, 1971

STATE OF WASHINGTON, ET AL.,
Plaintiffs,

v.

GENERAL MOTORS CORPORATION, ET AL.,
Defendants.

SEPARATE APPENDIX TO DEFENDANTS' SUPPLEMENTAL MEMORANDUM

(Names and addresses of attorneys on inside cover.)

WILSON - EPES PRINTING CO., INC. - RE 7-6002 - WASHINGTON, D. C. 20001

WALTER J. WILLIAMS
14250 Plymouth Road
Detroit, Michigan 48232
FORREST A. HAINLINE, JR.
CROSS, WROCK, MILLER & VIESON
Penobscot Building
Detroit, Michigan 48226
Attorneys for Defendant American Motors Corporation

LLOYD N. CUTLER
LOUIS F. OBERDORFER
JAMES S. CAMPBELL
ROBERT A. GERARD
WILMER, CUTLER & PICKERING
900 - 17th Street, N.W.
Washington, D.C. 20006
JULIAN O. VON KALINOWSKI
PAUL G. BOWER
GIBSON, DUNN & CRUTCHER
634 South Spring Street
Los Angeles, California 90014
Attorneys for Defendant Automobile Manufacturers Association, Inc.

TOM KILLEFER
PAUL A. HEINEN
WILLIAM E. HUTH
Chrysler Corporation
340 Massachusetts Ave.
Detroit, Michigan 48231
G. WILLIAM SHEA
PHILIP K. VERLEGER
MCCUTCHEN, BLACK, VERLEGER & SHEA
30th Floor
3435 Wilshire Blvd.
Los Angeles, California 90010
Attorneys for Defendant Chrysler Corporation

WRIGHT TISDALE
Ford Motor Company
The American Road
Dearborn, Michigan 48121
ROBERT L. STERN
ROGER W. BARRETT
MAYER, BROWN & PLATT
231 South LaSalle Street
Chicago, Illinois 60604
CARL J. SCHUCK
ERNEST E. JOHNSON
OVERTON, LYMAN & PRINCE
550 South Flower Street
Los Angeles, California 90017
Attorneys for Defendant Ford Motor Company

ROSS L. MALONE
ROBERT A. NITSCHKE
General Motors Building
Detroit, Michigan 48202
HAMMOND E. CHAFFETZ
JOSEPH DUCOEUR
KIRKLAND, ELLIS, HODSON, CHAFFETZ & MASTERS
Prudential Plaza
Chicago, Illinois 60601
MARCUS MATTSON
RICHARD F. OUTCAULT, JR.
LAWLER, FELIX & HALL
605 West Olympic Boulevard
Los Angeles, California 90015
Attorneys for Defendant General Motors Corporation

This Separate Appendix has been compiled by defendants for the convenience of the Court. It reprints materials which are referred to in defendants' Supplemental Memorandum, filed herewith, but which may not be easily available to the Court.

INDEX

ITEM 1—Overview of the Vehicle Emissions Problem

A. *Summary and Conclusions from EPA Annual Report on Vehicle Emissions**

The Clean Air Act as amended charges the Administrator of the Environmental Protection Agency with major responsibilities for the control of motor vehicle emissions. These duties include: establishing emission standards for pollutants which endanger public health and welfare; administrating a number of related activities concerned with vehicle testing, certification and enforcement; regulating the content of fuels; demonstrating the feasibility of low-emission vehicles; monitoring the development of improved devices to control emissions from internal combustion engines; and directing research and development activities related to alternative power systems.

In addition Sections 202(b)(1)(A) and 202(b)(1)(B) require that:

(1) 1975 automobiles achieve a 90% reduction in the emissions of hydrocarbons (HC) and carbon monoxide (CO) which were allowable in 1970, and

(2) 1976 automobiles achieve a 90% reduction in the emissions of oxides of nitrogen (NO_x) from the average levels measured on 1971 automobiles which were not subjected to any federal or state NO_x emission standards.

* * * *

Since the establishment of the Environmental Protection Agency on December 2, 1970, EPA has completed a number of actions related to the control of

---

* Environmental Protection Agency, Annual Report to the Congress of the United States in Compliance with Section 202(b)(4), Public Law 90-148, the Clean Air Act As Amended (July 9, 1971), at 1-1 to 1-10.

emissions from motor vehicles. An initial contract has been signed with the National Academy of Sciences to identify the resources necessary to study the technological feasibility of attaining the 1975 and 1976 standards.

EPA has published an advance notice of proposed rule-making indicating its intention to control or prohibit the use of alkyl lead in motor vehicle gasoline.

* * * *

In February, the Administrator sent a letter to all domestic and foreign auto manufacturers requesting information about research and testing activities related to the development of emission control systems designed to meet the 1975 and 1976 standards. EPA also conducted two days of public hearings on this subject during May of 1971.

* * * *

EPA has published certification test results for 1971 model vehicles and engines. National ambient air quality standards have been promulgated which include motor vehicle related pollutants. Regulations have been proposed defining the useful life of vehicles and requiring the inclusion in owners' manuals of maintenance instructions for emission control systems. Specific numerical standards and test procedures have been established for 1975 and 1976 emissions of HC, CO and NO_x.

Demonstration programs relating to low-emission vehicles have been initiated.

* * * *

The Low-Emission Vehicle Certification Board prescribed by Section 212 of the Act has been established.

* * * *

EPA is also directing a research and development program for low-emission vehicular power systems other than the internal combustion engine.

* * * *

Chapter 4 deals with the health and welfare effects of motor vehicle related pollutants. While vehicular emissions are important sources of pollution, especially in congested urban areas, they are not the only sources of these contaminants. In discussing health and welfare impacts it is important to note that it is ambient air quality, the composition of a local air mass, rather than emission levels from particular sources, which is the significant factor although the two are clearly related.

It is difficult to generalize about the relative importance of various contributions of the same air contaminants to ambient air quality because most air masses undergo lateral movements. Thus relative impacts must be looked at in terms of specific localities reflecting differences in geography, meteorological conditions, traffic patterns and the size and locations of all sources of the same pollutants.

A detailed discussion of the progress reported by industry is contained in Chapter 5. This material describes a number of control devices under development and outlines some of the technical problems facing the industry. This material also reiterates a number of concerns expressed by the manufacturers in their communications with EPA.

The final section of this report, Chapter 6, deals with the costs associated with motor vehicle emission control.

* * * *

Neither the final control system needed to achieve the 1975 standards nor the technology for attaining the 1976 standards, have yet been identified. Thus, the cost figures contained in Chapter 6 must be considered preliminary and include informal industry estimates of initial costs ranging from $80 to $600 per car for 1975. However, it appears clear that the costs associated with 1975 and 1976 standards will be considerably greater than those experienced in reaching Federal emission standards through 1974.

Information provided to EPA by auto manufacturers revealed a significant increase in emission control systems research and development activity since the passage of the 1970 amendments to the Clean Air Act. During the first six months of accelerated development, industry laboratories have reported the attainment of reduced emission levels. While there are many problems to be overcome to convert laboratory results into reduced emission levels from mass-produced autos, the added industry effort should improve prospects for significant technological improvements.

* * * *

During the recent public hearings industry spokesmen expressed major reservations about the technological feasibility of achieving the statutory emission standards within the time limits prescribed by law. The manufacturers were unanimous in asserting that the levels of reduction required for 1975/76 precluded the substitution of alternative power systems, making it essential that emission control be achieved through an improved internal combustion engine. Industry representatives consistently stated that reaching the 1976 NO_x emission levels goes beyond the limits of current knowledge and will require some major tech-

nological breakthrough early enough to permit mass production of 1976 models. They also expressed concern about the high cost of attaining the low levels of emissions required by the statute.

At these same hearings representatives of public interest organizations were skeptical of industry statements about their inability to develop the necessary technology to reduce emissions to the required levels. These witnesses pointed to previous instances of resistance by the industrial community to deadlines which were ultimately achieved. Suspicion was also voiced about the vigor of government enforcement concerning interim standards and test procedures. This climate of mistrust makes it important that, to the degree possible, matters related to motor vehicle emission control be given full public exposure.

Motor vehicle emissions are important sources of HC, CO, and NO_x pollutants especially in congested urban areas. However, they are not the only sources of these contaminants. The specific contribution of vehicle emissions to the degradation of ambient air quality is a complex matter and varies from place to place. These variations are attributable to differences in geography, meteorological conditions, traffic patterns, and the size and location of other sources of these pollutants. More information on these matters is expected with the completion of State implementation plans required under the legislation. These plans are also expected to include a variety of alternative abatement strategies. With additional information about the costs and effectiveness of emission control from all types of sources, it should be possible to undertake detailed cost-effectiveness analyses in order to insure that the ambient air quality standards are achieved at the most reasonable cost to the American people.

One of the unfortunate aspects of motor vehicle emission control is that reducing levels of hydrocarbons and carbon monoxide, which is done primarily through increasing the efficiency of combustion, tends to make more difficult the control of oxides of nitrogen, whose formation is largely a function of the heat of combustion. Thus, a major technological challenge faces the Nation's auto industry in meeting these emission standards.

EPA is moderately optimistic that the 1975 standards can be attained especially since it is expected that unleaded gasoline will be generally available at that time. We are also hopeful that technological developments will enable the manufacturers to reach the 1976 standards. However, the costs associated with achieving these standards may be high. Therefore, the Agency is not recommending any legislative changes at this time, although they may be needed in the future.

B. *Relationship of Emissions Control to Air Quality Standards: EPA Annual Report**

As indicated in Chapter 4, the control of auto emissions is an important element in achieving the ambient air standards for HC, CO, NO_x, and photochemical oxidants. However, the relationships between automobile emissions control and the achievement of national ambient air quality standards is extremely complex. For example:

---

* Environmental Protection Agency, Annual Report to the Congress of the United States in Compliance with Section 202(b)(4), Public Law 90-148, The Clean Air Act As Amended (July 9, 1971), at 6-6 to 6-10.

a) Motor vehicles are not the only important sources of HC, CO, and NO_x. . . .

b) The significance of auto emissions upon ambient air quality varies from place to place, and therefore so does the effectiveness of auto emission controls compared to controls over other sources.

c) The cost of HC, CO, and NO_x control for motor vehicles are interrelated since some types of HC and CO control make it more difficult to reduce emissions of NO_x.

d) Meeting the 1975/76 standards will have a cumulative impact over time on air quality as new controlled vehicles replace older models in the automobile fleet. This can be seen on Figures 3, 4, and 5 [included: see pp. 8-10, *infra*], which depict EPA estimates of future national levels of NO_x, HC and CO emissions from gasoline-fueled motor vehicles assuming all future Federal standards are achieved. The graphs do not reflect the possible impact of modifying used vehicles to attain emission reductions.

Considerations such as these are particularly important in attempting to find the least cost means of achieving ambient air quality standards, since the impact of achieving various reductions in automobile emissions will influence the costs of reducing pollutants from other sources. Other sources of particular pollutants (e.g., NO_x from power plants) may be so important in some areas that the reduction of automobile emissions will contribute relatively little to meeting ambient standards in that area.

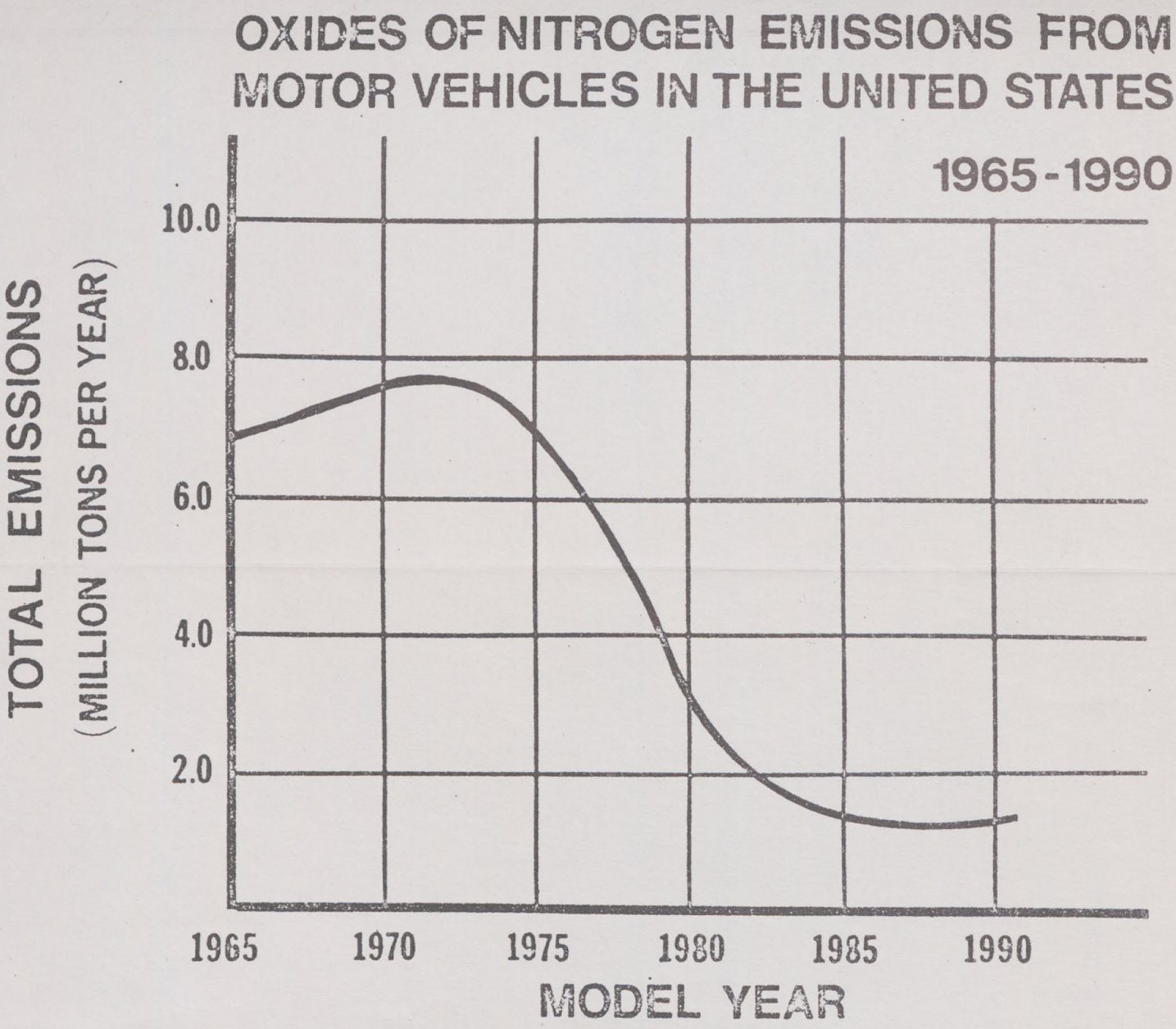

FIGURE 3

PROJECTIONS BASED ON ACHIEVING ALL FEDERAL EMISSION STANDARDS

HYDROCARBON EMISSIONS FROM MOTOR VEHICLES IN THE UNITED STATES

1965-1990

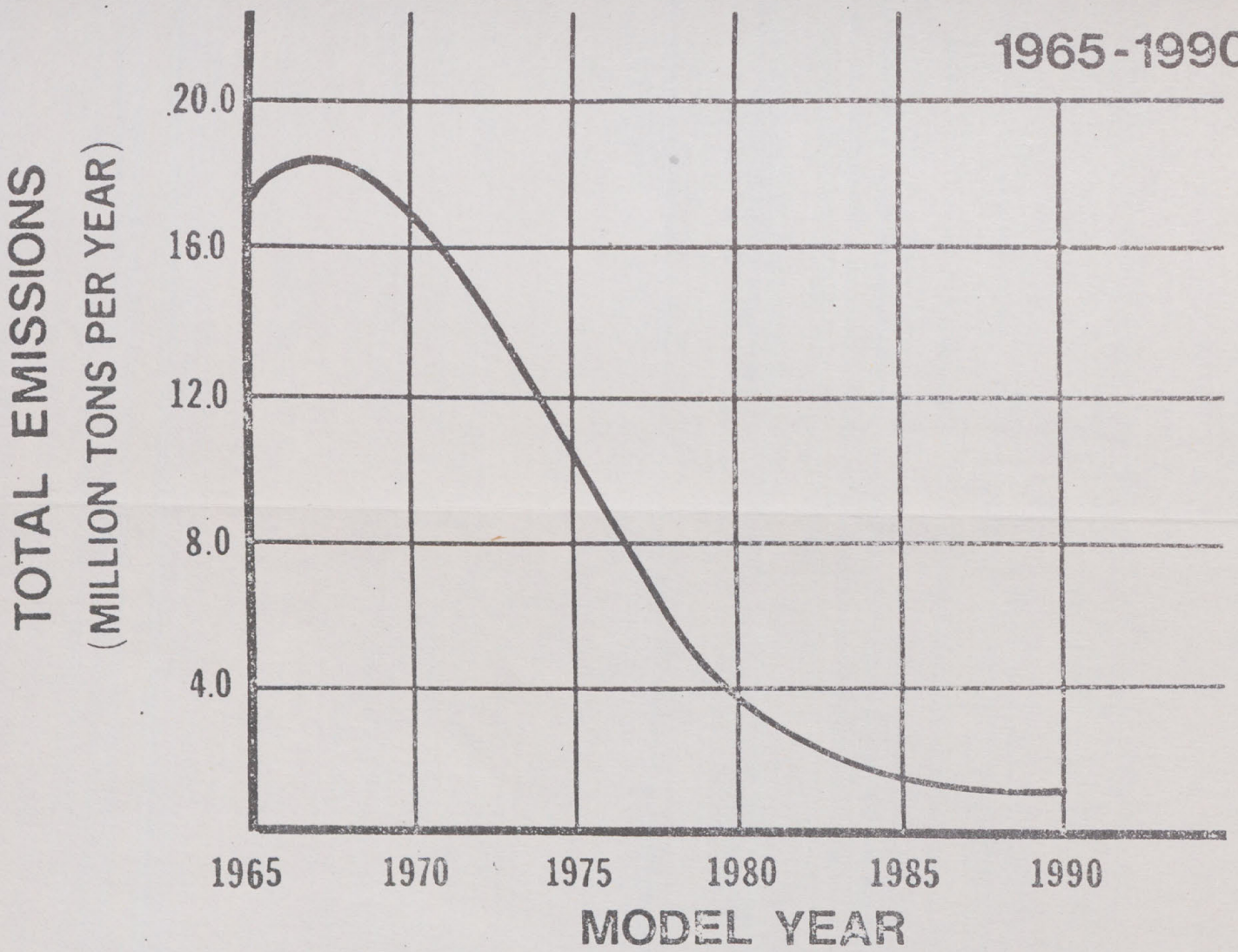

FIGURE 4

PROJECTIONS BASED ON ACHIEVING ALL FEDERAL EMISSION STANDARDS

CARBON MONOXIDE EMISSIONS FROM MOTOR VEHICLES IN THE UNITED STATES

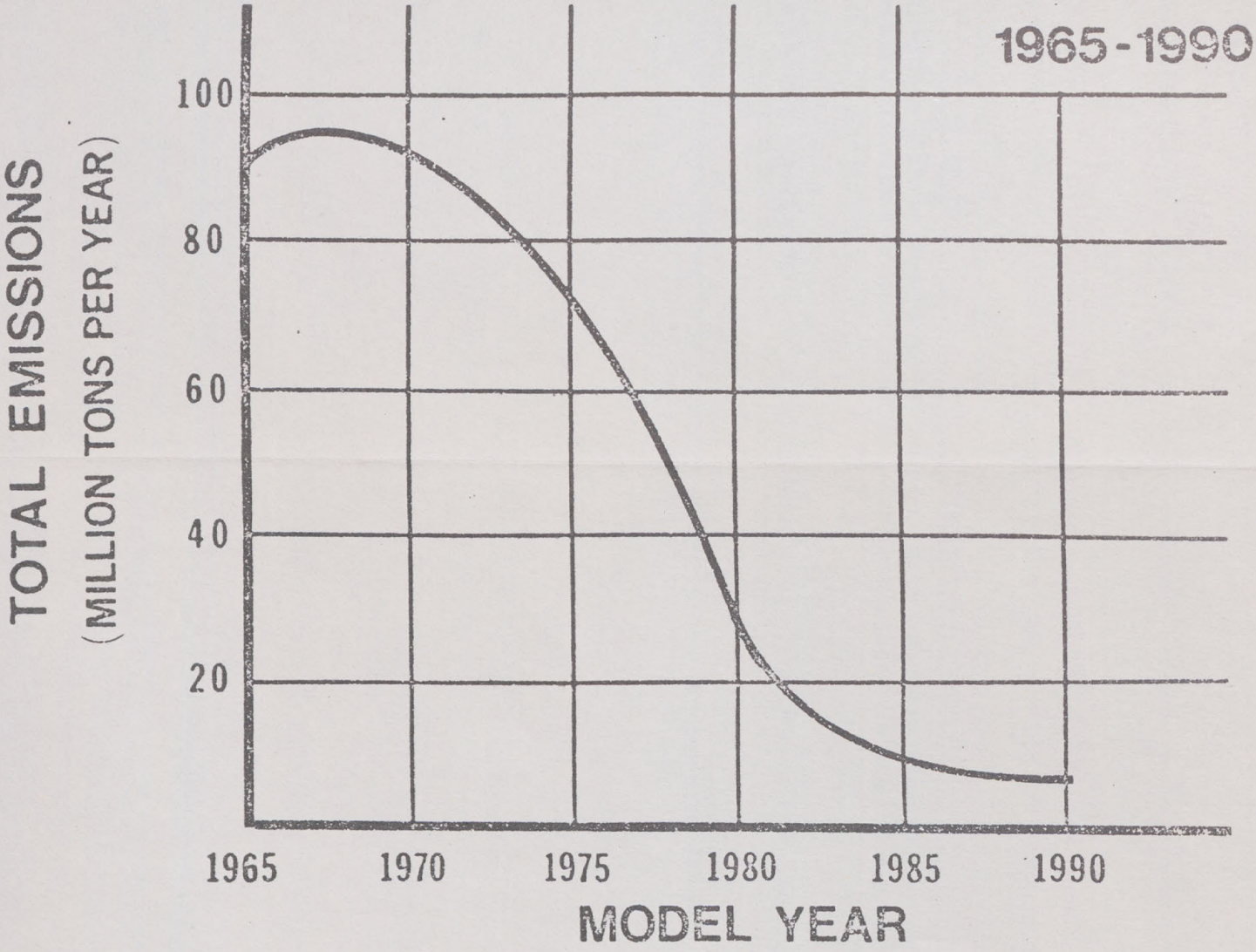

FIGURE 5

PROJECTIONS BASED ON ACHIEVING ALL FEDERAL EMISSION STANDARDS

ITEM 2—Technical Factors Involved in Control of Vehicle Emissions*

The predominant source of carbon monoxide (CO), nitrogen oxide (NO_x), and hydrocarbon (HC) from mobile combustion sources is the exhaust gas from gasoline-fueled engines. An example of the difficulties involved in eliminating exhaust emissions is portrayed in Figure 1-1. [Omitted.] This graph illustrates, for a typical range, that exhaust CO and HC emissions could be reduced by increasing the ratio of air to fuel to the point where more air is present than is required for complete combustion of the fuel to carbon dioxide and water (i.e., an air-fuel ratio greater than the stoichiometric ratio).[**] Maximum emissions of NO_x, however, would occur under such conditions. At very low air-fuel ratios, the NO_x emissions could be reduced, but high concentrations of CO and HC would be produced. At the extremely high air-fuel ratios where all three emissions could, theoretically, be low, operating difficulties such as misfire and stalling would be encountered with most commercially available, gasoline-fueled, internal combustion engines, causing poor performance and high emissions of CO and HC.

Various approaches and devices have been developed, and others are under development for controlling emissions of CO, NO_x, and HC from mobile sources. These encompass various principles of oper-

* HEW, Control Techniques for Carbon Monoxide, Nitrogen Oxide, and Hydrocarbon Emissions from Mobile Sources, National Air Pollution Control Administration Publication No. AP-66, at 1-1, 2-11 to 2-15 (1970) (footnotes omitted).

[**] "Stoichiometric ratio" is a term used to define an air-fuel mixture which is theoretically of the correct ratio to obtain complete combustion without excess oxygen.

ation, degrees of effectiveness, complexity, and cost. It is the purpose of this document to present a review of these control methods and to summarize Federal and state emission control programs as they relate to emissions of CO, NO_x, and HC from mobile sources.

* * * *

2.2.3 Emissions

Contaminant emissions from a motor vehicle without emission controls originate from four sources: (1) the carburetor, (2) the fuel tank, (3) the crankcase, and (4) the engine exhaust. Hydrocarbon emission from the first source is the result of fuel vaporization during "hot soak" after shutdown.[*] Vaporization from the tank occurs primarily when the fuel temperature in the tank increases. Crankcase emissions are the result of blowby past the piston rings. These emissions, unless controlled, escape to the atmosphere through the road draft tube or the crankcase ventilation cap. Hydrocarbons and CO appear in the exhaust gas as products of incomplete combustion. Oxides of nitrogen result from the reaction of the nitrogen and oxygen contained in the combustion air at the high temperature prevailing during combustion.

Figure 2-9 [included: see following page] shows the approximate distribution of the emissions from a motor vehicle without any emission control devices.

---

[*] "Hot soak" means the transfer of heat from hot components of an engine to cooler components such as the carburetor.

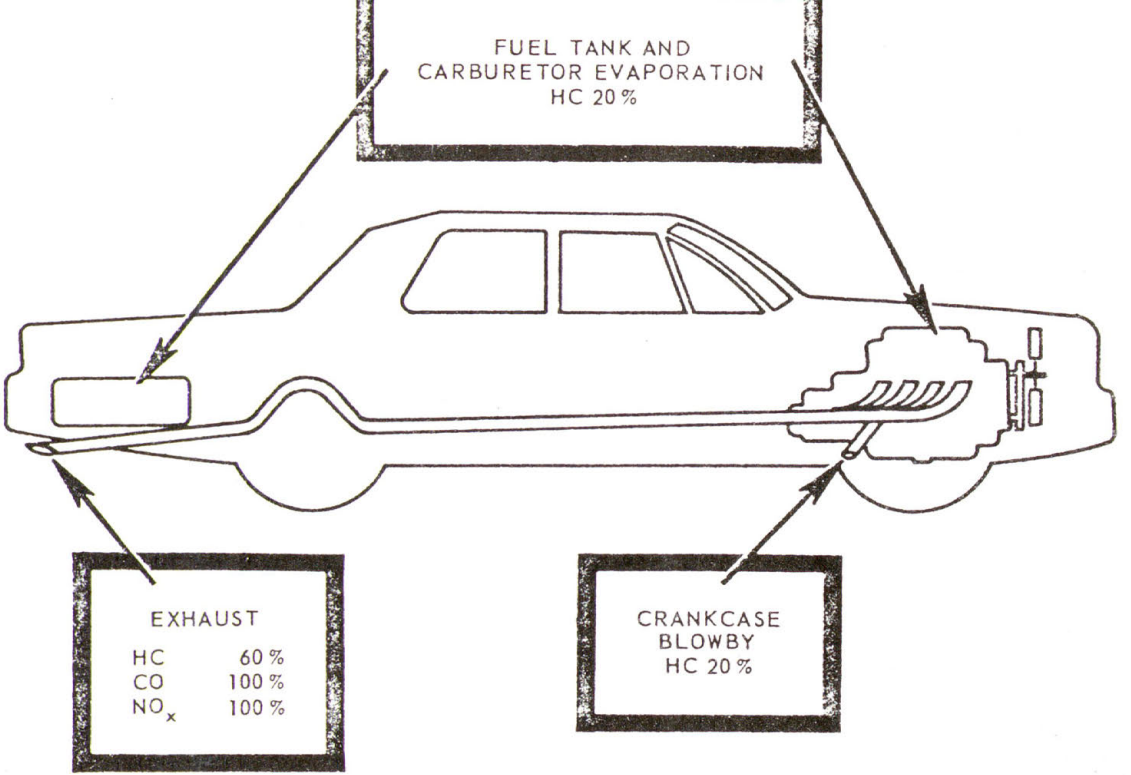

Figure 2-9. Approximate distribution of emissions by source for a vehicle not equipped with any emission control systems.

2.2.3.1 Nature and Formation of Emissions

When a hydrocarbon fuel is burned with the amount of air containing enough oxygen to oxidize it completely, the following basic reaction might be assumed to occur:

$$1.00\ CH_{1.85} + 1.460\ O_2 + 5.50\ N_2 \rightarrow$$
$$0.925\ H_2O + 1.00\ CO_2 + 5.50\ N_2$$

This reaction incorporates the following assumptions:

1. Most hydrocarbon fuels are accurately represented as consisting of 1.85 hydrogen atoms per carbon atom ($CH_{1.85}$).
2. The volume ratio of nitrogen (N_2) to oxygen (O_2) in the air is 3.76:1.
3. The fuel is burned completely to water (H_2O) and carbon dioxide (CO_2).
4. Nitrogen is inert and does not react with any other substances in the combustion chamber.

Assumptions 1. and 2. are quite true in practice. The formation of CO, NO_x, and HC in the combustion process indicates that assumptions 3. and 4. are not wholly correct.

2.2.3.1.1 CO and hydrocarbons. Combustion of the carbon in the fuel proceeds (simplified) through the following steps:

$$2\ C + O_2 \rightarrow 2\ CO$$
$$2\ CO + O_2 \rightarrow 2\ CO_2$$

The first reaction proceeds at a much greater rate than the second. Hydrogen in the fuel is oxidized to H_2O quite easily, provided sufficient oxygen is available locally for combustion. Poor distribution and mixing of fuel and air (which is likely to occur to

some extent when fuel droplets rather than fuel vapor are present) can result in incomplete combustion, and produce CO that is emitted in the exhaust gases. Although the overall air-fuel mixture may be stoichiometric, local conditions at a particular point in a combustion chamber may be far from stoichiometric. Such conditions of poor distribution are also conducive to increased hydrocarbon emissions.

Obviously, a fuel-rich (low air-fuel ratio) mixture introduces more fuel into the combustion chamber than can be completely burned, increasing emissions of CO and hydrocarbons. Also, an air-rich (high air-fuel ratio) mixture would provide excess air to partially offset the increased emissions that result from poor distribution and vaporization. The relatively large amount of excess air used in the diesel and gas turbine engines is the dominent reason for their relatively low emissions of CO and hydrocarbons.

Other factors may also contribute to increased emissions. One of these is the quenching of the flame at the relatively cool combustion chamber boundaries. Quenching can occur even if the fuel is perfectly vaporized and distributed throughout the chamber and is well established as the most significant mechanism leading to exhaust hydrocarbon emissions in properly designed spark-ignition engines.

Gross malfunction of the ignition or fuel induction systems can increase emissions of CO and hydrocarbons from spark-ignition engines. A misfire allows an entire air-fuel charge to be emitted. An automatic choke sticking closed or a very dirty air cleaner element can reduce air-fuel ratio, generally increasing emissions of CO and hydrocarbons.

Chemical equilibrium phenomena should be considered in a discussion of the formation of CO and hydrocarbons. Combustion reactions are somewhat reversible at high temperatures, indicating that products and reactants can exist in equilibrium at high temperatures. This partial reversal of combustion reactions at high temperature is known as dissociation.

If the equilibrium mixture is cooled rapidly (as it is by rapid expansion), it may be "frozen", meaning that its composition is unable to change, even though equilibrium considerations indicate that dissociation should be greatly reduced as the temperature is reduced. The rapid lowering of temperature and the accompanying decrease in the rate at which the mixture approaches the new low-temperature equilibrium, are responsible for the freezing of the composition of the mixture.

2.2.3.1.2 NO_x. Equilibrium considerations are very important in the discussion of the formation of NO_x. The reaction

$$N_2 + O_2 \underset{\leftarrow}{\rightarrow} 2\ NO$$

indicates that nitrogen may be oxidized to nitric oxide (NO) and exist in equilibrium with N_2 and O_2. The concentration of NO which may exist (theoretically) is significant only at high temperatures. This means that N_2 and O_2 do not unite to form a significant concentration of NO at low temperatures. Rapid cooling (as discussed in Section 2.2.3.1.1) can occur, however, and "freeze" the mixture with a relatively high concentration of NO. Generally, the higher the flame temperature to which air is exposed, the higher will be the resulting NO concentration after rapid cooling. The rate of reaction of NO back

to N_2 and O_2 is very low at low temperatures, even though equilibrium considerations favor the reaction.

It is essential to understand the difference between chemical kinetics, which involve the rate at which chemical reactions proceed (which is influenced by temperature), and chemical equilibrium, which involves theoretical concentrations of products and reactants as a function of temperature (and pressure for some reactions), without any consideration of the time which may be required to achieve equilibrium as conditions of temperature (and pressure) change.

From the preceeding discussion, it is apparent that NO_x emissions could be minimized by:

1. Reducing the flame temperature during combustion of air-fuel mixtures.
2. Providing insufficient oxygen to oxidize N_2.
3. Expanding (cooling) the mixture of combustion products at a slow rate which would allow NO to reform N_2 and O_2.

One of the most effective methods for reducing both flame temperature and the amount of oxygen available is to reduce the air-fuel ratio. A fuel-rich mixture burns at a lower temperature than a stoichiometric mixture because heat that could otherwise be used to heat the gases in the combustion chamber must be used to heat excess fuel.

Since oxidation of carbon to CO occurs at a greater rate than oxidation of CO to CO_2, and because combustion of a mole (specific number of molecules) of carbon to CO releases less heat than combustion of a mole of CO to CO_2, burning of a fuel-rich mixture results in a lower heat release than burning of a stoichiometric mixture. The overabundance of fuel

leaves little oxygen available to react with nitrogen. This rich-mixture approach would minimize NO_x emissions at the expense of greatly increased emissions of CO and hydrocarbons unless further measures were taken to control them specifically.

When a high air-fuel ratio charge is burned, much oxygen is available for oxidation of N_2, but the effect of low-flame temperature—resulting from the heating of excess air that does not enter into the combustion reactions—predominates, and reduces NO_x emissions. Presently available spark-ignited, gasoline-fueled engines exhibit poor performance under such conditions, however, probably because of the low velocity of flame propagation through a fuel-lean mixture, resulting in reduction of thermal efficiency. Operation at fuel-lean conditions can damage exhaust valves, and may cause backfiring through the carburetor at very high air-fuel ratios.

Other engine variables influencing the NO_x concentration in spark-ignited engine exhaust gas are:

1. Spark timing—Advancing the spark usually increases the oxides of nitrogen by increasing peak combustion temperature.
2. Engine speed—Increasing speed while advancing the spark and at constant or increasing torque (decreasing manifold vacuum) promotes NO_x formation with either lean or rich mixtures by allowing less time for the products of combustion to expand and approach equilibrium at a lower temperature. Increasing engine speed, however, while maintaining constant power and decreasing torque may tend to decrease NO_x formation by depressing combustion pressure and temperature. The

fact that power is proportional to the product of torque and speed suggests that it may be possible to "optimize" the engine characteristics for the lowest NO_x emissions at a given power level.

3. Compression ratio—Higher compression ratios, which increase peak combustion pressure and temperature, favor formation of NO_x, particularly under lean-mixture conditions.
4. Fuel distribution—NO_x concentration for a particular cylinder depends on the air-fuel ratio in the cylinder. Poor mixture distribution resulting in a near stoichiometric mixture in only a few cylinders of an engine causes a relatively large increase of NO_x for the entire engine.
5. Coolant temperature—Raising the coolant temperature tends to increase NO_x concentration.
6. Combustion chamber deposits—A greater deposit accumulation may increase NO_x concentration.

The high compression ratio of the compression-ignition (diesel) engine results in a high combustion temperature conducive to NO_x emissions. The gas turbine may prove to have the inherent capability for low NO_x emissions. Combustion at fuel-lean conditions in the primary zone, followed by dilution of combustion gases with secondary air at an optimum rate in a long combustion chamber to approach equilibrium at the turbine inlet temperature, may greatly reduce NO_x emissions. The cooling of gases at an optimum rate in a reciprocating-piston, internal-combustion engine is difficult to achieve because engine speed inherently sets the rate of expansion.

ITEM 3—The California Experience in Retrofitting Crankcase Emission Controls

A. *1963 California Statute Requiring Retrofit of Crankcase Emissions Controls**

The people of the State of California do enact as follows:

* * * *

Section 24393 of [the Health and Safety Code] is amended to read:

24393. (a) For the purpose of this section, the 10 months of January 1965 through October 1965 shall be considered as numbered consecutively from 1 through 10.

(b) Each passenger motor vehicle except those specifically exempted, or previously so equipped, shall, during the calendar year 1965, be equipped with a certified device to control emission of pollutants from the crankcase during or prior to the month in which the last digit of its license number corresponds with the number assigned to such month in subdivision (a).

(c) No passenger motor vehicle, except those specifically exempted, shall be registered after December 31, 1965, unless and until it is equipped with a certified device to control emissions of pollutants from the crankcase.

---

* California Statutes, 1963, ch. 999, § 8, at 2264-68.

B. *1964 California Legislative Hearing on Results of Retrofitting Crankcase Emissions Controls**

CHAIRMAN McMILLAN: Today's hearing of the Assembly Interim Committee on Governmental Efficiency and Economy is on the subject of legislation proposing to register and regulate persons in the business of motor vehicle repair. The two bills are Assembly Bill 2348 by Assemblyman Kennick and Assembly Bill 2638 by Assemblyman Meyers. This controversial matter has been before us for several sessions and has been considered in previous hearings by the Committee on Transportation and Commerce as well as our committee. We hope that a draft of a bill may be proposed at this hearing that will answer the needs of the public and the profession and that we can recommend to the legislature during the 65 session.

Public attention has been called to this problem in recent months due to new legislation providing for the installation of smog control devices on automobiles. Our committee has received numerous complaints from people who have had disastrous experiences. The device or the installation or workmanship has been faulty, resulting in damage to their cars or the cost of the work has been exorbitant. We would like to ascertain whether legislation of the nature proposed here could protect the public in such instances.

We expect to hear arguments for and against the proposed legislation this morning and this afternoon

---

* Transcript, Assembly [of the State of California] Interim Committee on Governmental Efficiency and Economy, August 7, 1964: Hearing on Motor Vehicle Repair and Smog Control Devices, at 1, 97.

will go into the specific charges pinpointing the problems in the motor vehicle business.

* * * *

JENNINGS: My name is Lester Jennings.

* * * *

I have a prepared speech that will take about four minutes if that won't take too much time. There has been considerable discussion recently concerning the responsibility for engine damage caused by the presently required Crankcase Smog Control Devices on automobiles.

I would like to state that we are working with a group known as the Citizens for Smog Suppression.

There is apparently little dispute on the fact of damage, as Mr. D. A. Jensen, Executive Officer of the Motor Vehicle Pollution Control Board, has stated his department has received complaints on more than ½ of 1% of the 4 million presently installed devices, or more than 20,000 complaints. He also says, "If they (the automobile industry) have ½ of 1% complaints on any part of an automobile engine, it's a disaster."

It is further inconceivable that *all* who have experienced difficulties of this nature would have complained, or that even a large percentage would have.

The question resolves then to the area of responsibility for the damage with the Motor Vehicle Board claiming this is the fault, in the vast majority of cases, of the mechanics installing these devices. Apparently this accusation stems from the assumption the devices are complicated, delicate, finely machined and need such fine adjustments as to preclude the average mechanic being capable of properly installing same.

C. *1965 California Legislative Report on Results of Retrofitting Crankcase Emissions Controls**

The committee heard testimony on Assembly Bill 2348 by Assemblyman Kennick (1963 Session) and Assembly Bill 2638 by Assemblyman Meyers (1963 Session) in San Francisco on Friday, August 7, 1964. The two bills provide for the registration and regulation of persons in the business of motor vehicle repair. A follow-up hearing on AB 2638 was held in San Francisco on Wednesday afternoon, December 16, 1964.

Public attention had been called to this problem in recent months due to new legislation providing for the installation of smog control devices on automobiles. Many complaints had been received by the committee chairman and the authors of the bills that the devices had been improperly installed, charges were excessive, and motor damage had resulted.

* * * *

FINDINGS

1. Devices installed upon used cars are causing problems which have not developed in new cars which were engineered and designed for the use of a particular device.
2. It was asserted that smog control devices required on old used cars is the first such retroactive or "aftermarket" program and leads to forced obsolescence of cars. Additional motor tune-ups, new engines, etc., sometimes necessitated are an unfair and undue expense for the public. The com-

---

* Assembly [of the State of California] Interim Committee Reports 1963-1965, Vol. 8, No. 8, at 31-34 (1965).

plaints, according to the Smog Control Board, are usually due to the incorrect installation of the device. All agreed that crankcase devices on new and old cars have increased mechanical problems and the need for additional upkeep and expense.

3. Charges were made that the devices even on new cars cause the consumption of more oil and gasoline which eventually can cause an increase in atmosphere pollution.

Recommendations

1. Present law concerning inspections should be reconsidered.
2. There should be a publicity program to inform the public of the necessity for servicing devices on cars.
3. A modification of the present law is recommended in cases where installation would be detrimental to the vehicle or the installation charge out of proportion to the value of the car, or the law should be changed to require only new cars to have such devices.

D. *1965 California Statute Suspending Crankcase Retrofit Requirement**

The people of the State of California do enact as follows:

SECTION 1. Section 27156.5 is added to the Vehicle Code, to read:

27156.5. Notwithstanding the provisions of Section 40000, the failure of any person to have a certified motor vehicle pollution control device for the control of emission of pollutants from the crankcase installed upon a used passenger vehicle, as required by Section 24393 of the Health and Safety Code, shall not constitute a crime; and no prosecution of such person for any violation of Section 27156 on account of such failure occurring prior to the effective date of this section shall be commenced or continued.

SEC. 2. Section 24393.4 is added to the Health and Safety Code, to read:

24393.4. Notwithstanding the provisions of Section 24396, the failure of any person to have a certified device for the control of emission of pollutants from the crankcase installed upon a used passenger vehicle, as required by Section 24393, shall not constitute a crime; and no prosecution of such person for any violation of Section 24393 occurring prior to the effective date of this section shall be commenced or continued.

SEC. 3. This act is an urgency measure necessary for the immediate preservation of the public peace, health or safety within the meaning of Article IV

---

* California Statutes, 1965, ch. 3, at 872-73.

of the Constitution and shall go into immediate effect. The facts constituting such necessity are:

Under existing legislation, owners of used passenger vehicles in a number of counties in the state are required, commencing in January of this year, to have motor vehicle pollution control devices for the control of emissions of pollutants from the crankcase installed on their vehicles. This requirement has caused great concern and confusion throughout the state, and the Legislature is currently considering legislation designed to substantially eliminate this requirement and to clarify the law with respect to motor vehicle pollution control. If such legislation is enacted, and it appears probable that it will be, a substantial number of motorists in this state will either have incurred needless expense to have devices installed or will have run the risk, during the period prior to its enactment, of being prosecuted for a misdemeanor. This act provides that the failure of such persons to have the devices installed under the existing schedule of installment is not a crime; and in order to provide immediate protection for these persons it is essential that this act go into immediate effect.

E. *1965 California Statute Limiting Scope of Crankcase Retrofit Requirement**

The people of the State of California do enact as follows:

* * * *

Section 24390 is added to [the Health and Safety Code] to read:

24390. (a) Every 1966 or later year model motor vehicle subject to registration in this state shall be equipped with a certified device or devices to control emission of pollutants from the crankcase and exhaust.

(b) On and after December 1, 1965, every motor vehicle of 1963 or later year model subject to registration in this state shall be equipped with a certified device to control the emission of pollutants from the crankcase.

(c) Every motor vehicle of 1955 through 1962 year model subject to registration in this state upon transfer of ownership and registration to an owner whose residence is in a county or portion of a county within an air pollution control district which may function and exercise its powers shall be equipped with a certified device to control the emission of pollutants from the crankcase.

---

* California Statutes, 1965, ch. 2031, § 4, at 4609.

ITEM 4—Early History of Vehicle Emissions Control in California

A. *1953 Legislative Report Discussing Discovery of Role of Hydrocarbons in Air Pollution**

It was known, of course, when the air pollution control district was created in 1947, that there was smoke in the air, coming from oil burning, rubbish burning, and the disposal of industrial wastes. This pollution could be seen and was immediately attacked.

* * * *

Sulphur dioxide was also known to be present in the air in large quantities, and it was known that it was one of the causes of reduced visibility. Tests showed about 600 tons were emitted into the atmosphere each day, about half of it from the chemical and oil industries, and the other half from oil-burning heat-and-power producing equipment.

* * * *

Dusts, fumes, and liquid particles were also known to be in the atmosphere, resulting from the metallurgical industries, from mining, earth processing, clay grinding, and asphalt production, etc. In 1948, approximately 100 tons per day were emitted into the atmosphere.

* * * *

None of these visible or known pollutants seemed to be potent enough even at high concentration to produce the eye irritation and crop damage which

---

* Report of the Subcommittee of the Assembly [of the State of California] Interim Committee on Governmental Efficiency and Economy, Study and Analysis of the Facts Pertaining to Air Pollution Control in Los Angeles County 12-15 (1953).

was complained of in Los Angeles County. Search was made for other pollutants. Altogether more than 50 chemical compounds or elements were found in the atmosphere. These were given scientific analysis. The most important of these were discovered to be hydrocarbons or gasoline vapors.

It was known that large quantities of gasoline vapors were emitted into the air but gasoline vapor in itself appeared to be harmless. As a result of scientific studies, principally those of Dr. A. J. Haagen-Smit, of the California Institute of Technology, who was employed on a full-time basis by the air pollution control district, it was discovered that the hydrocarbons in gasoline vapor were oxidized by ozone and other substances when in the prescence of sunlight. The concentration of ozone in the atmosphere about Los Angeles is about 10 times that known in any other industrial area. Scientific research has shown that the hydrocarbons under these circumstances give rise to the irritating material which causes eye irritation and crop damage. They also give rise to aerosols or haze and to bad smelling compounds. These results can be produced in the laboratory artificially by the oxidization of hydrocarbons.

More than 2,000 tons of hydrocarbons were emitted into the atmosphere daily in 1948, about 1,100 tons from petroleum refining and tank storage, about 850 tons from motor vehicles, about 115 tons from delivery losses in petroleum marketing and 25 tons by other industries. Within the past six months a reduction of 100 tons per day has been effected by the use of vapor-recovery systems and properly designed storage tanks which prevent the emission of gasoline vapors. The Automobile Manufacturers Association in Detroit is working in close liaison with the district

in endeavoring to develop some process by which the emission from motor vehicles may be reduced.

* * * *

This very recent discovery of hydrocarbons in the air pollution picture has created an entirely new problem which was undreamed of at the time the district was created.

B. *1958 Report to Legislature on Progress in Developing Vehicle Emissions Controls**

My name is Smith Griswold. I am the Air Pollution Control Officer of Los Angeles County. It was my feeling, from the letter I received from you assemblymen, that your prime purpose was to discuss the progress made and the situation as it now exists in regard to control devices and I would pretty much like to stay with that and just comment briefly with what has happened since your committee met nearly two years ago, but I would like to go into detail so that there wouldn't be any misunderstanding of a rather complicated problem as to the availability of devices and as to their installation on the nearly six-million cars we have in California.

Since your last meeting, there have been very important breakthroughs in the field of device development. Now, I would like to outline briefly that a device development, a practical development, has to be broken down into several things. Now, four years ago the industry and all of us in this field felt that there were certain types of controls which could go

---

* Transcript, Assembly [of the State of California] Interim Committee on Transportation and Commerce, December 1, 1958: Hearing on Automotive Smog Control, at 2-4.

on a car. Some of them were deceleration fuel shutoffs to control the emissions of hydrocarbons at the carburetor, on the intake side. At one time, five years ago, it was felt that that was an easy thing to do and most of our work was done in that field and while we still were working on the control at the exhaust, yet that being a very difficult job, necessarily would take much longer.

* * * *

[S]ome two years ago our improved instrumentation showed us that the deceleration cycle, instead of being about forty to fifty percent of the exhaust or of the problem from the automobile, it dropped to where it was around twenty to thirty percent. Now, it became quite obvious that the installation of even a deceleration fuel shutoff device, which is much simpler, much easier to engineer, would require several years, two to three years to install on the three million cars in Los Angeles County.

During those three years, the normal accretion of additional automobiles would be such in this area that by the time the device was installed, the percentage of performance would be offset by the increased number of automobiles, and therefore, there might not be or, in fact, reasonably would not be, an appreciable improvement in the general smog characteristics as we know them in Los Angeles, so the emphasis was shifted, rather drastically, not to the exclusion of the deceleration fuel shutoff, but to bringing along the exhaust-type control device with a consideration of the fuel shutoff as a complementary or supplementary device.

C. *1959 Legislative Report on Status of Vehicle Emission Control**

It is the purpose of this report to review past studies of the smog and noise nuisances produced by motor vehicles in the heavily trafficked metropolitan areas and to obtain information concerning the current status of research programs by industry and governmental agencies designed toward the development of principles and devices with which to combat the spread of noxious gases and annoying noise.

A. Smog Control Devices

1. *Background*

This committee delayed its hearing on the problem of control of that portion of smog which is induced by motor vehicle exhaust fumes until after the automotive industry had completed its symposium on this topic in the late fall of 1958. This was done in order that testimony might be taken and information obtained from which some conclusions could be reached on the progress of research in this field. From this testimony it was hoped that recommendations could be made concerning the type, or types, of devices which could be used as standards for installation on motor vehicles in California to reduce the output of smog-producing hydrocarbons and oxides of nitrogen from automotive exhausts. The conclusion by the Los Angeles Air Pollution Control authorities, based on nearly 10 years of research on the part played by

---

* Report of the Assembly [of the State of California] Interim Committee on Transportation and Commerce, Motor Vehicle and Highway Problems 44-49 (Assembly Committee Reports 1957-59, Vol. 3, No. 6 (1959)).

the automobile in the increasing smog problem is the basis for the assumption that they are a major contributing factor.

* * * *

As a result of these assumptions concerning the part the automobile has played, and is playing, in the overall production of smog, not only in the Los Angeles area but elsewhere, the automotive industry in 1953 organized a Vehicle Combustion Products Committee under the direction of the Automobile Manufacturer's Association Engineering Advisory Committee, for the purpose of establishing an intensive, co-operative research program to develop methods for the control of the emissions of automotive exhaust gases which contribute to the air pollution problem. This action was undertaken primarily to assist the Los Angeles community to combat the automobile-induced factor of photochemical smog. The industry program has been conducted since that time at a cost of approximately one million dollars a year, as reported by them to an Assembly committee on October 22, 1958.

2. *Problems Encountered*

The problems encountered and which have not yet been completely and satisfactorily resolved by research teams representing both the Los Angeles Air Pollution Control District and the AMA are numerous. As pioneers in the search for intruments with which to accurately measure the effectiveness of principles which have been advanced to control the output of smog-producing gases from automobiles, the Los Angeles APCD believes that they have succeeded in effecting a breakthrough in this particular. As an

example, this improved instrumentation has made it possible for their researchers to eliminate the deceleration cycle of automotive operation as the principal cause of smog production by the automobile. While this discovery was of major importance, it has had the effect of increasing rather than decreasing the overall problem of control. This seeming paradox is, really, rather simply explained. While the problem of engineering a suitable device to control the gasoline intake to the motor so as to eliminate, or greatly reduce the quantity of a "rich" mixture of fuel passing through an idling motor was found to be a simple one, still the problem of installing such a device on the three million cars in Los Angeles County was a major one and would have required from two to three years to effect. Since it was discovered that the deceleration cycle was responsible for less than one-fourth instead of more than one-half of the automotive smog production, this would have been a major blunder.

But the elimination of the deceleration cycle as the major factor in automotive smog production has not reduced the scope of the problem. Instead, the improved instrumentation made it manifest that it would be necessary to control the gaseous output induced by all phases of car operation: that is, idling, cruising and acceleration as well as deceleration.

This meant that any control to be effective, would have to be located in the exhaust system. That is where research, currently, is being concentrated.

3. *Principles and Devices*

Two major principles for the reduction, percentagewise, of motor vehicle exhaust fumes have been de-

veloped. These are the use of catalytic converters to oxidize the exhaust hydrocarbons and the installation of afterburners to complete the combustion of the fuel which has passed, unburned, from the engine into the exhaust system.

Both these principles represent breakthroughs in the overall problem of reducing the amount of hydrocarbons produced as the result of the emission of unburned fuel from the motor to the surrounding atmosphere. But these developments do not solve the major problem, that of developing a device (or devices), designed in such a manner so as to be effective, economical, and of a size and shape to be symmetrically and readily installed on all types of automobiles.

* * * *

4. *Finding of Facts*

a. That research by an agency of the Los Angeles Air Pollution Control District, over a period of about eight years, has convinced that body that between 60 and 66 percent of the eye-irritating, crop damaging, smog is caused by photochemically induced reactions between the hydrocarbons and oxides of nitrogen which are contained in automobile exhaust gases.

b. That the Automobile Manufacturers in 1953 began a co-operative attack, with the Los Angeles APCD on the problem of reducing the emissions of hydrocarbons and oxides of nitrogen from automobiles.

c. That in recent years it has been determined that control of the problem can only be effected by the installation of a suitable device in the exhaust system of automobiles, rather than by controlling the

fuel mixture and quantity during the deceleration and idling cycles of motor operation.

d. That the AMA, in conjunction with the Los Angeles APCD, have developed two main principles of control of automobile-induced smog. These are:

1. The principle of using a catalytic converter to oxidize or dissolve the unburned hydrocarbons. These are of several types, using different catalytic agents, such as:
   a. The Oxy-Catalyst (Houdry-GM) Converter
   b. The Vanadium Pentoxide (Ford) Converter
   c. The Vanadia-Alumina (Ford) Converter
2. The afterburner principle designed to complete the combustion of unburned gases in a furnace-type device in the exhaust system.

e. That at the time of going to print, no device, based upon either of the above principles, has been developed which could be installed on automobiles already in operation.

f. That some of the problems confronting the AMA in the design and construction of a suitable operating device, employing either the catalytic converter or afterburner principle of hydrocarbon control, are:

1. Design, including size, shape, weight, safety, and installation characteristics.
2. Quantity of production. Will there be a market for such a product in areas other than Los Angeles or, in the maximum, all of California?

3. Buyer opposition to cars equipped with smog control devices, regardless of local or state regulations. This opposition is partly an economic one. The first cost of the least expensive device is now estimated to be between $125 and $200 per unit. In all of California this could mean an outlay of $1,125,000,000, at least, using an average cost of $150 per unit for 7,500,000 cars. This is a modest estimate. In addition, such a great outlay should be followed up by an adequate inspection system to insure that the devices are operating in an efficient manner. This could require a statewide inspection system for all motor vehicles with the concomitant problems of what type of inspection operation would be required, and whether state or private ownership (or a combination of both), would finance the project. Also involved would be the number and cost of individual inspections that would be necessary.

g. That there is some evidence to support the contention of the Los Angeles APCD that research in the field of smog control should be augmented and speeded up by assistance from state funds.

h. That even if a suitable device is developed to reduce the air contaminants produced by automobile exhaust fumes, there is still the problem of air pollution stemming from fumes caused by the evaporation of gasoline from automobile carburetors and tanks. The Los Angeles APCD estimates that as much as 84 tons of irritants are produced on the hottest days from this source.

i. That there is also the question of whether or not the automobile-induced air contamination is a local or a statewide problem.

j. That the witnesses representing the Los Angeles APCD were unanimous in their praise of the AMA smog control research team for their active interest in attempting to solve the Los Angeles smog problem and for the spirit of co-operation that exists between the APCD and the AMA research groups.

k. That a contributing factor in the problem of smog control is the rapid growth of the Los Angeles area which amounts to an equivalent of the entire present population of Pittsburgh, Pennsylvania, every three and one-half years. Industries and automobiles are increasing at least proportionately to the population growth.

l. That the California Highway Patrol will be ready to set up testing procedures whenever adequate smog control devices are produced and suitable standards for their operation are adopted. This could well require statewide inspection of all automotive vehicles at stated intervals because of the engineering difficulties which are apparent at this time.

m. Dr. Haagen-Smit, of the California Institute of Technology, in a letter to Chairman Lee Backstrand of the Southern California subcommittee, and which was read into the record, suggested an alternative to attempting the control of automotive-induced smog by the installation of devices on all motor vehicles. This was that it might become necessary to legislate on the olefin content of gasoline to produce a fuel free from smog-producing ingredients.

ITEM 5—Social, Political, and Economic Factors in Air Pollution*

Environmental problems seldom stem from simple causes. Rather they usually rise out of the interplay of many contributing circumstances.

Misplaced Economic Incentives

Many individuals cite selfish profit seekers for environmental degradation, rather than laying much of the blame—where it belongs—to misplaced incentives in the economic system. Progress in environmental problems is impossible without a clearer understanding of how the economic system works in the environment and what alternatives are available to take away the many roadblocks to environmental quality.

Our price system fails to take into account the environmental damage that the polluter inflicts on others. Economists call these damages—which are very real—"external social costs." They reflect the ability of one entity, e.g., a company, to use water or air as a free resource for waste disposal, while others pay the cost in contaminated air or water. If there were a way to make the price structure shoulder these external costs—taxing the firm for the amount of discharge, for instance—then the price for the goods and services produced would reflect these costs. Failing this, goods whose production spawns pollution are greatly underpriced because the purchaser does not pay for pollution abatement that would prevent environmental damage. Not only does this failure encourage pollution but it warps the price struc-

---

* Council on Environmental Quality, First Annual Report, *Environmental Quality* 12-16 (1970).

ture. A price structure that took environmental degradation into account would cause a shift in prices, hence a shift in consumer preferences and, to some extent, would discourage buying pollution-producing products.

Another type of misplaced incentive lies imbedded in the tax structure. The property tax, for example, encourages architectural design that leans more to rapid amortization than to quality. It may also encourage poor land use because of the need for communities to favor industrial development and discourage property uses, such as high-density housing, which cost more in public services than they produce in property taxes. Other taxes encourage land speculation and the leapfrog development that has become the trademark of the urban-rural fringe.

Values

Americans have placed a high priority on convenience and consumer goods. In recent times they have learned to value the convenience and comfort of modern housing, transportation, communication, and recreation above clean earth, sky, and water. A majority, like a prodigal son, have been willing to consume vast amounts of resources and energy, failing to understand how their way of life may choke off open space, forests, clean air, and clear water. It is only recently that the public has become conscious of some of the conflicts between convenience and a deteriorating environment.

* * * *

Population

Americans are just beginning to measure the magnitude of the impact of population and its distribution

on their environment. The concept that population pressures are a threat to the Nation's well-being and to its environment is difficult to grasp in a country which, during its formative decades, had an ever receding western frontier. That frontier ended at the Pacific many years ago. And it is at the western end of the frontier that some of the most serious problems of population growth emerge most clearly.

California continues to lure large numbers of Americans from all over the country, in large part because of its climate and its beauty. But as the people come, the pressures of population mount. Smog, sprawl, erosion, loss of beaches, the scarring of beautiful areas, and the congestion of endless miles of freeways have caused thoughtful Californians to consider stemming the continued uncontrolled development of their State. When the Governor's Conference on California's Changing Environment met last fall, it agreed that there was now a need "to deemphasize growth as a social goal and, rather, to encourage development within an ideal and quality environment."

* * * *

Technology

The major environmental problems of today began with the Industrial Revolution. Belching smoke from factory stacks and the dumping of raw industrial wastes into rivers became the readily identified, but generally ignored hallmarks of "progress" and production. They are no longer ignored, but the extraordinary growth of the American economy continues to outpace the efforts to deal with its unwanted byproducts.

* * * *

Mobility

The extraordinary, growing mobility of the American people constitutes another profound threat to the environment—in at least three major ways. The physical movement of people crowds in on metropolitan centers and into recreation areas, parks, and wild areas. Mobility permits people to live long distances from their places of employment, stimulating ever greater urban and suburban sprawl. The machines of this mobility—particularly automobiles and aircraft—themselves generate noise, air pollution, highways, and airports—all in their way affecting the environment.

* * * *

Limitations of Government Units

Most government agencies charged with solving environmental problems were not originally designed to deal with the severe tasks they now face. And their focus is often too narrow to cope with the broad environmental problems that cut across many jurisdictions. Agencies dealing with water pollution, for example, typically do not have jurisdiction over the geographic problem area—the watersheds. Control is split instead among sewerage districts, municipalities, and a multitude of other local institutions. To attack water pollution effectively may require establishing new river basin authorities or state-wide basin agencies with the power to construct, operate, and assess for treatment facilities.

* * * *

Information Gap

Sometimes people persist in actions which cause environmental damage because they do not know that

they are causing it. Construction of dams, extensive paving of land surfaces, and filling of estuaries for industrial development have in many cases been carried out with incomplete or wrong information about the extent of the impact on the environment. Furthermore, change in the environment has often been slow and exceedingly difficult to detect, even though piecemeal changes may eventually cause irreversible harm. Widespread use of certain types of pesticides, mercury pollution, and the use of dangerous substances such as asbestos occurred without advance recognition of their potential for harm.

ITEM 6—Varying Legislative Approaches to Inspection and Maintenance of Used Vehicles

A. *1971 California Air Resources Board Report on Reducing Emissions by Inspection**

The California motor vehicle emission control program requires the installation of control systems on motor vehicles as a means of reducing hydrocarbons, carbon monoxide and oxides of nitrogen. Success of this program depends on effectiveness of control systems at the time of installation and on their continual effectiveness during the service life of the vehicle. Once properly installed, systems for crankcase and evaporative emission control require relatively little maintenance and adjustment to continue to operate properly. Exhaust controls include the engine carburetion and ignition system and is much more sensitive to adjustment and maintenance.

In emission surveys, it is not unusual to find cars that discharge contaminants several times the average emissions. Many of these cars could be restored to a reasonable level of emission by minor adjustments or replacement of worn out ignition system components. Tests by the Air Resources Board of controlled vehicles have shown that the exhaust emissions often increase because of poorly maintained or maladjusted carburetion and ignition systems. The emissions would be lower if the vehicles are properly maintained and adjusted. Because of the potential benefits for emission reduction, interest has developed in a mandatory vehicle inspection program. As a

---

* California Air Resources Board, A Report to the Legislature on Vehicle Emissions Inspection 1-2, 14-23 (July 1, 1971).

result, the 1970 Legislature directed the Air Resources Board to undertake a study to determine:

1. The reductions in automotive emissions that could be achieved by practicable vehicle emission inspection programs; and
2. The costs of carrying out such programs on a permanent basis.

The Board was to report its findings and recommendations to the Legislature by July 1, 1971. Should the Board recommend the initiation of any specific vehicle emissions inspection program, it was also to describe the estimate of the reduction in air pollution that would be achieved, the manner in which the program would operate, and the projected annual cost.

* * * *

V. Discussion

1. *General Comments on Northrop and TAC Conclusions*

The study by Northrop and the evaluation by the Board's Technical Advisory Committee have both indicated inspection and mandatory maintenance would be beneficial in terms of hydrocarbon and carbon monoxide reductions, but would increase oxides of nitrogen emissions. There are the common findings that inspection would be costly in terms of total annual costs, would require skilled personnel that are not currently available, and would take a period of several years to develop and implement. The consensus of both studies is also that to be of maximum benefit, the program must be operative within a few years.

* * * *

2. *Effects on Emissions*

Among the four possible methods of inspection studied, Northrop concluded that the key-mode test was the most cost-effective. If a statewide inspection system is carried out using this method, exhaust hydrocarbon emissions could be reduced by 200 tons per day statewide averaged over the first five years, or by about 20 percent.

Reducing exhaust hydrocarbons by 20 percent, in effect, produces about a ten percent decrease in total hydrocarbon emissions to the atmosphere. In terms of improvement in photochemical smog, the benefit would even be less because the reduction of hydrocarbon is offset by oxides of nitrogen increases which will be discussed later.

It is questionable that an inspection program could be realistically expected to be fully implemented in 3 to 4 years. By that time, another 30 percent of the older cars would be replaced by new vehicles which will be equipped with exhaust control systems. Since inspection is more effective in reducing hydrocarbon from uncontrolled cars than new vehicles, the benefits of a program will be less if it were not operative until 3-4 years from now.

The expected hydrocarbon reduction, of 20 percent would be similar to the effect of reducing motor vehicle usage by 20 percent, that would be accomplished by a ride-sharing program, or by voluntarily restricting the use of motor vehicles. Reducing motor vehicle use would, of course, be even more beneficial because it would reduce all emissions, not just hydrocarbons and carbon monoxide.

A negative aspect of an inspection and maintenance program for present cars is the adverse effect

on oxides of nitrogen emissions. The increase in these emissions would partially offset the gain in the other emissions. When cars have oxides of nitrogen control systems, inspection would be expected to reduce the emission of these compounds from malfunctioning control systems. However, at that time the expected reduction in hydrocarbon and carbon monoxide will be less because there will be fewer uncontrolled vehicles.

With respect to carbon monoxide, there appears to be significant benefit. Not only are the magnitude and percentage of reduction large by comparison to hydrocarbon emissions, such reduction will also have a noticeable effect on the ambient concentration of carbon monoxide since over 90 percent of carbon monoxide in the air comes from motor vehicles. Carbon monoxide is not the most critical problem in California from the standpoint of public response to air pollution. Incidents of high carbon monoxide concentration will be alleviated through the current control program. Because photochemical air pollution is the most troublesome problem in California, this is the problem the inspection program should be mainly designed to help alleviate.

3. *Cost*

An inspection and maintenance program, regardless to the method used, would be costly.

* * * *

4. *Personnel Needs*

Northrop and TAC concluded that sufficient personnel with technical skills required for the inspection program are not now available.

* * * *

5. *Other Implications of Inspection Program*

The method most suitable for a statewide inspection program, and the emission benefits to be realized will vary depending on whether the program is intended to controlled vehicles, to uncontrolled vehicles or to both. If it is for both, the distribution of controlled and uncontrolled vehicles in the vehicle population and the type of control systems used are important factors that must be taken into account.

* * * *

VI. Summary

1. The study by Northrop and evaluation by the Board's Technical Advisory Committee both indicate that inspection and mandatory maintenance is technically feasible and that it would achieve some reductions of hydrocarbons and carbon monoxide emissions from motor vehicles, but it would increase oxides of nitrogen. The decision to undertake an inspection program, however, should not be based on technical feasibility alone. The expected benefits of the program must be balanced against the adverse effects of oxides of nitrogen increase, costs, inconvenience to the motorists, the requirement of trained and skilled personnel.
2. On a long-term basis, regular inspection and maintenance is needed. All or most of the cars will be equipped with systems that involve engine modifications, advanced control systems or combinations of these approaches. Inspection and periodic maintenance are required to ensure their continual effectiveness.
3. Any inspection method, if it is to be suitable, must be adaptable to future requirements, because

technology of emission control is changing. What is appropriate today may be obsolete a few years later.

4. It would not be prudent to embark at this time on an inspection program which requires permanently committed installations and large capital investments. Such a program should be amenable to easy modifications.

5. To be effective, a mandatory inspection and maintenance program must be manned by qualified personnel and the programs must be closely supervised.

VII. Recommendations

1. A statewide inspection program that requires the acquisition of State operated installations, dynamometers and testing equipment, not be established at this time.

2. A pilot inspection program using highly qualified stations be undertaken.

3. The pilot program should include determinations of:

   a. The applicability of annual inspection involving mandatory diagnosis, adjustment and repair to minimize motor vehicle emissions.

   b. The extent of upgrading service personnel needed and the means by which upgrading can be accomplished.

   c. The advantages and the problems of this inspection and maintenance system under actual operating conditions.

B. *1971 California Law Authorizing Retrofit Requirement to Reduce Oxides of Nitrogen**

The people of the State of California do enact as follows:

SECTION 1. Section 39107.6 is added to the Health and Safety Code, to read:

39107.6. Notwithstanding Section 39107, the board shall set standards for devices to significantly reduce the emission of oxides of nitrogen from the exhaust of 1966 through 1970 model year motor vehicles, as determined by the board from a representative sampling of such vehicles, which the board has found to be necessary and technologically feasible to carry out the purposes of this part.

In setting standards under this section, the primary consideration shall be the greatest possible reduction of oxides of nitrogen.

SEC. 2. Section 39177.1 is added to the Health and Safety Code, to read:

39177.1. (a) Whenever an exhaust emission control device meeting the standards established by the board under Section 39107.6 is accredited pursuant to the provisions of this article and is available for installation as determined by the board, every 1966 through 1970 model year motor vehicle having a manufacturer's gross vehicle weight rating of under 6,001 pounds, which is subject to registration in this state, shall be equipped with such accredited exhaust emission control device in accordance with a schedule of installation to be determined by regulation

---

* Senate Bill No. 578, November 16, 1971.

adopted by the board, in consultation with the Department of the California Highway Patrol and the Department of Motor Vehicles.

(b) Enforcement of the provisions of subdivision (a) shall be as follows:

(1) Vehicle inspections shall be conducted pursuant to Section 2814 of the Vehicle Code.

(2) Certificates of compliance shall be required upon initial registration, and upon transfer of ownership and registration pursuant to Section 4000.1 of the Vehicle Code.

(3) Certificates of compliance shall be required upon renewal of registration for the year 1973, pursuant to Section 4602 of the Vehicle Code.

(4) By such other authorized means as the board, the Department of Motor Vehicles, and the Department of the California Highway Patrol find practicable.

(c) After one or more devices are initially accredited, no device shall be accredited which is less effective than the one or ones initially accredited. Any subsequent accreditation of a more effective device shall not affect the accreditation of a previously accredited device.

* * * *

SEC. 5. Section 39177.4 is added to the Health and Safety Code, to read:

39177.4. (a) Any manufacturer of a device required by Section 39177.1 shall, as a condition of accreditation of such device by the board, agree that until there are two or more accredited devices suita-

ble for installation on motor vehicles of the same classification, such classification to be determined by the board, the manufacturer shall, with respect to his device for such classification of motor vehicles, either: (1) agree to enter into such cross-licensing or other agreements as the board determines are necessary to insure adequate competition among manufacturers of such devices to protect the public interest; or (2) agree as a condition to such accreditation that, if only one such device from one manufacturer is made available for sale to the public, the board shall, taking into consideration the cost of manufacturing the device and the manufacturer's suggested retail price, and in order to protect the public interest, determine the fair and reasonable retail price of such device and may require, as a condition to continued accreditation of such device, that the retail price of such device, including installation, not exceed such price as determined by the board. In either event, the retail price so determined by the board for a device required by Section 39177.1 shall not be in excess of thirty-five dollars ($35) per vehicle, installed.

(b) Accreditation may be revoked by the board after a public hearing for which notice has been given to the applicant who obtained the accreditation, if the actual cost of the device installed exceeds the cost, installed, estimated, or agreed to by such applicant.

* * * *

SEC. 8. This act is an urgency statute necessary for the immediate preservation of the public peace, health or safety within the meaning of Article IV of the Constitution and shall go into immediate effect. The facts constituting necessity are:

Presently required emission control devices for motor vehicles of 1966 through 1970 models do not eliminate enough of the oxides of nitrogen to insure the health and safety of the majority of California's citizens. It is now technically feasible to produce devices which will significantly reduce these dangerous substances. To insure that such devices are installed on most of such passenger vehicles within the shortest time possible, it is necessary to immediately begin programs for testing and approving such devices. Immediate passage of this act will also give manufacturers additional time to develop such devices.

C. *1971 Chicago Ordinance Requiring Inspection to Reduce Hydrocarbon and Carbon Monoxide Emissions**

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF CHICAGO:

SECTION 1. Chapter 17 of the Municipal Code of Chicago is hereby amended by adding a new article thereto to be designated Article IIA, Sections 17-2A.1 through 17-2A.7 inclusive, as follows:

ARTICLE IIA—AIR POLLUTION CONTROL: MOBILE SOURCES

* * * *

17-2A.2. It shall be unlawful within the City of Chicago on and after June 1, 1973 for any person

---

* Chicago, Illinois, Amendment to Chapter 17 of the Municipal Code, Art. IIA, November 29, 1971.

to permit, allow or cause the operation of any spark ignition powered motor vehicle in the City of Chicago which emits carbon monoxide (CO) or hydrocarbons (HC) in the exhaust emissions of the vehicle in excess of the following standards when measured by an approved exhaust gas analytical system under test procedures propounded in the Code of Recommended Practices of the Department of Environmental Control:

		Idle Exhaust Emission Standard	
Type of Vehicle	Model Year	Hydrocarbons	Carbon Monoxide
A. Non-Fleet	Pre-1968	1000 ppm	6.0%
Same	1968-1969	600	5.0
Same	1970 through 1974	500	4.0
Same	1975 and subsequent years	250	1.5
B. Fleet Vehicles	Pre-1968	600	5.0
Same	1968-1969	400	4.5
Same	1970 through 1974	300	3.5
Same	1975 and subsequent years	150	1.3
C. Passenger Carriers for Hire	Pre-1968	400	3.0
Same	1968-1969	300	2.0
Same	1970 through 1974	300	1.5
Same	1975 and subsequent years	100	0.8

D. All vehicles are required to have lower hydrocarbon and carbon monoxide emissions at 2250 plus or minus 250 rpm speed than at idle.

17-2A.3. It shall be unlawful within the City of Chicago on and after June 1, 1973 for any person to permit, allow or cause the operation of any spark ignition powered motor vehicle which emits visible smoke in the exhaust emissions at the exhaust outlet greater than No. 1 Ringlemann or equivalent.

17-2A.4. It shall be unlawful within the City of Chicago on and after June 1, 1973 for any person to permit, allow or cause the operation of any diesel-powered motor vehicle in the City of Chicago which emits smoke in the exhaust emissions of the vehicle in excess of the following standards when measured by an approved smokemeter under test procedures propounded in the Code of Recommended Practices of the Department of Environmental Control:

Type of Vehicle	Model Year	Mode of Test	Smoke Opacity Permissible
All	All	lugging	20%
All	All	accelerating	40%

17-2A.5. On and after June 1, 1973, every motor vehicle registered or subject to registration in the City of Chicago shall be inspected and tested annually for compliance with the emission standards established in Sections 17-2A.2, 17-2A.3 and 17-2A.4. The inspection and testing shall be performed at testing stations operated or designated by the Department of Environmental Control and in accordance with a schedule established by the Commissioner. The Commissioner shall issue a certificate of compliance to the registered owner of motor vehicles tested and found in compliance with the emission standards established by this Article IIA and it shall be unlawful for any person to permit, allow or cause the operation of any motor vehicle registered or subject to registration in the City of Chicago without first having secured said certificate of compliance; provided, however, that nothing herein contained shall excuse any person owning or operating a motor vehicle from maintaining said vehicle within the standards set forth in Sections 17-2A.2, 17-2A.3 and 17-

2A.4 of this Article on and after June 1, 1973; and provided, further, however, that nothing herein contained shall be deemed to preclude any appropriate enforcement agency from requiring a reinspection of any motor vehicle at such reasonable time or times as may be necessary following the certification herein provided.

* * * *

SECTION 2. This ordinance shall take effect on and after ten days from the date of its due passage and publication.

D. *Proposed New Jersey Law Requiring Inspection to Reduce Hydrocarbon and Carbon Monoxide Emissions**

TAKE NOTICE, that the New Jersey State Department of Environmental Protection will hold a public hearing on proposed Chapter 15 of the New Jersey Air Pollution Control Code: CONTROL AND PROHIBITION OF AIR POLLUTION FROM LIGHT-DUTY GASOLINE-FUELED MOTOR VEHICLES.

* * * *

This hearing will be held in accordance with the provisions of the Air Pollution Control Act (1954) as amended by Chapter 106, P.L. 1967.

It is recommended that at the time of the public hearing or prior thereto, a brief or briefs be submitted to the department on all matters desired to

---

* New Jersey State Department of Environmental Protection, Notice of Public Hearing on Air Pollution Control Code, Proposed Chapter 15 (May 27, 1971).

be brought to the attention of the department concerning the provisions of the proposed new code Chapter 15.

The text of the code chapter to be considered in the public hearing is presented on the following pages.

* * * *

Section 1 DEFINITIONS:

1.1 PERSON: Includes corporations, companies, associations, societies, firms, partnerships and joint stock companies as well as individuals, and shall also include all political subdivisions of this State or any agencies or instrumentalities thereof.

1.2 MOTOR VEHICLE: Includes all vehicles propelled otherwise than by muscular power, excepting such vehicles as run only upon rails or tracks.

* * * *

Section 2 PUBLIC HIGHWAY STANDARD:

No person shall operate any gasoline-fueled, light-duty motor vehicle or permit such vehicle which he owns to be operated upon the public highways of the State if the vehicle emits visible smoke in the exhaust emissions or in the crankcase emissions.

Section 3 INSPECTION STANDARD:

3.1 Any gasoline-fueled, light-duty motor vehicle which is subject to inspection required by the Division of Motor Vehicles, as a condition of compliance with said inspection, shall not emit visible smoke in the exhaust emissions or in the crankcase emissions.

3.2 Any gasoline-fueled, light-duty motor vehicle which is subject to inspection required by the Division of Motor Vehicles, as a condition of compliance with said inspection after the effective dates set forth in Table I, shall not emit carbon monoxide (CO) and/or hydrocarbons (HC) in the exhaust emissions in excess of the standards set forth in Table I, when measured using an approved exhaust gas analytical system and the prescribed inspection test procedure.

Section 4 EXCEPTION:

The provisions of Section 3.2 of this Chapter shall not apply to motorcycles.

TABLE I

INSPECTION STANDARDS

VEHICLES SUBJECT TO INSPECTION REQUIRED BY THE DIVISION OF MOTOR VEHICLES

(Reference P.L. Title 39:8-10)

MODEL YEAR OF VEHICLE	EFFECTIVE 1972		EFFECTIVE 1973	
	CO(%)	HC(PPM)	CO(%)	HC(PPM)
Up to and including 1967	7.5	1200	6.0	1000
1968-1969	5.0	600	4.0	500
1970 and Later	4.0	400	3.0	300

* * * *

BASIS FOR PROPOSED CHAPTER 15

AUTOMOTIVE AIR POLLUTION IN NEW JERSEY

New Jersey is particularly vulnerable to pollution from automotive sources because it has the highest density of motor vehicles in the United States—440

per square mile as of December 1969. In the metropolitan area, this density is much higher. Hudson County, for example, has 4,780 vehicles per square mile. Because of this heavy concentration, it is mandatory that all emissions which pollute the atmosphere be held to the minimum attainable through reasonable regulation.

The ultimate goal of controlling and prohibiting air pollution from light duty gasoline-fueled motor vehicles is, of course, to eliminate motor vehicle emissions as an air pollution problem. The inspection test prescribed in proposed Chapter 15 will be a significant step toward attaining this goal. A periodic check on emissions from New Jersey vehicles will be provided.

General Effects of Motor Vehicle Emissions on New Jersey's Air

The Federal Environmental Protection Agency has issued outdoor air quality standards for several pollutants which are primarily products of engine combustion processes and evaporation of gasoline. Among these are standards for carbon monoxide and hydrocarbons (for which New Jersey inspection standards are now proposed) and nitrogen dioxide. Federal air quality standards also have been issued for photochemical oxidants, which result from interactions between hydrocarbons and nitrogen oxides in the outdoor air after they have been emitted by vehicles or other sources.

A description of the effects of these pollutants and a comparison of New Jersey's air quality with the standards follow.

CARBON MONOXIDE (CO): Carbon monoxide is a colorless, odorless gas which affects human beings by depriving the blood of oxygen. In sufficiently high concentrations, carbon monoxide can cause death by suffocation. However, lesser concentrations in confined areas, such as jammed streets or expressways, can affect human response time in varying degrees.

* * * *

HYDROCARBONS (HC): Hydrocarbon concentrations in the outdoor air normally are not sufficient to have direct health effects on people. But, when the hydrocarbons react with oxides of nitrogen in the outdoor air, irritating photochemical oxidants (smog) result under certain weather conditions. The level of reactive hydrocarbons present during the morning hours determines the level of photochemical oxidants which can be formed later in the day if bright sunshine is present.

* * * *

NITROGEN OXIDES (NO_x): Nitrogen oxides are important to the formation of photochemical oxidants. In addition, one of the nitrogen oxides, nitrogen dioxide (NO_2), is directly toxic to human beings and can affect the respiratory system. The Federal standard for nitrogen dioxide in the outdoor air is 100 micrograms per cubic meter of air (0.05 parts per million) annual arithmetic mean. This standard was met at the three monitoring sites in New Jersey in 1970 . . . . However, concentrations of total nitrogen oxides in the air still are sufficient for photochemical oxidant formation on certain days.

* * * *

PHOTOCHEMICAL OXIDANTS (O_x): Eye irritation and respiratory impairment are two undesirable ef-

fects of photochemical oxidants. Persons suffering from respiratory ailments are particularly affected. The process of oxidant formation is complex, requiring the presence of bright sunlight and relatively still air, as well as the proper mixture of hydrocarbons and nitrogen oxides in the air. Outdoor air quality monitoring data give ample evidence that oxidant formation can and does occur in New Jersey.

* * * *

Laboratory studies conducted by various researchers suggest that, while hydrocarbons and nitrogen oxides both are necessary precursors of photochemical oxidants, reduction in hydrocarbons should be the primary step for oxidant control. New Jersey's proposing of motor vehicle inspection standards for hydrocarbons and carbon monoxide, but not for nitrogen oxides at this time, is basically in conformance with this finding.

SMOKE: Visible smoke is another form of air pollution from motor vehicles which is particularly objectionable to the public. In addition to being a nuisance to the motorist following a smoky vehicle, excessive smoke gives rise to general visibility reduction, eye irritation and damage to materials.

SUMMARY OF GENERAL EFFECTS: The data presented above are highly condensed from several years of measurements and study of air pollution levels in New Jersey. They are intended only to provide some explanation of the complex issues involved in assessing the impact of certain specific types of automotive exhaust emissions on the outdoor air.

The background of scientific information relating to the photochemical oxidant phenomenon (smog)

resulting from NO_x and HC reactions in the outdoor air draws heavily upon studies conducted in Los Angeles, California. There is reason to believe that the behavior and effects of these pollutants in New Jersey are similar to those which occur in Los Angeles, although the effects are not yet so severe or serious.

It can be stated in general that hydrocarbons, which contribute to photochemical smog, affect wide areas of the state, and that hydrocarbons exhausted from vehicles in one part of the state can have an effect on air quality many miles distant. Carbon monoxide, on the other hand, has its harmful effects within the immediate vicinity of dense traffic, and may have little significant consequence a few thousand feet away. Carbon monoxide is essentially a center city problem.

Unnecessary emissions of hydorcarbons and carbon monoxide must be reduced, if the threat of motor vehicle pollution is to be reduced.

* * * *

NECESSITY FOR STATE CONTROL

In order to assure that vehicles manufactured with control devices continue to perform with a reasonable degree of effectiveness, some form of inspection must be implemented by the State. It is well recognized that proper maintenance of engines and control systems would be a major step toward improved vehicle emission control.

* * * *

1967 AND EARLIER MODEL YEARS: Automobiles produced prior to 1968 were not equipped with systems designed to meet any legal requirements for air pollution control. However, beginning in 1963 vehicle

manufacturers did voluntarily install crankcase ventilating devices for reducing hydrocarbon emissions in the form of raw gasoline. This source of emission, which results from gasoline being blown by the piston rings, is commonly referred to as "engine blowby." Proper maintenance of these blowby control devices is vitally necessary if they are to continue to be effective and to prevent engine damage. Although State inspection of these systems would be desirable, the procedure for testing is not well adapted to the New Jersey motor vehicle inspection system, and no standard for this source is proposed.

Excessive and unreasonably high levels of tailpipe exhaust emissions from vehicles of this model year group result when engines are improperly maintained or are out of tune. Studies conducted by the department indicate that, if the engines of all pre-1968 cars exceeding the proposed standards were to be properly tuned and maintained, the concentration, as measured at the tailpipe, of the carbon monoxide emissions from this group of vehicles could be reduced by as much as 56 percent and hydrocarbons by 55 percent. The proposed standards, to become effective in 1972, would require engine maintenance on about 38 percent of the vehicles registered this year in New Jersey, or 783,000 pre-emissions control vehicles. The 1973 standards would require about 50 percent to be serviced.

It may initially appear that the proposed standards are unusually restrictive. However, the department has tested and systematically maintained many of these excessively emitting vehicles. Corrective maintenance has reduced emission levels of such vehicles well below the standard. Proper tuning of pre-emis-

sions-control vehicles to meet the proposed 1973 standards would reduce the total emissions of carbon monoxide and hydrocarbons entering New Jersey's outdoor air by 12 percent and 26 percent respectively.

1968-69 MODEL YEARS: Vehicles manufactured during these model years were equipped with exhaust emission control systems or devices in accordance with Federal requirements. Improper or inadequate maintenance of the engine and/or the emission control systems can cause unnecessarily high emissions of carbon monoxide or hydrocarbons. Studies conducted by the department indicate that proper maintenance of these vehicles would reduce the concentration, as measured at the tailpipe, of carbon monoxide emissions by 68 percent and of hydrocarbon emissions by 63 percent. The standards proposed to become effective in 1972 would require approximately 36 percent of these vehicles to be serviced, and the 1973 standards approximately 45 percent. Approximately 275,000 vehicles would be affected by the 1972 standards, and 351,000 a year later. The resulting reduction of total emissions as measured in the atmosphere would be on the order of 6 percent carbon monoxide and 5 percent hydrocarbons with the 1973 standards.

1970 AND LATER MODEL YEARS: Motor vehicles manufactured during these model years are equipped with advanced design emission control systems or devices. Again proper engine maintenance and maintenance of the control systems and devices is vital if these vehicles are to perform in such manner as to benefit from legal and technological advancements. Based on somewhat limited studies, the department's data indicate that about 28 percent of these vehicles

would fail inspection, and would require tune-up to meet the 1973 standards. The data gathered by the department suggest a concentration reduction of 82 percent for carbon monoxide emissions and 44 percent for hydrocarbon emissions would be achieved. This reduction would reduce total carbon monoxide by 2 percent in 1973, and total hydrocarbons would be reduced by 1 percent. Percent reductions in this group would increase in time as more vehicles in this class are purchased and as they come to require maintenance.

* * * *

The establishment of inspection standards for all New Jersey vehicles can make a significant contribution to improved air quality, particularly in urban areas. However, to assure meeting outdoor air quality standards, further tightening of inspection procedures and standards and perhaps more restrictive controls on motor vehicle emissions and traffic flow must be envisioned for the future.

The concept as offered in this proposal can make a significant start toward reducing air pollution from motor vehicles by assuring that vehicles with control devices continue to perform properly. At the same time, it will create an awareness on the part of the motoring public, the automotive service industry and the automobile manufacturing industry of a need to share in the responsibility for cleaning New Jersey's air.

ITEM 7—California Experience with Exhaust Control Devices, 1964-1965

A. *Approval of Three Exhaust Devices for Factory Installation on New 1966 Model Vehicles**

WHEREAS, Walker Manufacturing Company, a subsidiary of Kern County Land Co., Inc. and American Cyanamid Co., Inc. filed a joint application for approval of an exhaust emission control system on September 14, 1961; and

WHEREAS, the system is described as the Walker-Cyanamid Exhaust Control System, with major components comprised as follows:

1. A catalytic exhaust converter (with no over-temperature bypass),
2. A diaphragm-type air pump,
3. A Carburetor throttle positioner, and
4. Specified engine adjustments and Annual tune-up;

* * * *

WHEREAS, Arvin Industries, Inc. and Universal Oil Products, Inc. filed a joint application for approval of an exhaust emission control system on February 16, 1961; and

WHEREAS, the system is described as the Arvin-UOP Exhaust Control System, with major components comprised as follows:

1. A catalytic exhaust converter (with no over-temperature bypass), and
2. A diaphragm-type air pump;

* * * *

---

* California Motor Vehicle Pollution Control Board, Resolutions 64-12, 64-14 and 64-15 (June 17, 1964).

WHEREAS, W. R. Grace & Co., Inc. and Norris Thermador Corp. filed a joint application for approval of an exhaust emission control system on May 15, 1961; and

WHEREAS, the system is described as the Grace-Norris Exhaust Control System, with major components comprised as follows:

1. A catalytic exhaust converter (with an over-temperature bypass),
2. A rotary vane-type air pump, and
3. Exhaust valve air injection;

WHEREAS, the Motor Vehicle Pollution Control Board finds that [these systems comply] with the exhaust emission standards of the State Department of Public Health of 275 PPM of hydrocarbons and 1.5% of carbon monoxide, as established pursuant to Sections 426.1 and 426.5 of the Health and Safety Code, State of California, and as determined according to established procedures of the Board; and

WHEREAS, based upon demonstrations of compliance with established procedures, the Board finds that [these systems meet] the criteria of the Board, as published in Title 13 of the California Administrative Code, Chapter 3, Subchapter 1, Article 2, Section 2103.

THEREFORE, BE IT RESOLVED,

That this Board, under the powers and authority granted in Chapter 3, (Commencing at Section 24378) Division 20 of the Health and Safety Code,

Issue a certificate of approval for the [Walker-Cyanamid Exhaust Control System, Arvin-UOP Exhaust Control System, and Grace-Norris Exhaust

Control System] for new 1966 and subsequent model motor vehicles, factory installation, in classifications (b), (c), (d), (e) and (f), pursuant to Title 13, California Administrative Code, Chapter 3, Subchapter 1, Article 2, Sections 2104 and 2105.

B. ***Approval of One Exhaust Device for 1962 and Subsequent Model Vehicles****

WHEREAS, American Machine and Foundry Co., Inc. and Chromalloy Corporation, filed a joint application for approval of an exhaust emission control system on March 7, 1961; and

WHEREAS, the system is described as the AMF-Chromalloy Mark XII-W "Smog Burner", with major components comprised as follows:

1. A direct-flame exhaust converter (with modulating bypass valve),
2. A venturi for secondary air induction,
3. A specially calibrated carburetor, and
4. Specified engine adjustments and annual tune-up;

WHEREAS, the Motor Vehicle Pollution Control Board finds that the system complies with the exhaust emission standards of the State Department of Public Health of 275 PPM of hydrocarbons and 1.5% of carbon monoxide, as established pursuant to Sections 426.1 and 426.5 of the Health and Safety Code, State of California, and as determined according to established procedures of the Board; and

---

* California Motor Vehicle Pollution Control Board, Resolution 64-13 (June 17, 1964).

WHEREAS, based upon demonstration of compliance with established procedures, the Board finds that the system meets the criteria of the Board, as published in Title 13 of the California Administrative Code, Chapter 3, Subchapter 1, Article 2, Section 2103.

THEREFORE, BE IT RESOLVED,

That this Board, under the powers and authority granted in Chapter 3, (Commencing at Section 24378) Division 20 of the Health and Safety Code,

Issue a certificate of approval for the AMF-Chromalloy Mark XII-W "Smog Burner" for 1962 and subsequent model motor vehicles, in classifications (b), (c), (d), (e) and (f), pursuant to Title 13, California Administrative Code, Chapter 3, Subchapter 1, Article 2, Sections 2104 and 2105.

C. ***Staff Report on Device Approved for 1962 and Subsequent Model Vehicles****

Based on the test data and information submitted by the applicant, the Staff concludes as follows:

1. The AMF-Chromalloy exhaust control device system complies with the emission standards of the State Department of Public Health of 275 PPM of hydrocarbons and 1.5% carbon monoxide, as determined according to the established procedures of the Board.

---

* California Motor Vehicle Pollution Control Board, Summary of Report on Exhaust Control Devices of American Machine & Foundry Company—Chromalloy Corporation, June 10, 1964, at 3-4.

2. The system complies with the Board's criteria with the following exceptions:
   (a) Adequate service life data beyond 12,000 miles are as yet lacking, nor has a specific warranty been finalized;
   (b) Comprehensive device servicing plans of the applicant beyond one year, in order that adequate performance, commensurate with the test data, be ensured, are as yet lacking;
   (c) Cost data concerning net cost of the device to the consumer is not completely definitive.
3. Affirmative action by the Board for factory installation approval implies heavy reliance on the applicant and the automobile manufacturer who utilizes the device, to scale up production of it, to correct slight malfunctions in it, and to adapt it to the variety of vehicle model options involved, without sacrificing its performance or durability.
4. A Device Servicing System which ensures proper annual maintenance of the control system is absolutely essential before the contribution of this device to reducing vehicular pollution will correspond to the emission reductions claimed for the device.
5. Because of items 3 and 4 above, it is considered necessary that the applicant be capable of, and willing to, stand behind his product during the life of the vehicles upon which it is ultimately installed.

F. STAFF RECOMMENDATIONS

1. The staff recommends certification of the AMF-Chromalloy exhaust control device.

2. The Staff further recommends that continued approval be understood to be contingent upon the applicant submitting monthly progress reports to the Board during the period prior to the time that devices are installed on vehicles, and at appropriate intervals thereafter; and that such reports show satisfactory progress in overcoming the problems cited in the conclusions above.

D. *Report to Legislature on Costs of Exhaust Devices for Used Cars**

LOUIS FULLER, APCO, LOS ANGELES COUNTY AIR POLLUTION CONTROL DISTRICT: Thank you Mr. Chairman and members of the committee, I have presented today to the Los Angeles County Board of Supervisors a report which is an analysis in depth of the existing legislation controlling motor vehicles. It takes into consideration the impact of the federal legislation, whereby the Secretary of Health, Education and Welfare, is now empowered to set standards of emissions from motor vehicles starting in the year 1968. A number of other factors are also considered in making this report: The rate at which vehicles are disappearing off the road because of age; the impact of the rising population, not only of peo-

* Transcript, Assembly [of the State of California] Committee on Transportation and Commerce, March 8, 1966: Hearing on Air Pollution Control, at 2-4.

ple, but of motor vehicles; the extent to which gasoline is being consumed, and the projections of the use of gasoline in the future. These are the facts gentlemen, which are contained in that report.

* * * *

Assuming that there were devices to control the exhaust which were applicable, which could be installed on used vehicles, if there were such devices, which there are not at the present time, and if they could be installed in the years 1960 through 1965, during the three year period 1968 through 1970 you would have an initial reduction of 420 tons per day . . . .

* * * *

However, I think you have to consider that number one, there are no devices, and number two, the price ceiling of $65 including the installation cost, is something which does not intrigue the manufacturers of the devices, plus the fact that if and when a device were perfected, it would take some time for it to be throughly tested and approved. Then there would be the year of waiting before this device could become effective. And you have the tuning up, the production, distribution, and installation so actually you are talking about another three years, assuming that a device could be perfected this year. Now you will achieve practically the same results by the disappearance of the old vehicles off the highways.

ASSEMBLYMAN DANNEMEYER: Isn't there one device on the market now?

MR. FULLER: Not to my knowledge sir.

ASSEMBLYMAN DANNEMEYER: From our hearings last year I seem to recall that there was one device.

MR. FULLER: There was a device it was approved, but the price ceiling knocked that out. They cannot compete with the $65 price.

ASSEMBLYMAN DANNEMEYER: What price did they have.

MR. FULLER: I think they were around $85 to $90.

ASSEMBLYMAN DANNEMEYER: We had a device at the last session, didn't we, that would sell for $65?

MR. FULLER: I think Mr. Norris, or Norris Thermador did.

ASSEMBLYMAN DANNEMEYER: Is he out of the picture or something?

MR. FULLER: Yes, he is concerned about the fact that it takes two approved devices plus the fact that he doesn't know what action the Legislature might take before he would invest some millions of dollars in production of such a device. He would like to have some assurance, at least this is the indication I get.

MR. FRANCIS McLAUGHLIN, REPRESENTING LOS ANGELES COUNTY BOARD OF SUPERVISORS: Mr. Dannemeyer, as I recall we did have one approved device but as you recall the law stated that there had to be two or more devices approved.

ASSEMBLYMAN DANNEMEYER: Is there a company today that will produce and install an exhaust device at a cost not to exceed $65?

MR. FULLER: Not to my knowledge.

E. *Commendation of General Motors, Ford, Chrysler and American Motors for Contributions to California Emissions Control Program**

WHEREAS, [General Motors Corporation, Ford Motor Company, Chrysler Corporation and American Motors Corporation have] actively cooperated with the State of California in its program to control emissions from motor vehicles and;

WHEREAS, this assistance has included guidance and technical help on testing, development of instrumentation, including actual experimentation with cars and devices and;

WHEREAS, much basic research by [the companies named above have] materially assisted the State of California in defining its air pollution problem as a first step toward solution and;

WHEREAS, [the companies named above], together with other car companies, voluntarily installed crankcase control systems on 1961 model California vehicles and;

WHEREAS, on August 12, 1964, [the companies named above] told the Motor Vehicle Pollution Control Board in San Francisco they would meet California requirements for exhaust emission control for most 1966 model new vehicles sold in this State,

THEREFORE, BE IT RESOLVED,

That the California Motor Vehicle Pollution Control Board;

---

* California Motor Vehicle Pollution Control Board, Resolutions 64-18, 64-19, 64-20, and 64-21 (August 12, 1964).

1. Congratulates [the companies named above] on this significant contribution to the health and well being of the citizens of California and further
2. Urges [the companies named above] to continue their outstanding developmental efforts to better control emissions from their motor vehicles.

F. *Approval of Chrysler Exhaust Emission Control System for New 1966 and Subsequent Model Vehicles**

WHEREAS, Chrysler Corporation filed an application for approval of an exhaust emission control system on July 11, 1963; and

WHEREAS, the system is described as the Chrysler "Cleaner Air Package" with major components comprised as follows:

1. A vacuum-controlled valve for deceleration ignition advance
2. Leaner carburetion
3. Retarded ignition at idle
4. Specified annual engine tuneup and adjustments

WHEREAS, the Motor Vehicle Pollution Control Board finds that the system complies with the exhaust emission standards of the State Department of Public Health of 275 PPM of hydrocarbons and 1.5% of carbon monoxide, as established pursuant to Sections 426.1 and 426.5 of the Health and Safety Code, State of California, and as determined according to established procedures of the Board; and

---

* California Motor Vehicle Pollution Control Board, Resolution 64-36 (November 18, 1964).

WHEREAS, based upon demonstration of compliance with established procedures, the Board finds that the system meets the criteria of the Board, as published in Title 13 of the California Administrative Code, Chapter 3, Subchapter 1, Article 2, Section 2103,

NOW THEREFORE, BE IT RESOLVED,

That this Board, under the powers and authority granted in Chapter 3, (Commencing at Section 24378) Division 20 of the Health and Safety Code,

Issue a certificate of approval for the "Chrysler Cleaner Air Package" for 1966 and subsequent model Chrysler Corporation motor vehicles in classifications (b), (c), (d), (e) and (f), pursuant to Title 13, California Administrative Code, Chapter 3, Subchapter 1, Article 2, Sections 2104 and 2105.

G. ***Approvals of General Motors, Ford, American Motors, International Harvester and Kaiser-Jeep Systems for New 1966 and Subsequent Model Vehicles****

WHEREAS, General Motors Corporation filed an application for approval of an exhaust emission control system on October 5, 1964; and

WHEREAS, the system is described as the General Motors "Air Injection Reactor" with major components comprised as follows:

1. engine driven air pump
2. air injection into each exhaust port

---

* California Motor Vehicle Pollution Control Board, Resolutions 65-17, 65-18, 65-19, 65-20 and 65-21 (July 14, 1965).

3. carburetor and distributor modifications
4. recommended annual maintenance; and

* * * *

WHEREAS, Ford Motor Company filed an application for approval of an exhaust emission control system on September 1, 1964; and

WHEREAS, the system is described as the Ford "Thermactor" with major components comprised as follows:

1. Engine-driven air pump
2. Air injection into each exhaust port
3. Carburetor and distributor modifications
4. Recommended annual maintenance

* * * *

WHEREAS, American Motors Corporation filed an application for approval of an exhaust emission control system on October 28, 1964; and

WHEREAS, the system is described as the American Motors "Air Guard" System with major components comprised as follows:

1. engine-driven air pump
2. air injection into each exhaust port
3. carburetor and distributor modifications
4. annual maintenance

* * * *

WHEREAS, International Harvester Company filed an application for approval of an exhaust emission control system on March 22, 1965; and

WHEREAS, the system is described as the International Harvester Air Injection Exhaust Control System with major components comprised as follows:

1. engine-driven air pump
2. air injection into each exhaust port
3. carburetor and distributor modifications
4. piston modifications on some engines
5. recommended annual maintenance

* * * *

WHEREAS, Kaiser-Jeep Corporation filed an application for approval of an exhaust emission control system on October 28, 1964; and

WHEREAS, the system is described as the "Air Guard" System with major components comprised as follows:

1. engine-driven air pump
2. air injection into each exhaust port
3. carburetor and distributor modifications
4. annual recommended maintenance

WHEREAS, the Motor Vehicle Pollution Control Board finds that [these systems comply] with the exhaust emission standards of the State Department of Public Health of 275 PPM of hydrocarbons and 1.5% of carbon monoxide, as established pursuant to Sections 426.1 and 426.5 of the Health and Safety Code, State of California, and as determined according to established procedures of the Board; and

WHEREAS, based upon demonstration of compliance with established procedures, the Board finds that [these systems meet] the criteria of the Board, as published in Title 13 of the California Administra-

tive Code, Chapter 3, Sub-chapter 1, Article 2, Section 2103.

NOW THEREFORE, BE IT RESOLVED,

That this Board, under the powers and authority granted in Chapter 3, (Commencing at Section 24378) Division 20 of the Health and Safety Code,

Issue a certificate of approval for factory installation of [these systems for 1966 and subsequent model engines in specific classifications], pursuant to Title 13, California Administrative Code, Chapter 3, Subchapter 1, Article 2, Sections 2104 and 2105.

H. *Exemption of Two Percent of 1966 Model Vehicles from Exhaust Control Requirements**

WHEREAS Section 24385(5) of the Health and Safety Code provides that the Motor Vehicle Pollution Control Board shall exempt classifications of vehicles from the mandatory provisions of the law when it is found that a device "not available"; and

WHEREAS after appropriate hearings this Board has found that there is, in fact, no exhaust control systems available for certain 1966 makes and models of motor vehicles; and

WHEREAS this non-availability is due primarily to the fact that at this time there is no practical engineering method to control these vehicles; and

---

* California Motor Vehicle Pollution Control Board, Resolution 64-2 (January 20, 1965) (exhibit amended on six subsequent occasions through Jan. 11, 1966).

WHEREAS this exemption applies to only approximately 2% of the total estimated sale of American made passenger cars and commercial vehicles including half ton pick-up trucks.

NOW, THEREFORE, BE IT RESOLVED, That

1. The list of vehicles contained in Exhibit A attached to and made a part of this resolution [exhibit omitted] shall be exempt from the mandatory provisions of the Health and Safety Code and Motor Vehicle Code in respect to exhaust controls; and
2. This exemption shall apply to 1966 model new vehicles only.

I. *Effective Decertification of Exhaust Controls Not Developed by Vehicle Manufacturers**

WHEREAS the 1965 regular session of the State Legislature passed, and the Governor signed into law, legislation which establishes new laws and legislative policy for motor vehicle air pollution control, and

WHEREAS exhaust emission control devices approved prior to July 13, 1965, were evaluated, tested, and certified by this Board based upon State law and rules and regulations which have now been changed by this legislative action, and

WHEREAS these changes must be recognized and supported by appropriate Board action.

---

* California Motor Vehicle Pollution Control Board, Resolution 65-26 (September 15, 1965); IV [California] Motor Vehicle Pollution Control Board Bulletin 1 (September 1965).

NOW, THEREFORE BE IT RESOLVED that the Certificates of Approval of Exhaust Emission Control Devices, for new cars which are not now in production and which were certified by this Board prior to July 13, 1965, shall be restricted to the extent that they shall be applicable only when the laws of this State provide for periodic compulsory servicing of exhaust control devices, and

BE IT FURTHER RESOLVED that the Certificates of Approval of Exhaust Emission Control Devices for new cars which are now in production and which were certified by this Board prior to July 13, 1965, shall be valid for the 1966 model year only, and

BE IT FURTHER RESOLVED that any exhaust device approved prior to July 13, 1965, for used cars shall be considered valid only when its cost is in compliance with the limitations in this respect which have been imposed upon used vehicle installations by the laws of this State.

BOARD RESTRICTS DEVICE APPROVAL

Unanimous action by the Motor Vehicle Pollution Control Board, meeting in San Francisco Sept. 15, restricted certification of four previously approved exhaust control systems and limited use of a fifth to 1966 model vehicles only.

The action was taken in the light of legal exclusion of mandatory maintenance for the systems. Without required annual maintenance, the Board expressed doubt that the systems would meet State standards after a year's normal operation.

At the same time, the Board was concerned over the cost to the consumer. Faced with a price limit for used vehicle exhaust controls set by the Legislature, Board members felt costs for the muffler-type system previously ok'd for used cars failed to meet that criterion.

"This does not mean that exhaust controls will not go on 1966 California vehicles," William Nissen, chairman, emphasized. "The Chrysler Cleaner Air Package is already being installed on '66 models rolling off the assembly lines, while GM, Ford, Rambler, Kaiser-Jeep and International Harvester are equipping their new cars with various versions of the air injection reactor system.

"What this does mean is that California must insist on more stringent testing methods for exhaust controls so that they can meet requirements with the maintenance practices presently typical of most California car owners," Nissen stated.